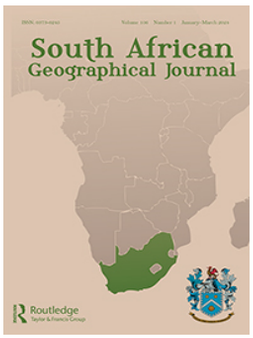

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Conservation corridors and ecological networks in South Africa: shortcomings of environmental legislation and policies

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ABSTRACT

Protected areas have long been the leading strategy to combat habitat fragmentation. However, studies have shown that this traditional approach can create habitat islands where populations are isolated, leading to their eventual extinction. As a result, conservation strategies have shifted to include more landscape-focused methods, including conservation corridors and ecological networks. However, what is not yet known is the extent to which South Africa's legislative and policy frameworks support this move. We identified and reviewed legislation and policies on conservation and protected areas in South Africa between 1976 to 2021 and outlined their shortcomings regarding a shift towards landscape-focused initiatives. None of the seven acts reviewed describe, protect, or enforce progressive landscape-based conservation methods. South Africa's environmental legislation is embedded in establishing and creating traditional protected areas while disregarding other methods. Moreover, the non-statutory policies reviewed were monotonous and had a limited scope that failed to provide an integrated and coordinated approach to conservation. Despite the plethora of protected area legislation and policies, South Africa's conservation approaches remain uninspiring and steadfast in traditional methods and have failed to evolve in 45 years.

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Environmental legislation; environmental policies; conservation corridors; ecological networks; landscape conservation; protected areas

1. Introduction

Modern-day development and industrialization are a hallmark of our society; however, these advancements pose a growing threat to the world's biodiversity and ecosystem functionalities (Barnosky et al., 2011; Ceballos et al., 2015; IPBES, 2019; Kolipakam et al., 2019). An increase in habitat loss, habitat fragmentation, rapid industrialization, changes in climate and variability, and increased levels of environmental pollution have put ecosystems and landscapes under immense pressure (Darkoh, 1997; Karlsson et al., 2018; Nazeer et al., 2016; Pachauri and Meyer, 2014; Qureshi et al., 2015; Tie & Cao, 2009; Wilson et al., 2016). To navigate this, countries depend heavily on environmental legislation for policies, regulations, guidelines, parameters, principles, and implementation procedures that regulate, manage and monitor activities that encroach on or

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threaten natural land and biodiversity (King et al., 2018). New policies that accommodate the ever-changing nature of biodiversity conservation and landscape ecology have emerged, and initiatives that protect biodiversities, such as protected areas, ecological networks, and conservation corridors, are encouraged.

Globally and in South Africa, protected areas have long been the popular and preferred choice in biodiversity conservation to protect against habitat fragmentation. Between 6–13% of South Africa's landscape is formally protected, with private protected areas significantly contributing to this number (Nel et al., 2017; Petersen et al., 2017). South Africa established the first conservancies in the mid-19th century after passing the Forest and Herbage Preservation Act 18 of 1859, which led to a plethora of environmental legislation focusing on protected natural environments, special nature reserves, and protected areas- both public and private (Steyn & Wessels, 2000). However, a shift has occurred in ecology studies where protected areas are no longer the panacea to habitat fragmentation (Mora & Sale, 2011; Venter et al., 2014). Protected areas may not effectively conserve biodiversity from a wide range of threats, often have financial constraints, implementation issues, and location biases, and may result in habitat islands (Mora & Sale, 2011; Newmark, 1996; Venter et al., 2014). Some studies have also shown that protected areas may create 'extinction debt' where the eventual extirpation of species in isolated areas is inevitable (Báldi & Vörös, 2006; Carroll et al., 2004; Malanson, 2002). Biodiversity conservation has stepped away from solitary fortress-style conservation in the form of protected areas and now encourages more progressive methodological innovations (Mathur & Sinha, 2008; Sharma et al., 2007). One such innovation is conservation corridors- a term often used interchangeably with ecological networks. Conservation corridors are areas of natural land that link protected national and private areas and are generally considered a successful conservation method (see Haddad et al., 2000; Joubert van der Merwe et al., 2019; Kietzka et al., 2015; Laborda et al., 2018; Lindenmayer & Hobbs, 2007). Corridors encourage the movement and migration of fauna and flora, enhance the variability of species populations, prevent species extinction, and protect threatened landscapes (Beier, 2018; Simberloff & Cox, 1987). There have been numerous studies on conservation corridors in South Africa, and their potential as a conservation tool is stressed (Dalziel & Evans, 2023). However, what is not yet known is to what extent South Africa's legislative and policy frameworks support and promote corridors and networks. We seek to determine whether these laws and policies advise and advocate for corridor implementation and management. Clear jurisdictional guidelines are especially prevalent as national and private protected areas comprise South Africa's conservation estate.

In addition, due to its past, conservation in South Africa goes hand in hand with political and social issues that shape how protected areas are managed and perceived today. This paper briefly traces the history and complexities of conservation in South Africa before identifying and reviewing fundamental legislative and policy frameworks supporting South African biodiversity conservation. We explore legislation and policies from 1976 to 2021 and outline the focus and shortfalls of these acts and policies regarding landscape ecology initiatives. As traditional protected areas are no longer the preferential choice for conservation, legislation and policies encompassing different landscape ecology methods are vital to ensure they are well established, conserve landscapes effectively, and meet their aims and objectives.

2. Context of protected areas and conservation in South Africa

2.1 South Africa's environmental and protected area history

Colonialism and Apartheid are important strands in South Africa's protected area and broader conservation history. These two forces shaped protected areas in South Africa and how the government and people view these areas today. Colonialism fostered the notion that nature could only be conserved and protected through dispossessing and excluding people (Martínez-Alier, 2001). During colonial conquests, fences ensured control and occupation as conservation through preservation became prevalent. By the 1920s and 1930s, two opposing views on wildlife management existed. The first was a holistic, *laissez-faire* approach where nature would not be manipulated or altered (Carruthers, 2008). This fortress-style conservation saw a hands-off and people-out approach to protected areas. During this time, South Africa's environmental legislation allowed for the declaration and protection of protected areas. However, the management of the parks was ineffective as non-professionals, often with military backgrounds, were left to run the parks without management plans (Goosen & Blackmore, 2019). Colonialism set a precedent for conservation during Apartheid which included the dispossession and segregation of citizens to create protected areas (Brooks, 2005; Carruthers, 2008; Gewald et al., 2018). The Natives Land Acts 27 of 1913 and Act 18 of 1936 (Union of South Africa, 1913, 1936) restricted the majority of the population to only 13% of the land in South Africa and was a way to control land, land use, and resources and assert power over people (Cock & Fig, 2000; Ramutsindela, 2004). The Union of South Africa disregarded environmental issues to increase economic activity and grow its military (Steyn, 2001). Early conservation in South Africa reflected complex power and social relations.

As political tension increased in the country, a second approach to wildlife management emerged. From the 1940s until the 1990s, 'management by intervention' was adopted, which saw what Cock and Fig (2000) termed 'double exclusion', where most of the population could not visit parks and were excluded from decision-making processes. National parks remained a symbol of exclusion, and protected areas reflected the government's domestic policies. The government's approach to wildlife management aligned with their authoritarian regime as a manipulative command and control approach strengthened through the decades.

2.2 Complexities and the politics of conservation post-Apartheid

Post-Apartheid conservation efforts, including co-management, community-based conservation, and improved public participation, sought to relinquish previous conservation approaches rife with political agendas while also catching up to global conservation targets (Kepe, 2008; Ngubane & Brooks, 2013; Olivier, 2013). Co-management aims to reconcile land claims while conserving biodiversity (Gewald et al., 2018). Post-1994 saw dispossessed people claim rights to land that now fell under protected areas and conservancies (Olivier, 2013). However, in the early 2000s, the government clarified that conservation was an issue of land management, not ownership (Kepe, 2008; Ngubane & Brooks, 2013). Co-management and land reform programmes aiming to undo past injustices have been heavily criticized in the literature and branded as unsuccessful

initiatives (Carlos Bezerra & Paphitis, 2021; Kepe et al., 2005; Kepe, 2008; Ngubane & Brooks, 2013). Another method used to include communities post-democracy is public participation. Public participation seeks to include affected communities in pre-development decisions and discussions (Kidd, 1999). Previous acts, specifically the Environmental Conservation Acts, Act 100 (Republic of South Africa, 1982 Act 73 Republic of South Africa, 1989), had weak public participation processes. However, the National Environmental Management Act of 1998 (Republic of South Africa, 1998) saw the introduction of provisions which allowed more thorough public participation (Kidd, 1999).

Today, policies attempt to balance development and social factors with the pressing need to conserve biodiversity. National parks initially reflected power structures, appropriated land, and asserted identities. South Africa's past was inimical to society, power relations, identity, and conservation perceptions and practices, which are still seen today. Protected areas still protect land rights and hide behind the conservation façade. The conversion of land for apparent ecological reasons further drives exclusion and reasserts power dynamics, creating politically and economically contested spaces (Brandt & Spierenburg, 2014; Kamuti, 2014). National parks still have social consequences (see Ramutsindela, 2004). However, a significant shift is rapidly transpiring where protected areas are utilized far less in biodiversity conservation.

2.3 Conservation territorialization

The late 1990s and early 2000s saw the popularization of peace parks and cross-boundary conservation to balance economic and social development mandates with conservation goals (Büscher, 2013). While boasting various benefits, including increasing international cooperation, increased tourism and species migration, underlying issues of power, politics, and social relations are often unmentioned (Büscher, 2013). Peace parks or Transfrontier conservation areas are a form of neo-liberal conservation where markets and profit-generated finance conservation goals (Büscher, 2013). Their neoliberal nature means they are isolated from the realities of conservation today and disregard the historical factors and power relations mentioned above (Büscher, 2013). Even corridors and networks within national borders may mirror past injustices through territorialization by and for conservation. Governments and organizations establish corridors and networks where communities depend on the land for resources, leading to dispossessing of land for conservation needs (Bluwstein & Lund, 2018). Before establishing corridors and networks, power relations and land use must be considered, as these newer initiatives may still reflect old systems. Due to South Africa's complex history with conservation, conservation methods must be cautious so as not to emulate past practices.

3. Methodology

We identified environmental legislation and policy documents supporting biodiversity conservation and establishing, managing, and implementing protected areas in South Africa from 1976 to 2021. We chose 1976 as this was when the National Parks Act 57 was established. For this study, we only reviewed acts and policies as bills, green papers, and white papers are often discussion papers that form. We searched the Department of

Forests, Fisheries and Environment (DFFE) website (https://www.dffe.gov.za/) for legislation; however, the website does not provide acts and regulations older than 1992, guidelines and policies before 1996, and green and white papers before 1996 and 1997. We, therefore, examined the University of the Witwatersrand's Online Library (https://libguides.wits.ac.za/environmental_affairs). This portal includes the 'Union of South Africa Statutes' encompassing laws between 1910 and 1989. This portal also provides a database of environmental acts, bills, white papers, green papers, and gazettes.

Under the screening process, we identified acts and policies solely focused on protected area management. We also included broader overarching legislation that is a tenet of environmental management. We excluded amendments from our search as the National Parks Act alone has been amended multiple times.

4. Results

The initial search on the DFFE website (DFFE, 2022) produced 354 pieces of legislation, of which 192 were acts and regulations and 162 were guidelines (Table 1). The University of the Witwatersrand's Online Library search identified 186 articles that comprised 135 acts and regulations, six policy documents and 45 statutes under the Union of South Africa (Table 1) (University of the Witwatersrand, 2022).

The screening process saw the identification of three crucial statutes under the Union of South Africa; the National Parks Act 57 of 1976 (Republic of South Africa, 1976), Environment Conservation Act 100 of 1982 (Republic of South Africa, 1982), and Environment Conservation Act 73 of 1989 (Republic of South Africa, 1989) (Table 2), and a further four critical pieces of legislation; the Constitution of the (Republic of South Africa, 1996, 1996), the National Environmental Management Act 107 of 1998 (Republic of South Africa, 1998), the National Environmental Management Act: Protected Areas Act 57 of 2003 (Republic of South Africa, 2003), National Environmental Management Act: Biodiversity Areas Act 10 of 2004 (Republic of South Africa, 2004) (Table 2). This screening process resulted in a total of seven acts.

Additionally, we identified 11 important policy documents on the DFFE website. These policies and guidelines are as follows; Guiding Principles for Projects on Biosphere Reserves 2002; National Biodiversity Strategy and Action Plan 2005 and 2015–2025; National Protected Areas Expansion Strategy (NPAES) 2008, 2016 and 2018; National Biodiversity Framework 2009 and 2021; National Biodiversity Assessment 2004, 2011 and 2018 (Table 2).

Table 1. Legislation search and screening results from the Department of Forests, Fisheries and Environment website and the University of the Witwatersrand's Online Library. Search conducted on 1/03/2022.

Legislation type:	DFFE website	Wits University Online Library
Acts and regulations	192	135
Policy documents	162	6
Union of South Africa Statutes	/	45
After screening		
Acts and regulations	4	4
Policy documents	11	0
Union of South Africa Statutes	/	3

Table 2. Identified and screened conservation and protected area legislation and policies between 1976 and 2021.

Date	Legislation	Comments
1976	National Parks Act 57	Advocates for and protects National Parks in South Africa today. It fails to accommodate other conservation initiatives and is outdated.
1982	Environmental Conservation Act 100	First, all-inclusive conservation legislation with a weak public participation process.
1989	Environmental Conservation Act 73	It replaced Act 100. It was more comprehensive and worked on the relationship between human activities and the environment. It remained focused on protected areas as a conservation method.
1996	Constitution of the Republic of South Africa	The highest law of South Africa. Section 24 addresses environmental rights and responsibilities.
1998	National Environmental Management Act 107	It replaced Act 73. Focused on integrated environmental management and considers the environment at all levels. However, it fails to mention other conservation methods to combat habitat fragmentation and conserve biodiversity.
2002	Guiding Principles for Projects on Biosphere Reserves	However, no implementation plan was provided for the first mention of ecological networks.
2003	National Environmental Management Act: Protected Areas Act 57	Auspice under Act 107 of 1998. Protects and outlines protected area management. Establishes protected areas as the core of conservation in South Africa.
2004	National Environmental Management Act: Biodiversity Act 10	Used concurrently with Protected Areas Act 57. Identifies priority areas through bioregional plans. However, it does not accommodate other landscape initiatives.
	National Biodiversity Assessment	Monitors the state of biodiversity, mentions corridors as part of South Africa's 'ecological infrastructure' and encourages corridor identification. However, the assessment is solely a guide that informs other policies and has a narrow scope.
2005	National Biodiversity Strategy and Action Plan	First policy under the Biodiversity Act. Informed by the National Biodiversity Assessment, this plan sought to create a conservation network but did not provide steps and processes.
2008	National Protected Areas Expansion Strategy	Outlines and promotes protected area expansion by possibly using corridors. It does not identify exact locations for this or provide a detailed strategy for this expansion.
2009	National Biodiversity Framework	This framework requires provinces to draft bioregional plans identifying CBAs, corridors, and networks.
2011	National Biodiversity Assessment	Mentions that corridors can be used to mitigate the effects of climate change. However, it does not elaborate on this.
2015	National Biodiversity Strategy and Action Plan 2015–2025	Similar to the 2005 plan. Proves no action plan or strategy regarding corridor expansion.
2016	National Protected Areas Expansion Strategy	It provides provincial expansion strategies and is more detailed than the 2008 version. However, like the 2008 version, it lacks implementation strategies.
2018	National Protected Areas Expansion Strategy	Same as the 2016 version with data from the Northern Cape added.
	National Biodiversity Assessment	Same as the 2011 assessment, even though it should include new findings from other policies.
2021	National Biodiversity Framework 2019–2024	Final policy reviewed. Mentions a landscape approach but fails to provide evidence for this approach- conservation corridors are mentioned as a method to increase stakeholder participation.

5. Discussion

5.1 Early protected area legislation in South Africa

We reviewed 18 pieces of legislation and policies focusing on protected areas in South Africa from 1976 until 2021 (Table 2). The first Act reviewed was the National Parks Act 57 of 1976 (Republic of South Africa, 1976), which replaced Act 56 of 1926. Act 57 governs all national parks in South Africa. Under Section 4, national parks have numerous objectives, including preserving and promoting the scientific study of animals, plant

life and objects of significance (Republic of South Africa, 1976). Here, traditional conservation methods are encouraged in the form of national parks. In the 1970s, protected areas, national parks, and reserves were popular conservation strategies. However, 46 years later, Act 57 remains the same and has not adapted to a newer conservation discourse. Act 57 is vital in the proclamation of national parks today, even though there is no mention of connecting reserves or conserving landscapes. A paradigm shift has occurred where newer conservation methods are favoured; however, South Africa's current ruling National Park Act ignores this shift.

Six years after the National Parks Act was ratified, the first all-encompassing conservation statute was passed. The Environmental Conservation Act, Act 100 of 1982 (Republic of South Africa, 1982), was initially praised as South Africa's first general environmental policy (Rabie, 1989). However, Act 100 became inadequate and had an abundance of deficiencies, particularly its weak public participation process. The Act was converted into the Environmental Conservation Act 73 in 1989 (Republic of South Africa, 1989). The enactment of the Environmental Conservation Act 73 was a crucial milestone for environmental management in South Africa (Steyn & Wessels, 2000). The Act sought to control and manage human activities that would negatively affect the environment, including land-use changes, developments, mining and mineral extraction, resource removal, and pollution (Republic of South Africa, 1989; Sowman et al., 1995). While still imperfect, the Act considered public opinion, making it more inclusive by integrating public and social matters into environmental conversations. The degree of inclusion is debatable as the vast majority of the population was still marginalized and excluded from National Parks (Cock & Fig, 2000). Act 73 heavily focused on creating protected natural environments and special nature reserves, which fall under a traditional, silo approach to conservation. Early environmental legislation in the late 1980s did not allow for the protection of landscapes, which would soon become widespread. These early acts and environmental legislation in South Africa, as a whole, were criticized for being fragmented, as various pieces of legislation emerged that were disjointed and uncoordinated (Hamann et al., 2000; Quinlan, 1993; Sowman et al., 1995). For example, Act 73 did not consider the Integrated Environmental Management (IEM) principles published in 1989 by the Council for the Environment; therefore, a set of regulations was subsequently published in 1997, making impact assessments mandatory (Hamann et al., 2000). This haphazard approach to environmental legislation shifted with the proclamation of the National Environmental Management Act, Act 107 of 1998 (King et al., 2018).

5.2 The National Environmental Management Act: continuing the unchanging conversation

The National Environmental Management Act (NEMA) of 1998 (Republic of South Africa, 1998) replaced the Environmental Conservation Act 73 as the need to encompass IEM strategies grew after Apartheid ended. The NEMA is a significant resource for environmental management in South Africa (Strydom & King, 2009). In 1996, the Constitution of the Republic of South Africa was ratified, to which NEMA gives effect to Section 24 (Republic of South Africa, 1996). The NEMA offers a set of principles that include the environment at all levels of planning and guides the decision-making

processes (Republic of South Africa, 1998). Compared to its predecessors, the Act encompasses social and economic factors in environmental discussions and has a well-founded public participation process, a first for post-democracy South Africa (King et al., 2018, 1147).

Under the NEMA, five specific environmental management acts emerged to make provisions for more detailed environmental laws for different aspects and elements of the environment (Strydom & King, 2009). First, and importantly for this paper, the National Environmental Management: Protected Areas Act, Act 57 of 2003; second, the National Environmental Management: Biodiversity Act, Act 10 of 2004; third, the National Environmental Management: Integrated Coastal Management Act, Act 24 of 2008 (Goble et al., 2014; Sowman & Malan, 2018); fourth, the National Environmental Management: Air Quality Act, Act 39 of 2004 (Tshehla & Wright, 2019); lastly, the National Environmental Management: Waste Act, Act 59 of 2008 (Zhakata et al., 2016).

Since 1982 with the Environmental Conservation Act 100, protected areas have been the cornerstone of conservation in South Africa; this remained unchanged with the National Environmental Management: Protected Areas Act 57 of 2003 (NEMPA) (Republic of South Africa, 2003). Today, protected areas are currently regulated and guided by Act 57 (Goosen & Blackmore, 2019; Strydom & King, 2009). Under Act 57, management plans became mandatory; decision-making processes included the public, and precise guidelines were set (Freitag et al., 2014; Goosen & Blackmore, 2019; Wylie et al., 2018). The Act clarifies protected area issues and regulates procedures, policies, and plans (King et al., 2018). However, the conversation regarding connected areas, corridors and networks remains unchanged compared to legislation from the 1980s. Objective 2 (d) of the Act aims to create a protected area network that includes state and privately-owned land (Republic of South Africa, 2003)- the first and only mention of a 'network' in the Act. However, the Act fails to recognize the importance of corridors or ecological networks. At the same time, protected areas remain favoured and divided into different categories: special nature reserves, national parks, nature reserves and protected environments, World Heritage Sites, marine protected areas, specially protected forest areas, forest nature reserves and forest wilderness areas, and mountain catchment areas. Not only does Act 57 not mention the importance of conserving landscapes, but it is also fragmented to the point that practitioners must rely on additional legislation, including the National Environmental Management Biodiversity Act 100 of 2004, when establishing management plans for protected areas (Goosen & Blackmore, 2019). While Act 57 deals with the declaration, implementation, and management of protected areas, these sections are disjointed, and its tenets correspond to those used in early environmental management legislation (Goosen & Blackmore, 2019).

The final legislation reviewed was the National Environmental Management: Biodiversity Act, Act 100 of 2004 (NEMBA) (Republic of South Africa, 2004). When establishing management plans for protected areas, practitioners must consult the NAMPA and NEMBA. Objective 2 (a)(i) of the Biodiversity Act states that the Act provides for the management and conservation of biological diversity (Republic of South Africa, 2004). According to section 39 (c), this is accomplished by identifying priority areas for conservation and establishing protected areas (Republic of South Africa, 2004). Bioregions, bioregional plans, and biodiversity management plans are also encouraged through the Act. Similar to the above legislation, the Biodiversity Act does not mention

corridors or networks or the protection of landscapes and remains steadfast in using protected areas to protect biodiversity. Bioregional and biodiversity management plans merely provide management and monitoring plans for a region to ensure the survival of a species or ecosystem and do not mention the inclusion of threatened landscapes, corridors, or networks. In addition, Chapter 4 sees the protection of critically endangered, endangered, and vulnerable ecosystems, again, with no emphasis on protecting landscapes.

NEMA and its auspices are the primary environmental legislation in South Africa. However, the legislation assumes a parochial approach to how landscapes, ecosystems, fauna, and flora should be protected and conserved. Consequently, the seven acts examined fail to describe, promote, and enforce other methods of biodiversity conservation. However, Section 38 requires the preparation of multiple policies and plans under the Biodiversity Act (Republic of South Africa, 2004). While non-statutory, these plans are regularly updated to incorporate new issues and discussions in and around conservation and may support newer conservation methods, including corridors.

5.3 Protected area policies: shifting the conservation discourse

South Africa's environmental legislation from 1976 to 2004 remained consistent in its exclusion of corridors and networks. Nevertheless, these conservation tools have been circulating in South African environmental policies since 2002. Of the 11 policy documents reviewed, the first mention of conservation corridors was in the Guiding Principles for Projects on Biosphere Reserves document in 2002 (Department of Forestry, Fisheries, and the Environment, 2002). This policy encourages regional networks to assemble large-scale ecological corridors, the first mention of this approach in South Africa. Unfortunately, no implementation or management plan is attached to this policy- it remains a suggestion. The following ten policies fall under the NEMBA. Under Section 38 of the NEMBA, the minister must prepare and adopt a National Biodiversity Framework three years after ratifying the Biodiversity Act (Republic of South Africa, 2004. However, the first National Biodiversity Framework was only published in 2009 (Table 2), five years after the Act was ratified.

Section 38 of the Biodiversity Act also states that the framework must be reviewed every five years. However, the second National Biodiversity Framework was only published in 2021, 12 years after the first version. Under Section 38, the framework must provide an integrated approach to biodiversity conservation and management, identify priority areas, and be consistent with NEMA principles (Republic of South Africa, 2004.

5.3.1. National Biodiversity Framework: worth the wait?

The National Biodiversity Strategy and Action Plan, National Biodiversity Assessment, and the National Protected Area Expansion Strategy inform the National Biodiversity Framework (*Figure* 1). The first National Biodiversity Framework (NBF) was published in 2009, and the latest version, the National Biodiversity Framework 2019–2024, was released in 2021. The framework aligns the strategic objectives identified in the National Biodiversity Strategy and Action plan, first published in 2005, with other national policies, strategies, and frameworks. Under this framework, regional plans, which identify critical biodiversity areas

(CBAs), networks and conservation corridors, are required. However, this is a nonbinding requirement (Republic of South Africa, 2009). Revised 12 years later, the NBF of 2019–2024 boldly claims South Africa has adopted a landscape approach (Republic of South Africa, 2021, p. 12). Still, the policy provides no evidence, as no examples of corridors, networks, or protected landscapes are provided. One of the principles outlined in Section 2.5 of the NBF 2019–2024 focuses on a landscape approach to biodiversity conservation and working beyond the boundaries of protected areas (Republic of South Africa, 2021). However, when discussing this approach, the NBF focuses heavily on stakeholder participation and social inclusivity, with no focus on the environmental benefits and why shifting away from protected areas is imperative.

The National Biodiversity Framework's purpose is not to provide the steps required to meet conservation goals. However, the framework is informed by other policies and must consider the findings and proposals from these plans and provide a congruent, coordinated, and integrated approach that advises South Africa's biodiversity management (Republic of South Africa, 2021, p. 1). This objective is not achieved regarding landscape initiatives as the framework barely mentions networks and corridors. The only mention of corridors is under the aims of the National Botanical Gardens Expansion Strategy, where the creation of corridors is encouraged. This solo mention of corridors is brief and limited to a specific location. Additionally, a clear step away from protected areas and towards corridors and networks is absent in this framework; despite Section 2.5 stressing the importance of a landscape approach, it remains an unconvincing suggestion as the framework ignores ecological networks and corridors. Both versions of the NBF were published past their deadlines and show little for this delay. The Biodiversity Act only requires the framework to be reviewed every five years. Therefore, the frameworks must have foresight encompassing various issues and solutions that will come about over the five or, in this case, 12 years between reviews. The National Biodiversity Frameworks fail to do this as the 2019 NBF only partly extends the ambit of its predecessor. According to the frameworks, biodiversity conservation in 2024 will be similar to that practised in 2009 as the framework provides no contemporary strategies.

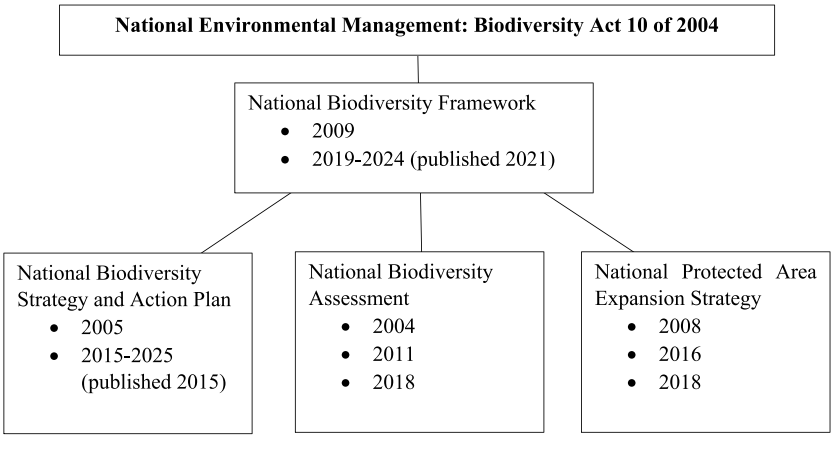

Figure 1. Policies under the National Environmental Management: Biodiversity Act 10 of 2004.

5.3.2. The National Biodiversity Strategy and Action Plan

The first policy produced under the Biodiversity Act was South Africa's National Biodiversity Strategy and Action Plan (NBSAP) of 2005, which informs the National Biodiversity Framework (*Figure* 1). The plan posited a strategy for biodiversity management in South Africa. It was created due to the Convention on Biological Diversity, where parties must outline how they intend to fulfil the convention's objectives (Republic of South Africa, 2005). Describing itself as a mainstreaming tool, it attempts to comprehensively outline its strategic objectives and develop a detailed implementation plan to achieve its conservation goals (Republic of South Africa, 2005 .

Strategic Objective 5 of the NBSAP sought to create a conservation network that conserves biodiversity across the landscape (Republic of South Africa, 2005; Moreover, objective 5.1 mentions protected area network expansion to conserve threatened species-prioritized as urgent. However, similarly to the previous policy, actual implementation and management steps are absent, which is ironic considering the name of the policy. The policy seeks to create a network of connected areas yet fails to mention how, why, or where this will happen, making it far from the comprehensive mainstream report promised.

Revised ten years later, the National Biodiversity Strategy and Action Plan from 2015 to 2025 again encourages the expansion of the conservation area (Republic of South Africa, 2015). The 2015 policy admits that there have not been 'fundamental changes in biodiversity policy in South Africa since 2009' (Republic of South Africa, 2015), p. 5). We agree because, in the six years, only one policy- the National Biodiversity Assessment- was published (Table 2). When reflecting on the 2005 plan, the 2015 plan notes strategic objective five as 'substantially achieved', even though there is no evidence. The strategic objectives changed in the 2015 plan as Strategic Objective 5 deals with developing a skilled workforce. Corridors and networks seem to have fallen under Strategic Objective 1 – an elusive move. Strategic Objective 1 states that protected areas must be comprehensive, represent a wide range of species and ecosystems, and be correctly and efficiently managed. The plan recommends expanding the conservation network 'through mechanisms under the Biodiversity Act, contract law and other informal agreements between the landowner and conservation authority' (Republic of South Africa, 2015), p. 20). Here, the policy fails to refer to these precise mechanisms and promotes conservation network expansion through informal agreements, typically not associated with coherent and effective management. The plan sought to provide detailed, comprehensive action strategies that address its objectives, but instead, it has provided a brief, narrow and incomplete plan.

The original 2005 NBSAP was far more progressive and realized the potential of corridors and networks early on. The plan prioritized protected area expansion and the creation of networks, even though its action plan was weak, with no implementation and management steps provided. The focus shifted ten years later as landscape initiatives, corridors, and networks were further side-lined, and actionable measures were absent. The policy admitted that no specific legislation protects or supports the implementation and management of landscape approaches but does not go on to endorse this.

5.3.3. The National Protected Area Expansion Strategy

The National Protected Area Expansion Strategy (NPAES) is another mandatory policy under NEMBA (*Figure* 1). The 2008 NPAES sought to achieve cost-effective, protected area expansion to ensure the protection of priority areas identified through the plan (Republic of South Africa, 2008). While it seems promising at first, when outlining the strategy in chapter 1, the plan clarifies that it does not identify exact locations for protected area expansion or provide detailed implementation planning to expand the network (Republic of South Africa, 2008, p. 8). Instead, the plan encourages protected area agencies to use NPAES as a guide to coordinate protected area expansion.

The NPAES describes corridors as part of South Africa's 'ecological infrastructure', a promising phrase advocating for corridors at face value. The original version of NPAES in 2008 briefly defined ecological infrastructure as 'nodes and corridors of natural habitat that provide a range of ecosystem services and resilience to the impacts of climate change and natural disasters' (Republic of South Africa, 2008, p. 9). The plan prioritized protected areas to mitigate the effects of climate change- specifically, the protection of natural connected landscapes and corridors. NPAES 2008 identifies 42 'focus areas' for protected area expansion. However, per its objectives in chapter 1, the plan does not provide exact, detailed sites but rather large sections of land, often spanning two provinces, with weak, broad, and minimal justification for protecting these areas. NPAES was updated in 2016 and 2018. However, these versions are the same as data from the Northern Cape was included in the latest publication (Republic of South Africa, 2018). The NPAES of 2016 extends the ambit of its predecessor by providing expansion strategies for each province, with corridors used as an essential principle to guide protected area expansion (Republic of South Africa, 2016). All the policies produced under the Biodiversity Act should advise each other. There should be a level of synergy between the policies. An objective from NPAES should be assigned a detailed action plan under the NBSAP. However, we know from section 4.3.2 that this is not the case.

5.3.4. The National Biodiversity Assessment

The National Biodiversity Assessment is the last policy that informs the National Biodiversity Framework. National Biodiversity Assessments (NBA) provide a spatial assessment of ecosystems and monitor the state of biodiversity in South Africa. Similar to the NPAES report, in the first Biodiversity Assessment in 2004, corridors were mentioned as part of South Africa's 'ecological infrastructure' (South African National Biodiversity Institute, 2005). Like NPAES, this report encourages the identification of corridors, but this remains a subtle suggestion. The 2011 and 2018 National Biodiversity Assessments state that corridors are vital for climate change resilience (South African National Biodiversity Institute, 2012, 2019). The 2011 report outlines that ecological networks can be planned and managed successfully (South African National Biodiversity Institute, 2012). However, the report does not elaborate on this, perhaps because it is out of scope as the NBA informs other policies and does not provide actionable plans.

5.4 Reflecting on South Africa's legislative and policy frameworks

The Biodiversity Act sees the publication of numerous policy documents (*Figure* 1). These documents have varying scopes, aims and objectives. Of the 11 we reviewed,

they all mention corridors in some form. While it is not within the ambit of the NBA, NPAES, or NBF to provide an action or implementation plan on protected area expansion or ideal locations for corridors, these policies are influential. The guidelines can promote new conservation methods and encourage a change from traditional forms towards more contemporary, effective initiatives. However, these policies waste this opportunity. The NBA states it is possible to manage ecological infrastructure sustainably but fails to mention what this would entail. The scope of NPAES is far too narrow as it omits the potential of corridors and networks to fast-track its expansion goals. The NBF claims South Africa has adopted a landscape approach but provides little to no proof. Although these policies are flawed, they have remained within their narrow scope. However, the National Biodiversity Strategy and Action Plan, which aims to develop a detailed implementation plan to achieve its conservation goals, does not outline the potential use of conservation corridors and networks except that informal agreements are encouraged. The policies reviewed in the sections above read as isolated plans and rarely refer to their predecessors and other strategies. The guidelines are out of touch with the current conservation discussions and recent findings. As a result, the planning and managing of corridors remains elusive in South Africa, even though discussions have occurred for 16 years in policy documents.

Legislation has also failed to acknowledge, implement, and protect corridors and networks. Compared to South Africa's early environmental legislation, the legislation is unchanged, ignoring newer initiatives. Moreover, the legislation currently governing national parks in South Africa is 46 years old. Currently, South Africa's *ad hoc* approach to environmental legislation does not support the establishment of newer measures. However, not everyone supports this view.

According to Keeley et al. (2019, p. 10), South Africa has 'strong national-level requirements to consider connectivity in spatial planning'. The evidence provided to support this claim was the National Biodiversity Act, which, as discussed in Section 4.2, that requires the development of bioregional plans, and the Spatial Planning and Land Use Act of 2013, which involves the zoning of each hectare in South Africa into spatial planning categories which include conservation. However, we argue that establishing bioregional plans and the zoning of conservation areas does not make for sound connected spatial planning in South Africa, especially compared to other countries where corridors and networks are established and protected through legislation.

Conservation corridors have been regulated through land-use planning legislation in Ontario, Canada, leading to a significant decline in development on private land in the area (Whitelaw & Eagles, 2007). Moreover, some Eastern European countries have mandated corridors and networks into national legislation. For example, Lithuania, Slovakia, and the Czech Republic have explicitly added ecological networks into national legislation (Jongman et al., 2004). In Poland, the Act on the Protection of Nature defines ecological networks and provides for their functions. It formally protects ecological networks as protected landscapes and provides for the ability to create protected landscape areas (Izakovičová & Świąder, 2017). While South Africa has many policies that encourage landscape initiatives to some degree- our legislation is far behind.

5.5 A way forward

Studies have shown that connectivity is critical regarding protected areas, and this may be achieved in South Africa by linking national protected areas with private land. However, as discussed in section two, converting and protecting land under the pretence of conservation recreates past themes of inequality and exclusion. Since the 1940s, legislation has permitted landowners to protect their land legally (De Vos et al., 2019). The NEMPA Act 57 of 2003 further protects private protected areas in South Africa (De Vos et al., 2019). Objective 2d states that the Act aims to create a network of protected areas, including state and privately-owned land. However, this diversification of protected area tenure types requires clear jurisdictional and legislative guidelines, currently unavailable in South Africa. Private game reserves cover 16.7% of South Africa, while national reserves only cover 6.2% (Holmes, 2013). Private protected areas ensure that the private sector is engaged in conservation matters, the conservation estate is expanded, and may play a significant role in conservation by reintroducing flagship species and starting breeding schemes (Holmes, 2013). Synergy is required between national and private protected areas- but this is absent in legislation and policies and is difficult in a country like South Africa with a problematic conservation past. In this case, the informal agreements encouraged in the NBSAP 2015 (Republic of South Africa, 2015) will not be sufficient. Merging national and private protected areas will unlock huge conservation potential and may be a cost-effective way to expand South Africa's conservation network and undo past injustices.

Approaches including biodiversity stewardship- which seeks to facilitate collaboration between private and communal landowners to protect and manage biodiversity-rich areas- have been adopted and used to create some corridors in South Africa (Barendse et al., 2016; Cockburn et al., 2019). Stewardship is voluntary and requires stewards to balance conservation requirements with social and economic needs. While it holds the potential to enable a high degree of collaboration among stakeholders (Brownlie et al., 2017; Cockburn et al., 2019; Stoll-Kleemann & O'riordan, 2002, issues of accountability and inadequate implementation have been documented (Barendse et al., 2016; Boon et al., 2016), further demonstrating the need for effective legislative and policy frameworks that act in congruence.

6. Conclusion

Biodiversity conservation has moved away from fortress-style protected areas to more progressive approaches encouraging corridors, networks, and connected landscapes. We sought to determine if South Africa's legislative and policy frameworks accommodate this shift. The above sections have explored and evaluated the past and current legislation and policies surrounding biodiversity conservation and protected area management in South Africa. Through this, we considered South Africa's conservation and protected area history, early conservation policies and practices and established a timeline where we traced the establishment of the NEMA. Additionally, we explored the auspices of NEMA, and the NEMPA, while not without its flaws, was identified as a crucial piece of legislation for the establishment, declaration, and management of protected areas-the cornerstone of biodiversity conservation in South Africa. While South Africa has

impressive environmental and protected area legislation, these acts do not support the new wave of landscape-focused initiatives, especially compared to other countries. South Africa's legislation does not protect or mandate the creation of corridors or networks. However, policies seem more encompassing, yet they provide no tangible action or implementation plans and are not regularly updated. No legislation provides a legal framework for establishing corridors and networks. While they are encouraged through policies, they cannot be established, regulated, managed, protected, and standardized across South Africa without supporting legislation. A shift must occur with a greater focus on connected landscape initiatives to effectively conserve threatened landscapes and South Africa's biodiversity. These initiatives must be rooted in legislation to implement clear guidelines and ensure they are formally protected while not repeating the past. South Africa should learn from other countries and include landscape initiatives in its legislation and policies to ensure that our conservation strategies move on from those practised in 1976.

Disclosure statement

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References

Báldi, A., & Vörös, J. (2006). Extinction debt of Hungarian reserves: A historical perspective. *Basic and Applied Ecology*, *7*(4), 289–295. https://doi.org/10.1016/j.baae.2005.09.005

Barendse, J., Roux, D., Currie, B., Wilson, N., & Fabricius, C. (2016). A broader view of stewardship to achieve conservation and sustainability goals in South Africa. *South African Journal of Science*, *112*(5–6), 1–15. https://doi.org/10.17159/sajs.2016/20150359

Barnosky, A. D., Matzke, N., Tomiya, S., Wogan, G. O., Swartz, B., Quental, T. B., Marshall, C., McGuire, J. L., Lindsey, E. L., Maguire, K. C., & Mersey, B. (2011). Has the Earth's sixth mass extinction already arrived? *Nature*, *471*(7336), 51–57. https://doi.org/10.1038/nature09678

Beier, P. (2018). A rule of thumb for widths of conservation corridors. *Conservation Biology*, *33*(4), 1–3. https://doi.org/10.1111/cobi.13256

Bezerra, J., & Paphitis, S. (2021). Epistemic injustice and land restitution in the case of protected areas: From policy to practice in South Africa. *Society & Natural Resources*, *34*(7), 906–924. https://doi.org/10.1080/08941920.2021.1900962

Bluwstein, J., & Lund, J. F. (2018). Territoriality by conservation in the Selous–Niassa Corridor in Tanzania. *World Development*, *101*, 453 465. https://doi.org/10.1016/j.worlddev.2016.09.010

Boon, R., Cockburn, J., Govender, N., Ground, L., Slotow, R., Mclean, C., Douwes, E., Rouget, M., & Roberts, D. (2016). Managing a threatened savanna ecosystem (KwaZulu-Natal sandstone sourveld) in an urban biodiversity hotspot: Durban, South Africa. *Bothalia-African Biodiversity & Conservation*, *46*(2), 1–12. https://doi.org/10.4102/abc.v46i2.2112

Brandt, F., & Spierenburg, M. (2014). Game fences in the Karoo: Reconfiguring spatial and social relations. *Journal of Contemporary African Studies*, *32*(2), 220–237. https://doi.org/10.1080/02589001.2014.925300

Brooks, S. (2005). Images of 'Wild Africa': Nature tourism and the (re) creation of Hluhluwe game reserve, 1930–1945. *Journal of Historical Geography*, *31*(2), 220–240. https://doi.org/10.1016/j.jhg.2004.12.020

Brownlie, S., von Hase, A., Botha, M., Manuel, J., Balmforth, Z., & Jenner, N. (2017). Biodiversity offsets in South Africa–challenges and potential solutions. *Impact Assessment and Project Appraisal*, *35*(3), 248–256. https://doi.org/10.1080/14615517.2017.1322810

Büscher, B. (2013). *Transforming the frontier: Peace parks and the politics of neoliberal conservation in Southern Africa*. Duke University Press. https://www.dukeupress.edu/transforming-the-frontier

Carroll, C., Noss, R. F., Paquet, P. C., & Schumaker, N. H. (2004). Extinction debt of protected areas in developing landscapes. *Conservation Biology*, *18*(4), 1110–1120. https://doi.org/10.1111/j.1523-1739.2004.00083.x

Carruthers, J. (2008). Conservation and wildlife management in South African national parks, 1930s–1960s. *Journal of the History of Biology*, *41*(2), 203–236. https://doi.org/10.1007/s10739-007-9147-3

Ceballos, G., Ehrlich, P. R., Barnosky, A. D., García, A., Pringle, R. M., & Palmer, T. M. (2015). Accelerated modern human-induced species losses: Entering the sixth mass extinction. *Science Advances*, *1*(5), 1–5. https://doi.org/10.1126/sciadv.1400253

Cockburn, J., Cundill, G., Shackleton, S., & Rouget, M. (2019). The meaning and practice of stewardship in South Africa. *South African Journal of Science*, *115*(5–6), 1–13. https://doi.org/10.17159/sajs.2019/5339

Cock, J., & Fig, D. (2000). From colonial to community based conservation: Environmental justice and the national parks of South Africa. *Society in Transition*, *31*(1), 22–35. https://doi.org/10.1080/21528586.2000.10419008

Dalziel, A., Evans, M. (2023). The emergence of landscape initiatives as amethod for biodiversity conservation in South Africa. Manuscript in preparation.

Darkoh, M. B. K. (1997). Environmental impacts of urban-industrial development in the developing world. *Journal of African Research and Development*, *27*, 127–137.

Department of Forestry, Fisheries, and the Environment. (2002). Guiding principles for projects on biosphere reserves, 22 March. 2002. https://www.dffe.gov.za/legislation/guidelines

Department of Forests, Fisheries and the Environment. (2022). Acts and regulations. Retrieved from https://www.dffe.gov.za/legislation/actsregulations. Accessed March 1, 2022.

De Vos, A., Clements, H. S., Biggs, D., & Cumming, G. S. (2019). The dynamics of proclaimed privately protected areas in South Africa over 83 years. *Conservation Letters*, *12*(6), e12644. https://doi.org/10.1111/conl.12644

Freitag, S., Biggs, H., & Breen, C. (2014). The spread and maturation of strategic adaptive management within and beyond South African national parks. *Ecology and Society*, *19*(3). https://doi.org/10.5751/ES-06338-190325

Gewald, J. B., Spierenburg, M., & Wels, H. (Eds.). (2018). *Nature conservation in Southern Africa. Morality and marginality: Towards sentient conservation?*. Brill. https://brill.com/display/title/39072

Goble, B. J., Lewis, M., Hill, T. R., & Phillips, M. R. (2014). Coastal management in South Africa: Historical perspectives and setting the stage of a new era. *Ocean & Coastal Management*, *91*, 32–40. https://doi.org/10.1016/j.ocecoaman.2014.01.013

Goosen, M., & Blackmore, A. C. (2019). Hitchhikers' guide to the legal context of protected area management plans in South Africa. *Bothalia-African Biodiversity & Conservation*, *49*(1), 1–10. https://doi.org/10.4102/abc.v49i1.2399

Haddad, N. M., Rosenberg, D. K., & Noon, B. R. (2000). On experimentation and the study of corridors: Response to Beier and Noss. *Conservation Biology*, *14*(5), 1543–1545. https://doi.org/10.1046/j.1523-1739.2000.99572.x

Hamann, R., Booth, L., & O'riodan, T. (2000). South African environmental policy on the move. *South African Geographical Journal*, *82*(2), 11–22. https://doi.org/10.1080/03736245.2000.9713689

Holmes, G. (2013). What role do private protected areas have in conserving global biodiversity? *SRI Working Papers*, (46). https://eprints.whiterose.ac.uk/76968/

IPBES. (2019). *Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the intergovernmental science-policy platform on biodiversity and ecosystem services*. IPBES secretariat. https://doi.org/10.5281/zenodo.3553579

IPCC. (2014). *Climate change 2014: Synthesis report. Contribution of working groups i, ii and iii to the fifth assessment report of the intergovernmental panel on climate change* [core writing team, Pachauri, R. K. and Meyer, L. A. (Eds.)], 151. https://www.ipcc.ch/report/ar5/syr/

Izakovičová, Z., & Świąder, M. (2017). Building ecological networks in Slovakia and Poland. *Ekológia*, *36*(4), 303–322. https://doi.org/10.1515/eko-2017-0025

Jongman, R. H., Külvik, M., & Kristiansen, I. (2004). European ecological networks and greenways. *Landscape and Urban Planning*, *68*(2–3), 305–319. https://doi.org/10.1016/S0169-2046(03)00163-4

Joubert van der Merwe, L., Pryke, J. S., & Samways, M. J. (2019). Well-managed grassland heterogeneity promotes butterfly conservation in a corridor network. *Journal of Environmental Management*, *238*, 382–395. https://doi.org/10.1016/j.jenvman.2019.03.021

Kamuti, T. (2014). The fractured state in the governance of private game farming: The case of KwaZulu-Natal Province, South Africa. *Journal of Contemporary African Studies*, *32*(2), 190–206. https://doi.org/10.1080/02589001.2014.936678

Karlsson, T. M., Arneborg, L., Broström, G., Almroth, B. C., Gipperth, L., & Hassellöv, M. (2018). The unaccountability case of plastic pellet pollution. *Marine Pollution Bulletin*, *129*(1), 52–60. https://doi.org/10.1016/j.marpolbul.2018.01.041

Keeley, A. T., Beier, P., Creech, T., Jones, K., Jongman, R. H., Stonecipher, G., & Tabor, G. M. (2019). Thirty years of connectivity conservation planning: An assessment of factors influencing plan implementation. *Environmental Research Letters*, *14*(10), 103001. https://doi.org/10.1088/1748-9326/ab3234

Kepe, T. (2008). Land claims and comanagement of protected areas in South Africa: Exploring the challenges. *Environmental Management*, *41*(3), 311–321. https://doi.org/10.1007/s00267-007-9034-x

Kepe, T., Wynberg, R., & Ellis, W. (2005). Land reform and biodiversity conservation in South Africa: Complementary or in conflict? *The International Journal of Biodiversity Science and Management*, *1*(1), 3–16. https://doi.org/10.1080/17451590509618075

Kidd, M. (1999). The national environmental management act and public participation. *South African Journal of Environmental Law and Policy*, *6*(1), 21–31.

Kietzka, G. J., Pryke, J. S., & Samways, M. J. (2015). Landscape ecological networks are successful in supporting a diverse dragonfly assemblage. *Insect Conservation and Diversity*, *8*(3), 229–237. https://doi.org/10.1111/icad.12099

King, N. D., Strydom, H. A., & Retief, F. P. (2018). *Environmental management in South Africa* (3rd ed.). Juta, Cape Town.

Kolipakam, V., Singh, S., Pant, B., Qureshi, Q., & Jhala, Y. V. (2019). Genetic structure of tigers (Panthera tigris tigris) in India and its implications for conservation. *Global Ecology and Conservation*, *20*, 1–12. https://doi.org/10.1016/j.gecco.2019.e00710

Laborda, Á., de Oca, L. M., Pérez-Miles, F., Useta, G., & Simó, M. (2018). The spider fauna from Uruguay River islands: Understanding its role in a biological corridor. *Biodiversity Data Journal*, *6*(6). https://doi.org/10.3897/BDJ.6.e27319

Lindenmayer, D. B., & Hobbs, R. J. (2007). *Managing and designing landscapes for conservation: Moving from perspectives to principles*. John Wiley & Sons. https://www.wiley.com/en-us/Managing+and+Designing+Landscapes+for+Conservation:+Moving+from+Perspectives+to+Principles-p-9780470691601

Malanson, G. P. (2002). Extinction□debt trajectories and spatial patterns of habitat destruction. *Annals of the Association of American Geographers*, *92*(2), 177–188. https://doi.org/10.1111/1467-8306.00285

Martínez-Alier, J. (2001). Wilderness versus the environmentalism of South Africa's poor? *Capitalism Nature Socialism*, *12*(3), 99–103. https://doi.org/10.1080/104557501101245153

Mathur, P. K., & Sinha, P. R. (2008). Looking beyond protected area networks: A paradigm shift in approach for biodiversity conservation. *International Forestry Review*, *10*(2), 305–314. https://doi.org/10.1505/ifor.10.2.305

Mora, C., & Sale, P. F. (2011). Ongoing global biodiversity loss and the need to move beyond protected areas: A review of the technical and practical shortcomings of protected areas on land and sea. *Marine Ecology Progress Series*, *434*, 251–266. https://doi.org/10.3354/meps09214

Nazeer, M., Tabassum, U., & Alam, S. (2016). Environmental pollution and sustainable development in developing countries. *Pakistan Development Review*, *55*, 589–604. https://doi.org/10.30541/v55i4I-IIpp.589-604

Nel, J. L., Le Maitre, D. C., Roux, D. J., Colvin, C., Smith, J. S., Smith-Adao, L. B., Maherry, A., & Sitas, N. (2017). Strategic water source areas for urban water security: Making the connection between protecting ecosystems and benefiting from their services. *Ecosystem Services*, *28*, 251–259. https://doi.org/10.1016/j.ecoser.2017.07.013

Newmark, W. D. (1996). Insularization of Tanzanian parks and the local extinction of large mammals. *Conservation Biology*, *10*(6), 1549–1556. https://doi.org/10.1046/j.1523-1739.1996.10061549.x

Ngubane, M., & Brooks, S. (2013). Land beneficiaries as game farmers: Conservation, land reform and the invention of the 'community game farm in KwaZulu-Natal. *Journal of Contemporary African Studies*, *31*(3), 399–420. https://doi.org/10.1080/02589001.2013.811790

Olivier, L. (2013). Bossiedokters and the challenges of nature co-management in the Boland area of South Africa's Western Cape. *Journal of Contemporary African Studies*, *31*(3), 361–379. https://doi.org/10.1080/02589001.2013.804246

Petersen, L., Reid, A. M., Moll, E. J., & Hockings, M. T. (2017). Perspectives of wild medicine harvesters from Cape Town, South Africa. *South African Journal of Science*, *113*(9–10), 1–8. https://doi.org/10.17159/sajs.2017/20160260

Quinlan, T. (1993). South Africa's integrated environmental management policy at the crossroads of conservation and development. *Development Southern Africa*, *10*(2), 229–238. https://doi.org/10.1080/03768359308439685

Qureshi, M. I., Rasli, A. M., Awan, U., Ma, J., Ali, G., Alam, A., Sajjad, F., & Zaman, K. (2015). Environment and air pollution: Health services bequeath to grotesque menace. *Environmental Science and Pollution Research*, *22*(5), 3467–3476. https://doi.org/10.1007/s11356-014-3584-2

Rabie, A. (1989). Rationalisation of environmental legislation. *SA Public Law*, *4*(2), 272–278. https://hdl.handle.net/10520/AJA02586568_613

Ramutsindela, M. (2004). *Parks and people in postcolonial societies: Experiences in southern Africa* (Vol. 79). Springer. https://link.springer.com/book/10.1007/1-4020-2843-1

Republic of South Africa. (1976). National Parks Act (Act No. 57 of 1976). Government Gazette, *130*, 5096.

Republic of South Africa. (1982). Environmental Conservation Act (Act 100 of 1982). Government Gazette, *2587*.

Republic of South Africa. (1989). Environmental Conservation Act (Act 73 of 1989). *Government Gazette*, *288*, 11927.

Republic of South Africa. (1996). The Constitution of the Republic of South Africa (Act 108 of 1996). *Government Gazette*, *378*, 17678.

Republic of South Africa. (1998). National Environmental Management Act (Act 107 of 1998). *Government Gazette*, *401*, 19519.

Republic of South Africa. (2003). National Environmental Management Act: Protected Areas Act (Act 57 of 2003). *Government Gazette*, *464* 26025.

Republic of South Africa. (2004). National Environmental Management: Biodiversity Act (Act 10 of 2004). *Government Gazette*, *467*, 26436.

Republic of South Africa. (2005) . *Department of Environmental Affairs and Tourism*. National Biodiversity Strategy and Action Plan 2005.

Republic of South Africa. (2008) . *Department of Environmental Affairs*. National Protected Areas Expansion Strategy.

Republic of South Africa. (2009). The National Environmental Management Act: Biodiversity Act: National Biodiversity Framework. Government Gazette, 32474.
Republic of South Africa. (2015).Department of environmental affairs. *National Biodiversity Strategy and Action Plan*, 2015–2025.
Republic of South Africa. (2016) . *Department of Environmental Affairs*. National Protected Areas Expansion Strategy.
Republic of South Africa. (2018) . *Department of Environmental Affairs*. National Protected Areas Expansion Strategy.
Republic of South Africa. (2021). The National Environmental Management Act: Biodiversity Act: National Biodiversity Framework. Government Gazette, 44229.
Sharma, E., Chettri, N., Gurung, J., & Shakya, B. (2007). The landscape approach in biodiversity conservation. In *A regional cooperation framework for implementation of the convention on biological diversity in the Kangchenjunga Landscape*. *ICIMOD*. https://agris.fao.org/agris-search/search.do?recordID=XF2015001016
Simberloff, D., & Cox, J. (1987). Consequences and costs of conservation corridors. *Conservation Biology*, *1*(1), 63–71. https://doi.org/10.1111/j.1523-1739.1987.tb00010.x
South African National Biodiversity Institute. (2005). *National Spatial and Biodiversity Assessment*, 2004. http://bgis.sanbi.org/Projects/Detail/55
South African National Biodiversity Institute. (2012). *National Biodiversity Assessment 2011*, http://bgis.sanbi.org/nba/project.asp
South African National Biodiversity Institute. (2019). *National Biodiversity Assessment 2018*, http://biodiversityadvisor.sanbi.org/planning-and-assessment/national-biodiversity-assessment-nba-2018/
Sowman, M., Fuggle, R., & Preston, G. (1995). A review of the evolution of environmental evaluation procedures in South Africa. *Environmental Impact Assessment Review*, *15*(1), 45–67. https://doi.org/10.1016/0195-9255(94)00004-K
Sowman, M., & Malan, N. (2018). Review of progress with integrated coastal management in South Africa since the advent of democracy. *African Journal of Marine Science*, *40*(2), 121–136. https://doi.org/10.2989/1814232X.2018.1468278
Steyn, P. (2001). Environmental management in South Africa: Twenty years of governmental response to the global challenge, 1972-1992. *Historia*, *46*(1), 25–53. https://hdl.handle.net/10520/EJC38020
Steyn, P., & Wessels, A. (2000). The emergence of new environmentalism in South Africa, 1988□1992. *South African Historical Journal*, *42*(1), 210–231. https://doi.org/10.1080/02582470008671375
Stoll-Kleemann, S., & O'riordan, T. (2002). From participation to partnership in biodiversity protection: Experience from Germany and South Africa. *Society & Natural Resources*, *15*(2), 161–177. https://doi.org/10.1080/089419202753403337
Strydom, H. A., & King, N. D. (2009). *Environmental management in South Africa*. Juta and Company Ltd. Cape Town.
Tie, X., & Cao, J. (2009). Aerosol pollution in China: Present and future impact on the environment. *Particuology*, *7*(6), 426–431. https://doi.org/10.1016/j.partic.2009.09.003
Tshehla, C., & Wright, C. Y. (2019). 15 years after the national environmental management air quality act: Is legislation failing to reduce air pollution in South Africa? *South African Journal of Science*, *115*(9–10), 1–4. https://doi.org/10.17159/sajs.2019/6100
Union of South Africa. (1913). *The Natives Land Act (Act 27 of 1913)*.
Union of South Africa. (1936). *The Natives Land Act (Act 18 of 1936)*.
University of the Witwatersrand. (2022). Environmental Affairs: Policy Documents/Acts. Retrieved from https://libguides.wits.ac.za/c.php?g=145459&p=952320. Accessed March 1, 2022.
Venter, O., Fuller, R. A., Segan, D. B., Carwardine, J., Brooks, T., Butchart, S. H., DiMarco, M., Iwamura, T., Joseph, L., O'grady, D., Possingham, H. P., Rondinini, C., Smith, R. J., Venter, M., & Watson, J. E. M. (2014). Targeting global protected area expansion for imperilled biodiversity. *PLoS Biology*, *12*(6), e1001891. https://doi.org/10.1371/journal.pbio.1001891

Whitelaw, G. S., & Eagles, P. F. (2007). Planning for long, wide conservation corridors on private lands in the Oak Ridges Moraine, Ontario, Canada. *Conservation Biology*, *21*(3), 675–683. https://doi.org/10.1111/j.1523-1739.2007.00708.x

Wilson, M. C., Chen, X. Y., Corlett, R. T., Didham, R. K., Ding, P., Holt, R. D., Holyoak, M., Hu, G., Hughes, A. C., Jiang, L., & Laurance, W. F. (2016). Habitat fragmentation and biodiversity conservation: Key findings and future challenges. *Landscape Ecology*, *31*(2), 219–227. https://doi.org/10.1007/s10980-015-0312-3

Wylie, D. K., Bhattacharjee, S., & Rampedi, I. T. (2018). Evaluating the quality of environmental impact reporting for proposed tourism-related infrastructure in the protected areas of South Africa: A case study on selected EIA reports. *African Journal of Hospitality, Tourism and Leisure*, *7*(3), 1–14. https://www.ajhtl.com/uploads/7/1/6/3/7163688/article_21_vol_7_3__2018.pdf

Zhakata, E., Gundani, S. R., Chauke, V., & Odeku, K. O. (2016, October). A critic of NEMA: Waste Act 59 of 2008, so many promises, little implementation and enforcement. *The 5th Annual Conference on 20 years of South Africa's Post-Apartheid Local Government Administration*, Mokopane, South Africa.