



# SCIENCE POLICY BRIEF

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written by: Antoinette Emeldah Moleele (SPIBES East Africa)  
Email: anto.mol21@gmail.com

## Harnessing the Biodiversity–Climate Nexus to Strengthen Conservation Policy and Decision-Making in Botswana: Evidence from the Mokolodi Nature Reserve (MNR)

### Overview

Climate change and biodiversity loss are two of the most pressing sustainability challenges facing countries today. The biodiversity-climate nexus: the interconnection between these two crises, provides a valuable framework for understanding and addressing them together. In Botswana, weak policy implementation has left ecosystems increasingly vulnerable to climate impacts and biodiversity decline. These environmental stresses extend beyond ecology, affecting key sectors including agriculture, health, finance, and local governance, with real consequences for people's livelihoods and wellbeing. Addressing these challenges requires inclusive, evidence-based policies with clear, measurable targets. Applying the biodiversity-climate nexus approach offers Botswana, and countries facing similar pressures, a more integrated path toward conservation and long-term climate resilience.

### Background

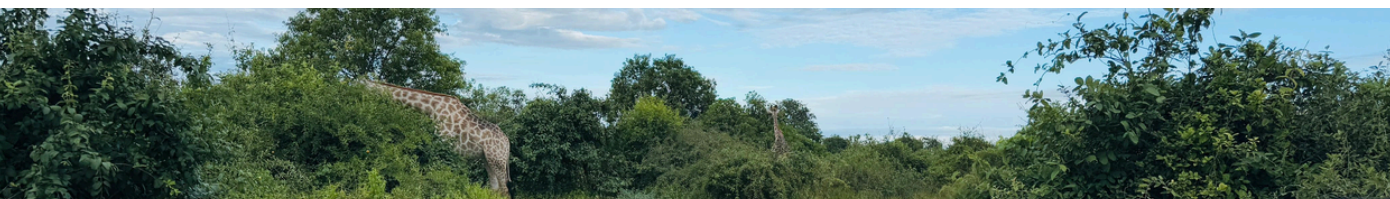
Climate mitigation and biodiversity conservation are mutually reinforcing. Healthy ecosystems play a critical role in carbon storage and emissions reduction; an opportunity that policy can actively harness [1, 2]. The Southern African region is particularly vulnerable, facing compounding pressures of environmental degradation, climate change, and poverty [3]. Climate projections for this region point to a hotter, drier future, with reduced rainfall and rising temperatures posing significant threats to Botswana's ecosystems, land use, and land cover. This study employed a biodiversity–climate nexus approach in the Mokolodi Nature Reserve (MNR) to examine the interconnections between climate change and biodiversity, identifying affected sectors, key trade-offs and synergies, and gaps in current policy responses.

The Mokolodi Nature Reserve (MNR) is a privately-managed, gated protected area located in southeastern Botswana. MNR covers approximately 4,500 hectares and supports diverse wildlife and vegetation [4].

The study combined interviews of 20 experts (from agriculture, environment, energy, local government and youth sectors) in Mokolodi nature reserve, as well as locals, leaders, decision makers, business owners and NGOs from fringe communities, to understand perceptions of climate change and biodiversity, policy awareness, and their influence on interactions with the environment. In addition, A total of 40 stakeholders participated in a normative scenario-mapping workshop, drawing on the National Ecosystem Assessment (NEA) report to identify key challenges and opportunities and to develop future pathways for biodiversity and climate action. Furthermore, to assess the impacts of climate change on biodiversity, land use and land cover (LULC) changes in Mokolodi Nature Reserve were analysed over a 30-year period, for 1995, 2005, 2015 and 2025. Relevant biodiversity and climate policy contents were also reviewed.

### Key recommendations

- Mainstream environment-centred decision-making by embedding the biodiversity-climate nexus model into national and sectoral policy planning processes.
- Develop actionable implementation strategies at all levels of government, with clear timelines, responsibilities, and measurable targets.
- Mandate inclusive stakeholder engagement, ensuring that sector experts, local communities, and policymakers are meaningfully involved in policy design and review.
- Strengthen legal enforcement by introducing clear consequences for non-compliance with environmental laws and regulations.
- Establish robust monitoring frameworks to track progress on policy implementation and biodiversity conservation outcomes.
- Integrate agro-ecological practices into agricultural planning to promote climate-resilient and biodiversity-friendly food systems.



## NATIONAL CLIMATE AND BIODIVERSITY CONTEXT

Botswana is home to rich and diverse biodiversity, encompassing iconic landscapes such as the Okavango Delta, which is a Ramsar and UNESCO World Heritage Site, and the Kalahari Desert, alongside protected areas, grasslands, woodlands, and one of the world's largest elephant populations. This natural wealth underpins the country's economy and livelihoods, supporting tourism, fishing, and food security, among other benefits [5]. However, climate change poses a growing and significant threat to this biodiversity, driving ecosystem degradation and disrupting the livelihoods of communities whose lives are closely intertwined with the natural environment. Projections indicate that Southern Africa, including Botswana, will become hotter and drier, intensifying these impacts over time [6]. Addressing these challenges requires integrated solutions. For instance, nature-based solutions (NbS) can deliver benefits for both climate mitigation and biodiversity conservation [2], while ecosystem-based approaches such as agroforestry can strengthen climate resilience and should be incorporated into Botswana's adaptation and conservation strategies [7].

## THE BIODIVERSITY-CLIMATE LINKAGES IN MNR

Botswana recognises the close links between biodiversity and climate change. Its National Biodiversity Strategy and Action Plan (NBSAP) promotes coordinated action, strong policies, monitoring, and sustainable practices to address these interconnected challenges. As biodiversity underpins multiple sectors, its loss can affect livelihoods, agriculture, water resources, human health, and ecosystem resilience.

Results from the interviews showed that participants are experiencing the impacts of climate change–biodiversity interactions in their daily lives, including, increased wildlife–livestock conflicts due to water scarcity, and declines in endemic fruit trees and endemic bird species.

From the futures thinking workshop, participants identified four future scenarios (Fig. 1), including *business as usual*, *economic optimism*, *environmental optimism*, and *policy reform*. The environmental optimism scenario offers the strongest pathway for long-term sustainable development and should guide future policy decisions.

Archetypes	Policies & Regulations	LULC	Education & Awareness	Urbanization	Inflation	Climate Change	Environmental degradation	Poverty & Unemployment
Business as Usual	↘	↗	↘	↗	↗	↗	↗	↗
Economic Optimism	↘	↗	↗	↗	↗	↗	↘	↘
Environmental Optimism	↗	↗	↗	↗	↘	↗	↘	↘
Policy Reform	↘	↗	↗	↗	↘	↘	↘	↘

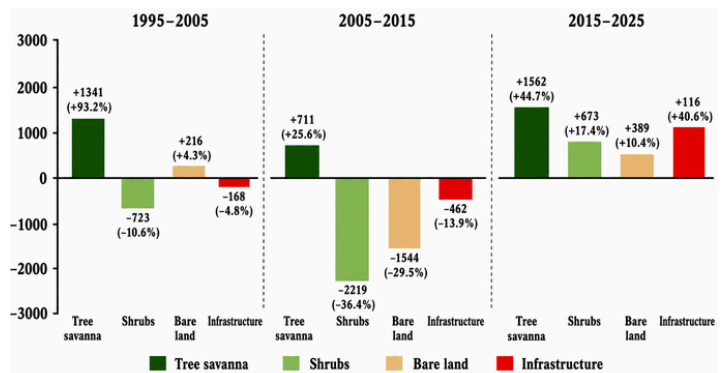
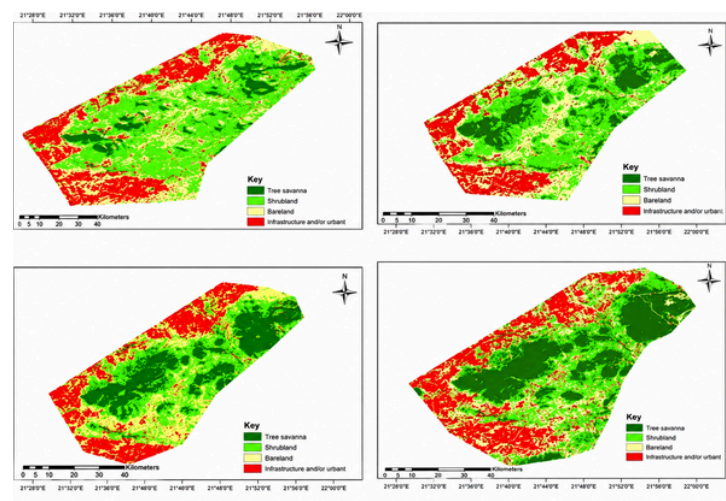
**Fig. 1.** Four scenario (biodiversity-climate nexus) archetypes and associated drivers of change. Arrow colour indicates positive (green) or negative (red) impacts, while arrow direction shows the magnitude of change. (slight or strong; increase or decrease).

Results from the land use and land cover analyses (Fig. 2) further highlight biodiversity–climate linkages, showing an increase in invasive woody plant species, such as *Vachellia tortilis* and *Dichrostachys cinerea* that may reduce native shrubs and vegetation through competition for resources.

## NATIONAL POLICIES ON BIODIVERSITY & CLIMATE CHANGE

Botswana's National Climate Change Policy (2021) aims to integrate climate change and sustainability into development planning to strengthen resilience and adaptive capacity. It promotes low-carbon development, poverty reduction, environmental protection, and alignment with national and international commitments, including the Nationally Determined Contributions (NDCs) [6]. Implemented by the Ministry of Environment, Wildlife and Tourism. It promotes low-carbon development pathways that support socioeconomic goals, while contributing to greenhouse gas reduction.

Botswana's National Biodiversity Strategy and Action Plan (NBSAP) (2016) outlines the status and trends of biodiversity, the drivers and impacts of biodiversity loss, and the value of ecosystem services. It also identifies financing mechanisms, challenges, and opportunities for biodiversity conservation [8].



**Fig. 2.** Map of LULC in Mokolodi Nature Reserve for 1995, 2005, 2015 & 2025 (top image) and Comparison of LULC Gains and losses over time & percentages from 1995-2025 (bottom image). Dark green is forest, Light green is shrubs, Light brown is bareland and Red is infrastructure/urban areas.

Biodiversity loss and climate change remain major challenges in Botswana. Although policies support adaptation and mitigation, their effectiveness depends on strong integration, implementation, and public participation. Gaps in awareness, employment opportunities, sustainable practices, and climate resilience continue to weaken biodiversity and climate outcomes [9].

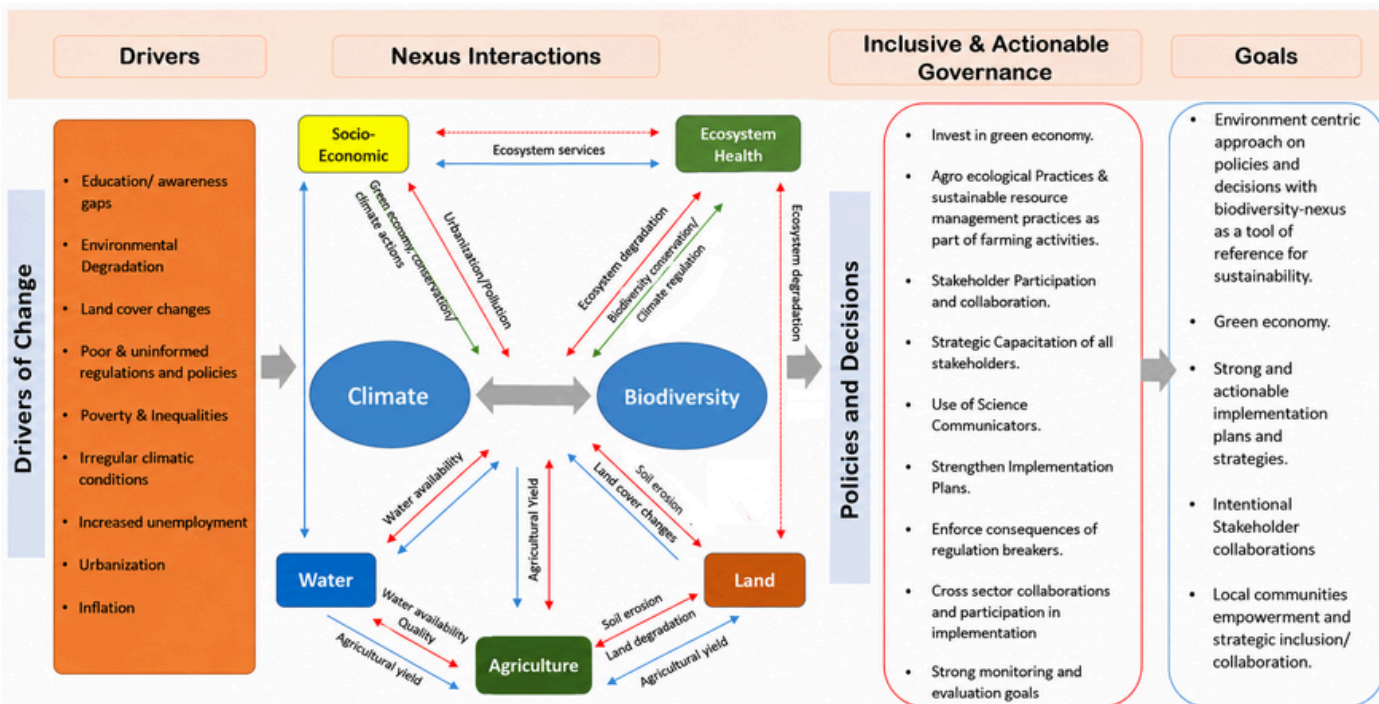
As shown in Fig. 1, these drivers assessed across the four future scenarios shows worsening trends in most cases, with the exception of the environment-centred scenario, which offers more positive outcomes.

The stakeholder-derived conceptual framework of the biodiversity–climate nexus (Fig 3), highlights key interactions, trade-offs, and policy gaps that can be addressed through inclusive and actionable interventions. The framework shows that biodiversity conservation can enhance species richness, ecosystem health, and habitat protection, while supporting ecotourism, economic growth, and employment opportunities.

At the same time, as tradeoffs, climate variability can drive biodiversity loss and ecosystem degradation, reducing ecological functions and water availability.

These impacts can lower agricultural productivity and weaken local livelihoods and socioeconomic well-being.

These interactions can inform more effective policies and decision-making, provided they are socially inclusive and actionable. Achieving this requires stakeholder participation, strong monitoring and evaluation systems, effective enforcement of environmental regulations, and the integration of agroecological practices to strengthen climate resilience and support biodiversity conservation.



**Fig 3.** Conceptual framework of the biodiversity–climate nexus developed through stakeholder participation. Green arrows indicate synergies, red arrows indicate trade-offs, while blue arrows represent the symbiotic interactions between the two.

## Conclusion

The findings highlight the need for Botswana to move beyond siloed approaches and adopt an environment-centred framework anchored in the integrated biodiversity–climate nexus framework. However, effective implementation requires coordinated action across sectors, strong monitoring and enforcement mechanisms, and meaningful stakeholder participation. Empowering communities, the private sector, and civil society will be critical to achieving sustainable biodiversity conservation and climate resilience.

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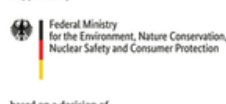
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