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**Biodiversity Conservation Strategies and their Impact on Ecosystem
Health in Mozambique**

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Abstract

Purpose: The aim of the study was to analyze the biodiversity conservation strategies and their impact on ecosystem health in Mozambique.

Methodology: This study adopted a desk methodology. A desk study research design is commonly known as secondary data collection. This is basically collecting data from existing resources preferably because of its low cost advantage as compared to a field research. Our current study looked into already published studies and reports as the data was easily accessed through online journals and libraries.

Findings: Biodiversity conservation strategies in Mozambique have enhanced ecosystem health, promoting species richness and habitat preservation. Through protected area management and community-based initiatives, threatened species and ecosystems have shown signs of recovery. Sustainable land management and habitat restoration projects have bolstered ecosystem resilience. However, challenges like habitat fragmentation and illegal wildlife trade persist, demanding ongoing research and integrated conservation approaches for sustained biodiversity and ecosystem health.

Unique Contribution to Theory, Practice and Policy: Resilience theory, community-based natural resource management (CBNRM) & political ecology may be used to anchor future studies on biodiversity conservation strategies and their impact on ecosystem health in Mozambique. Implement community-based conservation initiatives that empower local communities to actively participate in biodiversity conservation efforts. Ensure that biodiversity conservation is mainstreamed into national development policies and strategies in Mozambique

Keywords: *Biodiversity Conservation Strategies, Ecosystem Health*

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INTRODUCTION

Ecosystem health indicators encompass various aspects that reflect the overall well-being and functioning of an ecosystem. Species diversity, as an indicator, refers to the variety of different species present within an ecosystem. Habitat quality assesses the suitability and condition of the physical environment for supporting diverse species and ecological processes. Ecosystem services represent the benefits that humans derive from ecosystems, such as pollination, water purification, and climate regulation. For example, in the United States, a study by Tilman (2017) demonstrated a decline in species diversity in grassland ecosystems due to agricultural intensification, with a significant loss of plant and animal species over the past century (Tilman, 2017). Similarly, research in the United Kingdom by Oliver (2015) highlighted the degradation of habitat quality in freshwater ecosystems, with over 75% of rivers failing to meet ecological standards due to pollution and habitat alteration (Oliver, 2015).

In developing economies such as India, ecosystem health indicators also face significant challenges. For instance, a study by Singh (2016) reported a decline in species diversity in Indian forests due to deforestation and habitat fragmentation, with certain species facing extinction threats (Singh, 2016). Additionally, research by Gupta (2018) in China highlighted the deterioration of ecosystem services in urban areas, with increased air and water pollution leading to adverse impacts on human health and well-being (Gupta, 2018). These examples underscore the importance of addressing environmental degradation and promoting sustainable development practices in developing economies.

In the United States, the decline in species diversity is evident, particularly in ecosystems affected by human activities such as agriculture and urbanization. According to a study by Tilman (2017), grassland ecosystems have witnessed a significant loss of plant and animal species due to agricultural intensification over the past century. This decline in species diversity threatens the stability and resilience of these ecosystems, impacting their ability to provide essential ecosystem services such as soil fertility and pest regulation. Japan faces challenges related to habitat quality, particularly in coastal and marine ecosystems. Pollution from industrial activities and urbanization has led to habitat degradation and loss of biodiversity in these areas. For example, a study by Fujii (2018) highlighted the impact of coastal development on mangrove habitats in Japan, with significant declines in habitat quality and loss of important ecosystem functions such as coastal protection and fishery support.

In India, rapid urbanization and industrialization have led to the deterioration of ecosystem services, particularly in urban areas. Gupta (2018) reported on the degradation of ecosystem services in cities like Delhi, where air and water pollution have reached alarming levels, posing serious threats to human health and well-being. This degradation of ecosystem services underscores the urgent need for sustainable urban planning and environmental management strategies in developing countries like India. China faces challenges related to both species diversity and ecosystem services, particularly in rapidly developing urban areas. Research by Zhang (2019) highlighted the decline in species diversity in Chinese forests due to habitat loss and fragmentation caused by infrastructure development and agricultural expansion. Additionally, the degradation of ecosystem services such as water purification and flood regulation has been

observed in urban areas like Beijing, where pollution and habitat destruction have compromised the ability of ecosystems to provide these essential services.

United Kingdom faces challenges related to habitat quality, particularly in freshwater ecosystems. Research by Oliver (2015) highlighted the degradation of habitat quality in UK rivers, with over 75% failing to meet ecological standards due to pollution and habitat alteration. This degradation negatively impacts the health of aquatic ecosystems and their ability to provide essential services such as water purification and support for diverse aquatic species. Germany has been focusing on ecosystem services, particularly in urban areas where green spaces play a crucial role in providing various services. A study by Haase (2014) examined the importance of urban green spaces in German cities for regulating microclimate, improving air quality, and enhancing recreational opportunities for residents. Such ecosystem services contribute significantly to the quality of life in urban environments and highlight the importance of maintaining and enhancing green infrastructure in developed economies.

Australia faces challenges related to habitat degradation and species loss, particularly in fragile ecosystems such as coral reefs. Research by Hughes (2018) highlighted the severe impact of climate change and ocean acidification on the Great Barrier Reef, resulting in coral bleaching events and loss of biodiversity. Protecting and restoring the health of coral reef ecosystems is critical for maintaining biodiversity and supporting the fisheries and tourism industries in Australia. Canada's boreal forests are essential for biodiversity conservation and ecosystem services such as carbon storage and water regulation. However, industrial activities such as logging and oil extraction pose significant threats to these ecosystems. Studies by Schmiegelow (2016) have emphasized the importance of sustainable forest management practices and protected areas in conserving biodiversity and maintaining the resilience of boreal forest ecosystems in Canada.

Mexico's tropical forests are biodiversity hotspots, but they face threats from deforestation and illegal logging. Research by Dirzo (2014) highlighted the decline in species diversity in Mexican forests due to habitat loss and fragmentation, with implications for ecosystem functioning and the provision of ecosystem services such as carbon sequestration and watershed protection. Strengthening conservation efforts and promoting sustainable land use practices are essential for preserving the health of forest ecosystems in Mexico. Indonesia's rich biodiversity is under threat from deforestation, habitat degradation, and illegal wildlife trade. Research by Koh (2019) emphasized the importance of protected areas and community-based conservation initiatives in safeguarding biodiversity and ecosystem services in Indonesian forests. Addressing deforestation and promoting sustainable land use practices are critical for maintaining the health and resilience of forest ecosystems in Indonesia.

In Brazil, the Amazon rainforest faces significant threats to species diversity due to deforestation and land conversion for agricultural purposes. Studies by Laurance (2014) have documented the loss of biodiversity in the Amazon, with implications for ecosystem functioning and the provision of vital services such as carbon sequestration and climate regulation. Addressing deforestation and promoting sustainable land use practices are critical for maintaining ecosystem health in countries like Brazil. South Africa grapples with challenges related to both terrestrial and marine ecosystems. Research by Reyers (2018) emphasized the importance of conserving biodiversity in South African grasslands, which provide essential ecosystem services such as soil fertility

maintenance and water regulation. Additionally, in marine ecosystems along the South African coastline, overfishing and habitat degradation threaten biodiversity and the provision of ecosystem services such as fisheries and tourism.

In Sub-Saharan African economies, ecosystem health indicators are crucial for ensuring the resilience and sustainability of natural systems. For instance, a study by Muhanguzi (2019) in Uganda highlighted the importance of conserving biodiversity for maintaining ecosystem services such as soil fertility and water regulation, which are vital for agricultural productivity and food security (Muhanguzi, 2019). Similarly, research by Mokgolodi (2017) in Botswana emphasized the role of habitat restoration efforts in improving ecosystem health and supporting biodiversity conservation in degraded landscapes (Mokgolodi, 2017). These studies emphasize the need for integrated approaches to ecosystem management and conservation in Sub-Saharan Africa to address ongoing environmental challenges and promote sustainable development.

In Nigeria, habitat degradation and loss of biodiversity are significant issues, particularly in the Niger Delta region due to oil exploration and deforestation. Studies by Adekalu (2016) have documented the impact of oil spills on mangrove ecosystems, resulting in the loss of habitat quality and disruption of ecosystem functions such as coastal protection and fishery support. Kenya faces challenges related to both terrestrial and marine ecosystems, with habitat degradation and overexploitation of natural resources threatening biodiversity and ecosystem health. Research by Mwaura (2018) highlighted the decline in species diversity in Kenyan forests due to deforestation and land conversion for agriculture and settlement. Similarly, in marine ecosystems such as coral reefs, overfishing and pollution have led to habitat degradation and loss of ecosystem services such as tourism and coastal protection.

In Uganda, wetland ecosystems play a crucial role in supporting biodiversity and providing essential services such as water purification and flood regulation. Research by Muhanguzi (2019) highlighted the importance of conserving wetland biodiversity for maintaining ecosystem health and supporting agricultural productivity and food security in Uganda. Addressing threats such as habitat loss and pollution is essential for ensuring the resilience of wetland ecosystems in the country. Tanzania faces challenges related to habitat degradation and loss of biodiversity, particularly in forest ecosystems. Research by Burgess (2018) documented the decline in species diversity in Tanzanian forests due to deforestation and illegal logging activities. Preserving forest biodiversity is crucial for maintaining ecosystem functions such as carbon sequestration, soil stabilization, and provision of habitat for wildlife in Tanzania.

Biodiversity conservation strategies encompass a range of approaches aimed at preserving and restoring the variety of life forms within ecosystems. Protected areas, such as national parks and reserves, serve as crucial sanctuaries for diverse species, providing habitats where they can thrive free from human interference (CBD, 2004). These protected areas play a vital role in safeguarding species diversity by preserving habitats and preventing habitat destruction and fragmentation. Habitat restoration, another key strategy, involves the rehabilitation of degraded ecosystems to enhance habitat quality and promote the recovery of native species populations (SER, 2004). By restoring degraded habitats, this strategy helps improve ecosystem health indicators such as habitat quality and species diversity, contributing to the overall resilience of ecosystems.

Community-based conservation is a participatory approach that involves collaboration between local communities and conservation organizations in managing natural resources (Berkes, 2004). This strategy empowers communities to take ownership of conservation efforts, leveraging traditional knowledge and practices to sustainably manage biodiversity. Through community-based conservation initiatives, local communities become stewards of their natural environment, leading to more effective protection of habitats and species diversity (Adams, 2004). By linking biodiversity conservation strategies such as protected areas, habitat restoration, and community-based conservation to ecosystem health indicators like species diversity, habitat quality, and ecosystem services, it becomes evident that these strategies are interdependent and mutually reinforcing, contributing to the resilience and sustainability of ecosystems.

Problem Statement

Biodiversity conservation strategies play a crucial role in safeguarding ecosystems and maintaining their health and resilience. In Mozambique, a country renowned for its rich biodiversity and unique ecosystems, the effective implementation of conservation strategies is paramount to mitigate the escalating threats posed by habitat loss, deforestation, poaching, and climate change. However, despite the existence of conservation initiatives, Mozambique continues to face significant challenges in balancing conservation efforts with socio-economic development goals, resulting in biodiversity loss and degradation of ecosystem health. Recent studies (Silva, 2021) underscore the urgency of addressing the gaps in biodiversity conservation strategies and their implications for ecosystem health in Mozambique. These studies highlight the need for a comprehensive assessment of existing conservation policies, management practices, and their effectiveness in protecting key biodiversity hotspots and critical ecosystems. Additionally, the impact of human activities, such as land-use change, agriculture expansion, and infrastructure development, on biodiversity loss and ecosystem degradation requires thorough investigation to inform evidence-based conservation interventions.

Furthermore, the lack of financial resources, institutional capacities, and community participation pose significant barriers to the implementation of effective biodiversity conservation strategies in Mozambique (Lopes, 2020). The unsustainable exploitation of natural resources, coupled with inadequate enforcement of conservation laws and regulations, exacerbates the threats to biodiversity and ecosystem health. Therefore, there is an urgent need to identify and address the socio-economic drivers of biodiversity loss while promoting sustainable land-use practices and community-based conservation approaches. In light of these challenges, a comprehensive understanding of the factors influencing biodiversity conservation strategies and their impact on ecosystem health is essential for informing policy decisions and guiding conservation efforts in Mozambique. By identifying key drivers of biodiversity loss, assessing the effectiveness of conservation interventions, and promoting stakeholder engagement and capacity-building initiatives, Mozambique can enhance its conservation efforts and ensure the long-term health and resilience of its ecosystems.

Theoretical Framework

Resilience Theory

Originating from ecology, resilience theory, pioneered by C.S. Holling and Brian Walker focused on understanding the ability of ecosystems to absorb disturbances and maintain their structure and function. The main theme of resilience theory is the capacity of ecosystems to adapt and reorganize in response to environmental changes, thereby sustaining their health and functionality over time. In the context of biodiversity conservation in Mozambique, resilience theory is relevant as it emphasizes the importance of conserving biodiversity to enhance ecosystem resilience. By maintaining diverse species assemblages and ecological interactions, conservation strategies can increase the resilience of ecosystems to various stressors, including climate change, habitat degradation, and invasive species (Folke, 2016).

Community-Based Natural Resource Management (CBNRM)

Community-Based Natural Resource Management (CBNRM) is a theory that emphasizes the involvement of local communities in the management and conservation of natural resources. Originating from the field of environmental governance and development studies, CBNRM recognizes the importance of empowering local communities to take ownership of conservation initiatives and benefit from sustainable resource management practices. The main theme of CBNRM is the promotion of community participation, equity, and social justice in natural resource governance. In Mozambique, where rural communities often depend on natural resources for their livelihoods, CBNRM approaches can play a crucial role in fostering sustainable conservation practices. By involving local communities in decision-making processes and recognizing their traditional knowledge and resource rights, CBNRM can enhance the effectiveness and legitimacy of biodiversity conservation strategies (Hockings, 2018).

Political Ecology

Political ecology examines the socio-political dynamics that shape human-environment interactions and resource management practices. Originating from geography and anthropology, political ecology highlights the role of power relations, institutional arrangements, and political-economic forces in influencing conservation outcomes. The main theme of political ecology is the recognition of the inherently political nature of environmental issues and the need to address underlying power asymmetries and inequalities in conservation efforts. In the context of biodiversity conservation in Mozambique, political ecology is relevant as it sheds light on the socio-economic drivers of environmental degradation and the distributional impacts of conservation policies. By critically analyzing the political and economic interests that influence conservation strategies, political ecology can inform more equitable and socially just approaches to biodiversity conservation in Mozambique (Büscher, 2019).

Empirical Review

Silva (2017) assessed the effectiveness of community-based conservation initiatives in protecting biodiversity in Mozambique's coastal areas. Through a combination of field surveys and participatory methods, the researchers engaged local communities in the management of marine protected areas. The study found that community-managed marine protected areas led to significant improvements in fish biomass and species richness. This highlights the importance of

local engagement and participatory approaches in conservation efforts, particularly in coastal ecosystems where communities rely heavily on marine resources. The findings suggest that empowering local communities to manage marine protected areas can enhance biodiversity conservation and ecosystem health in Mozambique's coastal regions.

Machado (2018) investigated the impact of habitat restoration on terrestrial biodiversity in Mozambique's degraded landscapes. Using systematic vegetation surveys and ecological assessments, the researchers evaluated the effectiveness of restoration interventions such as native species reforestation and habitat connectivity enhancement. The study revealed notable increases in species diversity and ecosystem resilience following restoration efforts. These findings underscore the potential of habitat restoration as a critical strategy for biodiversity conservation and ecosystem health improvement in Mozambique. The study emphasizes the importance of restoring degraded landscapes to support biodiversity and enhance ecosystem services in the region.

Matavele (2019) examined the effectiveness of protected area management in safeguarding biodiversity hotspots in Mozambique's national parks. Utilizing remote sensing data and field surveys, the researchers evaluated the status of biodiversity within protected areas and compared management effectiveness across different sites. The study found that well-managed protected areas with adequate enforcement measures exhibited higher species abundance and habitat quality compared to poorly managed areas. This highlights the importance of strong governance and enforcement mechanisms in ensuring the effectiveness of protected area networks for biodiversity conservation. The findings suggest that strategic management interventions are essential for maintaining biodiversity hotspots and preserving ecosystem integrity in Mozambique's national parks.

Sá (2020) explored the role of sustainable land-use planning in mitigating biodiversity loss in Mozambique's rural landscapes. Through stakeholder consultations and spatial analysis, the researchers identified key land-use planning strategies such as land zoning and conservation corridors. These strategies aim to maintain habitat connectivity and protect critical biodiversity areas. The study emphasizes the importance of integrating biodiversity conservation into land-use planning processes to achieve sustainable development goals while safeguarding ecosystem health. The findings suggest that proactive land-use planning can help mitigate the adverse impacts of land-use change on biodiversity and promote ecological resilience in Mozambique's rural landscapes.

Gonçalves (2018) investigated the impact of invasive species on biodiversity conservation in Mozambique's ecosystems. Using field surveys and ecological assessments, the researchers evaluated the spread and ecological effects of invasive species on native flora and fauna. The study found that invasive species, such as *Prosopis juliflora* and *Chromolaena odorata*, have negatively impacted native biodiversity by outcompeting indigenous plants and disrupting ecosystem processes. These findings underscore the importance of invasive species management as a critical component of biodiversity conservation strategies in Mozambique. The study recommends implementing control measures to mitigate the spread of invasive species and restore ecosystem integrity in affected areas.

Sousa (2021) assessed the effectiveness of agroforestry systems in promoting biodiversity conservation and ecosystem services provision in Mozambique's agricultural landscapes. Through field experiments and ecological monitoring, the researchers compared biodiversity levels and ecosystem functions in traditional monoculture systems versus agroforestry systems. The study found that agroforestry systems supported higher levels of biodiversity, soil fertility, and water retention compared to monoculture systems. These findings highlight the potential of agroforestry as a sustainable land-use practice for enhancing biodiversity conservation and improving agricultural productivity in Mozambique. The study recommends promoting the adoption of agroforestry practices to enhance ecosystem resilience and support rural livelihoods in the country.

Marques (2019) investigated the role of community-based ecotourism in biodiversity conservation and local livelihoods in Mozambique's conservation areas. Through surveys and interviews with local communities and tourists, the researchers assessed the socio-economic and environmental impacts of ecotourism initiatives. The study found that community-based ecotourism projects contributed to biodiversity conservation by providing alternative livelihoods for local communities and raising awareness about the value of conservation. However, challenges such as limited access to markets and inadequate infrastructure hindered the sustainable development of ecotourism in some areas. The findings suggest that strengthening community involvement and improving tourism infrastructure are essential for maximizing the benefits of ecotourism while minimizing its negative impacts on biodiversity and local communities in Mozambique.

METHODOLOGY

This study adopted a desk methodology. A desk study research design is commonly known as secondary data collection. This is basically collecting data from existing resources preferably because of its low-cost advantage as compared to field research. Our current study looked into already published studies and reports as the data was easily accessed through online journals and libraries.

FINDINGS

The results were analyzed into various research gap categories that is conceptual, contextual and methodological gaps

Conceptual Gap: Despite Silva's (2017) emphasis on the effectiveness of various conservation and management strategies in Mozambique, there is a conceptual gap in understanding the holistic integration of these strategies. While individual studies focus on community-based conservation, habitat restoration, protected area management, sustainable land-use planning, invasive species management, agroforestry systems, and ecotourism, there is limited research that synthesizes these approaches into a comprehensive conservation framework. A conceptual study that examines the synergies and trade-offs between different conservation strategies and their cumulative effects on biodiversity conservation and ecosystem health in Mozambique would provide valuable insights for policymakers and conservation practitioners. Such research would contribute to the development of integrated conservation strategies that address the multifaceted challenges facing biodiversity conservation in Mozambique and enhance the effectiveness of conservation efforts in the region.

Contextual Gap: Contextually, Machado's (2018) study highlights successful conservation interventions and their outcomes, yet there is a gap in understanding the specific challenges and opportunities for biodiversity conservation in Mozambique's diverse ecosystems. While the study provide valuable insights into the ecological outcomes of conservation efforts, there is limited exploration of the socio-economic, political, and cultural factors that influence conservation outcomes at the local and national levels. A contextual study that investigates the socio-economic drivers of biodiversity loss, community perceptions of conservation initiatives, and the role of governance structures in shaping conservation outcomes would fill this gap and provide context-specific recommendations for effective conservation planning and implementation. By addressing these contextual factors, researchers and policymakers can develop more targeted and sustainable conservation strategies that account for the unique socio-economic and environmental contexts of different regions in Mozambique.

Geographical Gap: Geographically, while Matavele's (2019) study focused on biodiversity conservation efforts in coastal areas and national parks, there remains a gap in research focusing on Mozambique's inland and forested regions, particularly in the northern and central parts of the country. While coastal areas and national parks have received significant attention in the existing studies, other ecologically important regions, such as montane forests and savannas, remain understudied. A geographical study that assesses biodiversity patterns, threats, and conservation priorities in these overlooked regions would help fill this gap and contribute to a more comprehensive understanding of biodiversity conservation in Mozambique. By addressing this geographical gap, researchers can ensure that conservation efforts are inclusive and effective across diverse ecosystems and regions, thereby maximizing the conservation impact and promoting long-term ecological sustainability in Mozambique.

CONCLUSION AND RECOMMENDATIONS

Conclusions

In conclusion, the biodiversity conservation strategies implemented in Mozambique have significant implications for ecosystem health and resilience. Through the examination of theories such as resilience theory, community-based natural resource management (CBNRM), and political ecology, it becomes evident that effective conservation efforts must consider both ecological and socio-political dimensions. Resilience theory underscores the importance of maintaining biodiversity to enhance ecosystem resilience in the face of environmental disturbances. CBNRM emphasizes the critical role of community participation and empowerment in promoting sustainable resource management practices. Political ecology highlights the need to address underlying power dynamics and socio-economic inequalities that shape conservation outcomes.

The challenges facing biodiversity conservation in Mozambique are multifaceted, including habitat loss, deforestation, poaching, and climate change. These challenges are exacerbated by limited financial resources, institutional capacities, and community engagement. However, there are opportunities for innovation and collaboration to overcome these barriers and promote effective conservation strategies. By integrating scientific research, community engagement, and policy interventions, Mozambique can enhance its conservation efforts and safeguard its rich biodiversity for future generations.

Moving forward, it is essential to prioritize holistic approaches that balance conservation goals with socio-economic development needs. This requires fostering partnerships between government agencies, non-governmental organizations, local communities, and other stakeholders to develop contextually relevant and sustainable conservation strategies. Additionally, investing in education, capacity-building, and awareness-raising initiatives can empower local communities to actively participate in conservation efforts and promote stewardship of natural resources.

In conclusion, biodiversity conservation in Mozambique is not only crucial for protecting unique ecosystems and species but also for ensuring the well-being and resilience of local communities. By embracing interdisciplinary approaches, leveraging traditional knowledge, and promoting inclusive decision-making processes, Mozambique can strengthen its conservation efforts and contribute to global biodiversity conservation goals.

Recommendations

Theory

Further research is needed to advance resilience theory by exploring the specific mechanisms through which biodiversity conservation contributes to ecosystem resilience in Mozambique. This entails conducting empirical studies to assess how different conservation strategies enhance the adaptive capacity of ecosystems to withstand environmental disturbances. By elucidating the linkages between biodiversity conservation and ecosystem resilience, researchers can contribute to the theoretical understanding of complex ecological systems and inform more effective conservation interventions.

Practice

Implement community-based conservation initiatives that empower local communities to actively participate in biodiversity conservation efforts. This involves establishing community-managed protected areas, promoting sustainable resource management practices, and providing training and capacity-building support to local stakeholders. By fostering collaboration between communities, conservation organizations, and government agencies, community-based conservation approaches can enhance the effectiveness and sustainability of biodiversity conservation efforts in Mozambique. Recognize and integrate traditional ecological knowledge (TEK) into biodiversity conservation practices. Indigenous and local communities in Mozambique possess valuable insights and traditional practices that have sustained biodiversity and ecosystems for generations. Incorporating TEK into conservation strategies not only enriches scientific understanding but also promotes culturally appropriate and contextually relevant approaches to ecosystem management. Collaborative research projects and partnerships between scientists and indigenous communities can facilitate the documentation and integration of TEK into conservation planning and implementation.

Policy

Ensure that biodiversity conservation is mainstreamed into national development policies and strategies in Mozambique. This requires integrating biodiversity conservation objectives into sectoral policies related to land use planning, agriculture, forestry, and infrastructure development. By aligning conservation goals with broader development agendas, policymakers can promote sustainable development pathways that prioritize biodiversity conservation and ecosystem health.

Enhance enforcement mechanisms to combat illegal wildlife trade, poaching, and habitat destruction in Mozambique. This involves strengthening law enforcement agencies, improving surveillance and monitoring systems, and implementing stricter penalties for wildlife crimes. By enhancing deterrence measures and addressing governance challenges, policymakers can create an enabling environment for effective biodiversity conservation and enforcement of conservation laws.

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