TOWARDS RESPONSIBLE WASTE MANAGEMENT IN PROTECTED AREAS: AN EVALUATION OF SOUTH AFRICAN NATIONAL PARKS MANAGEMENT PLANS

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ABSTRACT

Waste management in protected areas is crucial to maintain their integrity and protected status, yet there is increasing evidence that the complexity of governance associated with their management can underpin poor waste management practice. In the absence of integrated waste management plans applying specifically to protected areas in South Africa, it falls to the protected area management plans to become the *de facto* waste management plan. An analytical framework comprising six principles for waste management in protected areas is adopted as the basis for evaluation of the management plans, which can also be used in other country settings and future evaluations. Protected area management plans of twenty South African national parks were systematically evaluated against this analytical framework. The evaluation highlighted several weaknesses and several cross-cutting areas for improvement, such as waste-related risks not being addressed in the management plan; important considerations in introductory narratives not finding their way into objectives or actions of management programmes, as well as objectives being stated without measurable criteria or indicators, and actions without sufficient detail for implementation and monitoring. The paper suggests recommendations to enhance the inclusion of principles towards responsible waste management in future protected area management plans.

Keywords: waste management hierarchy, pollution prevention, waste services, principles, developing countries

INTRODUCTION

Waste management in protected areas has increasingly become a concern, and it is recognised that responsible waste management in such areas is crucial to preserving their ecological integrity and ensuring sustainable tourism (Przydatek, 2019; Roos et al., 2022). Internationally, protected areas are responding to waste challenges through various innovative approaches. At Mole National Park in Ghana, reuse, upcycling and plastic-selling initiatives aim to reduce pollution (Nutsugbodo et al., 2024), while Mount Kilimanjaro in Tanzania uses a 'trash-in-trash-out' system to enhance waste collection and promote recycling (Kaseva & Moirana, 2009). Similarly, in the United States, the National Park Service's 'zero landfill' initiative combines waste reduction, recycling and composting to divert waste from landfills and instil sustainable practices among park visitors (Miller et al., 2019). These international examples underscore the importance of clear, coordinated management responses, which is an aspect often complicated by the complex governance structures that shape waste management practices in protected areas (Roos et al., 2023).

In South Africa, the complexity of waste management is heightened by the fragmented division of responsibilities across national, provincial and municipal authorities. National parks and marine protected areas fall under national entities like SANParks and the Department of Forestry, Fisheries, and the Environment (DFFE), while provincial and municipal parks are managed by respective conservation authorities and local governments. Waste management is a constitutional mandate of local government, which is responsible for planning and service delivery, including waste collection, storage and disposal (RSA, 1996). These services

Signage at Mountain Zebra National Park, explaining the importance of responsible waste practices and encouraging visitors to remove their waste © Francois Retief

are coordinated through legislated Integrated Waste Management Plans (IWMPs) at a local municipality level.

The implementation plans incorporated in IWMPs primarily address waste management within the main municipal area and its residential communities, with limited attention given to remote or outlying regions such as national parks[1] (Rodseth et al., 2020). This exclusion is largely due to logistical challenges, including difficult terrain, poor access roads and long transport distances; as well as constrained municipal budgets, inadequate infrastructure and limited personnel (Viljoen et al., 2021). Consequently, national parks often lack the detailed provision for waste management planning, support and infrastructure that IWMPs offer to more urbanised and densely populated regions. These shortcomings are echoed by Du Plessis et al. (2013), who highlight persistent challenges related to ineffective waste handling in South African national parks and argue that urgent interventions are needed to improve waste management and recycling practices in these ecologically sensitive areas.

In South African national parks, the primary sources of waste include tourist accommodation and catering facilities, administrative operations, and staff and visitor lodging (Du Plessis et al., 2013; SANParks, 2018a). The waste generated is predominantly solid in nature and comprises food waste, packaging materials (such as plastics, cardboard and cans), glass, garden waste and household hazardous wastes. In more remote parks, the accumulation of waste is exacerbated by logistical constraints, including infrequent collection and limited on-site processing or recycling capacity. These realities underscore the need for targeted and context-specific waste management interventions.

In the absence of applicable municipal IWMPs, protected area management plans emerge as a pragmatic instrument for managing solid waste in South African national parks. SANParks is also developing an integrated waste management strategy for its parks. This research intends to inform this strategy by critically evaluating existing management plans against waste management principles, establishing a baseline for current performance. This framework will serve as a benchmark for assessing future waste management practices and their evolution under the new strategy.

Accordingly, the aim of this paper is to derive and apply an analytical framework for evaluating the extent to which responsible waste management is provided for in protected area management plans, using South African national parks as a case study. We believe that the derived framework will also be valuable for evaluating programmes and/or plans emanating from future waste management strategies.

1 National Parks (Parks) have been defined by the IUCN as areas to be managed for ecosystem protection and the promotion of education and recreation.

Open waste bins along the coastline at West Coast National Park - posing potential risks of loss of containment, despite efforts to reduce pollution in sensitive marine environments © Claudine Roos

Protected area management plans

Protected area management plans are comprehensive documents developed under the South African National Environmental Management: Protected Areas Act (57 of 2003) (NEM: PAA) to guide the administration and operation of these areas. They outline the goals, strategies and actions necessary to maintain and enhance the ecological, cultural and recreational value of protected areas. According to Goosen and Blackmore (2019), protected area management plans fulfil three primary functions. First, they ensure that protected areas are managed effectively, aligning with the purposes for which they were established. Second, they provide a consistent framework for management actions, ensuring continuity during transitions between different authorities or managers. Third, they serve as a transparent mechanism for the public, demonstrating that protected areas are being managed in their best interests and those of future generations.

SANParks oversees twenty national parks (Figure 1), each guided by a park management plan (PMP), which is revised every ten years. While strategic direction is provided by SANParks' head office, park-specific teams are responsible for drafting and implementing these plans. Each park operates under its own internal management structure, typically led by a Park Manager and supported by functional units like conservation, tourism, and infrastructure. Larger parks may have dedicated staff for roles such as waste management, whereas smaller parks often have limited personnel, impacting their capacity to address operational issues. Although SANParks provides templates for PMPs (Goosen & Blackmore, 2019), there is no national standard mandating the detailed coverage of issues like waste management. As a result, the inclusion of waste-related objectives may vary based on local contexts, staff capacity and available resources.

Despite their critical role in conservation, protected area management plans in South Africa have received limited research attention regarding their implementation and effectiveness (Goosen & Blackmore, 2019). Existing studies tend to focus on biodiversity and cultural heritage management (e.g. Goodman, 2003; Taru et al., 2013), with minimal evaluation of how these plans address other essential areas such as waste management. This gap in research constrains the development of effective, context-specific strategies for managing waste within protected areas.

Methods

In the absence of specific legal requirements, other criteria or established best practice principles for waste management in national parks, the evaluation uses

An open bin with scattered waste in Golden Gate Highlands National Park, likely disturbed by monkeys or baboons - underscoring ongoing human-wildlife waste conflicts in protected areas © Claudine Roos

the principles proposed by Roos et al. (2023) in their paper *'Proposing principles towards responsible waste management in South African protected areas'*. In short, these principles include:

Principle 1. Protection of ecosystems and biodiversity: This principle aims to ensure that waste is managed to avoid damage to unique and endemic species, ecosystems and habitats. To achieve no net loss of biodiversity, waste infrastructure should be located outside sensitive areas while remaining accessible to park users. This aims to ensure that ecological integrity is maintained, as even minor impacts in protected areas can be considered significant.

Principle 2. Prevention and remediation of pollution: Principle 2 advocates for the responsible management and disposal of waste, as well as the prevention of littering and illegal dumping to avoid pollution and contamination as far as possible. It furthermore requires the remediation and rehabilitation of areas that have been contaminated by waste.

Principle 3. Implementation of the waste management hierarchy: The waste management hierarchy aims to avoid, minimise, re-use, recycle and recover waste, with disposal as the last resort. Principle 3 requires that the waste management hierarchy is considered and implemented in protected areas as far as possible.

Principle 4. Provision of effective waste services and infrastructure: This principle emphasises the need for planned, reliable waste services, including collection, transportation and disposal, as well as appropriate infrastructure such as bins, separation and composting facilities, and transfer or treatment stations within protected areas. In the South African context, many protected areas are situated in remote or rural locations where municipal waste services are limited or entirely absent. Logistical challenges, such as long distances and wildlife interference, combined with financial constraints, complicate service provision. Consequently, management authorities are often required to establish and manage these services independently or through private sector partnerships. To ensure environmental compliance and legal alignment, institutional frameworks must allocate dedicated budgets, personnel and capacity.

Principle 5. Promotion of participation and building of partnerships: This principle emphasises the importance of meaningful stakeholder participation and sustainable partnerships in waste management. Engaging interested and affected parties, including local communities and Indigenous groups, ensures that waste

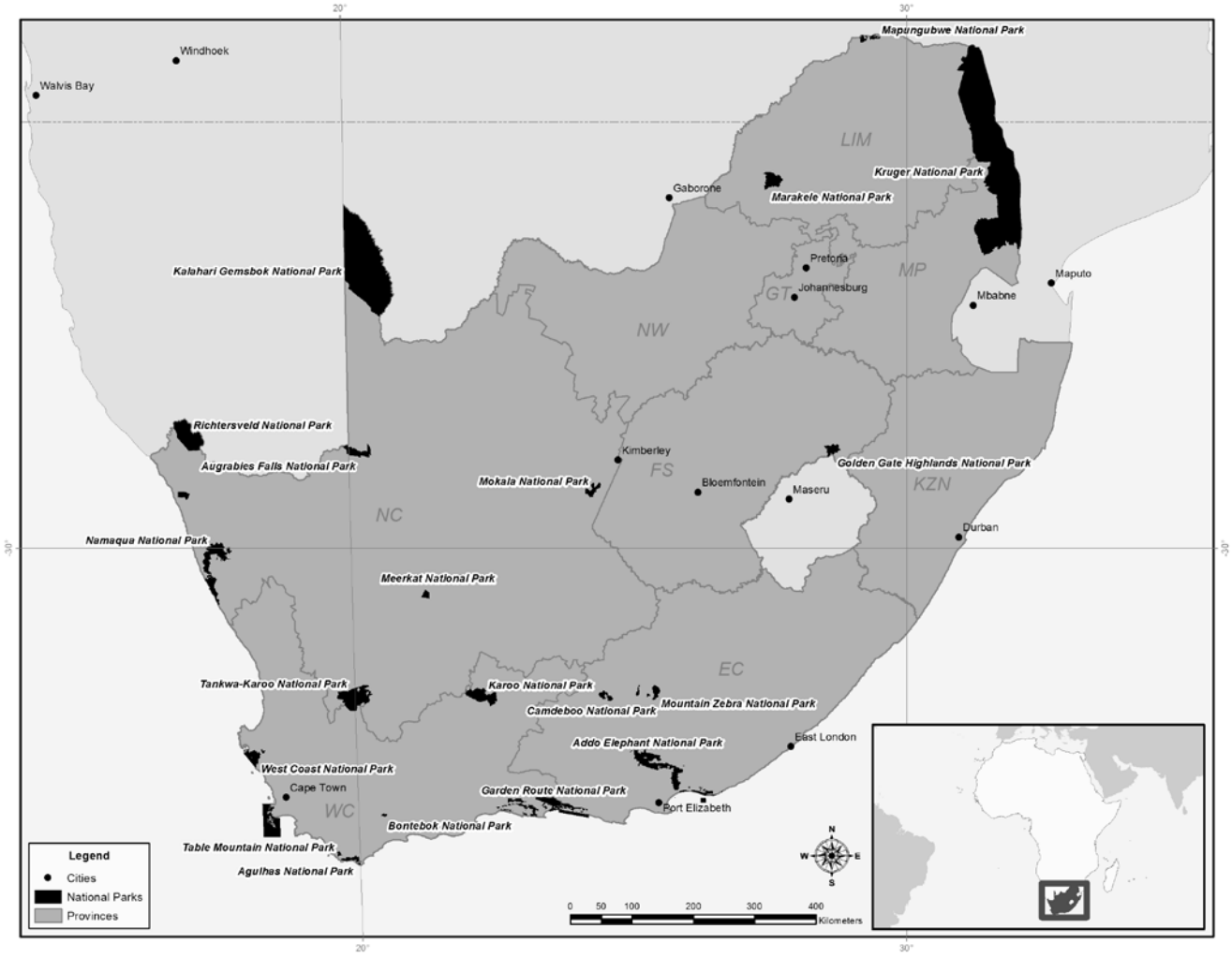

Figure 1. Map of the twenty national parks in South Africa.

practices are appropriate, accepted and informed by local knowledge. Traditional and Indigenous knowledge can support the development of context-sensitive solutions, while inclusive consultation fosters ownership, trust and long-term success.

Principle 6. Contribution to well-being, livelihood and capacity: Waste management in protected areas can support community well-being through job creation, skills development and livelihood opportunities. This includes integrating local communities and the informal waste sector into circular economy initiatives. Building local capacity through education, awareness and training is essential to enable effective waste management and unlock related opportunities.

These principles align with South African environmental and waste legislation and have been contextualised for protected areas based on the objectives of protected area and biodiversity legislation. They also draw on international principles, guidelines, and good or best practices for waste, biodiversity, ecotourism and protected area management (see Roos et al., 2023 for detail). Including these principles in management plans would support compliance with both legal requirements and international best practices.

Although only published in 2023 and not legally required, the principles are valuable as an evaluation tool. Assessing their inclusion in current management plans provides insight into the current state of waste management planning and serves as a baseline for evaluating alignment with best practice. This, in turn, informs recommendations for improving management actions and guiding future plans. The same principles can be used to evaluate future integrated waste management plans or strategies, helping determine whether these contribute to improved waste management in South Africa's national parks.

A case study approach was used, focusing on South Africa's national parks. Final, approved park management plans (PMPs) were obtained for all selected parks. Most PMPs were developed after 2014 (Table 1), although five (Bontebok, Camdeboo, Marakele, Tankwa Karoo, and West Coast) were under revision during the study.

Table 1. National parks included in the evaluation with the date and status of their park management plans (PMPs).

Park and management plan	Province	Management plan date	Status
Addo Elephant National Park (SANParks, 2015a)	Eastern Cape	2015–2025	Approved October 2015
Agulhas National Park (SANParks, 2020a)	Western Cape	2020–2029	Approved December 2020
Augrabies Falls National Park (SANParks, 2024)	Northern Cape	2024–2033	Approved March 2024
Bontebok National Park (SANParks, 2013a)	Western Cape	2013–2023	Approved September 2013, being revised
Camdeboo National Park (SANParks, 2013b)	Eastern Cape	2013–2023	Approved September 2013, being revised
Garden Route National Park (SANParks, 2020b)	Western Cape and Eastern Cape	2020–2029	Approved December 2019
Golden Gate Highlands National Park (SANParks, 2020c)	Free State	2020–2029	Approved December 2020
Karoo National Park (SANParks, 2017a)	Western Cape	2017–2027	Approved September 2017
Kgalagadi Transfrontier Park (SANParks, 2023a)	Northern Cape	2023–2027	Approved August 2023
Kruger National Park (SANParks, 2018a)	Mpumalanga and Limpopo	2018–2028	Approved November 2018
Mapungubwe National Park (SANParks, 2019)	Limpopo	2019–2028	Approved November 2019
Marakele National Park (SANParks, 2014a)	Limpopo	2014–2024	Approved November 2014, being revised
Meerkat National Park (SANParks, 2022)	Northern Cape	2022–2031	Approved September 2022
Mokala National Park (SANParks, 2017b)	Northern Cape	2017–2027	Approved September 2017
Mountain Zebra National Park (SANParks, 2016)	Eastern Cape	2016–2026	Approved May 2016
Namaqua National Park (SANParks, 2023b)	Northern Cape	2024–2033	Approved July 2023
Richtersveld National Park (SANParks, 2018b)	Northern Cape	2018–2028	Approved August 2018
Table Mountain National Park (SANParks, 2015b)	Western Cape	2015–2025	Approved April 2016
Tankwa Karoo National Park (SANParks, 2014b)	Western Cape and Northern Cape	2014–2024	Approved November 2014, being revised
West Coast National Park (SANParks, 2013c)	Western Cape	2013–2023	Approved September 2013, being revised

Each PMP was systematically reviewed to assess its provision for waste management. A data mining approach was used to search for keywords such as *'waste', 'waste management', 'litter', 'littering', 'refuse', 'garbage', 'pollution', 'barrier'*, and *'micro-plastic'* across all sections of each PMP – including introductory text and specific programme content. These programmes are usually presented in tables detailing objectives, sub-objectives, actions, responsibilities and the Portfolio of Evidence (PoE). Each reference was then assessed against the six responsible waste management principles. The level of inclusion was categorised as follows (see Table 2): Addressed (A) indicated in green; Partially addressed (B) indicated in yellow; or Not addressed (C) indicated in orange.

Table 2: Extent to which proposed principles for responsible waste management are provided for in the park management plans (PMPs) of twenty South African national parks, with A = addressed (green), B = partially addressed (yellow), C = not addressed (orange)

Park management plans	**Principle 1:** Protection of ecosystems and biodiversity	**Principle 2:** Prevention and remediation of pollution	**Principle 3:** Implementation of the waste management hierarchy	**Principle 4:** Provision of effective waste services and infrastructure	**Principle 5:** Promotion of participation and building of partnerships	**Principle 6:** Contribution to well-being, livelihoods and capacity
Addo Elephant National Park	C	C	C	B	C	C
Agulhas National Park	C	C	A	B	C	C
Augrabies Falls National Park	C	C	A	A	B	C
Bontebok National Park	C	C	C	C	C	C
Camdeboo National Park	C	C	C	C	C	C
Garden Route National Park	C	A	A	B	C	C
Golden Gate Highlands National Park	C	C	A	A	C	B
Karoo National Park	C	C	C	A	C	C
Kgalagadi Transfrontier Park	C	C	C	B	C	C
Kruger National Park	C	B	A	A	A	A
Mapungubwe National Park	A	C	A	A	C	C
Marakele National Park	C	C	C	C	C	C
Meerkat National Park	C	C	C	C	C	C
Mokala National Park	C	C	C	B	C	C
Mountain Zebra National Park	C	C	C	B	C	C
Namaqua National Park	C	C	A	B	C	C
Richtersveld National Park	C	C	C	B	C	C
Table Mountain National Park	C	C	C	C	C	C
Tankwa Karoo National Park	C	B	C	C	C	C
West Coast National Park	C	B	C	C	C	C

RESULTS AND DISCUSSION

Table 2 provides the results of the evaluation of the twenty national parks' management plans against the six principles proposed for responsible waste management in protected areas.

Extent to which proposed principles for responsible waste management in protected areas are addressed in park management plans

Most park management plans made some reference to waste management, although in a limited way. Five of the twenty plans did not include waste management in any programme but mentioned rules such as 'no littering' and 'disposal of waste in bins' in the appended internal park regulations. Similarly, some plans identified 'littering', 'waste disposal' and 'poor waste management practices' as threats in the narrative sections but failed to translate these into concrete actions within their programme components. The best-performing plan was that of Kruger National Park, which mentioned 'waste' sixteen times, addressed four principles and partially addressed a fifth.

Principle 1: Protection of ecosystems and biodiversity

Principle 1 emphasises the conservation of ecosystems and biodiversity within protected areas to ensure they provide services, value and benefits for current and future generations. This principle underscores the importance of achieving no net loss to biodiversity through effective waste management practices that avoid damage to unique, endemic, threatened or declining species, habitats and ecosystems (Roos et al., 2023).

Of the twenty national parks (Table 2), only Mapungubwe National Park addressed (A) Principle 1 in the context of managing human–wildlife conflicts. This programme

provides for *"monitoring the implementation and effectiveness of an integrated waste management plan to minimise human–wildlife conflict issues"* (SANParks, 2019: 104). At the time of the research, it could not be established whether an IWMP had been developed and implemented.

The fact that only one out of twenty national parks has addressed Principle 1 highlights a significant gap in the consideration of waste management measures towards the protection of ecosystems and biodiversity. To address this gap, national parks should acknowledge the ecological risks of poor waste management, such as pollution, habitat degradation and harm to wildlife. Waste-related risks should be integrated into biodiversity conservation strategies and ecological monitoring. Parks can adopt preventative measures like wildlife-proof bins, anti-littering enforcement and clean-up operations in high-risk areas. Management objectives should link waste reduction to ecosystem protection and include measurable indicators to track progress. Strengthening this principle supports both biodiversity conservation and alignment with broader environmental mandates.

Principle 2: Prevention and remediation of pollution

Four of the twenty park management plans have addressed (A) or partially addressed (B) Principle 2 (Table 2), which aims at the prevention, minimisation, mitigation and remediation of pollution.

The Garden Route National Park management plan identifies *"lack of proper waste management"* and *"litter, illegal dumping and ineffective waste management"* as threats to the park's vital attributes (SANParks, 2020b: 42–43). It includes a sub-objective to ensure responsible waste management, with actions such as reviewing current practices to support pollution prevention. Similarly, the Kruger National Park plan lists *"pollution from refuse"* as a threat (SANParks, 2018a: 43). While the Freshwater Ecosystem Programme notes groundwater monitoring linked to sanitation and waste disposal (SANParks, 2018a: 111), no further waste-related monitoring is outlined in the plan's action programmes. Furthermore, the management plans of Tankwa Karoo and West Coast National Parks address waste management within the Environmental Management Programme, highlighting the need to identify environmental impacts and legal requirements, set objectives and targets, and implement, monitor and review actions for continuous improvement (SANParks, 2013c: 50; SANParks, 2014b: 62). Lastly, the narrative section of the Management Programme for

Waste separation bins at Malelane Camp, Kruger National Park, with an elephant in the background - a visual reminder of the intersection between conservation infrastructure and wildlife presence © Claudine Roos

the Langebaan Ramsar site included in the West Coast National Park management plan (SANParks, 2013c: 96–102) highlights the duty to *"Ensure all waste and sewage discharges within the Lagoon and catchment of the aquifers are appropriately licensed (Lead Agency: Saldanha Bay Municipality, Priority: High)"*.

These provisions partially align with Principle 2, focusing on the minimisation of impacts and the prevention of pollution. No specific mention is, however, made of waste management in the Environmental Management Programme objectives or actions.

Principle 3: Implementation of the waste management hierarchy

Principle 3 considered the extent to which management plans addressed the implementation of the waste management hierarchy, (i.e. the extent to which waste is avoided, minimised, reused, recycled or recovered). Principle 3 was most frequently provided for in the evaluated management programmes, with seven of the twenty management plans addressing (A) the implementation of the waste management hierarchy (Table 2).

Several national park management plans integrate waste management into their Responsible Tourism Programmes, with an emphasis on waste minimisation and recycling. Parks such as Agulhas, Augrabies Falls, Golden Gate Highlands, Kruger, Mapungubwe and Namaqua have sub-objectives to *"use local resources sustainably"* and *"minimise waste and recycle",* in line with Principle 3. However, only the Kruger National Park management plan specifies a measurable target, aiming for a 30 per cent reduction in solid waste over seven years through initiatives such as plastic reduction and partnerships with recycling companies (SANParks, 2018a: 163).

The Climate Change Programmes of these parks highlight increased recycling but do not provide concrete actions. Kruger National Park is also unique in focusing on changing human behaviour towards waste management through education for both staff and tourists (SANParks, 2018a: 179), although research suggests that such efforts alone may not suffice without additional strategies (Strydom, 2018). Augrabies Falls National Park mentions performing a lifecycle assessment of waste for recycling opportunities, but this is not formalised in the action plan. The Garden Route National Park stresses waste reduction and resource-efficient designs for new activities, redesigns and upgrades (SANParks, 2020b: 93), while Namaqua National Park includes waste minimisation in its infrastructure planning but provides no further details in its action plan (SANParks, 2023b). This emphasises the importance of providing for waste management considerations in environmental impact assessment (EIA) processes for developments in protected areas, as highlighted by Claassens et al. (2022).

Despite the frequent inclusion of Principle 3 provisions in the evaluated management plans, many of these provisions lack specific targets or key performance indicators for waste reduction or recycling. Furthermore, many sections of text in the narrative parts of the management plans are not translated into concrete objectives and actions (as part of programmes), risking that these measures will not be effectively addressed.

Principle 4: Provision of effective waste services and infrastructure

Principle 4, which advocates for the provision of effective waste services and infrastructure, was also frequently provided for in the management plans, with five of the management plans addressing (A) and eight of the management plans partially addressing (B) this principle (Table 2).

The Infrastructure Programmes of the park management plans for Augrabies, Golden Gate Highlands, Kruger and Mapungubwe National Parks include a sub-objective to ensure the maintenance and upgrading of solid waste infrastructure. The specific actions for this sub-objective include compiling an inventory of existing infrastructure to assess the required maintenance and implementing an annual maintenance plan. These actions represent an essential first step in providing effective waste services and infrastructure within the parks. The research project *'Perspectives on the Future of Waste Management in South African Protected Areas',* funded by the South African Department of Science and Innovation (DSI) and the Council for Scientific and Industrial Research (CSIR), aims to assess the status of waste management infrastructure in national parks, contributing to the inventory of waste-related infrastructure.

Other national parks, such as Addo Elephant, Agulhas, Garden Route, Karoo, Kgalagadi, Mokala, Mountain Zebra, Namaqua and Richtersveld, partially address Principle 4 in their Infrastructure Programmes, which reference the *'touching the earth lightly'* principle, including waste management infrastructure. However, these plans do not provide detailed specifications for the required infrastructure or integrate waste management into specific management objectives or actions.

The management plans for Karoo and Garden Route National Parks stand out by including more specific provisions related to waste management services and infrastructure. Karoo National Park's Environmental Management Programme includes a sub-objective to *"coordinate and implement effective waste management (solid and fluids)"* (SANParks, 2017a: 97), though it refers to *'Waste Management Policies'* without further details. The Terrestrial Ecosystems Management Programme of Garden Route National Park also addresses *"appropriate infrastructure designs and effective waste disposal"* as part of a sub-objective focused on managing the human–wildlife interface, though no detailed actions or specific infrastructure designs are outlined in the plan (SANParks, 2020b).

More detailed management actions, with allocation of budget, timeframes and responsible persons would be required to ensure that waste management infrastructure and services are effectively implemented in these parks.

Principle 5: Promotion of participation and building of partnerships

Objectives and actions towards the achievement of Principle 5, focusing on the promotion of participation and building of partnerships, were poorly addressed in the park management plans evaluated. Only one management plan (Kruger National Park) addressed this principle (A), while another management plan (Augrabies Falls National Park) partially addressed it (B) (Table 2).

The Integrated Land Use and Regional Planning and Management Programme of the Kruger National Park includes a sub-objective to promote responsible natural resource management and land restoration, with an action to *"develop guidelines, criteria, and programmes for co-operative waste management within adjacent communities"* (SANParks, 2018a: 86). Additionally, the Kruger management plan's Infrastructure Programme outlines an action to develop an MoU with recycling companies to purchase recyclable products (SANParks, 2018a: 163), supporting the park's 30 per cent waste reduction target over the next 7 years. These provisions align with Principle 5, which encourages partnerships to address waste management.

Although not formally integrated into any specific programmes, the Augrabies Falls National Park management plan partially addresses Principle 5. The plan notes that the park collaborates with various organisations, such as the Park Forum, Kakamas Water Users Association and the Kai! Garib Environmental Forum, to share information, support cultural initiatives, and enhance waste and sanitation management in the surrounding municipalities (SANParks, 2024: 71).

While these collaborations align with Principle 5, which emphasises the importance of partnerships and stakeholder engagement in addressing waste management challenges, it is crucial that these efforts are formally recognised and integrated into park management plans. Specifically, incorporating these collaborations into the Stakeholder Engagement or Communications Programmes would ensure that partnerships are strategically managed, clearly defined and effectively coordinated. This formal integration would also enhance transparency and accountability, allowing for better tracking of joint initiatives and their outcomes. Moreover, by institutionalising these partnerships within park management plans, the park can establish clear frameworks for cooperation, allocate appropriate resources, and ensure that stakeholders, including local communities and external partners, are provided for.

A vervet monkey "investigating" waste separation bins at Pretoriuskop Camp, Kruger National Park © Claudine Roos

Principle 6: Contribution to well-being, livelihoods and capacity

Lastly, Principle 6 acknowledges the contribution that responsible waste management could make towards well-being, livelihoods and capacity building. This principle is poorly provided for in the management plans of national parks, with Principle 6 being addressed (A) in only one management plan (Kruger National Park) and partially addressed (B) in another management plan (Golden Gate Highlands National Park) (Table 2).

The Integrated Land Use and Regional Planning Programme of Kruger National Park includes a sub-objective to promote responsible resource management and land restoration. This involves developing guidelines and programmes to support co-operative

Educational signage discouraging littering at Golden Gate Highlands National Park - part of ongoing visitor awareness and environmental stewardship initiatives © Claudine Roos

waste management with adjacent communities, linking to environmental education and socio-economic development (SANParks, 2018a: 86). These initiatives could foster capacity building, skills development, job creation and enhance livelihoods. Similarly, the Golden Gate Highlands National Park management plan's Socio-economic Transformation Programme highlights various community development programmes, including waste management and the Extended Public Works Programme (EPWP), but lacks further details on waste management actions (SANParks, 2020c: 105).

Similar to what was suggested under Principle 5, park management plans could include more specific actions and measurable objectives related to waste management in the context of community development. This could involve incorporating waste management as a key component of local socio-economic programmes, with clear targets for waste reduction, recycling and job creation in the surrounding communities. Additionally, formalising partnerships with local stakeholders (see Principle 5) could enhance collaboration and ensure that waste management initiatives are effectively integrated into broader strategies.

CONCLUSIONS

In the absence of forthcoming integrated waste management strategies and plans, protected area management plans are a potentially valuable instrument for managing waste in national parks. Therefore, this paper aimed to evaluate the extent to which responsible waste management principles are provided for in the management plans of twenty South African national parks to inform future waste management plans and practices, thus leading to improved adoption of the principles. The findings reveal that, apart from two principles *(Principle 3: Implementation of the waste management hierarchy* and *Principle 4: Provision of effective waste services and infrastructure),* most park management plans make insufficient provision for the proposed principles towards responsible waste management.

Beyond the incomplete coverage of the principles, several cross-cutting weaknesses were identified. In several park management plans, waste-related concerns such as littering, pollution and inadequate waste disposal are recognised as environmental risks or threats. However, these are often not translated into actionable objectives or interventions within the structured management programmes. Similarly, waste management is sometimes acknowledged in the narrative introductions of programme sections, but not incorporated into the formal objectives, actions or performance indicators. Where objectives and actions are included, they tend to be generalised and lack the specificity required for effective implementation, monitoring and reporting.

Several contextual and systemic factors may explain why many South African protected areas fail to sufficiently address waste management in their management plans. Many parks are located in remote or rural areas, where access to municipal waste services is limited or entirely absent. This places the full responsibility for planning,

funding and implementing waste services on park management authorities, many of which operate under severe financial and capacity constraints. Furthermore, waste management is often deprioritised in favour of more visible conservation issues such as biodiversity protection or anti-poaching efforts. Limited technical expertise, a lack of dedicated waste management staff, and the absence of clear national guidelines or enforcement mechanisms for waste planning in protected areas further contribute to these shortcomings (Roos et al., 2023).

These systemic challenges are further reflected in the inconsistent provision for waste management across park management plans. Although SANParks is the statutory authority responsible for drafting and implementing park management plans for all national parks in South Africa (Goosen & Blackmore, 2019), there is significant variation in how these plans address waste management. This disparity can be attributed to several factors, one of which is the lack of detailed, national-level guidance or regulation specifically requiring consistent waste management planning within management plans.

Recommendations to address cross-cutting weaknesses and to enhance the inclusion of responsible waste management principles into future protected area management plans include:

- Strengthening strategic planning and implementation: Waste management should be integrated into all stages of park planning, with clear objectives, measurable indicators, budgets and responsible personnel. Objectives should align with biodiversity and habitat protection, addressing pollution and litter risks in sensitive environments.
- Institutionalising governance and accountability: To address fragmented responsibility, governance structures should be formalised within parks and institutions. Multi-stakeholder committees, including park staff, municipalities and community representatives, can improve coordination and accountability. SANParks should assign clear mandates and performance targets for waste management.
- Promoting adaptive and participatory management: Adopt adaptive co-management frameworks that allow for iterative learning, stakeholder input and regular performance reviews. Stakeholder participation may enhance compliance, local ownership and socio-economic opportunities related to waste, including education and job creation.
- Mainstreaming waste management across conservation mandates: Waste management must be integrated into conservation goals, alongside biodiversity protection. Management plans should include waste considerations as part of ecological risk assessments, biodiversity monitoring and habitat protection.
- Enhancing environmental education and information dissemination: Educational efforts should be directed not only at local communities and park staff but also at tourists, who are key actors in waste generation. Visitor-focused interventions, such as interpretive signage, information boards and digital communication platforms, can foster awareness, encourage responsible behaviour and support waste reduction at source.

We recognise that improving the content of protected area management plans does not in itself guarantee the implementation of effective waste management. However, failure to incorporate these responsible waste management principles does reduce the likelihood of effective implementation since actions and budgeting are linked to the plans. This research serves as a first step in improving waste management planning towards more effective waste management in the context of protected areas. The proposed evaluation framework may be useful in evaluating future waste management plans or programmes developed for national parks.

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RESUMEN

La gestión de los residuos en las áreas protegidas es fundamental para mantener su integridad y su condición de protegidas, pero cada vez hay más pruebas de que la complejidad de la gobernanza asociada a su gestión puede dar lugar a prácticas deficientes en este ámbito. A falta de planes integrados de gestión de residuos que se apliquen específicamente a las áreas protegidas de Sudáfrica, corresponde a los planes de gestión de las áreas protegidas convertirse en el plan de gestión de residuos *de facto*. Se ha adoptado un marco analítico que comprende seis principios para la gestión de residuos en las áreas protegidas como base para la evaluación de los planes de gestión, que también puede utilizarse en otros contextos nacionales y en futuras evaluaciones. Se han evaluado sistemáticamente los planes de gestión de veinte parques nacionales sudafricanos con arreglo a este marco analítico. La evaluación puso de relieve varias deficiencias y varios ámbitos transversales que deben mejorarse, como la falta de atención a los riesgos relacionados con los residuos en el plan de gestión; la ausencia de consideraciones importantes en las narrativas introductorias que no se reflejan en los objetivos o las medidas de los programas de gestión, así como la formulación de objetivos sin criterios o indicadores medibles y medidas sin detalles suficientes para su aplicación y seguimiento. El documento formula recomendaciones para mejorar la inclusión de principios para una gestión responsable de los residuos en los futuros planes de gestión de las áreas protegidas.

RÉSUMÉ

La gestion des déchets dans les zones protégées est essentielle pour préserver leur intégrité et leur statut protégé, mais il apparaît de plus en plus clairement que la complexité de la gouvernance associée à leur gestion peut être à l'origine de mauvaises pratiques en matière de gestion des déchets. En l'absence de plans de gestion intégrée des déchets s'appliquant spécifiquement aux zones protégées en Afrique du Sud, il incombe aux plans de gestion des zones protégées de devenir le plan de gestion des déchets *de facto*. Un cadre analytique comprenant six principes pour la gestion des déchets dans les zones protégées est adopté comme base pour l'évaluation des plans de gestion, qui peut également être utilisé dans d'autres contextes nationaux et pour des évaluations futures. Les plans de gestion de vingt parcs nationaux sud-africains ont été systématiquement évalués à l'aide de ce cadre analytique. L'évaluation a mis en évidence plusieurs faiblesses et plusieurs domaines transversaux à améliorer, tels que les risques liés aux déchets qui ne sont pas pris en compte dans le plan de gestion, les considérations importantes dans les descriptions introductives qui ne se retrouvent pas dans les objectifs ou les actions des programmes de gestion, ainsi que les objectifs énoncés sans critères ou indicateurs mesurables et les actions sans détails suffisants pour leur mise en œuvre et leur suivi. Le document formule des recommandations visant à renforcer l'intégration des principes d'une gestion responsable des déchets dans les futurs plans de gestion des zones protégées.