



KAZA GREEN GROWTH TRENDS AND OPPORTUNITIES ANALYSIS

PATHWAYS TOWARDS SUSTAINABLE
GREEN GROWTH FOR THE KAZA

This study was commissioned by the Worldwide Fund for Nature (WWF) in partnership with the Kavango-Zambezi Transfrontier Conservation Area (KAZA TFCA) Secretariat.

WWF and the KAZA TFCA Secretariat gratefully acknowledge the valuable contributions of the lead researchers and authors of this report: Mrs. Inonge Mukumbuta Guillemin, Dr. Peter Scheren and Ms. Juliane Winkler. We also extend our sincere thanks to the steering group that guided the study, in particular Dr. Mike Knight and Mr. Gordon Horner of WWF, and Dr. Nyambe Nyambe of the KAZA Secretariat.

Finally, we gratefully acknowledge WWF Netherlands for its financial and technical support to the study.

The views and conclusions expressed in this report are those of the authors and do not necessarily represent those of WWF, the KAZA TFCA Secretariat, or their partner organizations.

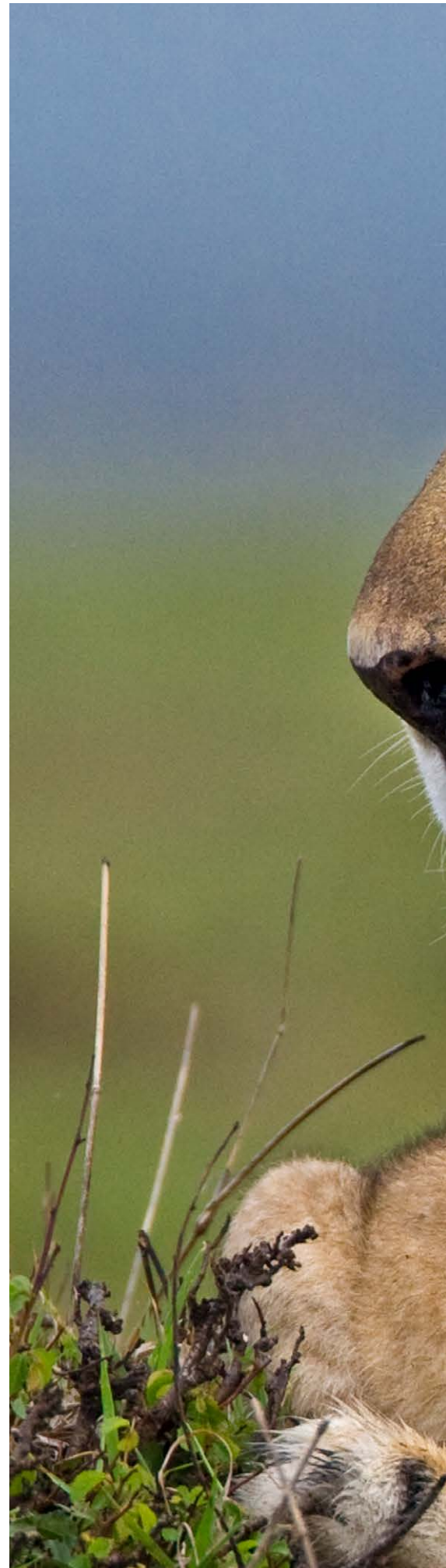
Authors:

Mrs. Inonge Mukumbuta Guillemin, United Nations University Institute for Integrated Management of Material Fluxes and of Resources

Dr. Peter Scheren, Worldwide Fund for Nature

Ms. Juliane Winkler

Final report, 21 June 2026





© naturepl.com / Andy Rouse / WWF

CONTENTS

FOREWORD 7

EXECUTIVE SUMMARY 9

1. INTRODUCTION 11

1.1. The Strategic Importance of the KAZA TFCA	12
1.2. KAZA Vision and Institutional Context	13
1.3. Emerging Development and Sustainability Pressures	14
1.4. The Case for Green Growth Pathways	15
1.5. Purpose and Scope of the Report	17
1.6. Methodological Approach	17

2. TOURISM 18

2.1. Overview of the Sector	19
2.2. Trends and Developments	21
2.3. Challenges and Opportunities for Green Growth	28
2.4. Key Conclusions and Recommendations	31

3. AGRICULTURE 32

3.1. Overview of the Sector	33
3.2. Trends and Developments	36
3.3. Challenges and Opportunities for Green Growth	43
3.4. Key Conclusions and Recommendations	45

4. EXTRACTIVE INDUSTRIES 46

4.1. Overview of the Sector	47
4.2. Trends and Developments	49
4.3. Challenges and Opportunities for Green Growth	57
4.4. Key Conclusions and Recommendations	58

5. INFRASTRUCTURE DEVELOPMENT 59

5.1. Overview of the Sector	60
5.2. Trends and Developments	61
5.3. Challenges and Opportunities for Green Growth	68
5.4. Key Conclusion and Recommendations	70

6. SETTLEMENTS AND URBANIZATION 71

6.1. Overview of the Sector	72
6.2. Trends and Developments	73
6.3. Challenges and Opportunities for Green Growth	77
6.4. Key Conclusions and Recommendations	78

7. WATER RESOURCES MANAGEMENT 79

7.1. Overview of the Sector	80
7.2. Trends and Developments	82
7.3. Challenges and Opportunities for Green Growth	85
7.4. Key Conclusions and Recommendations	86

8. PESTLE ANALYSIS 87

8.1. Political	89
8.2. Economic	90
8.3. Social	92
8.4. Technological	93
8.5. Legal	94
8.6. Environmental	96
8.7. Conclusions and Recommendations	96

9. PATHWAYS TOWARDS GREEN GROWTH IN THE KAZA TFCA 98

9.1. Introduction	99
9.2. Systems Interactions and Strategic Trade-offs	100
9.3. Pathway 1: Strengthening the Nature-Based Economy	101
9.4. Pathway 2: Sustainable Land and Water Management	102
9.5. Pathway 3: Green Infrastructure and Regional Connectivity	103
9.6. Pathway 4: Inclusive Livelihoods and Community Empowerment	104
9.7. Pathway 5: Regional Cooperation, Policy Harmonisation, and Knowledge Systems	105
9.8. Sectoral Contributions to the Green Growth Pathways	106
9.9. Cross-Cutting Enabling Conditions	108

10. CONCLUSIONS AND STRATEGIC OUTLOOK 109

10.1. Overall Conclusions	110
10.2. Strategic Implications for Green Growth in the KAZA TFCA	111
10.3. Looking Ahead	112

REFERENCES 113

ANNEX: OVERVIEW OF STRATEGIC PATHWAYS FOR GREEN GROWTH 123

LIST OF FIGURES

Figure 1.	Key characteristics of the Kavango Zambezi Transfrontier Conservation Area (KAZA).	12	Figure 21.	An illustration of existing veterinary cordon fences in the KAZA landscape.	42
Figure 2.	Principles of Green Growth.	16	Figure 22.	Cumulative GDP contribution by sector in KAZA member states.	47
Figure 3.	Evolution of tourism receipts (2019-2025).	19	Figure 23.	Distribution of Zambezi Teak and Kiaat.	49
Figure 4.	Tourism sector contribution to national GDP and employment (2025).	20	Figure 24.	Kiaat <i>P. angolensis</i> timber quantity totals.	50
Figure 5.	Tourist arrivals by KAZA member countries.	21	Figure 25.	An illustration of illegal logging and trade in Namibia.	51
Figure 6.	Concentration of tourism activities in the KAZA TFCA.	22	Figure 26.	Zambia wood extraction for charcoal.	51
Figure 7.	The revenue generated from trophy hunting (2019-2022).	24	Figure 27.	Mining projects in KAZA landscape.	52
Figure 8.	The differences in profitability of trophy hunting currently versus the scenario of a trophy hunting ban.	24	Figure 28.	An illustration of conflicting land use and governance in the KAZA landscape.	53
Figure 9.	A visual representation of the correlation between media coverage, water flow levels at Victoria Falls and tourist arrivals over the years.	25	Figure 29.	Walvis Bay - Ndola - Lubumbashi Development Corridor and distribution of number plates and company headquarters along corridors.	62
Figure 10.	A visual representation of tourism operators' most concerns and impacts of COVID-19 in the KAZA.	26	Figure 30.	Overview of existing irrigation systems and proposed and existing hydropower dams in the KAZA region.	63
Figure 11.	A map illustrating access and connectivity across KAZA across all modes of transport.	27	Figure 31.	Population with access to electricity in KAZA TFCA.	64
Figure 12.	An overview of the benefits and disbenefits of tourism expansion on KAZA.	28	Figure 32.	An illustration of potential solar energy development in KAZA. Data extracted from global solar atlas, 2024.	65
Figure 13.	Mean crop productivity in KAZA.	33	Figure 33.	Main roads and railway connections in the KAZA.	66
Figure 14.	Share of agriculture in GDP among the KAZA states.	34	Figure 34.	Flight connectivity in the KAZA.	67
Figure 15.	A visual representation of agriculture practices in the KAZA member states.	35	Figure 35.	Expansion of settlements along road networks.	74
Figure 16.	An illustration of mean land surface temperature.	37	Figure 36.	Live elephants (bulls and family herds) and livestock observations in the KAZA TFCA survey area during the 2022 elephant survey (Bussière et al., 2023), overlayed on a human settlement density map created from the Open Buildings dataset (Sirko et al., 2021).	75
Figure 17.	Historic and projected mean annual temperature (°C) and annual precipitation (mm) across KAZA	38	Figure 37.	Watersheds in the KAZA TFCA region	83
Figure 18.	The expansion of cropland between 2000 to 2020.	39	Figure 38.	KAZA PESTLE Analysis	88
Figure 19.	Soil fertility in the KAZA landscape	39	Figure 39.	Economic income potential and growth pathway for the KAZA.	91
Figure 20.	Annual Forest loss in the KAZA region.	40			

LIST OF TABLES

Table 1.	Overview of current and potential Non-Timber Forests Products (NTFPs) in the KAZA	54
Table 2.	Overview of fundamental conventions and policy frameworks relevant to the KAZA region	95
Table 3.	Overview of interfaces between the strategic pathways and sectoral analyses	107

LIST OF ACRONYMS

BDA	Development Bank of Angola
CBNRM	Community-Based Natural Resource Management
CBT	Community-based trading
CITES	Convention on International Trade in Endangered Species
COSO	Committee of Senior Officials
EIA	Environmental Impact Assessment
ESIAs	Environmental and Social Impacts Assessments
FAO	Food Agriculture Organization
FMD	Foot Mouth Disease
GDP	Gross Domestic Product
GGGI	Global Green Growth Institute
GIS	Geographic Information System
HWC	Human-Wildlife Conflict
IDP	Integrated Development Plan
SARAP	Southern African Rock Art Project
SEA	Strategic Environmental Assessments
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resources Management
KAZA	Kavango-Zambezi Transfrontier Conservation Area
LEDs	Low Emissions Development Strategy
MSP	Multi-Stakeholder Process
NGOs	Non-Governmental Organizations
NTFPS	Non-Timber Forest Products

OKACOM	Okavango River Basin Water Commission
PAs	Protected Areas
PB	Planetary Boundaries
PES	Payments For Ecosystem Services
PESTLE	Political, Economic, Social, Technological, Legal, And Environmental
PND	Plano de Ordinâmes de Pescas e Aquicultura
R&D	Research & Development
REASAP	Regional Energy Access Strategy and Action Plan
SADC	Southern African Development Community
SDGs	Sustainable Development Goals
SWOT	Strengths, Weaknesses, Opportunities, And Threats
TFCA	Transfrontier Conservation Area
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNSD	United Nations Statistics Division
VFCs	Veterinary Cordon Fences
WDA	Wildlife Dispersal Area
WTE	Waste To Energy
WWF	Worldwide Fund for Nature
ZAMCOM	Zambezi Course water Commission

FOREWORD



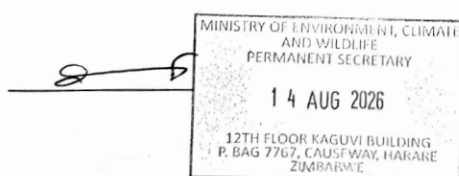
© Patrick Bentley / WWF-US

The Kavango Zambezi Trans Frontier Conservation Area (KAZA TFCA) is an ambitious and visionary partnership that brings together five countries — Angola, Botswana, Namibia, Zambia, and Zimbabwe — in a collaborative effort to conserve biodiversity while fostering sustainable development. This ‘green growth’ trends and opportunities analysis report provides a comprehensive framework for defining potential green growth pathways towards integrating conservation with economic development, aiming to secure a sustainable future for the region. This initiative’s collaborative nature underscores the shared responsibility and commitment of the Partner States to achieve these goals.

This report underscores the need to harmonise economic development with environmental sustainability and social inclusion. Leveraging the region’s abundant natural assets can unlock significant economic value, create job opportunities and enhance livelihoods. It identifies the key trends shaping a transition to green growth, together with the opportunities and risks across the region’s most promising sectors; tourism, agriculture and the extractives. It also examines these sectors with an essential footprint, such as settlements, freshwater management and infrastructure. Its overarching goal is to establish a sustainable development model that prioritises ecological conservation and socio-economic advancement, serving as a basis for a green growth strategy for the KAZA.

This report was compiled using a combination of desktop studies, Geographic Information System (GIS) tools, and stakeholder interviews. This work accumulates contributions from the KAZA Partner States including various partners, consultants and the KAZA Secretariat. It reflects insights and strategies developed through extensive consultations, including a workshop at the 2024 KAZA Heads of State and Government Summit. These methodological approaches ensured a robust and comprehensive understanding of the region’s dynamics and the feasibility of proposed strategies. We thank all the stakeholders, experts, and partners who have contributed to this analysis. Your insights and commitment have been invaluable in shaping an ambitious and achievable vision of establishing a world-class conservation and tourism destination.

As we move forward, we call upon all partners to join the KAZA Partner States in implementing the recommendations derived from this analysis and, ensure that the TFCA becomes a beacon of sustainable development and a source of pride for our nations. Together, we can achieve a sustainable and prosperous future for the Kavango-Zambezi, its people, and its unparalleled natural heritage.



Mr. Simon Masanga

Permanent Secretary

Chair - Committee of Senior Officials (COSO) – KAZA TFCA

Ministry of Environment, Climate and Wildlife

ZIMBABWE



EXECUTIVE SUMMARY

The Kavango-Zambezi Transfrontier Conservation Area (KAZA TFCA) is the world's largest terrestrial transboundary conservation landscape, spanning approximately 520,000 km² across Angola, Botswana, Namibia, Zambia, and Zimbabwe. The landscape encompasses globally significant ecosystems, including the Okavango Delta, the Zambezi River system, extensive wetlands, savanna woodlands, and important wildlife dispersal areas supporting some of Africa's largest remaining populations of elephants and other large mammals.

At the same time, KAZA is a major socio-economic landscape supporting the livelihoods and well-being of approximately three million people. Tourism, agriculture, fisheries, forestry, water resources, and wildlife economies all depend directly on the ecological integrity and natural capital of the broader landscape. KAZA therefore represents both a globally significant conservation landscape and an important regional development opportunity for Southern Africa.

The KAZA Treaty established a shared regional vision among the five Partner States to promote transboundary conservation, sustainable development, and regional cooperation. Building on this vision, the report assesses the trends, challenges, opportunities, and pathways for advancing green growth across the KAZA TFCA.

The report examines key sectors shaping the region's development trajectory, including tourism, agriculture, extractive industries, infrastructure, settlements, and water resource management. It also analyses broader political, economic, social, technological, legal, and environmental (PESTLE) factors influencing long-term sustainability and resilience.

The analysis demonstrates that KAZA is undergoing rapid environmental, economic, and social change. Population growth, agricultural expansion, infrastructure development, settlement growth, extractive industries, and increasing pressure on land and water resources are reshaping the landscape and placing growing pressure on ecosystems, wildlife corridors, and ecological connectivity. Climate change further intensifies these pressures through increasing drought frequency, rainfall variability, water stress, ecosystem degradation, and climate-related disasters.

At the same time, the report identifies significant opportunities for sustainable and inclusive economic development. Nature-based tourism remains one of the region's most important economic sectors, generating employment, conservation finance, and local enterprise opportunities. Agriculture remains central to food security and rural livelihoods, while climate-smart agriculture, sustainable land management, and improved water governance offer opportunities to strengthen resilience and productivity. Renewable energy systems, regional trade corridors, and improved digital connectivity also present important opportunities for economic diversification and regional integration if developed in environmentally sustainable and socially inclusive ways.

A central finding of the report is that the long-term sustainability of KAZA will depend on moving beyond fragmented sectoral approaches towards more integrated landscape-scale planning and governance systems. While sector-specific interventions remain essential, many of the region's key opportunities and risks emerge through interactions between sectors, ecosystems, infrastructure systems, and governance arrangements. Agricultural expansion affects wildlife corridors and tourism systems; watershed degradation affects agriculture, fisheries, hydropower generation, and biodiversity; infrastructure development influences settlement patterns and ecological connectivity; and climate change acts as a cross-cutting pressure affecting nearly all sectors simultaneously.



© Gareth Bentley / WWF-US

The report therefore proposes five integrated pathways towards green growth within the KAZA TFCA:

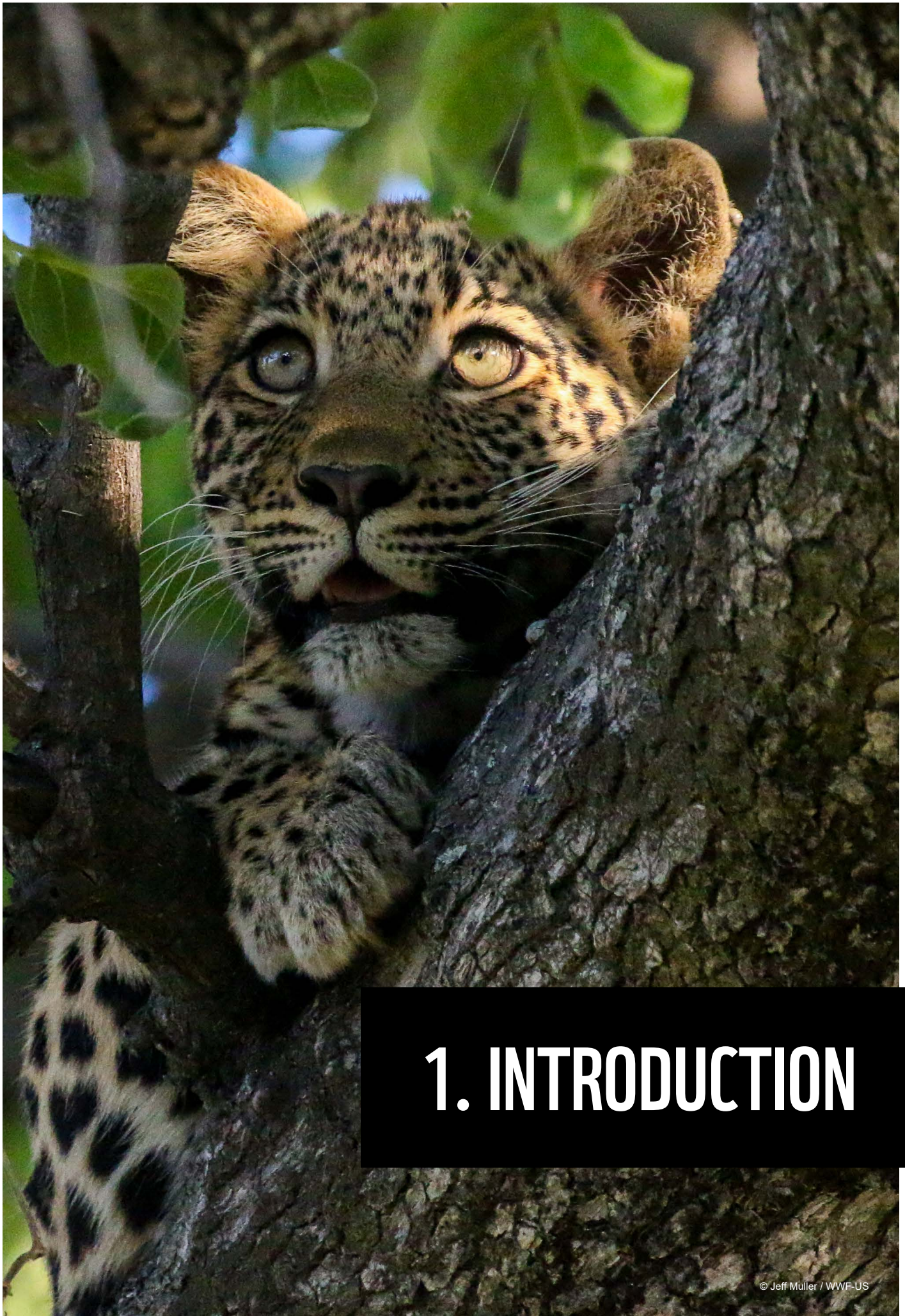
- 1 Strengthening the nature-based economy** through sustainable tourism, wildlife economies, sustainable forest product value chains, ecosystem restoration, and conservation finance;
- 2 Sustainable land and water management** through climate-smart agriculture, watershed protection, integrated land-use planning, and improved water governance;
- 3 Green infrastructure and regional connectivity** through climate-resilient infrastructure, renewable energy systems, sustainable transport corridors, and improved digital connectivity;
- 4 Inclusive livelihoods and community empowerment** through strengthened community-based natural resource management, improved benefit sharing, local enterprise development, and expanded access to services; and
- 5 Regional cooperation, policy harmonisation, and knowledge systems** through strengthened transboundary governance, integrated planning systems, regional monitoring, and knowledge-sharing platforms.

Together, these pathways provide a strategic framework for aligning conservation objectives with economic development, climate resilience, and social inclusion across the KAZA landscape.

The report further highlights the importance of improving integrated spatial planning; strengthening regional governance and policy harmonisation; strengthening sustainable financing mechanisms; investing in enabling infrastructure and technology; strengthening institutional capacity; and expanding inclusive community participation.

The KAZA TFCA possesses considerable potential to become an internationally significant model for integrated conservation and green growth. Realising this potential will require coordinated regional action, long-term investment, and continued collaboration between governments, communities, regional institutions, development partners, civil society, and the private sector.

Ultimately, the challenge facing KAZA is not whether development should occur, but how development can be pursued in ways that maintain the ecological systems and natural capital upon which long-term economic prosperity, resilience, and human well-being ultimately depend.



1. INTRODUCTION

1.1. THE STRATEGIC IMPORTANCE OF THE KAZA TFCA

The Kavango-Zambezi Transfrontier Conservation Area (KAZA TFCA) is the world's largest terrestrial transboundary conservation landscape, spanning approximately 520,000 km² across Angola, Botswana, Namibia, Zambia, and Zimbabwe. Established through the signing of the KAZA Treaty in 2011, the initiative represents a landmark regional commitment to transboundary conservation, sustainable development, and regional cooperation.

The KAZA TFCA encompasses more than 36 national parks, forest reserves, game management areas, conservancies, and community-managed conservation areas. The landscape includes globally significant ecosystems such as the Okavango Delta, the Zambezi River system, extensive savanna woodlands, wetlands, floodplains, and important wildlife dispersal areas that support some of Africa's largest remaining populations of elephants and other large mammals.

Beyond its ecological significance, KAZA is also a major socio-economic landscape supporting the livelihoods and well-being of approximately three million people. Tourism, agriculture, fisheries, forestry, water resources, and wildlife economies all depend directly on the region's ecological integrity and natural resource base. KAZA's ecosystems provide critical services including water regulation, carbon sequestration, climate regulation, soil stabilisation, and biodiversity conservation, all of which underpin long-term economic resilience and human well-being across the region. A snapshot of the key characteristics of the KAZA TFCA is presented in Figure 1.

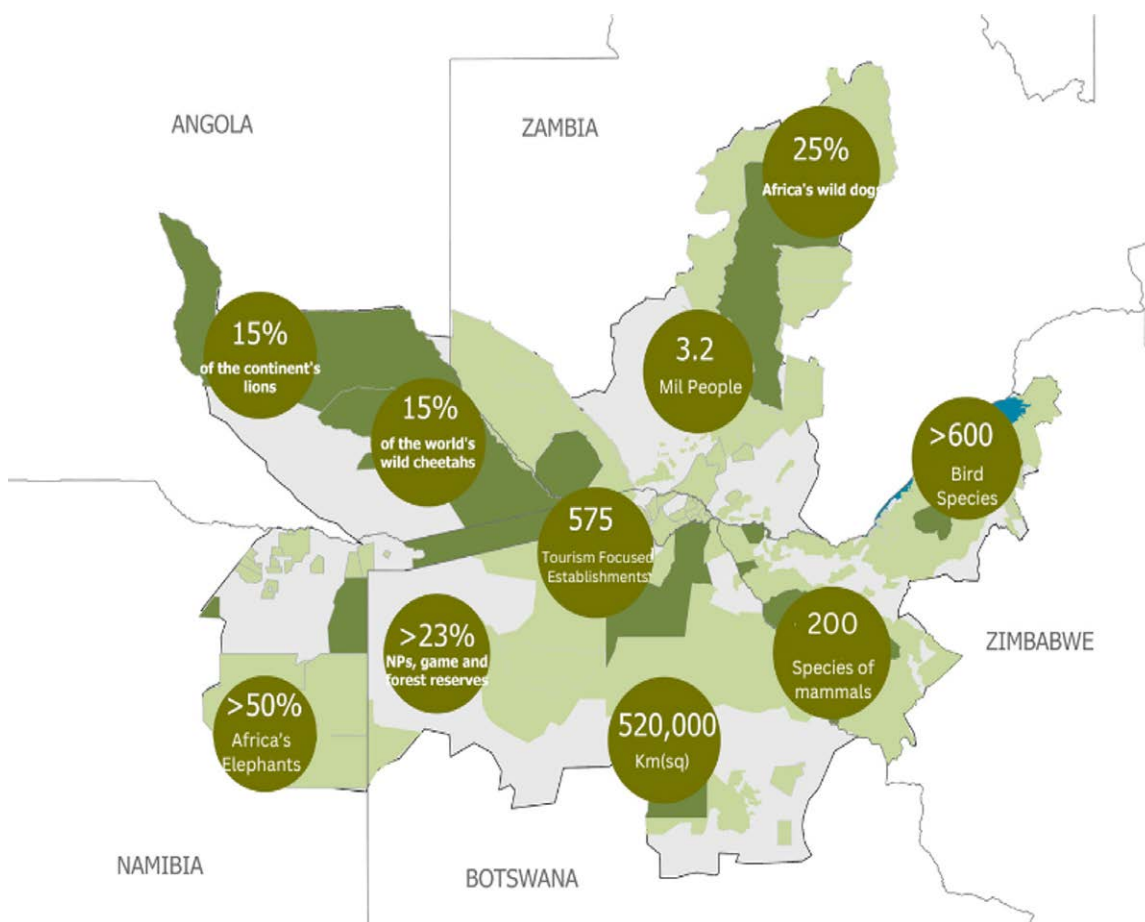


Figure 1. Key characteristics of the Kavango Zambezi Transfrontier Conservation Area (KAZA).

Source: WWF (2020)

1.2. KAZA VISION AND INSTITUTIONAL CONTEXT

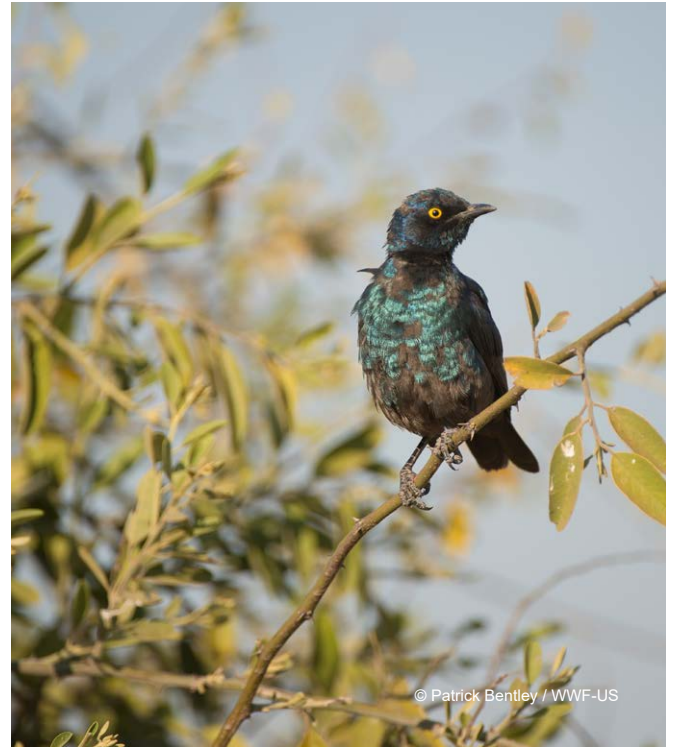
The establishment of the KAZA TFCA reflects a shared regional vision among the five Partner States to promote conservation and socio-economic development through transboundary cooperation and sustainable natural resource management.

THE VISION FOR KAZA

“TO ESTABLISH A WORLD-CLASS TRANS-FRONTIER CONSERVATION AND TOURISM AREA IN THE OKAVANGO AND ZAMBEZI RIVER BASIN REGIONS WITHIN THE CONTEXT OF SUSTAINABLE DEVELOPMENT.”

THE MISSION OF KAZA

“TO SUSTAINABLY MANAGE THE KAVANGO ZAMBEZI ECOSYSTEM, HERITAGE AND CULTURAL RESOURCES BASED ON THE BEST CONSERVATION AND TOURISM MODELS FOR THE SOCIO-ECONOMIC WELL-BEING OF COMMUNITIES AND OTHER STAKEHOLDERS IN AND AROUND THE ECO-REGION THROUGH THE HARMONISATION OF POLICIES, STRATEGIES AND PRACTICES.”



The KAZA Treaty provides the overarching framework for cooperation among the Partner States and establishes the institutional basis for transboundary conservation and sustainable development within the region. The initiative is supported through a multi-level governance framework involving the KAZA Secretariat, Ministerial structures, technical committees, national coordination mechanisms, local authorities, community institutions, and a broad range of development partners and stakeholders.

At the regional level, the KAZA Secretariat serves as the principal coordinating body, facilitating strategic collaboration, policy dialogue, programme coordination, and implementation support across the five Partner States. Governance systems within KAZA operate across multiple scales, ranging from regional and national institutions to local community-based governance structures such as conservancies and community trusts. These local governance systems play an important role in natural resource stewardship, benefit sharing, local participation, and human–wildlife conflict management.

The KAZA TFCA therefore represents not only a conservation initiative, but also a regional platform for promoting sustainable development, regional integration, climate resilience, and long-term green growth across a shared transboundary landscape.

1.3. EMERGING DEVELOPMENT AND SUSTAINABILITY PRESSURES

While KAZA possesses globally significant ecological and economic assets, the region is also undergoing rapid environmental, economic, and social change. Population growth, agricultural expansion, infrastructure development, extractive industries, settlement growth, and increasing demand for land and water resources are reshaping land-use patterns and placing growing pressure on ecosystems and ecological connectivity across the landscape.

At the same time, the socio-economic landscape of KAZA is characterised by high levels of rural poverty and vulnerability, with many communities relying directly on subsistence agriculture, livestock production, fisheries, forests, and natural resource use for livelihoods and food security. Agriculture remains central to rural livelihoods and national economies, but unsustainable land management practices, deforestation, land degradation, and increasing climate variability are placing additional strain on ecosystem resilience and agricultural productivity.

Tourism is a major economic driver within KAZA, supported by internationally recognised destinations such as Victoria Falls and the Okavango Delta. Nature-based tourism generates employment, foreign exchange earnings, and important incentives for biodiversity conservation. However, tourism systems remain vulnerable to climate change, fluctuating global economic conditions, infrastructure limitations, and external shocks such as the COVID-19 pandemic.

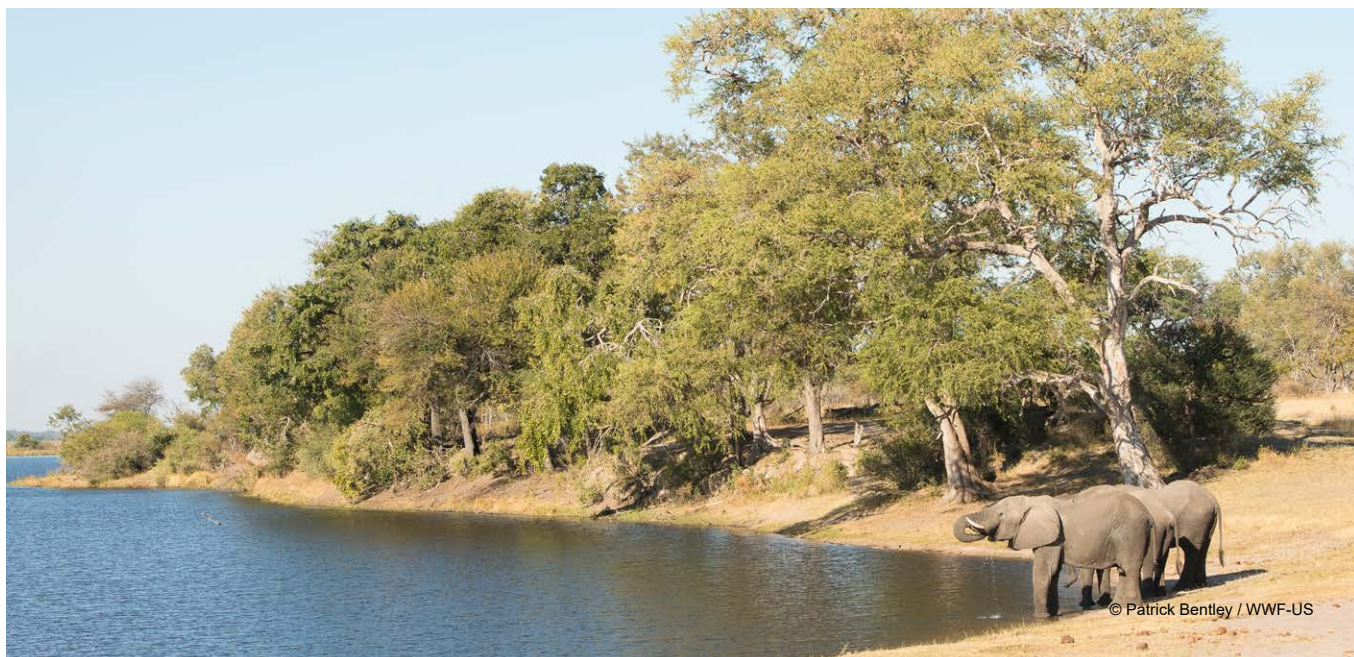
Infrastructure development, mining activities, settlement expansion, and growing regional trade corridors also present both opportunities and risks. While these sectors can contribute significantly to economic growth, regional integration, and improved service delivery, poorly planned development may contribute to habitat fragmentation, disruption of wildlife corridors, water stress, pollution, and increased pressure on ecologically sensitive areas.

Climate change acts as a major cross-cutting pressure affecting nearly all sectors across the KAZA landscape. Increasing drought frequency, rainfall variability, water stress, ecosystem degradation, and climate-related disasters are likely to affect agriculture, tourism, fisheries, settlements, hydropower systems, and biodiversity conservation. Climate change is also expected to intensify human–wildlife conflict and increase vulnerability among already marginalised communities.

These dynamics present both substantial risks and significant opportunities. While unsustainable development pathways may undermine biodiversity, ecosystem services, and long-term resilience, the region also possesses considerable potential to pursue integrated green growth pathways that align conservation objectives with inclusive economic development, climate resilience, and regional cooperation.

The challenge facing KAZA is therefore not whether development should occur, but how development can be pursued in ways that maintain the ecological systems and natural capital upon which long-term economic prosperity and human well-being ultimately depend.





1.4. THE CASE FOR GREEN GROWTH PATHWAYS

The analyses presented throughout this report demonstrate that the future sustainability of the KAZA TFCA will depend on more integrated approaches to development planning, natural resource management, infrastructure investment, and regional cooperation.

Many of the region's most significant opportunities and risks emerge through interactions between sectors, ecosystems, and governance systems. Agricultural expansion affects wildlife corridors and tourism systems; watershed degradation affects fisheries, agriculture, hydropower generation, and biodiversity; infrastructure development influences settlement dynamics and ecological connectivity; and climate change acts as a systemic pressure affecting nearly all sectors simultaneously.

At present, these dynamics are not sufficiently aligned. Agricultural expansion, infrastructure development, and settlement growth are often occurring in ways that compete with, rather than complement, conservation objectives. At the same time, economic opportunities linked to natural capital, particularly tourism and wildlife-based activities, remain unevenly distributed and vulnerable to external shocks. Without a more integrated approach, current trajectories risk reinforcing negative feedback loops, including continued land conversion and habitat fragmentation, declining ecosystem services, particularly water regulation, increased human–wildlife conflict, and heightened vulnerability to climate variability, among others.

Green growth has emerged as a multidimensional concept that offers a viable solution to this challenge. Introduced during the Rio+20 Summit in 2012, green growth advocates for a development trajectory that is low-carbon, resource-efficient, resilient, and socially inclusive (Kasztelan, 2017; Allan, 2012). It emphasises the need to align sectoral development with the sustainable management of natural capital, ensuring that economic activities reinforce, rather than undermine, ecosystem integrity.

In the KAZA context, this requires moving beyond sector-based planning toward a more integrated approach that:

- recognises interdependencies between tourism, agriculture, mining, infrastructure, and water systems
- aligns economic incentives with conservation outcomes
- strengthens resilience to climate change
- promotes inclusive participation and benefit-sharing

Figure 2 sets out the three critical dimensions of the green growth sustainability nexus defined by stakeholders during the KAZA heads of state pre-summit workshop (Livingstone, May 2024).

This conceptual diagram, as well as the principles adopted from Allen (2012), have been adapted to the context of the KAZA in line with the African Development Bank’s (AfDB) Green Growth Strategy and the Southern African Development Community’s (SADC) Green Growth Strategy.

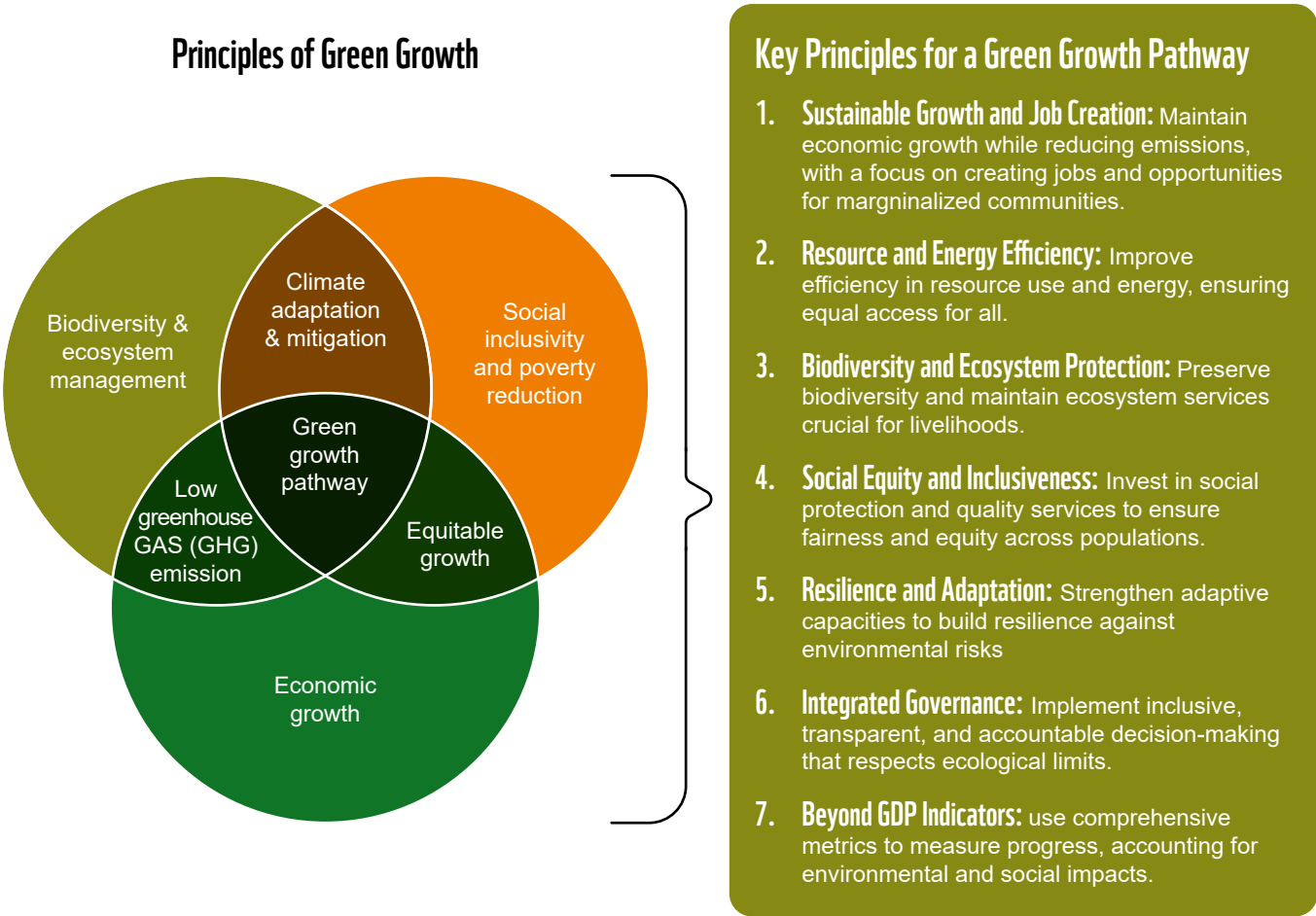


Figure 2. Principles of Green Growth.
Adapted from United Nations Environment Management Group, 2011.

The principles are based on three main dimensions: biodiversity and ecosystem service management, social inclusivity and poverty reduction, and economic growth. The strength of these principles lies in the interdependence of dimensions and resources for equitable and resilient sustainable development and the seven measures of inclusivity.

Importantly, green growth in KAZA is not about limiting development, but about shaping the direction and quality of development so that it remains viable over the long term and contributes to achieving the sustainable development goals.

1.5. PURPOSE AND SCOPE OF THE REPORT

This report provides a strategic assessment of trends, challenges, opportunities, and potential green growth pathways within the KAZA TFCA. It seeks to support the development of more integrated and sustainable approaches to economic development, conservation, climate resilience, and regional cooperation across the five KAZA Partner States.

The report focuses on key sectors and systems that shape the region's development trajectory, including:

- tourism,
- agriculture,
- extractive industries,
- infrastructure,
- settlements,
- and water resource management.

In addition to sectoral analysis, the report examines broader political, economic, social, technological, legal, and environmental dynamics influencing sustainable development within the KAZA landscape.

More specifically, the report identifies integrated green growth pathways that seek to:

- support biodiversity conservation and ecological connectivity;
- strengthen climate resilience;

- promote inclusive livelihoods and local economic development;
- improve regional cooperation and governance;
- and support long-term sustainable economic transformation across the region.

The report covers all five KAZA Partner States — Angola, Botswana, Namibia, Zambia, and Zimbabwe — and considers both national and transboundary dimensions of conservation and development.

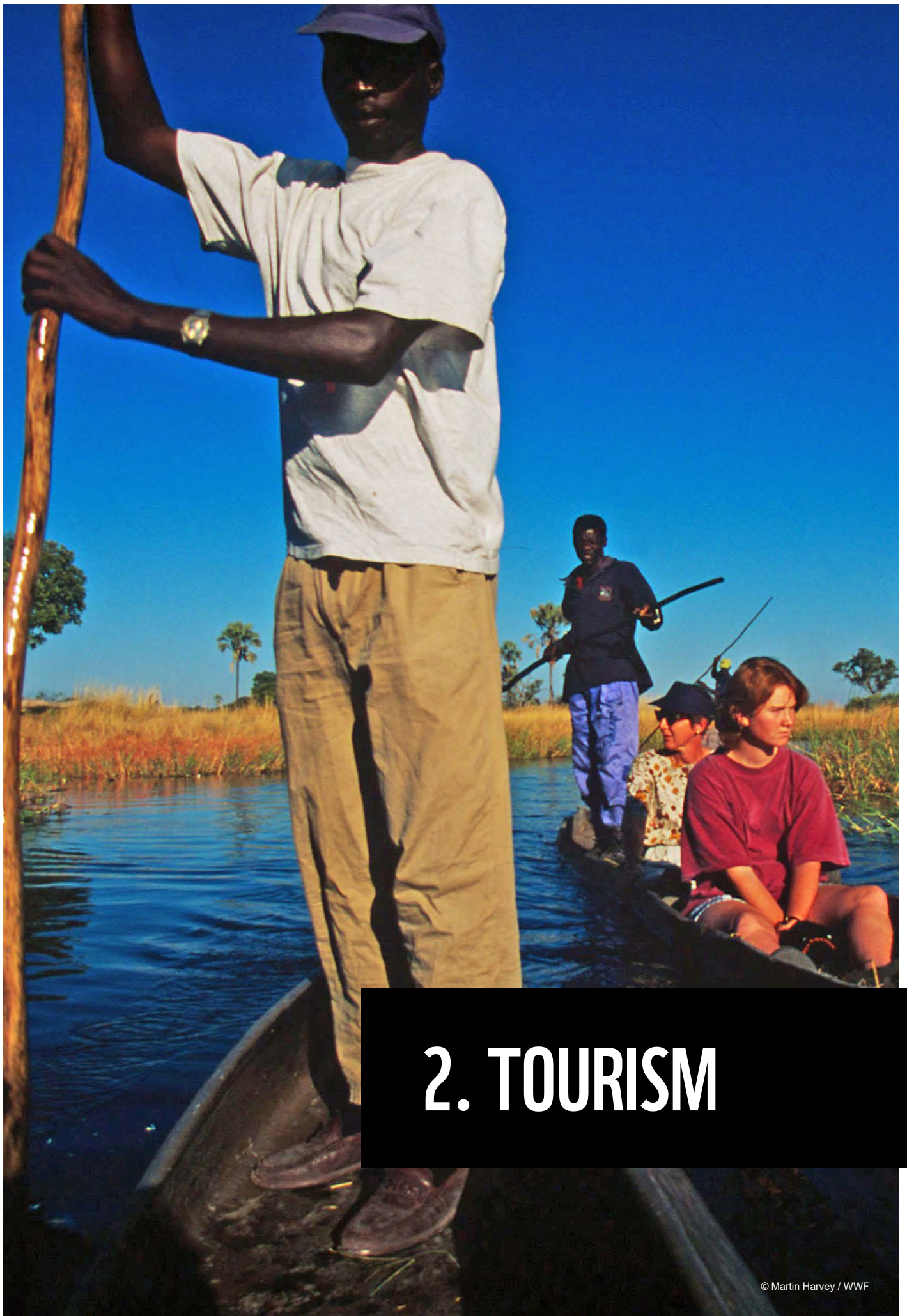


1.6. METHODOLOGICAL APPROACH

The findings and recommendations presented in this report are based on a combination of:

- desktop reviews,
- spatial and Geographic Information System (GIS) analyses,
- stakeholder consultations,
- expert interviews,
- workshops,
- and review of relevant regional and national policy frameworks.

The analysis adopts an integrated landscape perspective that recognises the interconnections between ecological systems, economic development, infrastructure and finance systems, governance arrangements, and local livelihoods across the KAZA TFCA. The report is intended to support strategic planning, policy dialogue, and decision-making related to green growth, conservation, climate resilience, and sustainable development within the KAZA landscape and the broader Southern African region. Top of Form



2. TOURISM

2.1. OVERVIEW OF THE SECTOR

The Kavango-Zambezi Transfrontier Conservation Area (KAZA TFCA) is internationally recognised for its exceptional biodiversity, iconic wildlife, and diverse landscapes, positioning it as one of Africa's premier nature-based tourism destinations. The region hosts three UNESCO World Heritage Sites—Mosi-oa-Tunya (Victoria Falls), Tsodilo Hills, and the Okavango Delta—alongside an extensive network of protected areas and community-managed conservation landscapes.

In addition, more than 600 documented cultural and heritage sites reflect the region's rich history and cultural diversity, including that of the San, Tonga, Lozi, Herero, Ndebele, and Tswana peoples.

These assets provide opportunities to expand tourism beyond wildlife viewing towards cultural and community-based tourism.

Tourism plays a significant role in the KAZA economy (see Figure 3 and Figure 4), generating both direct and indirect income and employment across sectors such as hospitality, transport, and services. The sector experienced a sharp decline in 2020 due to the COVID-19 pandemic, resulting in a substantial contraction in tourism-related income across all member countries. Since then, tourism has been recovering, although performance remains uneven across the region.

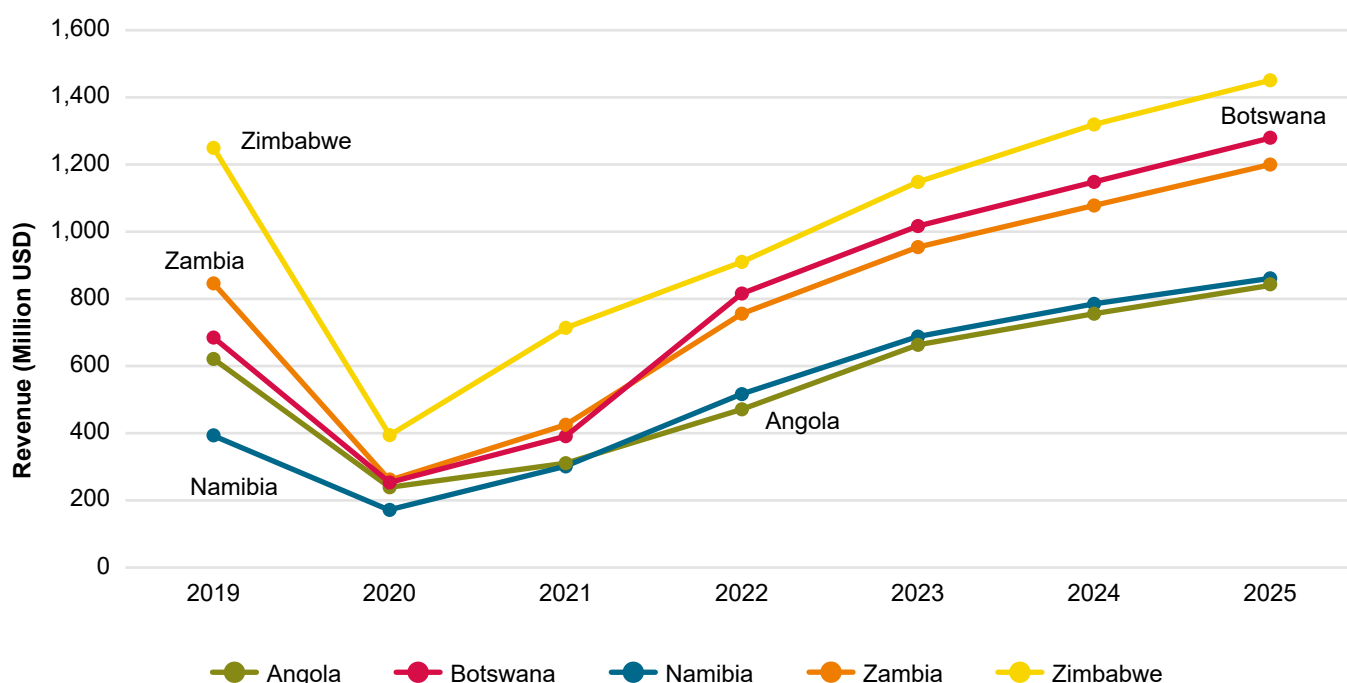


Figure 3. Evolution of tourism receipts (2019-2025).

Source: WTTC¹.

¹ <https://researchhub.wttc.org>

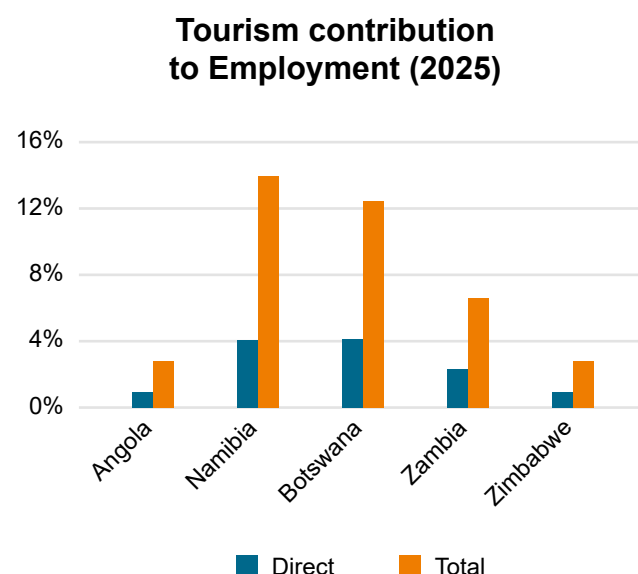
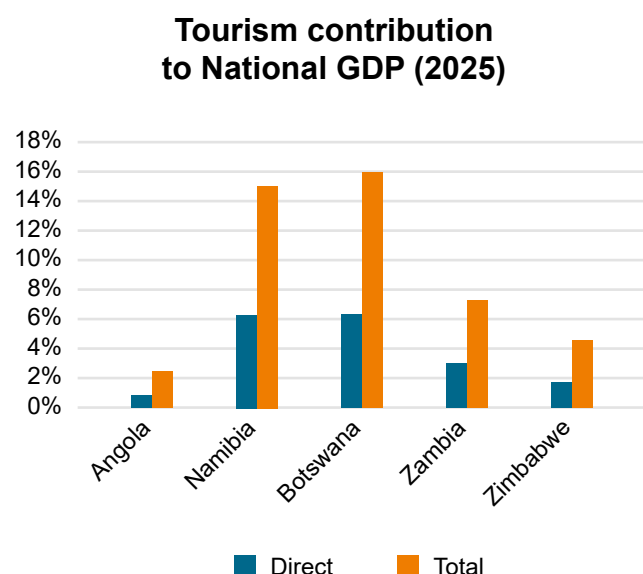


Figure 4. Tourism sector contribution to national GDP and employment (2025).

Source: WTTC

ANGOLA

According to World Travel & Tourism Council (WTTC) statistics, tourism contributed approximately 2.4% to Angola's GDP in 2025, the lowest among KAZA countries. Following the end of the civil war, Angola has sought to develop its tourism sector by leveraging its diverse natural and cultural assets. Despite a gradual increase seen over recent years, complex visa requirements and limited infrastructure continue to constrain international arrivals. Ongoing reforms, including visa facilitation measures and planned border expansions with Namibia, are expected to support tourism development.

BOTSWANA

Tourism is a central pillar of Botswana's economic diversification strategy. In 2025, the sector contributed 16.1% to GDP and supported approximately 114,300 jobs, representing 12.5% of total employment (WTTC data). Botswana has adopted a high-value, low-volume tourism model, supported by investments in infrastructure and value chain development. Initiatives such as the Kasane–Kazungula redevelopment aim to expand mid-range tourism offerings and strengthen regional integration.

NAMIBIA

Tourism is one of Namibia's fastest-growing sectors, contributing 15% to GDP and employing approximately 132,000 people in 2025 (WTTC data). Growth in international arrivals has been driven by the country's distinctive landscapes and wildlife assets. Namibia's community-based natural resource management (CBNRM) model plays a central role in linking conservation outcomes to tourism benefits. However, the sector faces increasing external scrutiny related to wildlife utilization practices.

ZAMBIA

Tourism contributed approximately 7.3% to GDP in 2025 according to the WTTC, driven largely by wildlife-based tourism and flagship attractions such as Victoria Falls, Kafue National Park, and South Luangwa. Despite strong natural assets, the sector underperforms relative to regional peers, with lower visitor numbers and revenue per tourist. Key constraints include infrastructure gaps, regulatory uncertainty, and high entry costs.

ZIMBABWE

Tourism is Zimbabwe's third-largest economic sector, contributing 4.6% to GDP and 2.8% to national employment in 2025 (WTTC data), and generating over USD 1,450 million in revenue, the highest of all KAZA Countries. Victoria Falls remains the primary attraction, complemented by wildlife tourism and hunting activities. However, political factors and international restrictions on trophy imports have affected sector performance.

2.2. TRENDS AND DEVELOPMENTS

Tourism in the KAZA TFCA is shaped by a set of interrelated trends that reflect both opportunities and structural constraints. These include uneven growth across countries, spatial concentration of tourism activity, vulnerability to external shocks, ongoing debates around wildlife utilisation, media-driven reputation risks, and persistent connectivity challenges.

BOX 1: TOURISM TRENDS IN THE KAZA

1. Uneven growth in tourist arrivals
2. Concentration of tourism in key hotspots
3. Impact of extreme weather and climate variability
4. Role of trophy hunting within the wildlife economy
5. Media and reputation risks
6. COVID-19 impacts
7. Limited access and regional connectivity

UNEVEN GROWTH IN TOURIST ARRIVALS

Tourism arrivals in the KAZA TFCA declined sharply—by approximately 78%—between 2019 and 2020 due to the COVID-19 pandemic (see Figure 5). Since then, the sector has partially recovered, reaching approximately 79% of pre-pandemic levels. However, recovery has been uneven across member states.

Zambia and Zimbabwe receive the largest share of visitors, largely due to Victoria Falls and associated tourism infrastructure. Botswana follows, driven by high-end tourism in the Okavango Delta and Chobe National Park, while Namibia attracts visitors through its unique landscapes. Angola continues to receive comparatively low visitor numbers.

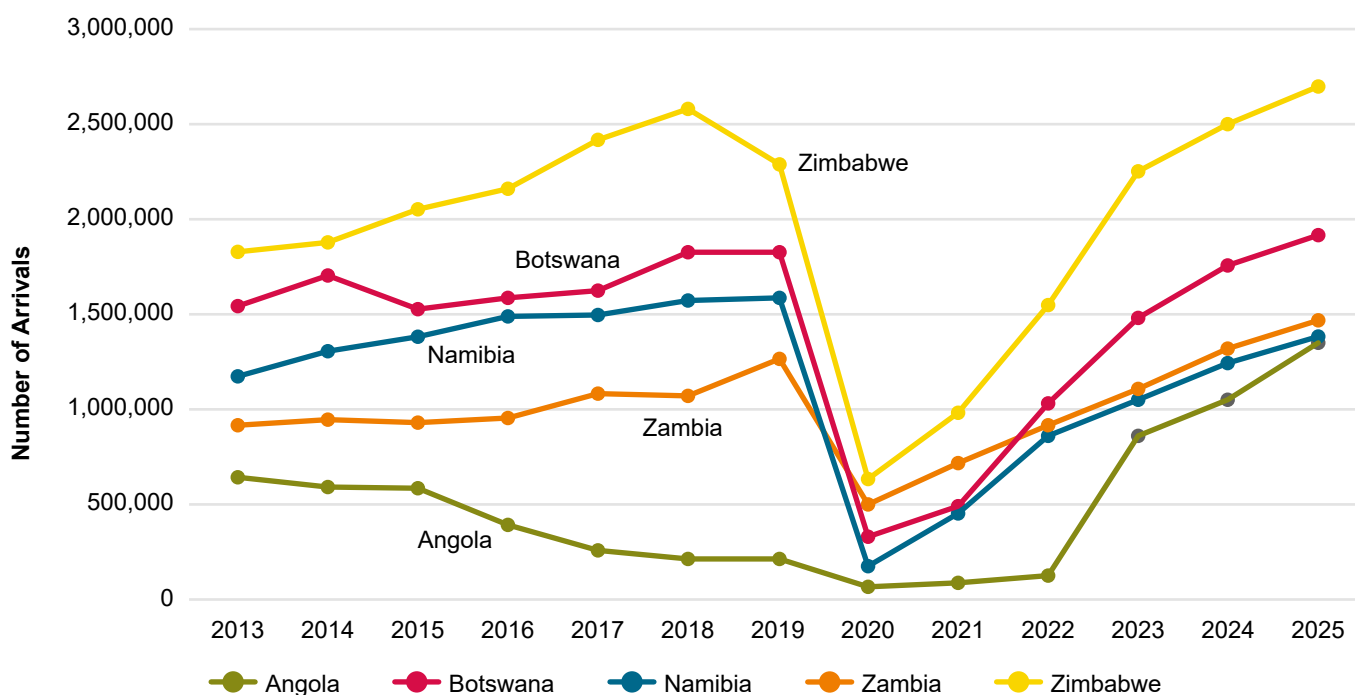


Figure 5. Tourist arrivals by KAZA member countries.

Source: World Bank²

² <https://data.worldbank.org/indicator/ST.INT.ARVL>

CONCENTRATION OF TOURISM IN KEY HOTSPOTS

Tourism activity within KAZA is highly concentrated around a limited number of destinations, including Victoria Falls, the Okavango Delta, Chobe National Park, Kafue National Park, and the Zambezi River. These areas benefit from established infrastructure and global recognition.

In contrast, many of the region's other tourism assets remain underdeveloped and under-visited; there are 620 lesser-known KAZA sites with low tourist numbers and activities. This spatial imbalance creates risks of overcrowding and environmental degradation in high-traffic areas, while limiting economic opportunities elsewhere in the landscape.

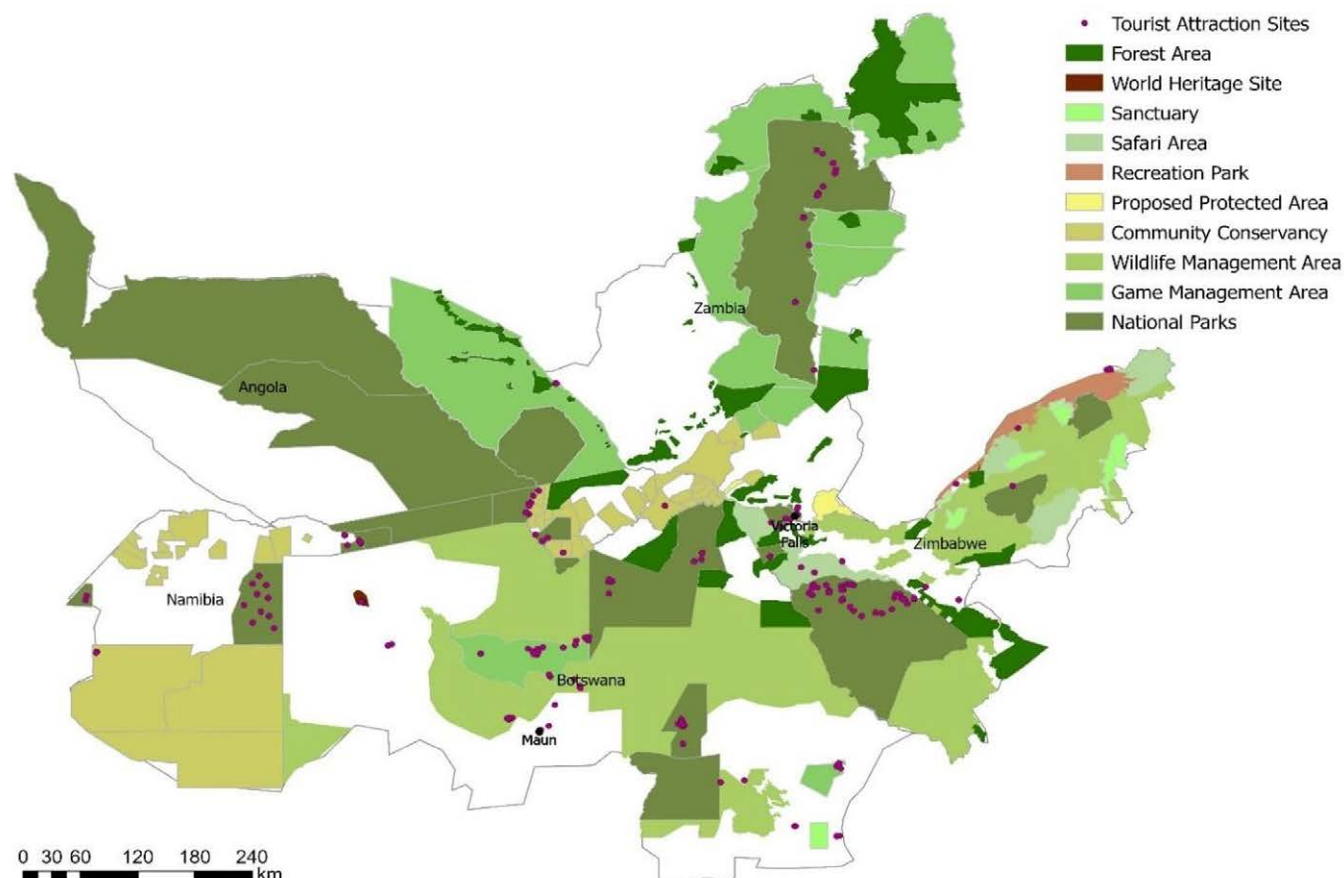


Figure 6. Concentration of tourism activities in the KAZA TFCA.

Source: Data extracted from KAZA Landscape AEF tool (2024)³.

3 https://www.arcgis.com/apps/mapviewer/index.html?url=https://wwfke-gisec.wwfkenya.org/arcgis/rest/services/KAZA_Landscape_Socioecological_Data/MapServer&source=sd



IMPACT OF EXTREME WEATHER AND CLIMATE VARIABILITY

According to Chang et al. (2024), one of the major global problems the tourism industry faces is extreme weather conditions due to climate change. Extreme weather events, including droughts and floods, affect ecosystem health, water availability, and the quality of key tourism attractions.

Fluctuations in river flows can significantly affect the visual and experiential value of Victoria Falls, which is central to the region's tourism brand. Climate change also poses longer-term risks to wildlife populations, including through habitat degradation and water scarcity, which may alter migration patterns and increase human–wildlife conflict.

Climate change related effects are also increasingly threatening the ecological integrity of the KAZA TFCA. Rising temperatures could lead to habitat loss, decreased breeding success, and higher mortality rates for species unable to adapt to hotter and drier conditions. For example, the elephant populations in KAZA, crucial to the ecosystem and tourism, are threatened by water scarcity. This could compel them to migrate further, searching for water, potentially increasing human-wildlife conflicts (Montero-Botey et al., 2024). The results of the recent elephant survey (Bussi re et al., 2023) raise suspicion that the rise of elephant mortalities is at least in part due to reduced water bodies and the proximity of water resources threatening wildlife species.

ROLE OF TROPHY HUNTING WITHIN THE WILDLIFE ECONOMY

Trophy hunting remains a complex and often contested component of the tourism sector. Internationally, it is frequently criticised on ethical grounds, with concerns related to animal welfare and species conservation. These concerns have led to calls for stricter regulation and, in some cases, bans on trophy imports, such as the European Parliament's ban on the import of trophies derived from species listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 1983), enacted in 2022.

Within the KAZA region, however, regulated trophy hunting is widely viewed as part of a broader wildlife economy. When based on sound ecological data and supported by strong governance, it can generate revenue for conservation, support community livelihoods, and create incentives to maintain wildlife habitats. At the same time, outcomes depend heavily on effective regulation, transparent quota systems, and equitable benefit-sharing. Poorly managed hunting can undermine conservation objectives and damage the reputation of the sector.

Figure 7 illustrates the revenue from safari and trophy hunting in KAZA member countries. Figure 8, furthermore, shows the impact of trophy hunting currently versus the scenario of a trophy hunting ban, for the case of Namibia.

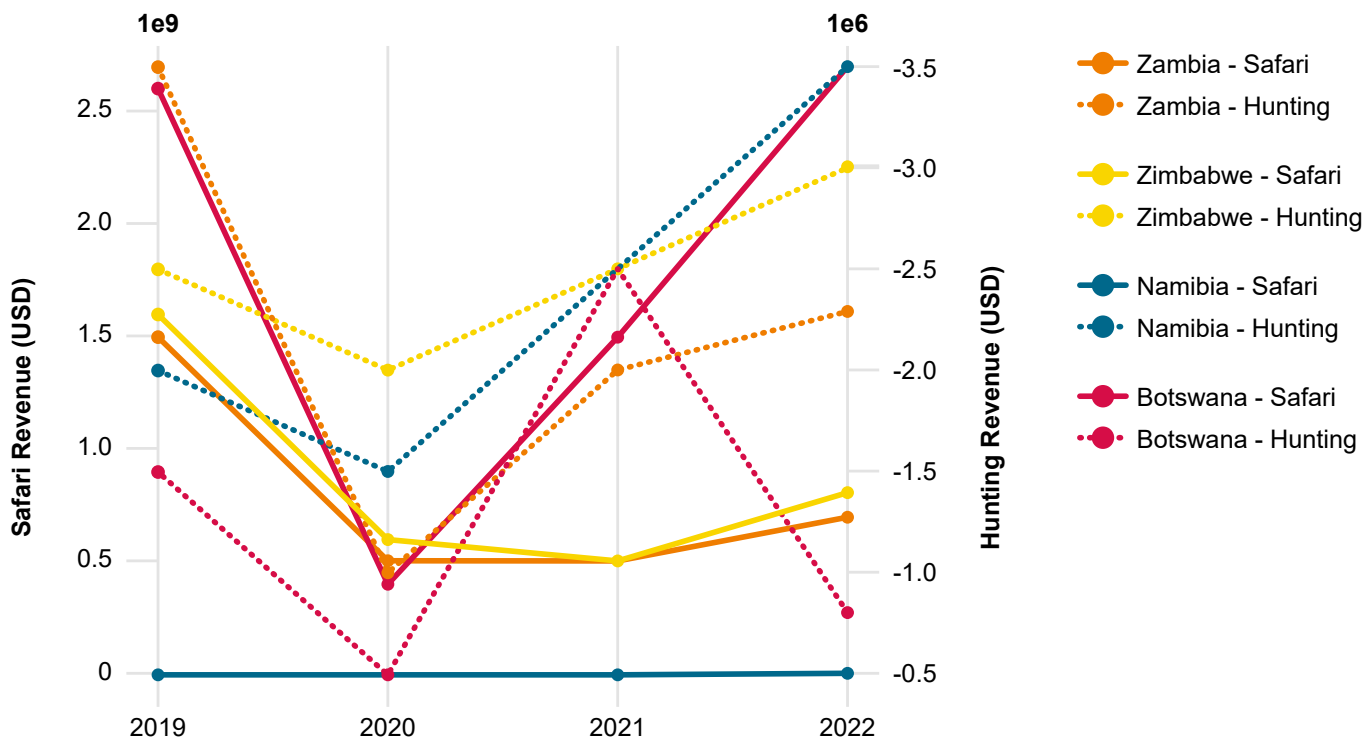


Figure 7. The revenue generated from trophy hunting (2019-2022).
Source: Compiled and calculated using various national reports.

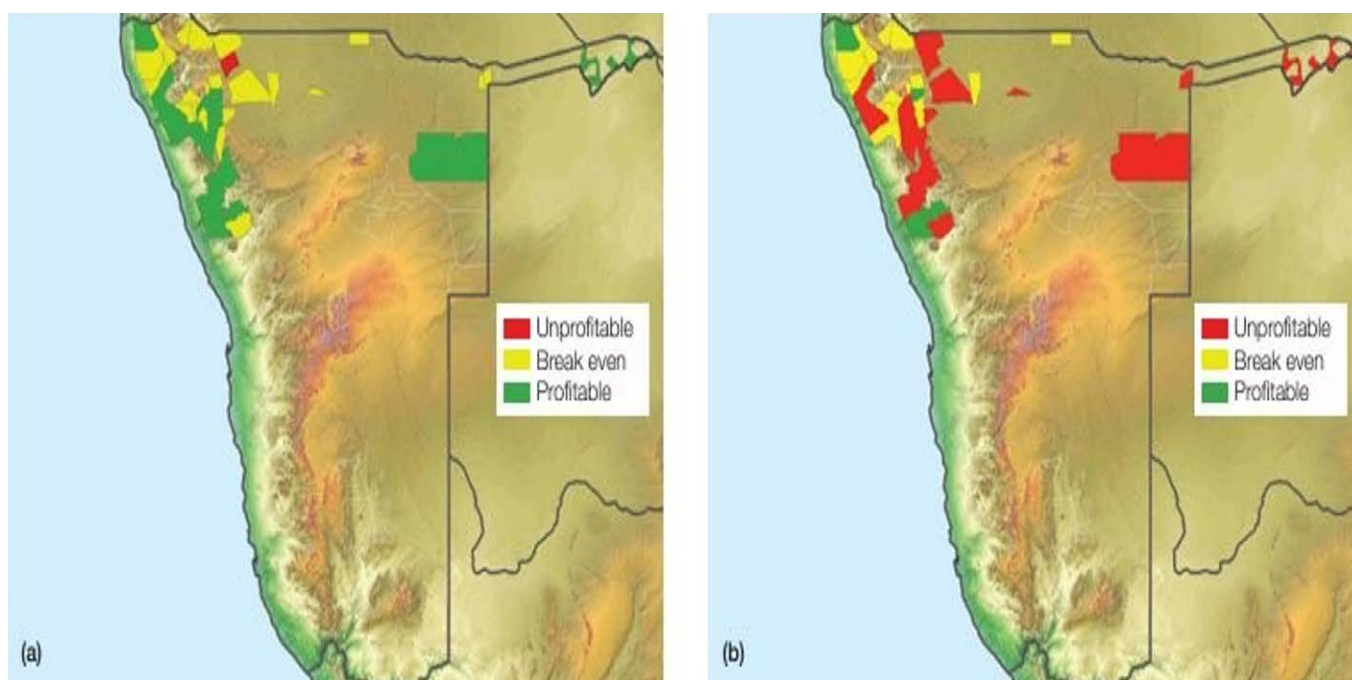


Figure 8. The differences in profitability of trophy hunting currently versus the scenario of a trophy hunting ban.
Source: Naidoo et al. (2016).

MEDIA AND REPUTATION RISKS

Media and communication play a critical role in shaping perceptions of KAZA as a tourism destination. Positive coverage can enhance the region's visibility and attractiveness, while negative reporting—particularly on issues such as drought, poaching, or wildlife management—can deter visitors.

For example, past drought events have led to widespread media coverage suggesting that Victoria Falls had dried up, despite continued water flow. Notably, droughts in 1982, 1998, 2016, and 2019/2020 were all followed by sharp declines in tourist arrivals at Victoria Falls (see Figure 9).

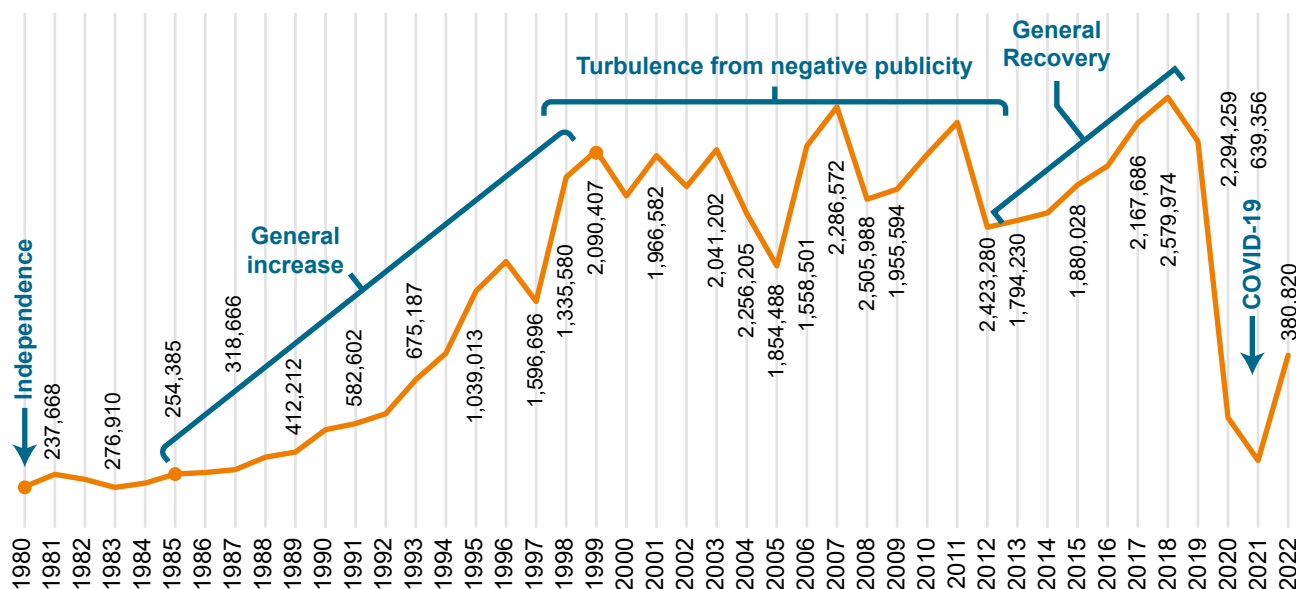
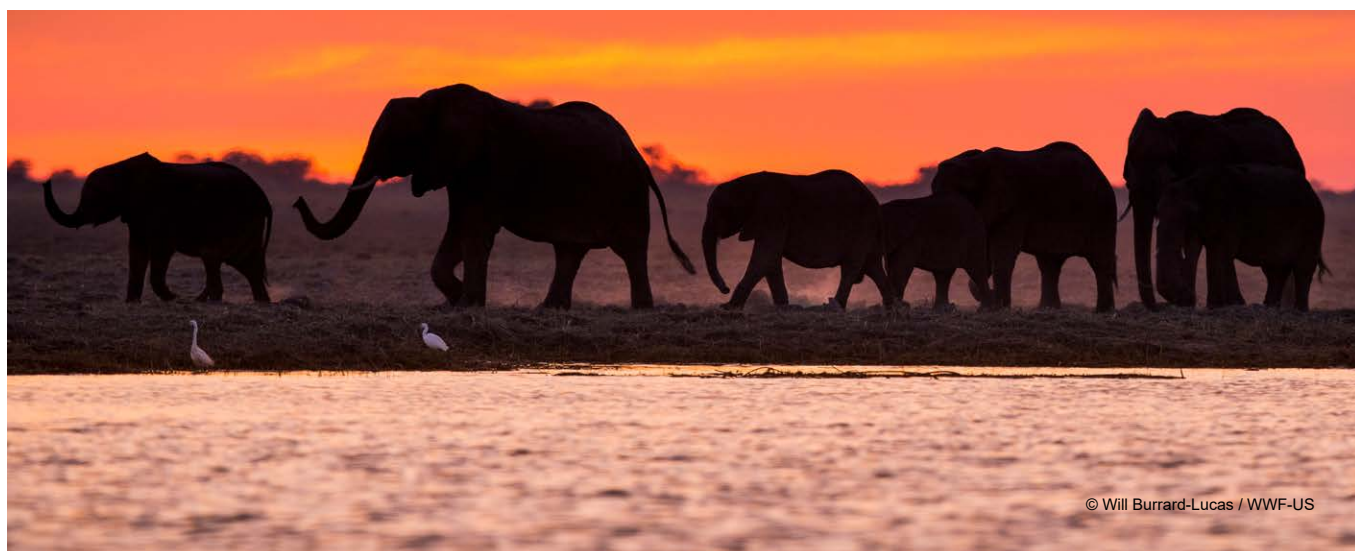


Figure 9. A visual representation of the correlation between media coverage, water flow levels at Victoria Falls and tourist arrivals over the years.

Source: Zimbabwe Tourism Authority (2024).

This underscores the necessity of effective communication strategies to promote KAZA's attractions and manage its public image. One of the primary challenges in this regard has been weak cognitive communication on complex issues such as trophy hunting and strategies for managing elephant overpopulation.

These topics require nuanced discussion, yet they are often misrepresented or oversimplified in the media, leading to public misunderstanding and negative perceptions.



© Will Burrard-Lucas / WWF-US

COVID-19 IMPACTS

The COVID-19 pandemic exposed the vulnerability of tourism-dependent economies in KAZA. The collapse in tourist arrivals led to significant revenue losses, affecting businesses, employment, and conservation financing (see Figure 9).

Reduced tourism income also constrained funding for conservation activities such as anti-poaching efforts and habitat management (Biggs et al., 2016).

The loss of tourism income also negatively impacted food security and overall community well-being. The collapse of this income stream not only jeopardized the livelihoods of communities reliant on tourism but also exacerbated poverty, unemployment rates (UNWTO, 2021) and food insecurity. Supply chain disruptions further aggravated this situation, leading to food shortages and increased prices. The economic strain also resulted in heightened crime and social unrest within these communities, compromising their security and stability (World Bank, 2020).

Figure 10 is a visual representation of tourism operator's most immediate concerns of Covid-19.

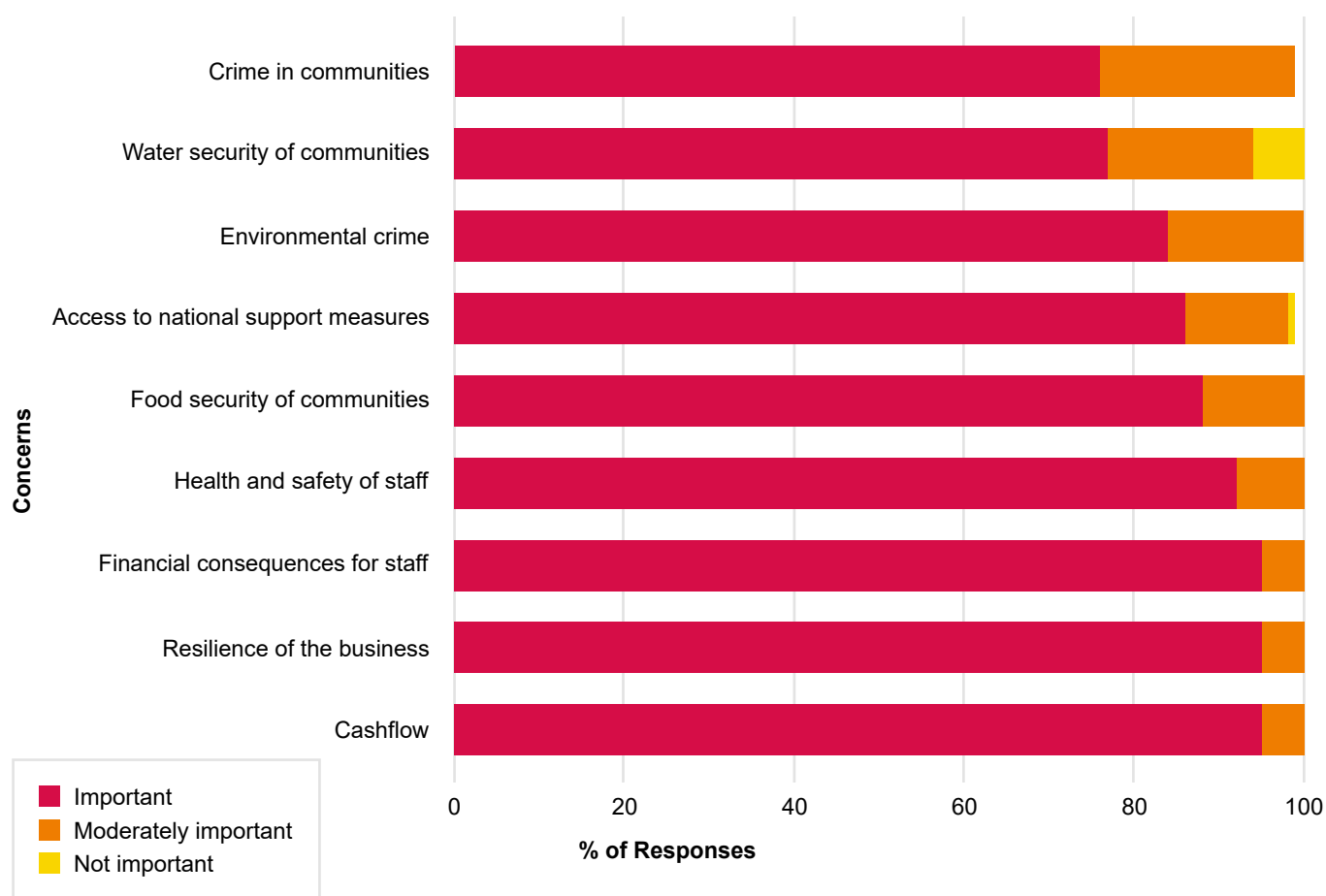


Figure 10. A visual representation of tourism operators' most concerns and impacts of COVID-19 in the KAZA. Source: World Travel and Tourism Council data (2021).

The economic downturn has prompted increased exploitation of natural resources as communities seek alternative sources of income, resulting in deforestation, overfishing, and other environmentally destructive activities (Barouki et al., 2021). Increased wildlife crime emerged as another critical issue. The surge in poaching incidents in several TFCAs can be attributed to less frequent law enforcement and anti-poaching patrols. This increase in illegal wildlife activities threatens endangered species and undermines the ecological balance and biodiversity (Lindsey et al., 2020).

The COVID-19 pandemic has underscored the vulnerability of tourism-dependent economies and highlighted the interconnectedness of conservation, community well-being, and environmental sustainability in TFCAs. The ripple effects of the pandemic emphasize the need for diversified income sources, enhanced conservation financing mechanisms, and resilient community structures to mitigate future shocks (Lindsey et al., 2020).

LIMITED ACCESS AND REGIONAL CONNECTIVITY

Connectivity remains a key constraint to tourism development in KAZA. Limited direct flights, underdeveloped transport infrastructure, and complex visa regimes restrict movement within the region.

Initiatives such as the KAZA UNIVISA (see Figure 11) represent important progress, enabling easier cross-border travel between Zambia and Zimbabwe, with planned expansion to other countries. However, further efforts are needed to improve regional integration, streamline visa systems, and enhance transport networks.

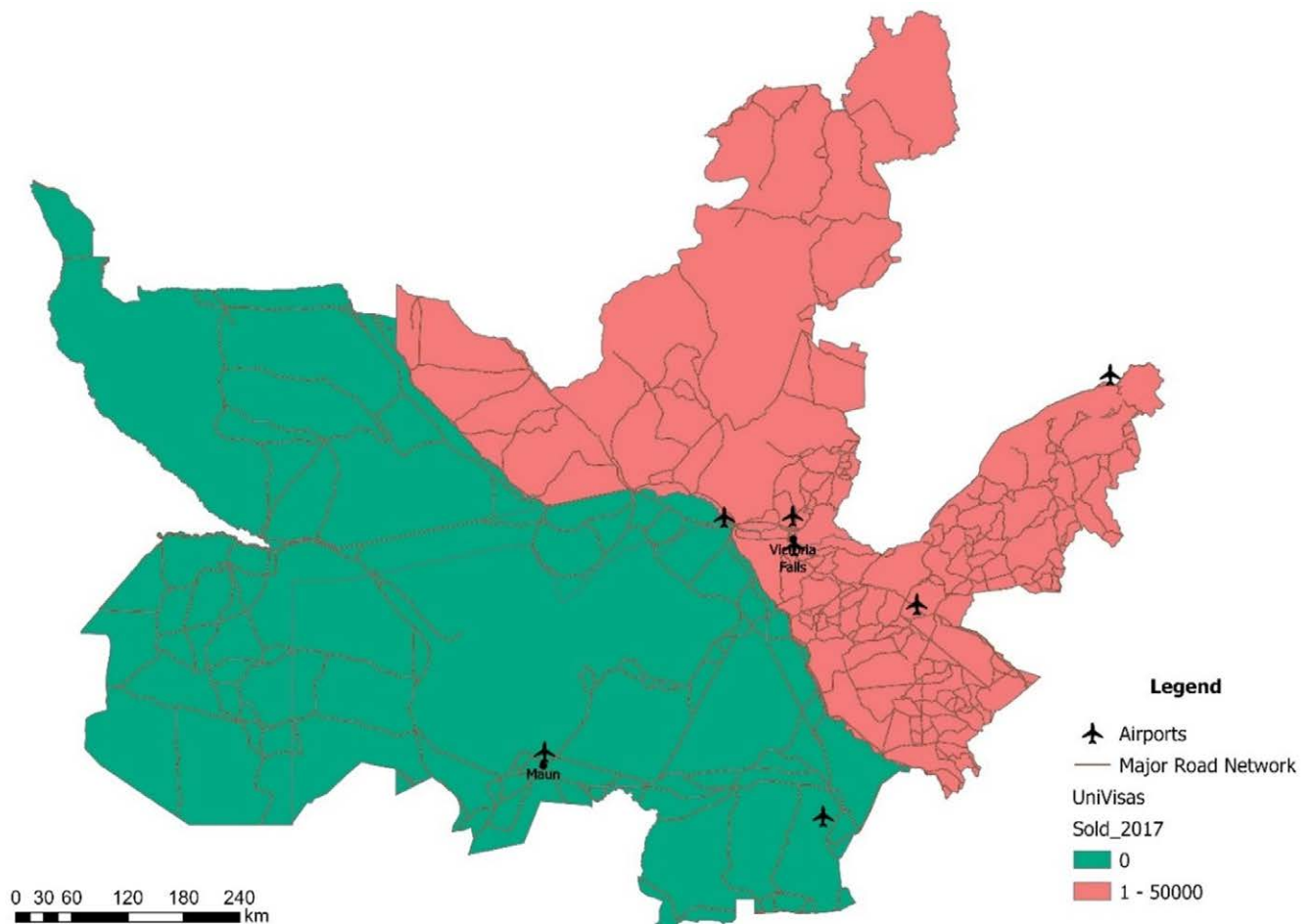


Figure 11. A map illustrating access and connectivity across KAZA across all modes of transport.

Source: Peace Parks Foundation data.

However, recent developments, such as Namibia's proposed restrictive visa regime, have raised concerns among stakeholders, including the SADC Business Council Tourism Alliance.

The proposed restrictions in Namibia may significantly hinder the growth of the country's tourism industry and broader economic development, potentially reversing the gains made through initiatives like the KAZA UNIVISA. While progress has been made, more comprehensive efforts are therefore needed to address the region's connectivity challenges and fully realize the full potential of tourism within KAZA.



© Will Burrard-Lucas / WWF-US

2.3. CHALLENGES AND OPPORTUNITIES FOR GREEN GROWTH

Tourism development within the KAZA TFCA presents a complex set of opportunities and challenges that are closely linked to broader land-use dynamics, resource availability, and governance systems. While tourism has strong potential to drive inclusive economic growth and support conservation, its outcomes depend on how effectively these dynamics are managed.

Figure 12 explores the tourism expansion in the KAZA region presenting a complex interplay of benefits and disbenefits, influencing economic, social, and environmental dimensions. While highly complex, a couple of key factors come out of this analysis:

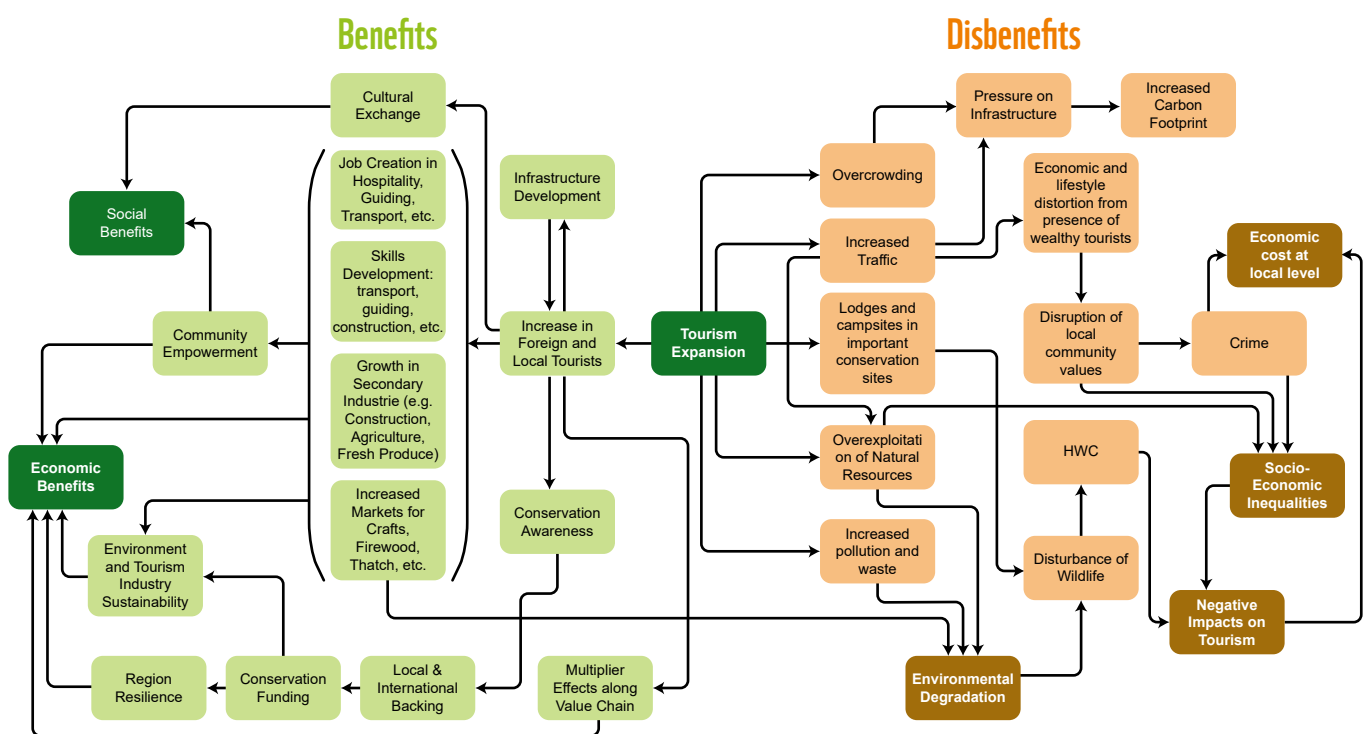


Figure 12. An overview of the benefits and disbenefits of tourism expansion on KAZA.

Source: Authors concept.

ECONOMIC AND LIVELIHOOD OPPORTUNITIES

Tourism is one of the few sectors in KAZA capable of generating significant economic value from natural capital while maintaining ecosystem integrity. It creates direct employment in hospitality, guiding, and transport, while also supporting indirect livelihoods through value chains such as agriculture, construction, and local services. This economic growth contributes to the overall resilience of the region by diversifying income sources and promoting local entrepreneurship (Ashley & Roe, 2002).

In addition, tourism can provide a critical revenue stream for conservation, including protected area management and community-based natural resource management systems. Where benefit-sharing mechanisms are effective, tourism can strengthen local incentives to conserve wildlife and reduce reliance on environmentally damaging activities such as unsustainable agriculture or resource extraction.

However, these benefits are unevenly distributed across the region. Tourism activity is spatially concentrated, and many communities—particularly in more remote areas—remain marginalised from tourism value chains. Addressing this imbalance is essential to maximise the sector's contribution to inclusive growth.

ENVIRONMENTAL RISKS AND RESOURCE PRESSURES

Tourism growth, if not carefully managed, can place significant pressure on ecosystems. The development of tourism-related infrastructure, increased traffic, pollution and waste, and the overexploitation of natural resources can threaten the region's delicate ecosystems (Buckley, 2011). Concentration of tourism activities in a limited number of hotspots increases the risk of habitat degradation, wildlife disturbance, and overuse of natural resources.

Resource pressures are particularly evident in relation to water. Tourism facilities, especially in high-end destinations, require substantial water and energy inputs, which can create competition with local communities and other sectors, particularly in drought-prone areas. Waste management, including plastic pollution, is another emerging concern in key tourism destinations. Without adequate systems in place, increasing visitor numbers can contribute to environmental degradation and undermine the ecological assets on which tourism depends.

BOX 2: PLASTIC POLLUTION IN THE KAZA

Since 2010, plastic pollution has been linked to the deaths of over 5,000 animals and numerous bird species in Zimbabwe alone. The ingestion of plastics has resulted in a condition known as plasticosis, which has contributed to the deaths of multiple elephants and other wildlife species in the region. Major tourist sites within KAZA, including Victoria Falls and Livingstone, are particularly affected, with an estimated 310 tons of new plastic waste entering these areas each month. A study involving two large hotels revealed that each hotel produces approximately 36,000 kg of plastic waste annually, translating to around 430 grams per tourist per day. Regarding national contributions to plastic waste, Zambia generates 518,000 tons annually, while Zimbabwe contributes 342,000 tons. This escalating plastic pollution degrades the environment and poses severe risks to the health of wildlife and local communities within KAZA.

Images. Source: Earth.org. (2022).





SOCIAL AND INSTITUTIONAL CHALLENGES

Tourism development can generate important social benefits, including employment, skills development, and community empowerment. However, it can also create social tensions where benefits are unevenly distributed or where local communities are excluded from decision-making processes.

In some cases, tourism development has contributed to rising living costs. The increased demand for water, land, and energy can lead to conflicts between tourism activities and the needs of local communities, particularly in areas where resources are already scarce (Gossling, 2003). Furthermore, the commodification of culture for tourism can result in the loss of authenticity and the marginalization of indigenous practices, eroding traditional lifestyles and cultural values (Li, Ismail, & Aminuddin, 2024). These dynamics can weaken social cohesion and reduce local support for conservation initiatives.

Institutional challenges also play a role. Weak coordination across sectors and countries, limited capacity for environmental management, and inconsistencies in policy implementation can undermine the sustainability of tourism development.

VULNERABILITY TO EXTERNAL SHOCKS

Tourism in KAZA is highly vulnerable to external shocks, including global economic downturns, pandemics, climate variability, and reputational risks driven by media narratives. The COVID-19 pandemic demonstrated the extent of this vulnerability, with severe impacts on livelihoods, conservation financing, and local economies. Similarly, climate-related events such as droughts can affect key attractions and reduce visitor demand, particularly where media coverage amplifies negative perceptions. These vulnerabilities highlight the need to strengthen resilience within the tourism sector, including through diversification of revenue streams and improved crisis preparedness.

OPPORTUNITIES WITHIN THE WILDLIFE ECONOMY

Tourism is a central pillar of the broader wildlife economy in KAZA, alongside other forms of wildlife utilization such as trophy hunting. Together, these activities generate economic incentives to maintain wildlife populations and conserve habitats. A key opportunity lies in strengthening this wildlife economy by improving governance, ensuring sustainable management practices, and enhancing benefit-sharing mechanisms. Diversifying tourism products — including community-based tourism and expanding into underutilized areas — can also reduce pressure on existing hotspots while increasing economic returns across the landscape.

2.4. KEY CONCLUSIONS AND RECOMMENDATIONS

KEY CONCLUSIONS

Tourism in the Kavango-Zambezi Transfrontier Conservation Area (KAZA TFCA) is a major economic driver and a central component of the region's wildlife economy. However, its development is uneven, spatially concentrated, and highly sensitive to environmental and external factors. Tourism activity is heavily concentrated around a limited number of flagship destinations, including Victoria Falls and the Okavango Delta. This concentration increases pressure on ecosystems in high-traffic areas while leaving other parts of the landscape underdeveloped and economically marginalized.

The sector faces a range of structural challenges. These include vulnerability to climate variability, particularly through impacts on water systems and key attractions; limited connectivity and infrastructure constraints; and reputational risks linked to media coverage and global perceptions related to issues such as trophy hunting. The COVID-19 pandemic further highlighted the sector's exposure to external shocks and its implications for livelihoods and conservation financing.

At the same time, tourism presents significant opportunities to support conservation, strengthen local livelihoods, and promote regional integration. Its role within the broader wildlife economy — including its interaction with other forms of wildlife utilization — remains critical to maintaining incentives for habitat conservation.

Overall, the sustainability of tourism in KAZA depends on achieving a more balanced and integrated approach that addresses environmental pressures, improves benefit-sharing, and strengthens resilience to external risks.

KEY RECOMMENDATIONS

To support a green growth pathway for tourism in KAZA, the following priority actions are recommended:

1 Diversify tourism development: Promote tourism in underutilized areas of the KAZA landscape to reduce pressure on high-traffic destinations and expand economic opportunities.

2 Strengthen sustainable tourism practices: Support eco-tourism and low-impact tourism models that minimize environmental degradation and enhance conservation outcomes.

3 Improve governance of wildlife utilization: Ensure that tourism and other wildlife-based activities, including trophy hunting, are governed by robust regulatory frameworks based on scientific evidence and sustainable practices.

4 Enhance conservation financing: Strengthen mechanisms to channel tourism revenues into (transboundary) conservation initiatives, e.g. through instruments such as the KAZA TFCA Fund.

5 Improve community benefit-sharing: Ensure that tourism revenues are distributed equitably and that local communities are actively engaged in tourism value chains and decision-making processes.

6 Strengthen environmental management systems: Improve waste management, pollution control, and environmental monitoring in key tourism areas to reduce ecological impacts.

7 Develop crisis preparedness and resilience mechanisms: Integrate climate adaptation measures into tourism planning and establish a sector-wide resilience and disaster response framework to address shocks such as pandemics and climate-related events.

8 Strengthen regional communication and branding: Develop a coordinated communication strategy to improve KAZA's international image, address misinformation, and promote its conservation and tourism value.

9 Improve infrastructure and connectivity: Invest in transport systems, streamline visa processes, and expand regional initiatives such as the KAZA UNIVISA to facilitate cross-border tourism.

10 Integrate tourism with spatial planning: Ensure that tourism and infrastructure development are aligned with land-use planning, including the protection of wildlife corridors and ecologically sensitive areas.



3. AGRICULTURE

3.1. OVERVIEW OF THE SECTOR

The agricultural sector in the Kavango-Zambezi Transfrontier Conservation Area (KAZA TFCA) plays a central role in livelihoods, food security, and rural economies. Approximately 32% of the landscape is classified as agricultural land, and the sector supports the livelihoods of over 70% of the population, particularly in rural areas.

Agricultural production varies significantly across the region. More productive areas—such as Zambia’s Barotse floodplain, parts of Zimbabwe, and Namibia’s Zambezi Region—benefit from relatively favourable climatic conditions, fertile soils, and access to river systems such as the Zambezi and Kwando (Salman et al., 2022). In contrast, less productive areas—particularly in western Botswana, southern Zimbabwe, and Angola’s Cuando Cubango Province—are characterised by low rainfall, poor soils, and high climate variability.

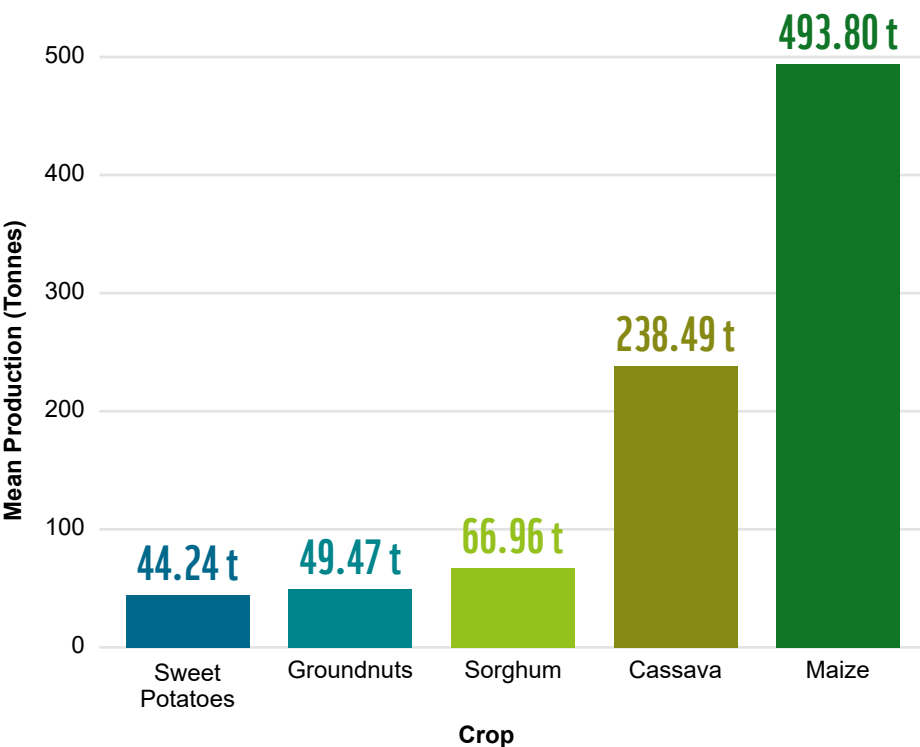
In these areas, dependence on rainfed agriculture results in low and highly variable yields, often compounded by soil degradation and deforestation (Hulke, 2023).

Maize is the dominant crop across the region, followed by cassava, sorghum, groundnuts, and sweet potatoes (see Figure 13). Livestock production, including cattle, goats, and poultry, is also a major component of rural livelihoods and contributes significantly to household income.

Despite its importance, the agricultural sector remains highly vulnerable to climate change and environmental degradation, with significant implications for food security, livelihoods, and long-term sustainability (Ahmad et al., 2020; CIRAD, 2024).

Figure 13. Main crop productivity in KAZA.

Source: Created using various FAO reports and Global Spatially-Disaggregated Crop Production Statistics Data for 2020 Version 1.0⁴.



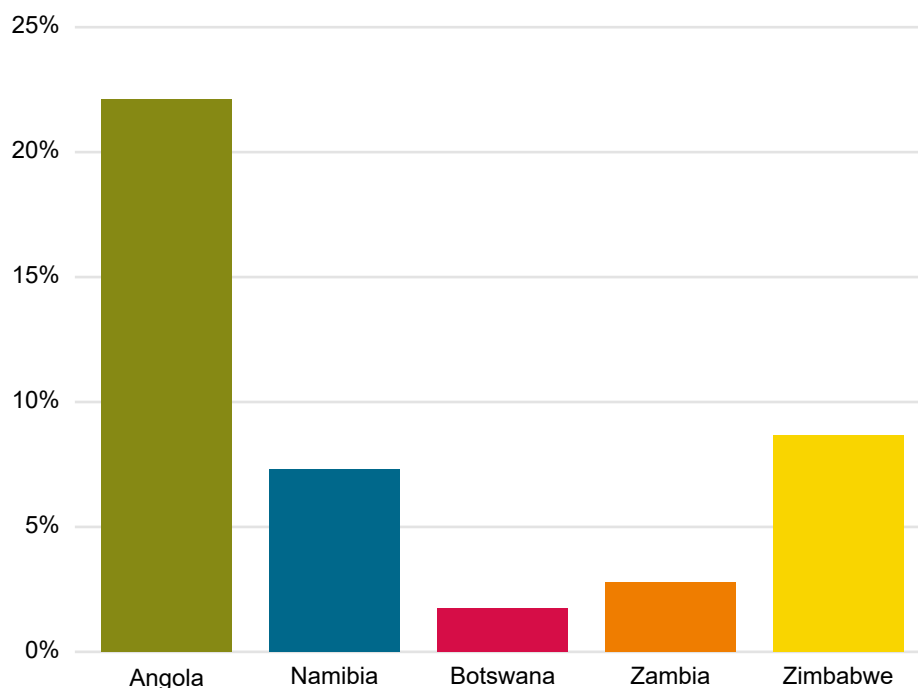
While the contribution to GDP varies across countries, agriculture is vital for rural livelihoods throughout.

Figure 13 provides a country-by-country overview of contributions of agriculture to the GDPs of the KAZA states, showing a steady increase over the past 5 years, a trend that appears to continue.

4 <https://www.fao.org/geospatial/resources/data-portals/en/>. (Global Spatially-Disaggregated Crop Production Statistics Data for 2020 Version 1.0)

Figure 14. Share of agriculture in GDP among the KAZA states.

Source: World Bank data⁵



A visual representation of agricultural practices in the region is presented in Figure 15. A country-level overview of the sector is presented below.

ANGOLA

Agriculture represented 22.1% of the country's GDP by 2024 (World Bank data⁵), sustaining two-thirds of the population by providing food, income, and employment. Around 80% of farmers operate at subsistence level or as small-scale commercial producers. Reliance on rain-fed agriculture exposes these farmers to climatic fluctuations (Turrall et al., 2011). The agricultural sector has maintained stable growth of 4-5% annually since 2020, offering diversification away from the oil-dependent economy. National plans like Planagrão prioritize crops such as wheat, rice, soy, and corn, with support from the Development Bank of Angola (BDA). Nevertheless, agricultural development in the KAZA part of Angola remains relatively limited, in part due to poor soil quality and the effects of past civil conflicts (FAO, 2021).

BOTSWANA

Although agriculture contributes less than 2% to Botswana's GDP, although 50% of the population relies on subsistence crops and livestock farming and over 45% of land is allocated to agriculture and livestock. The reliance on rainfall for farming increases vulnerability to climate-related disruptions (Botswana Statistics, 2023). In the KAZA region, agricultural activities mainly focus on grazing lands and game ranches, with limited crop production. Livestock production, especially cattle, contributes to 80% of the agricultural GDP, with beef being the primary export product. Aquaculture is an emerging sector, particularly in Mmadinare. The government of Botswana is actively seeking to attract private sector investment into commercial farms, tanneries, poultry hatcheries, and pig feed production through projects like the Zambezi Integrated Agro-Commercial Development and the Chobe-Zambezi water transfer scheme.

⁵ <https://data.worldbank.org>

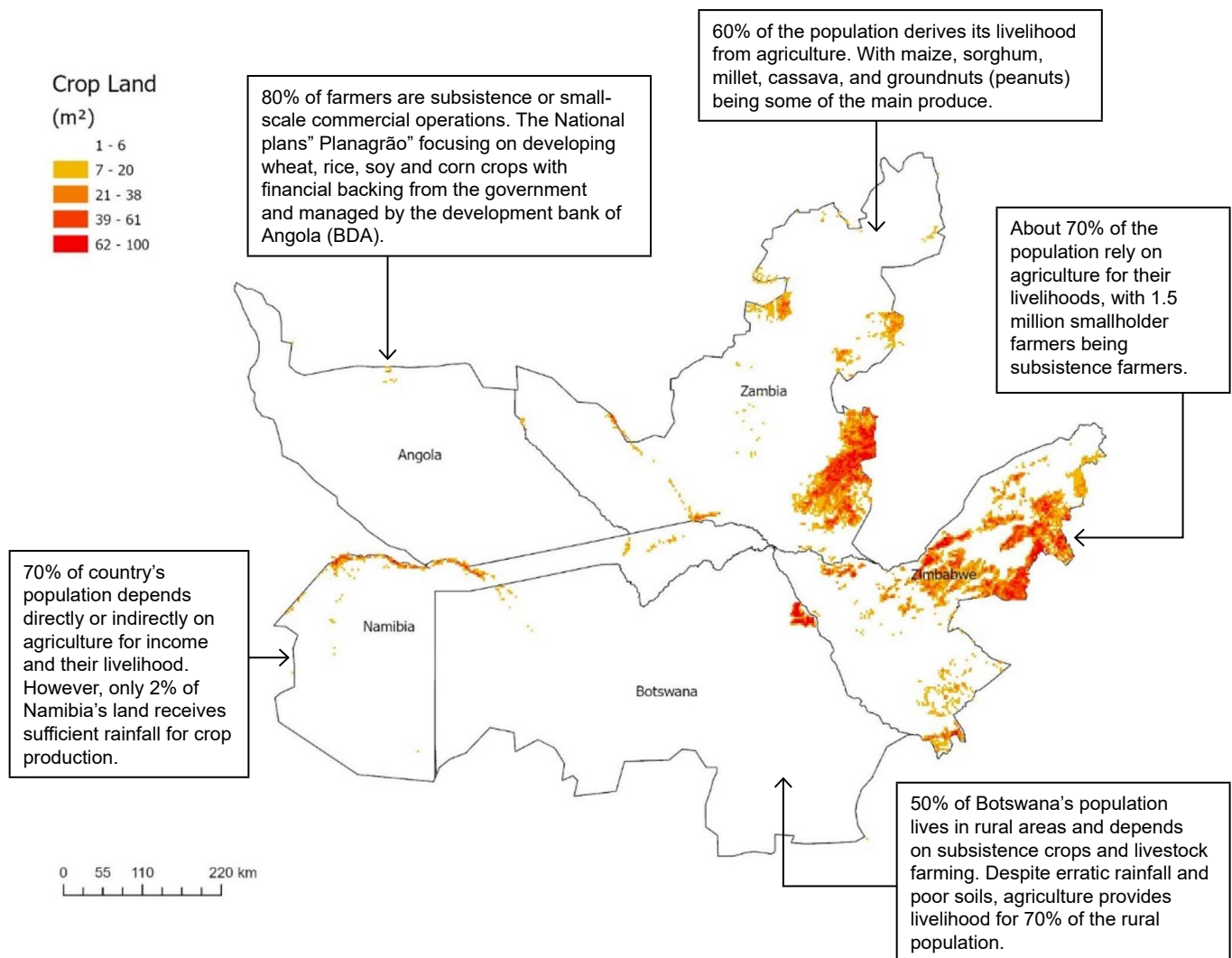


Figure 15. A visual representation of agriculture practices in the KAZA member states.

Source: Data extracted from KAZA Landscape AEF tool (2024)⁶

NAMIBIA

Agriculture and aquaculture are Namibia's second most important economic sectors. The sector contributes approximately 7.3% to the country's GDP (World Bank data⁵, 2024). Namibia, being the driest country in Sub-Saharan Africa, has 70% of its population depending directly or indirectly on agriculture, predominantly within the subsistence sector. However, only 2% of Namibia's land receives sufficient rainfall to support crop production, severely limiting the capacity of subsistence farmers to sustain their livelihoods in the face of increasing climate pressures (GIZ, 2020). Cattle raising, making up 6% of Namibia's GDP, is prevalent in the central and northern regions, though export restrictions due to veterinary fences impact the sector's growth.

ZAMBIA

Agriculture is critical in Zambia's economy, contributing less than 3% to GDP (World Bank data⁵), but supporting 70% of the population's livelihoods. The country is divided into three agroecological regions, each with varying rainfall and soil quality, suitable for cultivating crops such as cashew nuts, rice, cassava, millet and vegetables, and for raising cattle (for beef and dairy), poultry, and fisheries. Poor soil quality presents further challenges in certain areas of the KAZA region, affecting agricultural productivity.

⁶ https://www.arcgis.com/apps/mapviewer/index.html?url=https://wwfke-giscoe.wwfkenya.org/arcgis/rest/services/KAZA_Landscape_Socioecological_Data/MapServer&source=sd

ZIMBABWE

Agriculture in Zimbabwe contributed approximately 8.7% to the country's GDP in 2024 (World Bank data⁵), with over 4,130,000 hectares of arable land. Agriculture is the backbone of the economy, with about 70% of the population dependent on it for their livelihood, and 1.5 million smallholder farmers engaged in subsistence farming. The government offers 99-year leases for agricultural land, but weak enforcement hinders investment in the sector.

Inefficiencies in the “command” agricultural subsidy programs have impeded growth. Despite these challenges, agriculture in the KAZA region is diverse, including livestock, soya bean farming, dairy, forestry, fruit, beef, and maize production. Poor soil quality and rising Tsetse fly populations necessitate extensive fertilizer use, further complicating agricultural productivity.

3.2. TRENDS AND DEVELOPMENTS

Agriculture in KAZA is shaped by a number of interrelated trends that reflect both structural challenges and emerging opportunities.

BOX 3: AGRICULTURE TRENDS

1. Increasing impacts of climate change
2. Agricultural expansion as a key driver of deforestation
3. Rise of commercial monoculture farming
4. Continued prevalence of shifting cultivation
5. Importance of livestock systems for livelihoods and trade.

CLIMATE CHANGE IMPACTS

Agriculture in KAZA is highly vulnerable to climate variability. Rising temperatures, changing rainfall patterns, and increasing frequency of droughts are already affecting productivity and are expected to intensify in the coming decades (see Box 4). These changes are likely to reduce crop yields and shorten growing seasons, increase water stress and exacerbate land degradation and desertification.

The least productive areas, particularly the southern regions, are most vulnerable to rising temperatures and reduced growing seasons, pushing some areas beyond viable rainfed agriculture (Dube & Nhamo, 2019). For example, Coldrey & Turpie (2020) project that the decline in suitable agricultural land for dent maize, particularly in the central landscape of KAZA, at around 1.2 million hectares, indicating broader trends affecting other staple crops.

In the more productive areas, irregular rainfall patterns and higher evaporation rates threaten irrigation-dependent crops and could reduce yields in regions like the Barotse floodplain (Thurlow et al., 2021). The northern regions, with more abundant rainfall, may have more favourable conditions for agriculture, although they could face waterlogging or soil erosion issues. Adaptation strategies, such as improved water management, irrigation systems, and drought-resistant crops, are essential to sustaining agriculture in these vulnerable areas (Munang et al., 2013, Mulenga et al., 2020).



BOX 4: CLIMATE CHANGE IN THE KAZA REGION

The KAZA region is experiencing extreme weather conditions, particularly in the north and central areas, with average surface temperatures reaching as high as 38°C, as indicated in Figure 16. The region is highly susceptible to the impacts of climate change, especially rising temperatures, altered precipitation patterns, and their subsequent effects on biodiversity and local livelihoods.

Research reveals that temperatures in southern Africa have risen by an average of 0.5°C over the past century, with projected further increases ranging from 1.5°C to 3°C by 2050 (Hatfield et al., 2011). These changes have been linked to more frequent and intense droughts, reduced river flow, and increasing desertification processes, which are becoming more prevalent in the KAZA landscape.

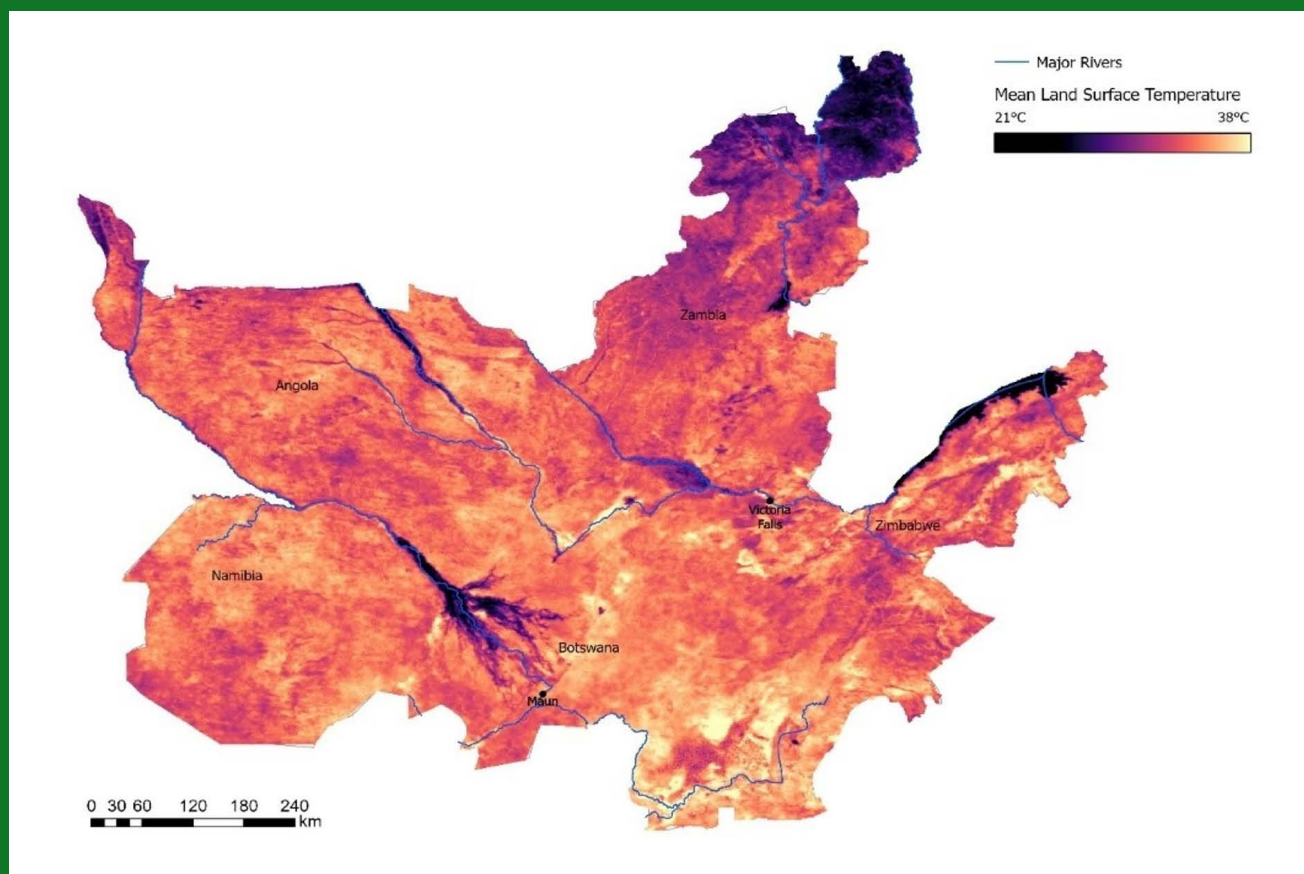


Figure 16. An illustration of mean land surface temperature.

Source: NASA LP DAAC (2024).

Figure 17 illustrates the historical (1960-1990) and projected (2040-2060) changes in mean annual temperature (left panels) and total annual precipitation (right panels) across the KAZA landscape. The historical data map shows that mean temperatures ranged between 20°C and 28°C, with the highest values recorded in the northern regions of Zambia and Angola.

The projections indicate a substantial increase in mean temperatures across the region, with values reaching above 30°C, mainly in Botswana and Zimbabwe, highlighting the trend of rising temperatures across KAZA. Additionally, higher rainfall (up to 2,000 mm) is projected in the northern parts of the region, in Angola and Zambia, while lower rainfall, between 300-1,000 mm, is expected in the southern parts (Namibia and Botswana). A significant factor affecting rainfall is the El Niño-Southern Oscillation (ENSO). ENSO events influence the region's rainfall, with El Niño phases generally associated with reduced rainfall and droughts, while La Niña phases bring increased precipitation (Mason & Goddard, 2001).

Historic and projected mean annual temperature (°C) and total annual precipitation (mm) across KAZA landscape

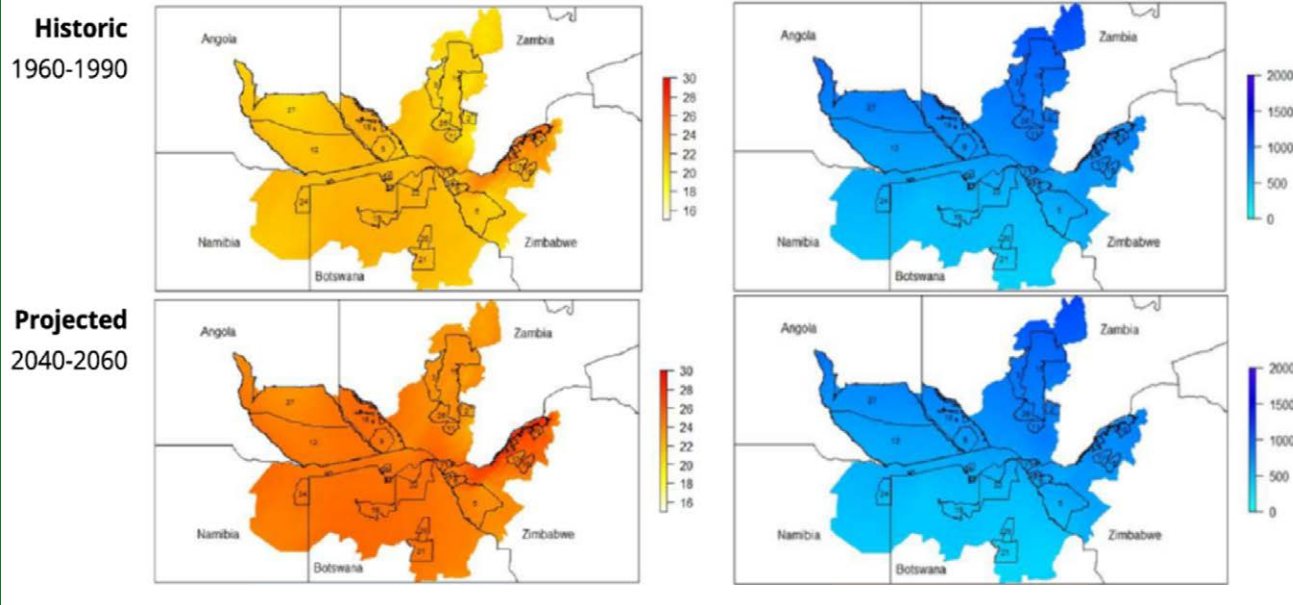


Figure 17. Historic and projected mean annual temperature (°C) and annual precipitation (mm) across KAZA

AGRICULTURE AS A DRIVER OF DEFORESTATION

Agricultural expansion is one of the primary drivers of deforestation in the KAZA region. A study conducted by WWF (Pacheco et al., 2021), identified 24 global deforestation fronts regions experiencing significant forest loss, among which parts of the Angolan highlands and Eastern Zambia. Box 5 presents an overview of the current deforestation trends in the KAZA region.

Various studies have shown that agricultural expansion is responsible for a substantial portion of the forest cover loss in KAZA, particularly in areas with high population density and proximity to urban centres (Vincent et al., 2020). Forest areas are systematically converted into agricultural land, negatively impacting the region's biodiversity, disrupting ecosystems and leading to the decline of various species dependent on forest habitats (Curtis et al., 2018).

Figure 18 shows the expansion of cropland between 2000 and 2020. As may be concluded, the expansion of crop production in the landscape is not uniformly distributed, with some regions, in particular the eastern section of the landscape (Zambia and Zimbabwe), experiencing higher rates of cropland density and development. This footprint resonates well with the observed deforestation hot spots presented in Box 5. Fritz et al. (2022) emphasizes that such land-use changes, if unmanaged, accelerate biodiversity loss and habitat fragmentation, threatening ecosystem stability.

The conversion of forests to agricultural land has long-term consequences. Deforestation in the region has exacerbated soil erosion and degradation, which in turn reduces the productivity of agricultural lands. As may be concluded from Figure 19, the main areas of cropland expansion are located in areas with currently good soil conditions. However, as forests are cleared, the protective vegetative cover that stabilises the soil is lost, leading to increased vulnerability to erosion. Over time, this soil degradation diminishes the fertility of the land, making it less suitable for agriculture and perpetuating a cycle of land abandonment and further deforestation.

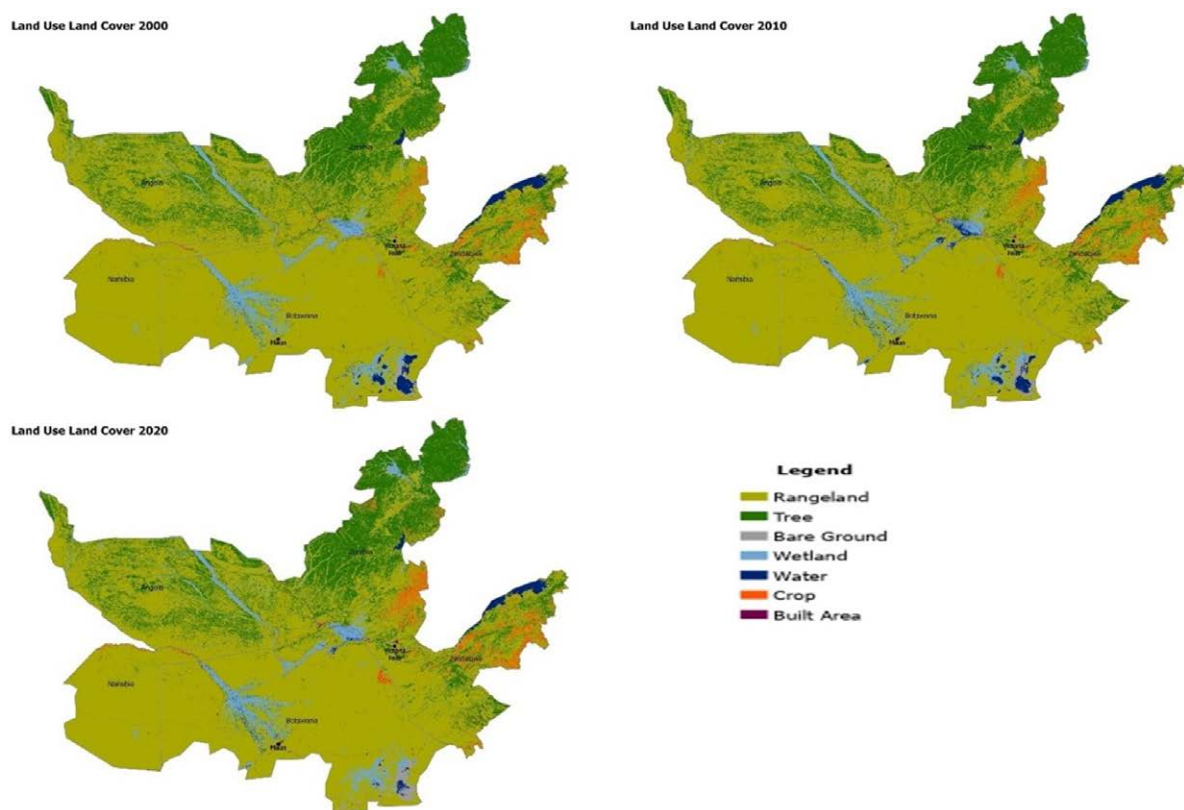


Figure 18. The expansion of cropland between 2000 to 2020.
Source: data extracted from Karra et al. (2021).

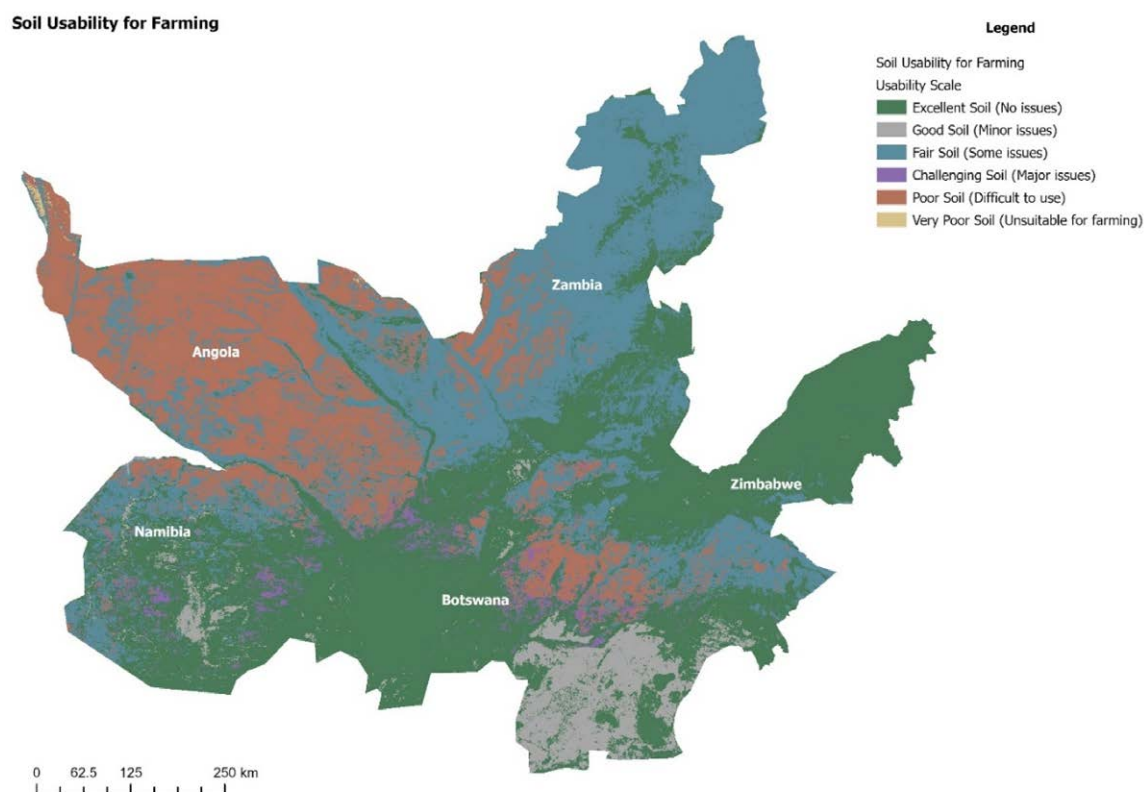


Figure 19. Soil fertility in the KAZA landscape⁷

⁷ Retrieved from https://developers.google.com/earth-engine/datasets/catalog/ISDASOIL_Africa_v1_fcc.

BOX 5: FOREST COVER LOSS AND DEFORESTATION IN THE KAZA REGION

The Kavango-Zambezi (KAZA) region has seen alarming deforestation rates, particularly in Zambia and Angola. Between 2001 and 2019, the KAZA region experienced a loss of over 257,000 hectares of tree cover, with Protected Areas (PAs) contributing to 35% of this decline. An all-time high of 45,000 ha was reached in 2022 as seen in Figure 20.

The main causes of deforestation in KAZA include land conversion for agriculture, cattle ranching, wildfires, urban growth, transport infrastructure, demand for charcoal and timber, and infrastructural development. Factors such as population growth, poverty, and limited alternative livelihoods exacerbate these pressures, leading to a greater dependence on forest resources. The socio-economic dynamics in the region, particularly the need for income and energy, significantly influence the rate and scope of deforestation.

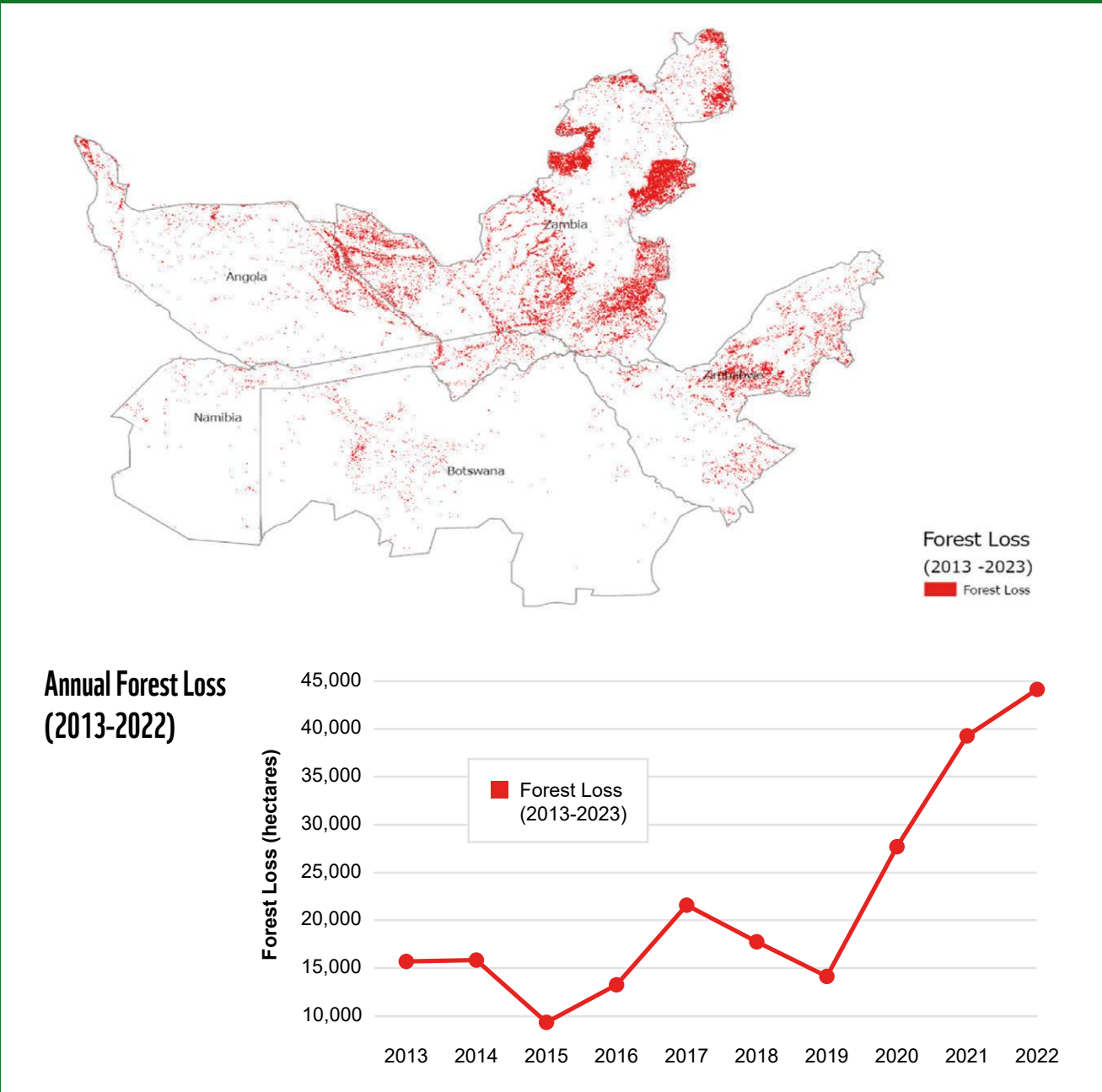


Figure 20. Annual Forest loss in the KAZA region.
Source: Global Forest Watch (2024).

RISE OF MONOCULTURE FARMING

The expansion of monoculture farming, particularly for crops such as maize and tobacco, is becoming increasingly prevalent in the KAZA region. While monoculture systems can increase short-term productivity, they often lead to long-term environmental degradation through soil nutrient depletion, increased vulnerability to pests and diseases, pollution of soil and water due to reliance on chemical inputs and reduced biodiversity, including pollinators like bees (Altieri, 1999). Furthermore, the intensive tillage associated with monoculture contributes to soil erosion, depleting soil structure and fertility (Lal, 2003).

Monoculture also entails economic risks, exposing farmers to price volatility and climate shocks (Lin, 2011). Socially, large-scale monoculture farming may displace smallholder farmers, undermining traditional, diversified farming systems that contribute to local food security (Altieri et al., 2011). Monoculture also exacerbates environmental stressors, such as climate change, as these systems lack the genetic diversity needed to adapt to changing conditions (Tscharntke et al., 2012; Challinor et al., 2014).

While monoculture farming may play a vital role in increasing food production, there is growing recognition of the need to transition towards more diversified and sustainable farming systems, including agroecology and agroforestry. These approaches emphasise biodiversity, crop rotation, and the integration of trees into agricultural systems, which enhance soil health, reduce the need for chemical inputs, and improve resilience to climate change (Altieri, 2002; Jose, 2009).



PREVALENCE OF SHIFTING CULTIVATION PRACTICES

Shifting cultivation remains widely practiced across the region, particularly among smallholder farmers. While it is rooted in traditional land-use systems, increasing population pressure and reduced fallow periods are making the practice less sustainable. The primary effects of this unsustainable practice are deforestation and habitat loss, soil degradation and erosion, declining fertility and increased carbon emissions. Secondary effects include the disruption of local water cycles by removing forest cover that regulates rainfall and water availability, and biodiversity loss, as the conversion of forests into agricultural land diminishes plant and animal species and affects ecosystem stability.

The causes of the prevalence of shifting cultivation practices in KAZA are multifaceted: population pressure drives the expansion of agricultural activities into previously untouched areas; limited access to modern farming techniques forces many to rely on traditional methods; economic necessity plays a crucial role, as shifting cultivation provides a means of subsistence and income for local communities; land tenure insecurity exacerbates the issue, as individuals lacking long-term land rights may be compelled to clear new land; cultural traditions deeply rooted in the practice; and poor land management policies and weak enforcement perpetuate the practice by failing to address its ecological consequences effectively.

Addressing these challenges requires a combination of improved land management, access to alternative livelihoods, and strengthened land tenure systems.

LIVESTOCK REARING REMAINS A SIGNIFICANT SOURCE OF INCOME FOR MANY IN THE REGION

Livestock production is a major component of the agricultural economy, particularly in Botswana and Namibia. However, the sector faces significant challenges related to disease control and market access.

Foot-and-mouth disease (FMD) remains a key constraint, particularly in areas where livestock and wildlife coexist, impacting both economic development and environmental sustainability (Ferguson et al., 2010). Veterinary cordon fences (see Figure 21) are used to control disease spread but can disrupt wildlife movement and undermine conservation objectives (McElwee et al., 2020).



© Gareth Bentley / WWF-US

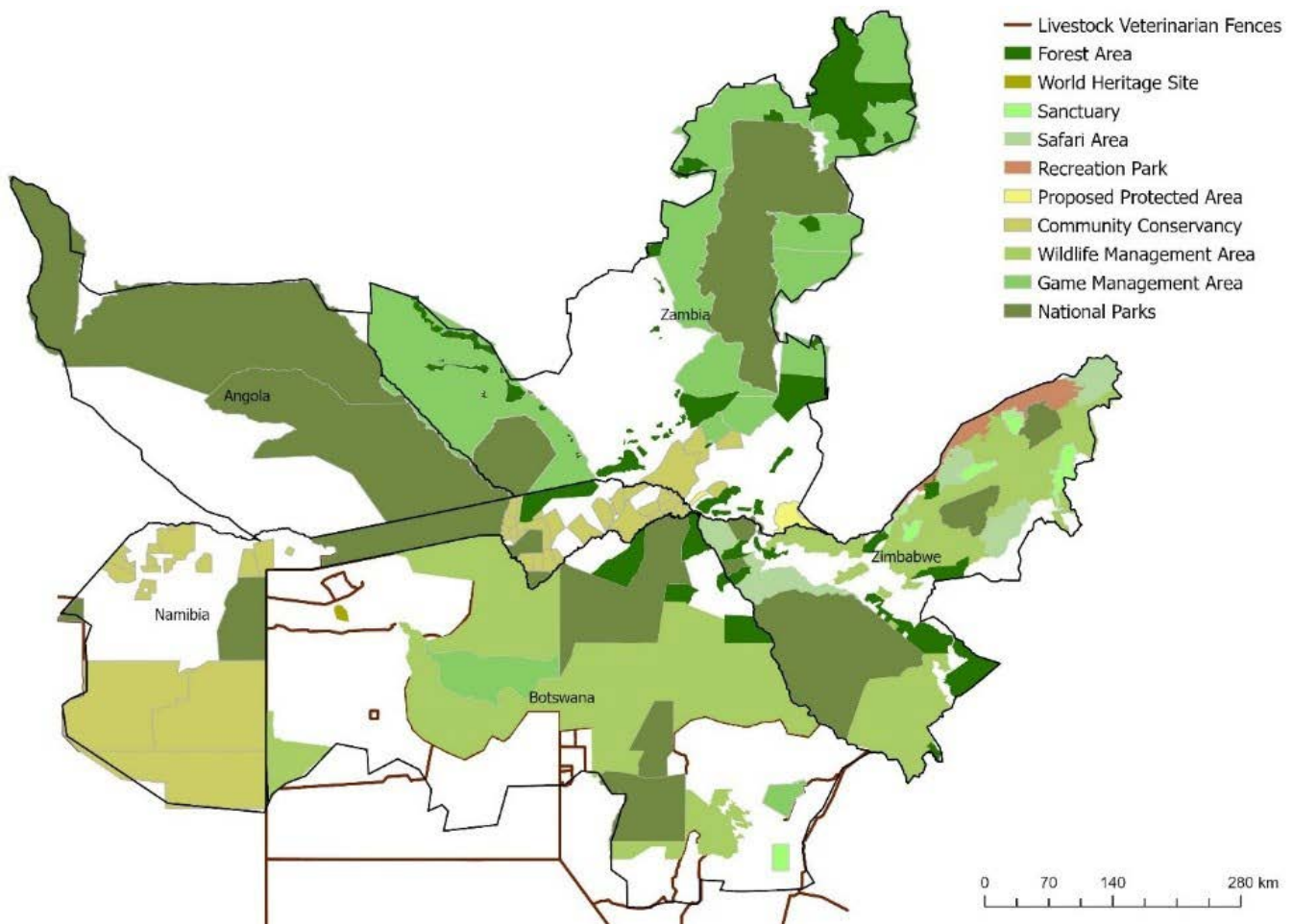


Figure 21. An illustration of existing veterinary cordon fences in the KAZA landscape.
Source: Data extracted from the KAZA database, 2024.

Commodity-Based Trading (CBT) is promoted as a solution to this challenge. CBT ensures animal products’ safety and health standards, particularly meat. It underscores product safety through specific processing measures such as deboning, maturation, and other techniques, enabling meat products to be trade-ready irrespective of the region’s FMD status (SADC, 2021), while reducing the need for stringent disease control measures such as veterinary fences.

3.3. CHALLENGES AND OPPORTUNITIES FOR GREEN GROWTH

Agriculture in the KAZA TFCA presents both significant development opportunities and major sustainability challenges. The sector is essential for livelihoods, food security, and rural economies, but current agricultural systems are also closely linked to deforestation, land degradation, water stress, and biodiversity loss.

Achieving a green growth pathway in KAZA therefore requires strengthening the productive capacity of the agricultural sector while reducing its environmental footprint and improving resilience to climate change.

FOOD SECURITY AND RURAL LIVELIHOOD OPPORTUNITIES

Agriculture remains the primary source of livelihoods for most of the population across the KAZA landscape, particularly in rural areas. The sector provides employment, food security, and income generation, especially for smallholder households. Agriculture also presents opportunities to strengthen regional trade and diversify economies that remain heavily dependent on tourism or mineral resources.

There is significant potential to improve agricultural productivity and rural incomes through sustainable intensification, improved market access, value addition and agro-processing, and better extension services and access to inputs. However, productivity levels remain low across much of the region due to poor soils, climate variability, limited infrastructure, and low levels of investment.

CLIMATE VULNERABILITY

Agricultural systems in KAZA are highly vulnerable to climate change. Rising temperatures, increasingly erratic rainfall, prolonged droughts, and shorter growing seasons are already affecting crop productivity and livestock systems. Dependence on rainfed agriculture significantly increases vulnerability, particularly in marginal and arid areas. Water scarcity is becoming an increasingly important constraint, especially in Botswana and Namibia.

Without adaptation measures, climate change is likely to reduce agricultural productivity, increase food insecurity and intensify rural poverty and vulnerability. At the same time, climate-resilient agricultural practices, including drought-resistant crops, irrigation systems, agroforestry, and conservation agriculture, offer opportunities to strengthen resilience and improve long-term sustainability.

LAND DEGRADATION AND DEFORESTATION

Agricultural expansion remains one of the principal drivers of deforestation and habitat fragmentation within the KAZA landscape. Shifting cultivation, expansion of cropland, charcoal production, and unsustainable grazing practices contribute to the loss of forests and ecosystem degradation.

These land-use changes have important long-term consequences, including declining soil fertility, increased erosion, reduced ecosystem services and biodiversity loss. In many areas, declining soil productivity contributes to a cycle of continued land clearing and agricultural expansion.

Opportunities exist to reduce these pressures through improved land-use planning, sustainable intensification, agroecological farming systems, and ecosystem restoration initiatives. Strengthening the integration between agricultural development and conservation planning will be essential to maintaining ecosystem integrity across KAZA.

HUMAN-WILDLIFE CONFLICT

Agriculture and wildlife conservation increasingly compete for land and resources across the KAZA landscape. Expansion of cultivation and livestock grazing into wildlife areas contributes to habitat fragmentation and increases human-wildlife conflict, including crop damage and livestock predation. At the same time, wildlife movement and disease transmission create challenges for livestock production, particularly in areas affected by Foot-and-Mouth Disease (FMD).

Balancing agricultural development with conservation objectives remains one of the region's most significant land-use challenges. Opportunities exist to promote more compatible production systems through integrated land-use planning, wildlife-compatible agriculture, buffer zones and coexistence approaches and improved compensation and mitigation mechanisms.

LIVESTOCK SYSTEMS AND MARKET OPPORTUNITIES

Livestock production is a major economic activity across the region, particularly in Botswana and Namibia. Cattle production contributes significantly to rural livelihoods and export earnings. However, veterinary disease controls—particularly cordon fencing related to FMD management—create ecological and economic trade-offs. While fences support disease control and export certification, they also disrupt wildlife movement and ecological connectivity.

Commodity-Based Trading (CBT) presents a promising opportunity to address these challenges by enabling safe trade in livestock products without requiring extensive fencing systems. This approach could improve market access while supporting conservation objectives and reducing fragmentation across the landscape.

INSTITUTIONAL AND GOVERNANCE CHALLENGES

Agricultural development in KAZA is affected by a range of institutional constraints, including weak land-use planning systems, limited extension capacity, inconsistent policy implementation and insecure land tenure in some areas. Cross-border coordination on agricultural and environmental management also remains limited, despite the transboundary nature of many ecosystems and resource systems.

Strengthening governance systems, improving regional coordination, and aligning agricultural policies with climate and conservation objectives will be critical to supporting sustainable agricultural development.



3.4. KEY CONCLUSIONS AND RECOMMENDATIONS

KEY CONCLUSIONS

Agriculture is a cornerstone of livelihoods in the KAZA TFCA but is currently characterised by low productivity, high climate vulnerability, and increasing pressure on land and natural resources. The sector plays a dual role as both a driver of economic development and a contributor to environmental degradation. Agricultural expansion, deforestation, and unsustainable practices such as monoculture and shifting cultivation are key challenges affecting long-term sustainability. Livestock farming, crucial for livelihoods, gives rise to conflicts with wildlife conservation, exacerbating issues such as disease control and human-wildlife conflict.

At the same time, agriculture offers significant opportunities for supporting green growth. Improving productivity, strengthening resilience, and aligning agricultural practices with conservation objectives can enhance food security while reducing pressure on ecosystems.

Achieving this transition will require a shift towards more sustainable, climate-resilient, and land-efficient agricultural systems, supported by improved governance, investment, and regional coordination.

KEY RECOMMENDATIONS

Based on this analysis, a number of key recommendations can be made to ensure that agricultural development in KAZA follows a green growth path:

- 1 Promote climate-resilient agricultural practices:** Scale up climate-smart agriculture, including agroecology, conservation agriculture, and agroforestry.
- 2 Support sustainable intensification:** Increase productivity on existing agricultural land to reduce pressure for expansion into natural ecosystems.
- 3 Promote compatible production systems:** Invest in Agri-Hubs, Cluster Farms, Herding4Health and other production methods, including processing facilities for adding value.
- 4 Awareness and capacity building:** Implement training programs on sustainable farming practices, including related business development.
- 5 Strengthen water management systems:** Invest in irrigation, water harvesting, and efficient water use technologies.
- 6 Improve land-use planning and enforcement:** Align agricultural development with conservation priorities and strengthen cross-border planning.
- 7 Enhance agricultural value chains and market access:** Improve infrastructure, reduce barriers to trade, and support value addition, such as through commodity-based trading systems that improve market access for livestock producers while reducing reliance on fencing systems.
- 8 Strengthen extension services and capacity building:** Provide training and support for farmers to adopt sustainable practices.
- 9 Address human–wildlife conflict:** Implement integrated land management approaches and policies to support coexistence.
- 10 Promote ecosystem restoration:** Rehabilitate degraded land, forests, and water systems to support long-term productivity.



4. EXTRACTIVE INDUSTRIES

4.1. OVERVIEW OF THE SECTOR

Extractive industries encompass activities related to the extraction and processing of natural resources, including mining, timber harvesting, and oil and gas exploration. Within the KAZA TFCA, these industries play an important economic role, contributing to government revenue, employment, infrastructure development, and export earnings.

At the same time, extractive activities are associated with significant environmental and social risks, particularly within ecologically sensitive and transboundary landscapes. Mining, timber harvesting, and fossil fuel exploration can contribute to deforestation, habitat fragmentation, pollution, and increased pressure on wildlife corridors and water systems.

Mining is the dominant extractive sector across much of the KAZA landscape, particularly in Botswana, Zambia, Zimbabwe, Namibia, and Angola (Günther, 2018).

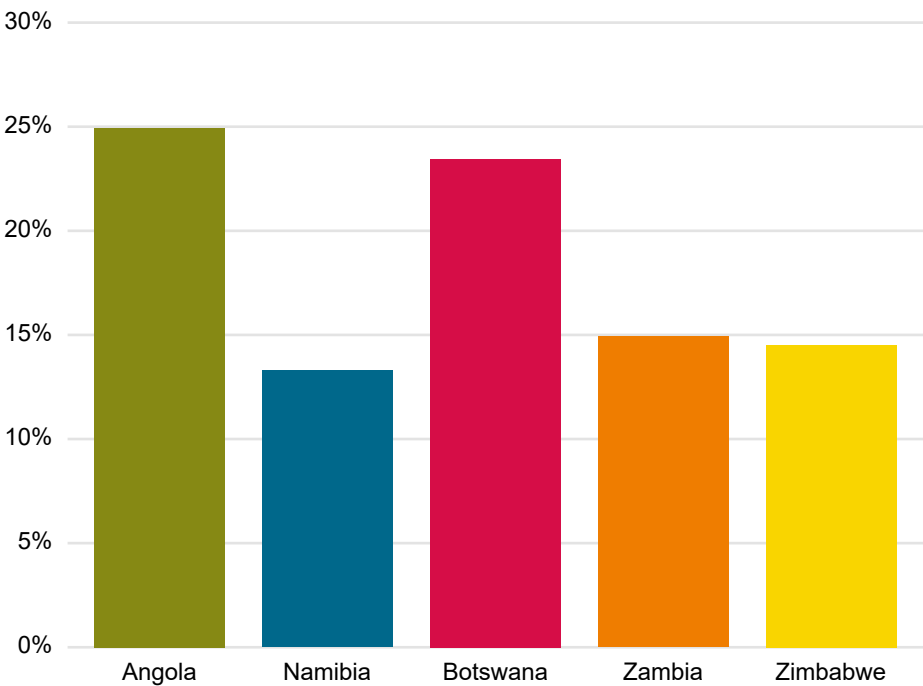
Key minerals include diamonds, copper, coal, gold, uranium, cobalt, lithium, and platinum group metals. The sector contributes significantly to national economies, accounting for approximately 16% of GDP in Botswana, 10% in Namibia and 12% in Zimbabwe.

Timber harvesting also represents a significant extractive activity within KAZA, driven by regional and international demand for hardwood species such as Kiaat and Zambezi Teak. Timber harvesting is considered an important contributing factor to deforestation and habitat loss within the region (Lindsey et al., 2014). In addition, oil and gas exploration activities are expanding in parts of Angola, Namibia, and Zimbabwe.

Figure 22 presents the cumulative GDP contribution by sector in KAZA member states.

Figure 22. Cumulative GDP contribution by sector in KAZA member states.

Source: International Monetary Fund (2025); Chamber of Mines of Namibia (2025); International Monetary Fund (2024); U.S. International Trade Administration (2026); World Bank (2025).



Balancing the economic contribution of extractive industries with the long-term sustainability of ecosystems and livelihoods remains a major policy challenge across the KAZA TFCA.

Below is a detailed country-by-country profile of their respective extractive sectors, highlighting key contributions, ongoing developments, and challenges.

ANGOLA

Angola's extractive sector is dominated by oil, gas, and diamond mining, with the oil and gas sector contributing approximately 90-95% of Angola's total export value, and 60-65% of the Government's tax and fiscal revenues (World Bank, 2025b). Recent exploration agreements include copper prospecting projects in Moxico and Cuando Cubango Provinces by Ivanhoe Mines, a company in the Canadian mining sector, valued at US\$6 billion (Domingos, 2023). The extractives industry contributes about 25% of nominal GDP (International Monetary Fund (2025). Angola has already experienced oil spills and other forms of pollution linked to the extractives industry, calling for strong sustainable practices and mitigation strategies (Ministry of Mineral Resources and Petroleum, 2023).

BOTSWANA

Botswana's economy remains heavily dependent on mining, particularly diamond production. The mining sector contributes between 22 and 25% of GDP (International Monetary Fund, 2024). The country ranks as the second-largest diamond producer worldwide. In addition, copper mining takes place in the KAZA TFCA area, specifically at the Boseto Copper Mine in Ngamiland where open-cut mines are associated with habitat destruction and soil erosion. (Mining Technology, 2011). Furthermore, oil exploration is ongoing, particularly in the Central Kalahari Game Reserve.

NAMIBIA

Mining contributes approximately 13.3% to Namibia's GDP (Chamber of Mines of Namibia, 2025) and includes diamonds, uranium, gold, zinc, and emerging rare earth minerals. Notably, Namibia is the world's fourth-largest producer of uranium oxide, though these primary operations are outside the KAZA region (Ministry of Mines and Energy, 2023). The country hosts some of the largest mining companies globally, with 9 out of the 10 top mining firms operating in Namibia, underscoring Namibia's significant role in the global mining industry (Namibian Chamber of Mines, 2023). Recent developments include oil and gas exploration in the Kavango Basin by Recon Africa, which has attracted significant international attention (ReconAfrica, 2020). While these projects may support economic diversification and investment, they also raise concerns related to biodiversity, water resources, and impacts on wildlife corridors.

ZAMBIA

Mining contributes approximately 15% to Zambia's GDP (World Bank, 2025) and remains central to export earnings, particularly through copper production, but also involving gold, cobalt, lead-zinc, iron, manganese, and emeralds (Kolala & Dokowe, 2021). The infrastructure supporting this sector has been bolstered by the Angola-Zambia oil pipeline agreement, which enhances the efficiency of oil transportation and underpins mining operations. Despite facing challenges like illegal mining, land degradation, and environmental concerns, Zambia is exploring new opportunities for local mineral processing and value addition, aiming to maximize the sector's contribution to the economy (Zambia Ministry of Mines, 2023). The Zambian government is implementing initiatives and reforms to improve mining practices and promoting environmental sustainability (Zambia Environmental Management Agency, 2021).

ZIMBABWE

Zimbabwe's mining sector is highly diversified and contributes approximately 14.5% of GDP and 80% of national export earnings (U.S. International Trade Administration, 2026). Key minerals include platinum group metals, gold, coal, chrome, diamonds, and lithium (The Chamber of Mines Zimbabwe, 2022). Zimbabwe hosts the world's second-largest platinum deposits and high-grade chromium ores, as well as the largest lithium deposits in Africa. Within the KAZA region, coal mining is exceptionally prominent, accompanied by the extraction of tin and copper, underscoring the region's importance to Zimbabwe's mining industry⁸. The country's mining industry is experiencing a resurgence due to the increasing demand for lithium-ion batteries, substantial Chinese investment, and the launch of new projects. Invictus Energy, an independent oil and gas company, has made a significant discovery of natural gas and condensate at its Mukuyu-2 well in the Cabora Bass project in northern Zimbabwe. While the sector presents opportunities for investment and economic growth, concerns remain regarding illegal mining, environmental degradation, and weak regulatory enforcement.

8 <https://theconversation.com/lithium-mining-in-zimbabwe-a-story-of-loss-for-one-community-237490>
<https://minedocs.com/19/Mining-Zimbabwe-Magazine-issue-55-June-2022.pdf>

4.2. TRENDS AND DEVELOPMENTS

Extractive industries within the KAZA TFCA are shaped by a number of interconnected trends that present both economic opportunities and environmental risks. These trends reflect increasing pressure on natural resources, growing demand for minerals and timber products, expansion of energy exploration, and emerging opportunities linked to other forms of natural resource extraction.

BOX 6: EXTRACTIVE INDUSTRY TRENDS

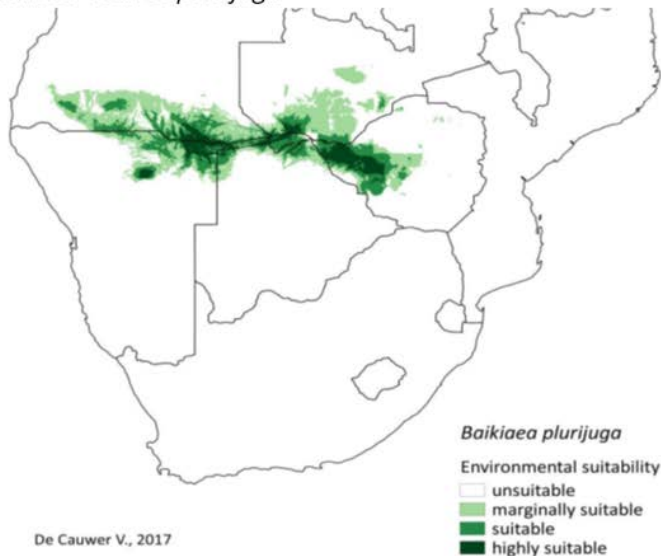
1. Unregulated logging for timber, firewood and charcoal production
2. Expansion of mining and fossil fuel exploration
3. Increasing land-use conflicts and encroachment into protected areas
4. Growing potential for non-timber forest products

UNREGULATED LOGGING FOR TIMBER, FIREWOOD AND CHARCOAL PRODUCTION

Illegal and unregulated logging remains one of the most significant environmental pressures within the KAZA landscape, associated with habitat fragmentation, biodiversity loss, declining ecosystem resilience and increased carbon emissions. High-value hardwood species such as Kiaat (*Pterocarpus angolensis*) and Zambezi Teak (*Baikiaea plurijuga*) are increasingly exploited to meet growing regional and international demand, particularly from Asian markets (see Figure 23). Traded forest products from Africa to China were valued at approximately USD 2.9 billion in 2014 (International Tropical Timber Organization, 2017), highlighting the scale of commercial demand driving extraction.

Distribution of Zambezi Teak and Kiaat

Zambezi Teak *B. plurijuga*



Kiaat *P. angolensis*

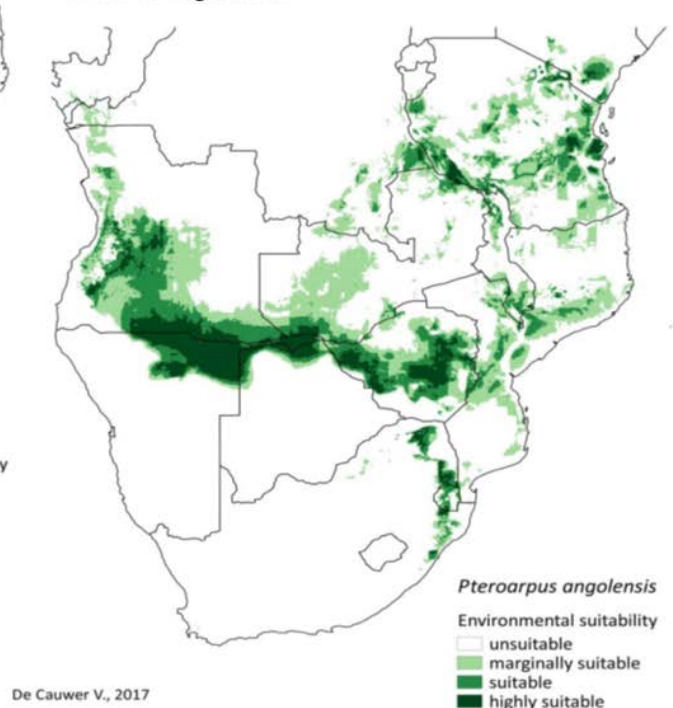


Figure 23. Distribution of Zambezi Teak and Kiaat.
Source: Nott et al. (2019)

Available data indicates that large quantities of Kiaat timber originate from Zambia and Angola, with Namibia functioning as an important transit corridor for exports to South Africa and international markets (see Figure 24). Limited traceability within permit systems further complicates efforts to monitor timber flows and enforce sustainable harvesting practices.

Illegal logging contributes significantly to deforestation and forest landscape fragmentation across the region. In Zambia, estimates suggest that up to 80% of timber extraction in some areas may occur outside formal regulatory systems (Chidumayo & Gumbo, 2010). Between 2010 and 2020, Zambia lost approximately 1.18 million hectares of tree cover, much of which has been linked to unsustainable timber harvesting and land clearing (Global Forest Watch, 2022). Total export is estimated at between 50,000 and 100,000 cubic meters annually, generating millions in profits for illegal loggers but at the expense of environmental sustainability (Curtis et al., 2018).

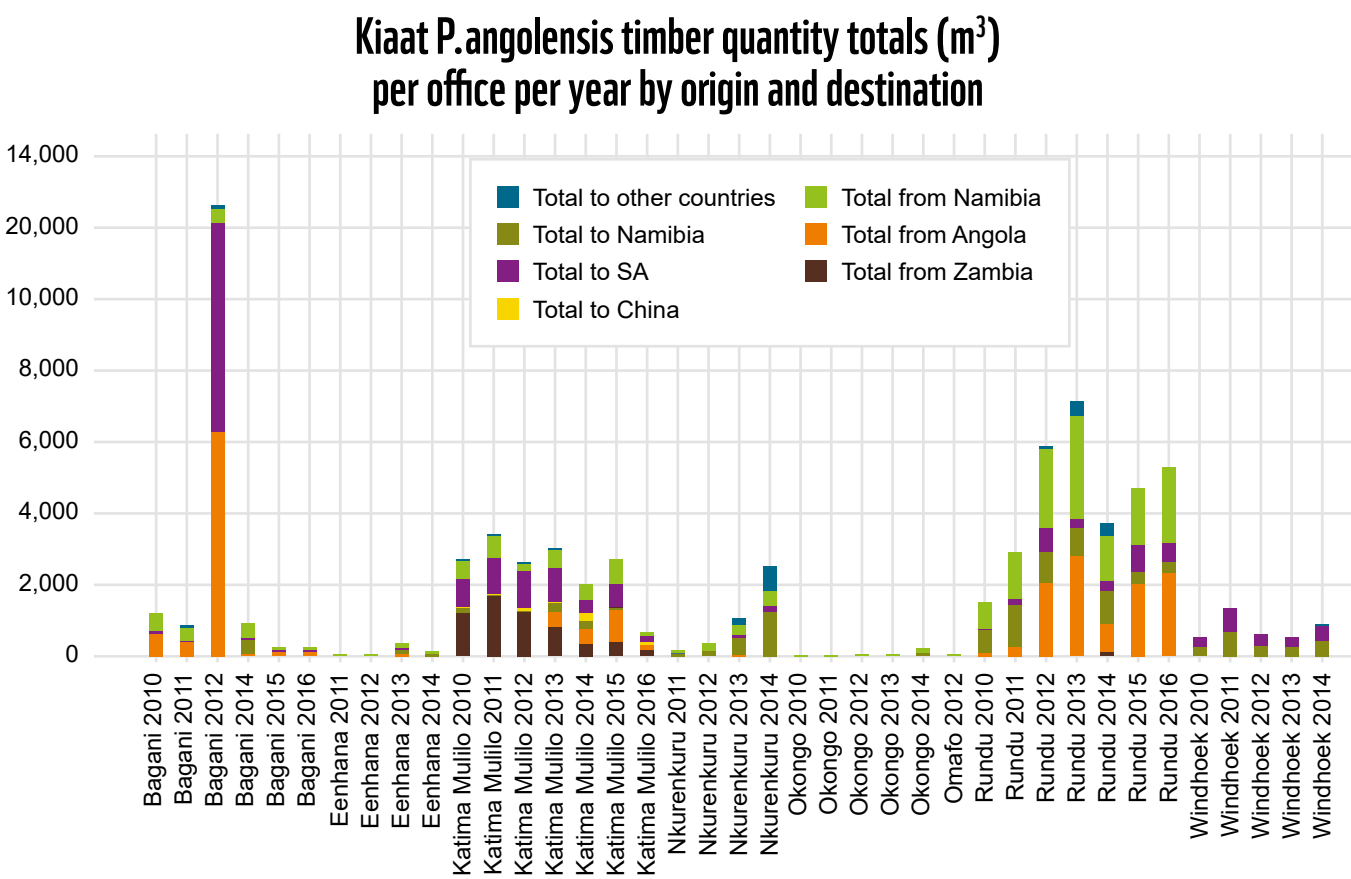


Figure 24. Kiaat *P. angolensis* timber quantity totals.
Source: Nott et al. (2019).

The international trade in timber fuels illegal logging activities, with timber exported to Asia through Tanzania and Mozambique ports, bypassing legal oversight (Booth et al., 2018), or smuggled through informal routes to neighbouring countries. For example, Namibia’s timber export to China has risen from 22 truckloads in 2015 to 308 truckloads by 2019, equating to over 8,500 tons of timber, much of which is sourced from the Caprivi Strip within the KAZA region⁹. Figure 25 depicts the critical points of illegal trade in Namibia.

The Mukula cartel is a significant player in illegal rosewood trafficking across Central and Southern Africa, mainly targeting the precious Mukula tree (*Pterocarpus tinctorius*) and Rosewood, driven by high demand for luxury furniture (Grobler, 2020). In Zambia alone, approximately 100,000 tons of Mukula are illegally harvested annually (Ngoma et al., 2023).

9 <https://www.occrp.org/en/investigation/they-are-finishing-the-trees-chinese-companies-and-namibian-elites-make-millions-illegally-logging-the-last-rosewoods>

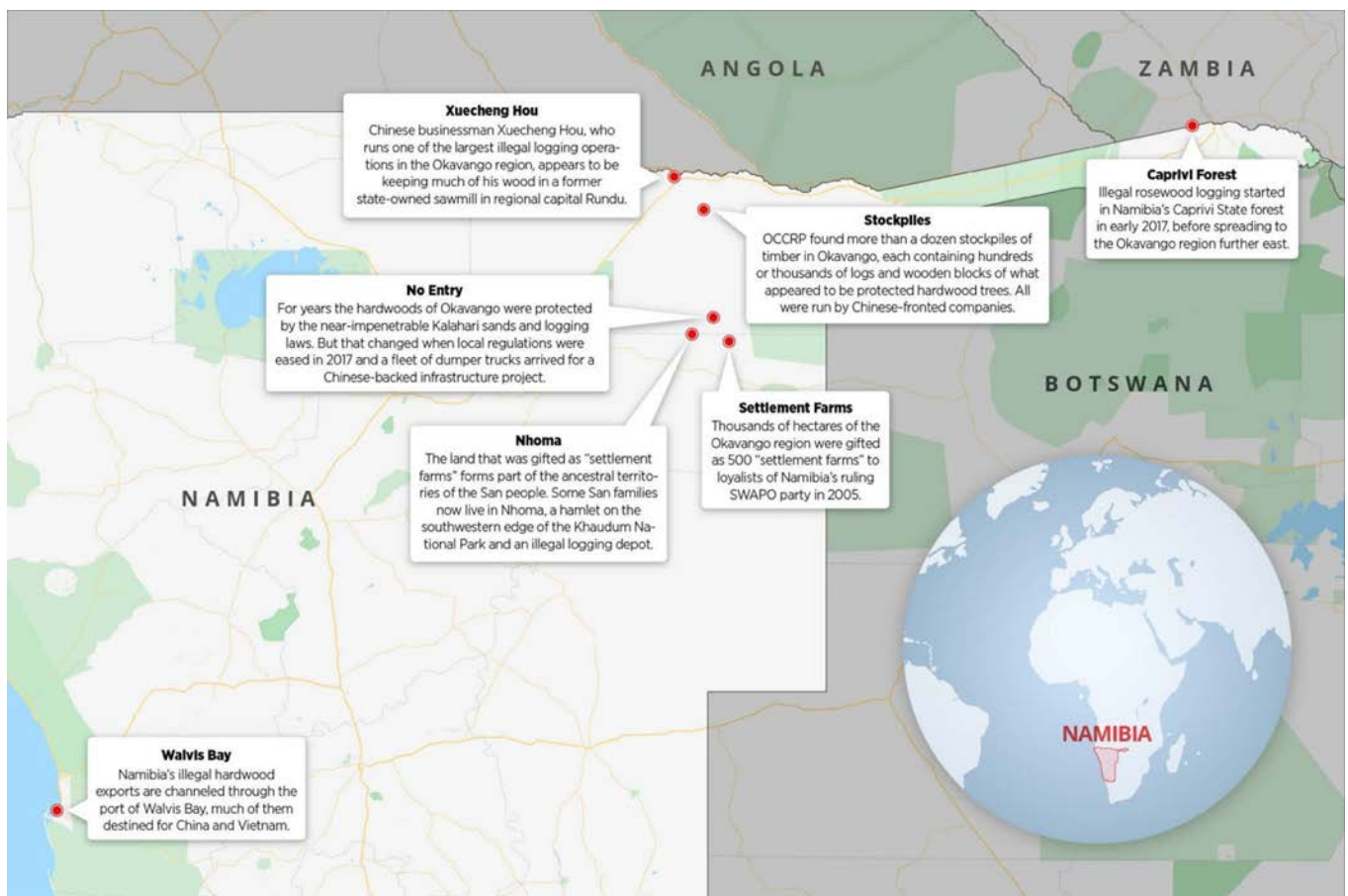


Figure 25. An illustration of illegal logging and trade in Namibia.

In addition to commercial timber extraction, charcoal production and firewood harvesting are major drivers of forest degradation, particularly in Zambia and Zimbabwe. Charcoal production alone has been estimated to contribute between 50–70% of forest loss in some areas (Muthelo et al., 2022). Growing urban demand for charcoal, combined with limited access to alternative energy sources, continues to increase pressure on forest resources. A recent ban on charcoal production in Zambia in three districts, in an effort to combat deforestation and an escalating climate crisis, evidences growing recognition of this problem.



Figure 26. Zambia wood extraction for charcoal.
Picture by Edliadi/CIFOR. 2017

INCREASING NUMBER OF APPROVED MINING PROJECTS

The KAZA TFCA has experienced a growing number of approved mining, oil, and gas exploration projects in recent years. Figure 27 illustrates the concentration of mining claims and exploration licenses across parts of Namibia, Zambia, and Zimbabwe, often adjacent to protected areas and wildlife corridors.

One of the most prominent developments is oil and gas exploration in Namibia's Kavango Basin by ReconAfrica. Estimates suggesting the basin could contain up to 31 billion barrels of oil have generated considerable international interest (ReconAfrica, 2020). Similar developments are emerging in northern Zimbabwe, where natural gas discoveries have also attracted new investment interest.

These developments present important economic opportunities, including increased foreign investment, infrastructure development, export earnings and government revenues. However, they also raise significant environmental and social concerns. Key risks include habitat fragmentation, disruption of wildlife corridors, pollution and contamination of water systems, increased greenhouse gas emissions and pressure on tourism and conservation-based economies. The possibility of fracking in the Kavango Basin further intensifies these concerns, as it carries additional environmental risks, including the potential for oil spills, which could devastate the region's waterways and wildlife (Gheorghiu, 2021).

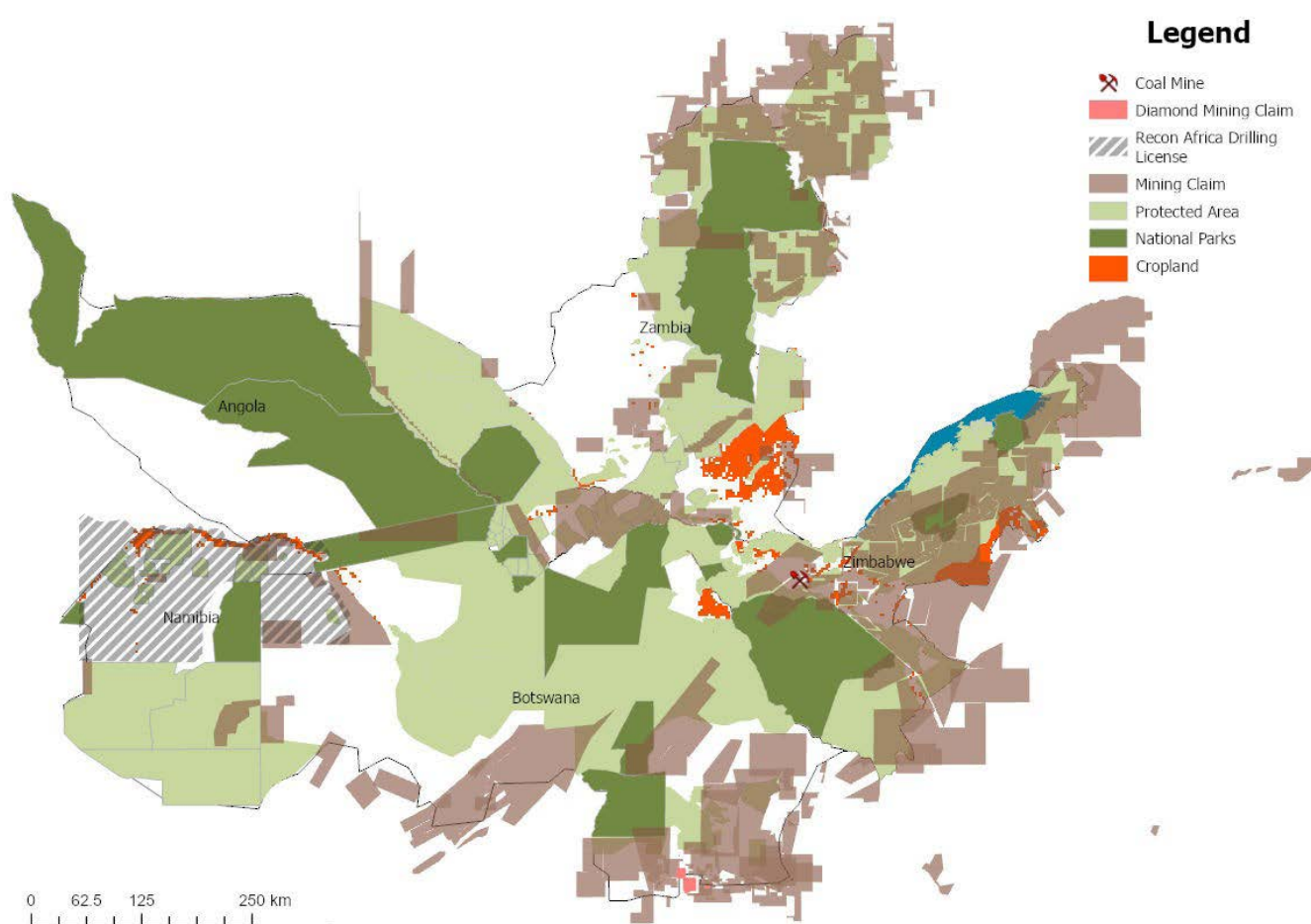


Figure 27. Mining projects in KAZA landscape.
Source: Data extracted from the KAZA database, 2024.

Concerns have also been raised regarding the extent to which benefits from extractive projects are distributed to local communities, particularly in remote rural areas. In addition, extractive activities can intensify existing land-use pressures, leading to conflict and displacements, and create governance challenges where mining concessions overlap with protected areas or community lands.

Considering these challenges, there is an urgent need for stringent environmental regulations and sustainable development strategies that consider ecological sustainability and the well-being of local communities over short-term economic gains from resource extraction (Lindsey et. al., 2014).

CONFLICTING LAND USE AND ENCROACHMENT INTO PROTECTED AREAS IN THE KAZA

The KAZA region faces significant challenges related to conflicting land use and governance. Diverging interests between mining, forestry, agriculture, infrastructure development, conservation, and human settlement is intensifying across the KAZA landscape.

This is particularly evident in areas where extractive activities overlap with protected areas, forest reserves, wildlife corridors, and communal lands (Lindsey et al., 2014). Figure 28 illustrates these overlapping land uses, emphasizing the encroachment of mining claims, cropland, and conservation zones in the KAZA TFCA.

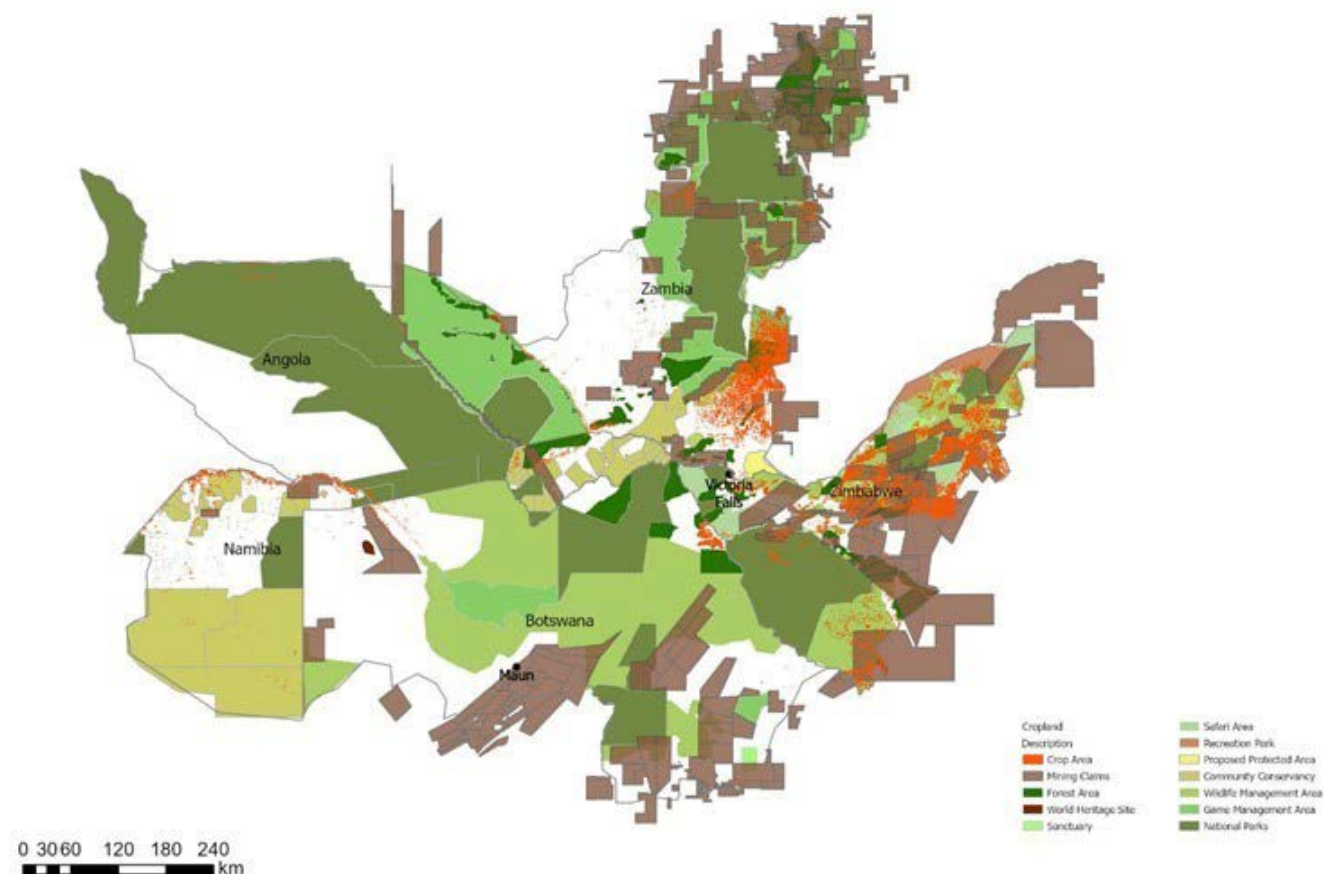


Figure 28. An illustration of conflicting land use and governance in the KAZA landscape.

Source: Data extracted from the KAZA database, 2024.

The transboundary nature of KAZA adds further complexity, as member states operate under differing land-use policies, regulatory systems, and development priorities. In some areas, weak spatial planning and limited coordination between sectors have contributed to increasing habitat loss and fragmentation, loss of ecological connectivity and human-wildlife conflict (De Cauwer, 2017).

The concentration of mining claims near ecologically sensitive areas, including around Victoria Falls and key wildlife corridors, illustrates the growing pressure on conservation landscapes. At the same time, expanding agricultural activities, charcoal production, and settlement growth further intensify land-use competition.

Without stronger integrated land-use planning and harmonised governance systems, these pressures are likely to increase over time, with implications for biodiversity conservation, tourism, water systems, and local livelihoods.

GROWING POTENTIAL FOR NON-TIMBER FOREST PRODUCTS

Non-timber forest products (NTFPs) represent one of the most significant opportunities for aligning rural livelihoods with conservation objectives in the KAZA TFCA. Products such as Baobab, Marula, Devil's Claw, honey, mushrooms, Mopane worms, indigenous fruits, and medicinal plants already contribute to household incomes and food security across the region (Beltcher, 2003, Kamwi et al., 2020). Additionally, NTFPs contribute to nutritional diversity by supplementing diets with essential proteins, vitamins and minerals, particularly in regions where climatic conditions may constrain agricultural production (Shackleton et al., 2015).

Sustainable harvesting of NTFPs can promote forest conservation by providing financial incentives for local communities to sustainably manage their natural resources (Angelsen et al., 2010). For example, the Baobab tree (*Adansonia digitata*), known as the "Tree of Life," not only supports various species and soil conservation but also yields fruits processed into powders and oils for local use and export. The estimated export value of Baobab products is between 5 and 7.5 million USD annually, growing at a rate of 3-6% annually (Mabhaudhi et al., 2019; Shackleton et al., 2015).

Devil's Claw (*Harpagophytum procumbens*), recognized for its anti-inflammatory properties used for example to treat arthritis, is exported in increasing volumes to European markets (Lavelle, J.-J. 2019). Similarly, Marula (*Sclerocarya birrea*) fruits, used in oil and beverages, has an estimated export value of 42-50 million USD, at a growth rate similar to Baobab's (Hlangwani et al., 2023).

NTFPs also include beekeeping and honey production, essential income sources in KAZA, leveraging ecosystem services like pollination to enhance agricultural productivity (Mbavha et al 2024). The expanding global organic and wild honey market will likely increase demand, thereby elevating income levels for communities engaged in this sector. Finally, Mopane worms (*Gonimbrasia belina*) are considered a delicacy and a significant protein source within southern Africa. While primarily consumed locally, there exists potential for export, particularly as global demand for sustainable protein sources rises (Sekonya, 2016).

Table 1 provides an overview of the diverse range of current and potential NTFPs in the KAZA.

Table 1. Overview of current and potential Non-Timber Forests Products (NTFPs) in the KAZA

NON-TIMBER PRODUCT	ID	NAMIBIA	ANGOLA	ZAMBIA	ZIMBABWE	BOTSWANA	REFERENCE
DEVIL'S CLAW <i>(Harpagophytum procumbens subsp)</i>		✓	✓		✓	✓	https://doi.org/10.1016/j.jep.2005.07.004
MARULA <i>(Sclerocarya birrea)</i>		✓	✓	✓	✓	✓	DOI: 10.1007/s11632-011-0110-1
MONGONGO OR MANKETTI NUTS <i>(Schinziophyton rautanenii)</i>		✓	✓	✓	✓	✓	https://link.springer.com/article/10.1007/s10531-016-1086-x

NON-TIMBER PRODUCT	ID	NAMIBIA	ANGOLA	ZAMBIA	ZIMBABWE	BOTSWANA	REFERENCE
EDIBLE INSECTS (A) <i>Cirina forda</i> (moth caterpillar) (B) <i>Gonimbrasia belina</i> (mopane 'worm' = caterpillar) (C) <i>Rhynchophorus phoenicis</i> (palm weevil grubs) (D) <i>Macrotermes spp.</i> (winged adult termite) (E) <i>Gryllus assimilis</i> (adult cricket) (F) <i>Ruspolia differens</i> (adult grasshopper) (G) <i>Encosternum delegorguei</i> (adult stink-bug) (H) <i>Oryctes rhinoceros</i> (palm beetle grub)		✓	✓	✓	✓	✓	https://doi.org/10.3390/insects11050283
MONKEY ORANGE <i>(Strychnos spinosa)</i>		✓		✓	✓	✓	https://www.researchgate.net/publication/262847171_Elliptic_Fourier_analysis_of_leaf_shape_in_southern_African_Strychnos_section_Densiflorae_Loganiaceae
BUFFALO THORN <i>(Ziziphus mucronata)</i>		✓	✓	✓	✓	✓	https://apps.worldagroforestry.org/treedb/AFTPDFS/Ziziphus_mucronata.PDF
HONEY <i>(Apis mellifera)</i>		✓	✓	✓	✓	✓	https://angop.ao/en/noticias/agricultura/apicultores-no-cuando-cubango-preveem-colher-acima-quatro-mil-litros-de-mel/
MUSHROOMS <i>(Termitomyces titanicus)</i>		✓		✓	✓		DOI: 10.3390/jof9010112 https://www.researchgate.net/publication/367161042_Termitomyces_Mushrooms_Termitomyces_a_Potential_Source_of_Nutrients_and_Bioactive_Compounds_Exhibiting_Human_Health_Benefits_A_Review
MOPANE WORMS (Caterpillars of the MOPANE EMPEROR MOTH, <i>Gonimbrasia belina</i>)		✓		✓	✓	✓	https://doi.org/10.1016/j.fufo.2024.100438

NON-TIMBER PRODUCT	ID	NAMIBIA	ANGOLA	ZAMBIA	ZIMBABWE	BOTSWANA	REFERENCE
BAOBAB PRODUCTS <i>(Adansonia digitata)</i> 		✓		✓	✓	✓	https://doi.org/10.1016/j.sajb.2017.09.014 https://www.researchgate.net/publication/306103661_Beauty_in_Baobab_a_pilot_study_of_the_safety_and_efficacy_of_Adansonia_digitata_seed_oil
MASAU BERRIES <i>(Ziziphus mucronata Willd. subsp. mucronata)</i> 				✓	✓	✓	https://apps.worldagroforestry.org/treedb/AFTPDFS/Ziziphus_mucronata.PDF
WILD OF SOUR PLUM <i>(Ximenia spp)</i> 		✓		✓		✓	https://bushguide101.com/sourplums-for-food-and-oil/
BIRD PLUM OR EEMBE Lozi (<i>mukumba, muzinzila</i>); Nyanja (<i>mziyi, mtacha</i>); Somali (<i>deen</i>); Swahili (<i>mnago</i>); Tigrigna (<i>aba</i>); Tongan (<i>mwii, mwinji</i>); Tswana (<i>mutsintsila</i>); Zulu (<i>uBalatsheni likulu, umMumu</i>) <i>(Berchemia discolor)</i> 		✓	✓	✓	✓	✓	https://apps.worldagroforestry.org/treedb/AFTPDFS/Berchemia_discolor.PDF
THATCH GRASS <i>(Thamnochortusspp., Aristida pilgeri, Chrysopogon nigritanus, Eragrostis pallens, Tristachya superba)</i> 		✓		✓	✓	✓	https://www.researchgate.net/publication/286447092_An_overview_of_grass_species_used_for_thatching_in_the_Zambezi_Kavango_East_and_Kavango_West_Regions_Namibia

Despite its potential, the NTFP sector remains constrained by weak market access, fragmented supply chains, limited (local) processing capacity, inadequate transportation infrastructure, inconsistent product quality and limited access to finance and technical support. Measures to capitalize on the potential of NTFPs therefore include investments in processing facilities and transportation infrastructure, ensuring standards and quality control systems, strengthening producers and trade organizations, and microfinance systems (Belcher et al., 2005, Arnold et al., 2011).

An underlying factor is low consumer and industry awareness about the potential of NTFPs (Shackleton & Pandey, 2014). Education and training programs addressing the economic potential of NTFPs, sustainable harvesting practices, and marketing strategies are therefore crucial for empowering communities and facilitating market access.

4.3. CHALLENGES AND OPPORTUNITIES FOR GREEN GROWTH

Extractives industries in the KAZA TFCA present a complex mix of economic opportunities and environmental risks. While the sector contributes significantly to national economies through exports, revenue generation, and infrastructure development, many extractive activities also place increasing pressure on ecosystems, water systems, forests, and biodiversity. Achieving a green growth pathway therefore requires balancing resource extraction with long-term environmental sustainability and community well-being.

ECONOMIC GROWTH AND REVENUE GENERATION

Extractive industries remain an important source of economic growth, foreign exchange earnings, government revenue, and employment across KAZA member states. Sustainable forestry, NTFPs and mining all play a strategic role in supporting national development and infrastructure investment.

There are emerging opportunities for local processing and value addition, regional trade, infrastructure development and downstream industries linked to extractive sectors. However, economic benefits are often unevenly distributed, in particular in the case of mining, whereby communities located near extraction sites continue to experience limited improvements in livelihoods and services.

DEFORESTATION AND ECOSYSTEM DEGRADATION

Unsustainable timber harvesting, charcoal production, and mining expansion are all contributing to forest loss, habitat fragmentation, and ecosystem degradation across the KAZA landscape. These pressures undermine biodiversity conservation, wildlife connectivity, water regulation functions and ecosystem resilience. Reducing these impacts will require stronger environmental governance, improved monitoring and enforcement systems, and greater investment in sustainable resource management practices.

WATER, POLLUTION, AND CLIMATE RISKS

Mining and fossil fuel extraction pose significant risks to water systems through contamination, over-abstraction, and pollution. These pressures are particularly concerning within ecologically sensitive areas and transboundary river systems. In addition, extractive industries also contribute to increasing greenhouse gas emissions and may intensify climate-related vulnerabilities across the region.

Improving environmental safeguards, strengthening environmental impact assessment systems, and integrating climate considerations into extractive sector planning will therefore be critical.

LAND-USE CONFLICT AND GOVERNANCE CHALLENGES

Competition between extractive industries, conservation, agriculture, settlements, and tourism is increasing across the KAZA landscape. In many areas, mining concessions and timber extraction overlap with protected areas and wildlife corridors. Weak coordination across sectors and countries further complicates land-use management. There is therefore a strong need for integrated spatial planning, harmonised transboundary governance and improved regulatory coordination across KAZA member states.

LIVELIHOODS OPPORTUNITIES

Non-timber forest products (NTFPs) present one of the strongest opportunities for aligning livelihoods with conservation objectives. Sustainable harvesting and value addition of products such as Baobab, Marula, honey, and Devil's Claw can support rural incomes while maintaining forest ecosystems.

Expanding access to markets and finance, strengthening processing capacity, and improving producer organisations could significantly increase the contribution of NTFPs to local economies and conservation incentives.

4.4. KEY CONCLUSIONS AND RECOMMENDATIONS

KEY CONCLUSIONS

Extractive industries play a significant role in the economies of KAZA member states, particularly through mining, timber harvesting, and emerging oil and gas exploration. However, the expansion of extractive activities is also increasing pressure on forests, water systems, biodiversity, and protected areas.

Unregulated logging, deforestation, land degradation, and encroachment into conservation areas remain major challenges across the landscape. At the same time, weak governance, illegal extraction, and fragmented land-use planning continue to undermine sustainable resource management.

Despite these challenges, opportunities exist to transition towards more sustainable and inclusive resource-based economies by strengthening environmental governance, improving transboundary coordination, and expanding sustainable forest-based value chains can support both economic development and conservation objectives.

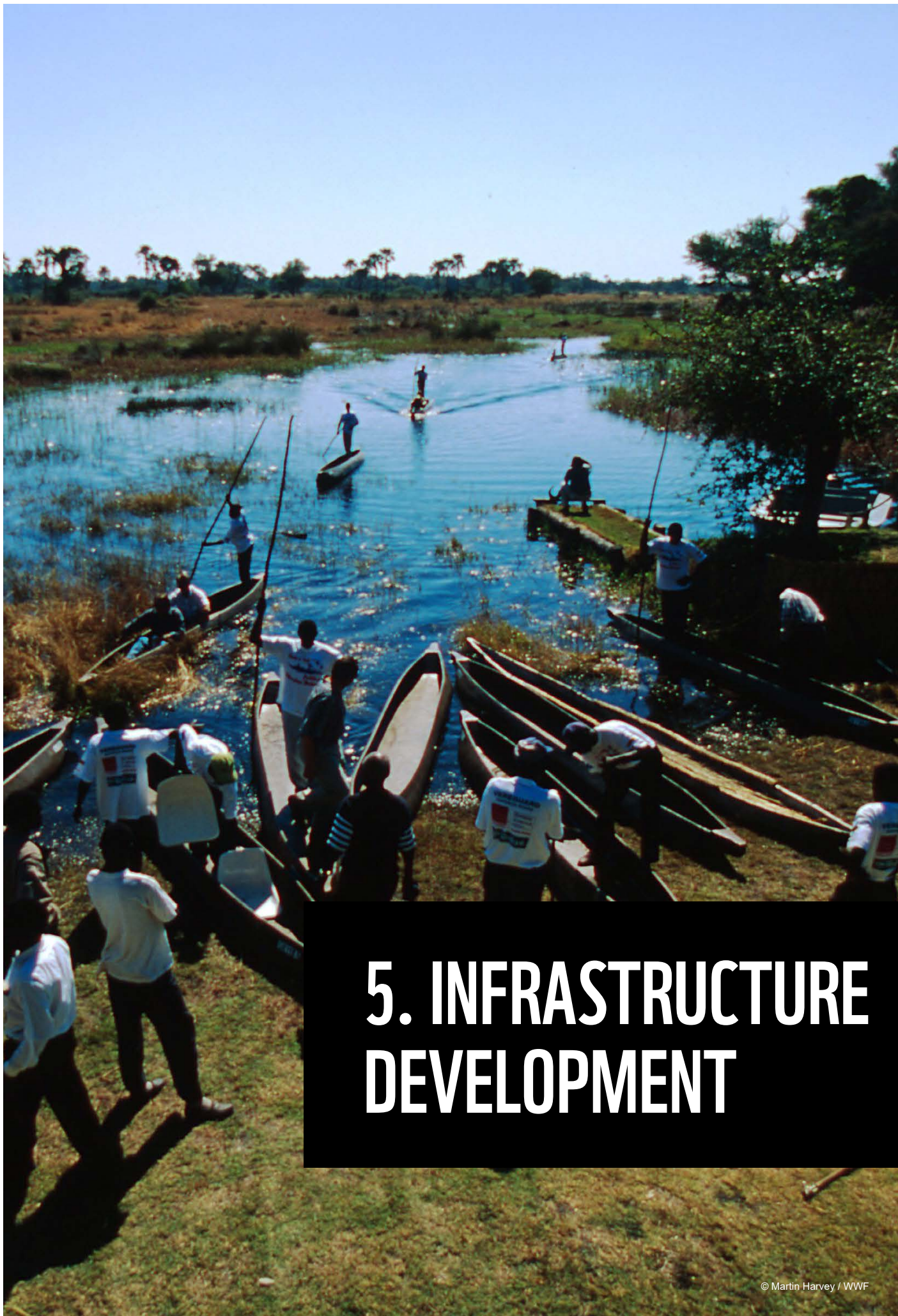
The long-term sustainability of extractive industries within KAZA will depend on balancing economic interests with ecosystem protection, climate resilience, and equitable benefit-sharing.

KEY RECOMMENDATIONS

Based on this analysis, several key recommendations can be made to ensure that developments in the extractives industry in the KAZA follows a Green Growth path:

- 1 Improve integrated land-use planning:** Align extractive industry development with conservation priorities, wildlife corridors, and regional spatial planning frameworks.
- 2 Strengthen governance and enforcement:** Strengthen monitoring and enforcement mechanisms to prevent illegal logging, mining, and trade in timber and other natural resources and ensure compliance with environmental regulations.
- 3 Promote sustainable extraction practices:** Ensure that mining, timber harvesting, and fossil fuel development are conducted according to strong environmental and social safeguards.

- 4 Strengthen transboundary governance and policy harmonization:** Harmonize policies and improve coordination across KAZA member states on land-use planning, environmental management, and extractive sector regulation.
- 5 Promote ecosystem restoration:** Support rehabilitation of degraded forests, landscapes, and water systems affected by extractive activities.
- 6 Expand sustainable forest-based value chains:** Strengthen awareness, processing, market access, public-private partnerships and value addition for non-timber forest products (NTFPs).
- 7 Support community participation and benefit-sharing:** Ensure that local communities are actively involved in decision-making processes and benefit equitably from extractive industries.
- 8 Strengthen environmental and social impact assessments:** Improve cumulative impact assessment systems for mining, oil, gas, and infrastructure development projects.
- 9 Promote sustainable energy alternatives:** Reduce dependence on charcoal and fuelwood through investment in alternative household energy systems.
- 10 Support regional market development for NTFPs:** Promote producer associations, certification systems, and regional cooperation to strengthen sustainable forest economies.



5. INFRASTRUCTURE DEVELOPMENT

5.1. OVERVIEW OF THE SECTOR

Infrastructure development plays a critical role in shaping green growth pathways within the Kavango-Zambezi Transfrontier Conservation Area (KAZA TFCA). Improved transport, energy, water, and communication infrastructure can support economic diversification, facilitate regional integration, enhance access to markets and services, and strengthen tourism and trade.

Infrastructure development within transboundary conservation landscapes presents significant environmental and social challenges. Roads, railways, dams, pipelines, and settlements can contribute to habitat fragmentation, disrupt wildlife corridors, alter hydrological systems, and increase pressure on ecologically sensitive areas. As a result, infrastructure development within KAZA requires careful planning to balance economic growth objectives with conservation priorities and ecosystem integrity.

Across the KAZA member states, infrastructure investment has accelerated in recent years, driven by post-conflict reconstruction, regional trade ambitions, tourism development, mining expansion, and growing demand for energy and services. Major regional corridor developments, including the Lobito Corridor and Walvis Bay–Ndola–Lubumbashi Development Corridor, are expected to significantly influence economic activity and spatial development patterns across the landscape.

At the same time, substantial infrastructure gaps remain, particularly in rural and remote areas. Limited access to electricity, clean water, sanitation, digital connectivity, and transport infrastructure continues to constrain livelihoods, economic opportunities, and access to essential services.

ANGOLA

Infrastructure development in Angola has accelerated significantly in recent years, largely driven by post-civil war reconstruction and economic diversification efforts. The country invests approximately USD 4 billion annually in infrastructure development, equivalent to around 4.1% of GDP, with major investments focused on transport and energy systems (Wanda, Oya, & Monreal, 2023). Key projects affecting the KAZA TFCA include the USD 5 billion Angola–Zambia Oil Pipeline (AZOP), the Lobito Corridor, and a proposed USD 5.2 billion hydropower development project.

BOTSWANA

Botswana allocates a substantial proportion of its national budget to infrastructure development, investing between 24% and 31% of total public expenditure, or more than USD 1.8 billion annually. The country has relatively well-developed primary infrastructure and views infrastructure investment as central to economic diversification beyond mining. Key developments include the Kazungula Bridge, expansion of Maun Airport, and investments in renewable energy infrastructure. Botswana and Namibia are also exploring large-scale solar energy development projects aimed at increasing regional power generation capacity.

NAMIBIA

Namibia has one of the region's more developed transport and road infrastructure systems. Under its National Development Plan, approximately USD 8.4 billion has been allocated for infrastructure development, with a focus on transport corridors and regional connectivity. Key projects include upgrades to the Trans-Zambezi Highway and road improvements connecting Katima Mulilo to other regions of the country. In addition, oil and gas exploration activities, such as the ReconAfrica project in the Kavango Basin, have increased infrastructure development pressures, including roads, pipelines, and drilling infrastructure.

ZAMBIA

Infrastructure development forms a major component of Zambia's National Development Plan, which prioritises transport corridors, regional integration, and energy infrastructure (Ministry of Finance and National Planning, 2022). The country invests approximately 6% of GDP annually in infrastructure development, equivalent to roughly USD 3 billion. Major projects within the KAZA landscape include the Livingstone–Kazungula Road, upgrades to Zambezi River crossings, the Kafue Gorge Lower Hydropower Project, and infrastructure investments linked to the Lobito Corridor, a critical transport route for essential raw materials and minerals from the Democratic Republic of the Congo and Zambia to the European Union and the United States. In addition, initiatives like Pave Zambia 2000, a project focused on rehabilitating urban roads and constructing or renovating 400 kilometres of roads, aim to enhance transportation infrastructure.

ZIMBABWE

Zimbabwe faces significant infrastructure maintenance and investment challenges, particularly in the energy and water sectors. Current infrastructure spending is estimated at approximately USD 0.8 billion annually, although inefficiencies contribute to substantial funding gaps.

Within the KAZA TFCA, major infrastructure developments include the expansion of Victoria Falls International Airport and road upgrades in the Hwange and Matetsi areas. These projects are expected to support tourism growth, improve regional connectivity, and strengthen economic activity.

5.2. TRENDS AND DEVELOPMENTS

Infrastructure development in the KAZA TFCA is shaped by a number of interconnected trends linked to regional integration, economic diversification, energy demand, and service delivery. While infrastructure investment presents important development opportunities, it also introduces growing environmental and governance challenges.

BOX 7: INFRASTRUCTURE DEVELOPMENT TRENDS

1. Expansion of regional transport and trade corridors
2. Increasing reliance on hydropower and water infrastructure
3. Persistent service infrastructure gaps
4. Poor regional connectivity and accessibility

EXPANSION OF REGIONAL TRANSPORT AND TRADE CORRIDORS

The KAZA region has experienced significant growth in infrastructure development to support economic diversification, mining, tourism, trade, and regional integration. Improved transport infrastructure is expected to strengthen market access, facilitate cross-border trade, and support regional economic growth. At the same time, infrastructure expansion is reshaping land-use dynamics and increasing pressure on ecosystems. As Laurance et al. (2013) note, road development often alters settlement patterns, increases accessibility to previously remote areas, and contributes to deforestation and land conversion.

One of the most significant developments is the proposed Trans-Zambezi Railway Extension, which forms part of the Walvis Bay–Ndola–Lubumbashi Development Corridor (Figure 29). The proposed 772 km Greenfield railway line aims to connect mining regions in Zambia and the Democratic Republic of Congo to Walvis Bay, thereby improving regional trade and mineral transportation efficiency. However, the corridor also crosses important wildlife dispersal areas, creating risks related to habitat fragmentation and disruption of wildlife movement patterns.

Similarly, the Lobito Corridor is expected to increase regional connectivity and facilitate mining and energy investments across Angola and Zambia. These developments highlight the need to integrate infrastructure planning with environmental safeguards and spatial planning frameworks.



© Jasper Doest / WWF

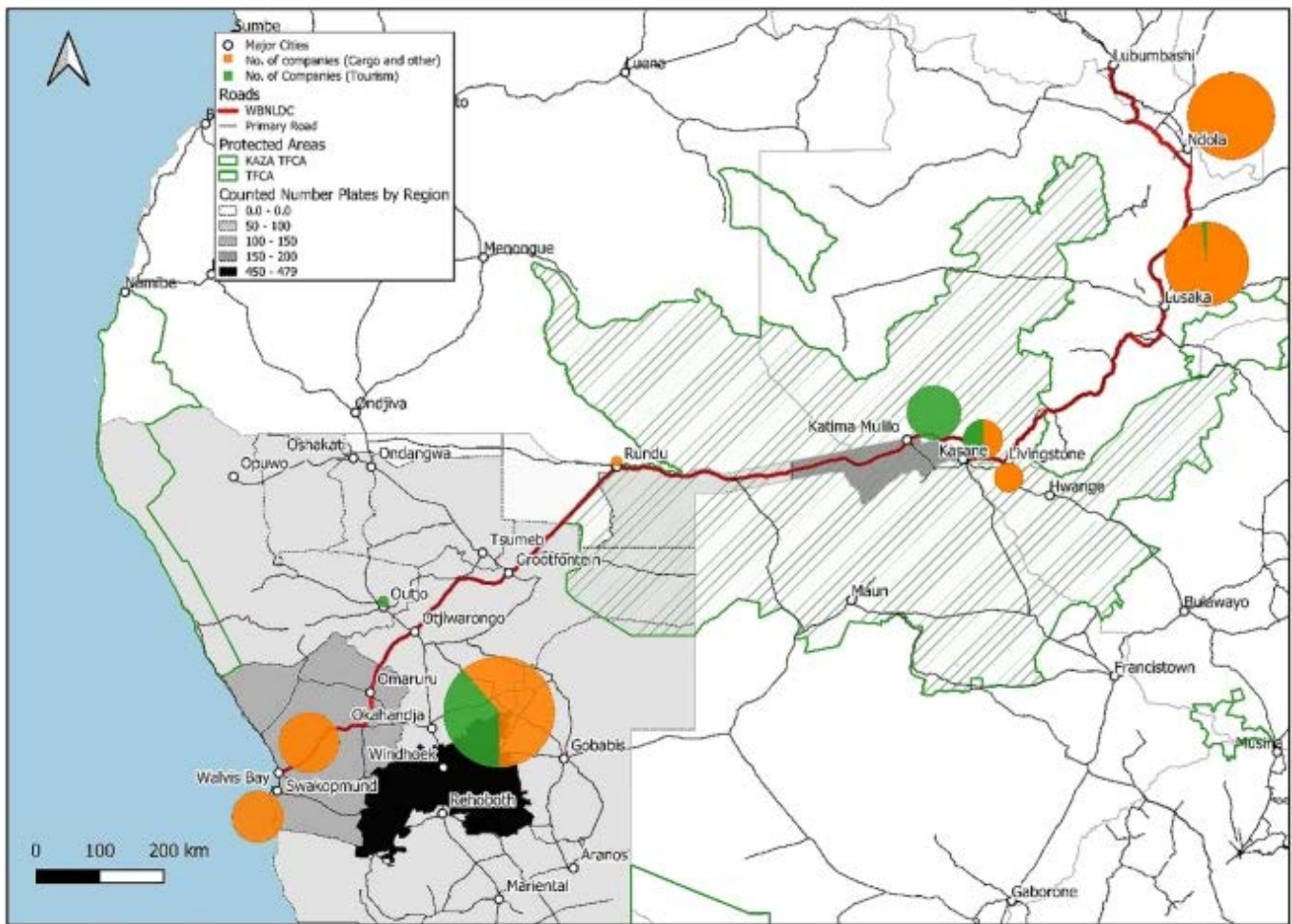


Figure 29. Walvis Bay - Ndola - Lubumbashi Development Corridor and distribution of number plates and company headquarters along corridors.

Source: Kalvelage et al. (2021)

INCREASING RELIANCE ON HYDROPOWER AND WATER INFRASTRUCTURE

The KAZA TFCA is experiencing growing investment in hydropower and water infrastructure as countries seek to improve energy security and support economic development. Several major dam and irrigation projects are planned or under development across the region (Figure 30). Key examples include Zambia's Kafue Gorge Lower Hydropower Project and Angola's proposed USD 5.2 billion hydropower development initiative. These projects are intended to increase electricity generation capacity, improve energy access, and support industrial growth.

Hydropower is often viewed as a relatively low-carbon and reliable energy source that can reduce dependence on fossil fuels. However, large-scale dam development can also create significant environmental and social impacts, including altered river flows, disruption of aquatic ecosystems, impacts on fish breeding patterns, habitat loss and displacement of local communities. The increasing dependence on hydropower also creates climate-related vulnerabilities. Declining water levels in Lake Kariba, for example, have contributed to electricity shortages in Zimbabwe, highlighting the sensitivity of hydropower systems to drought and climate variability.

Alongside hydropower expansion, irrigation infrastructure is also being developed in parts of Angola and Zambia to improve agricultural productivity and food security.

KAZA Hydrobasin Level 4 Structure

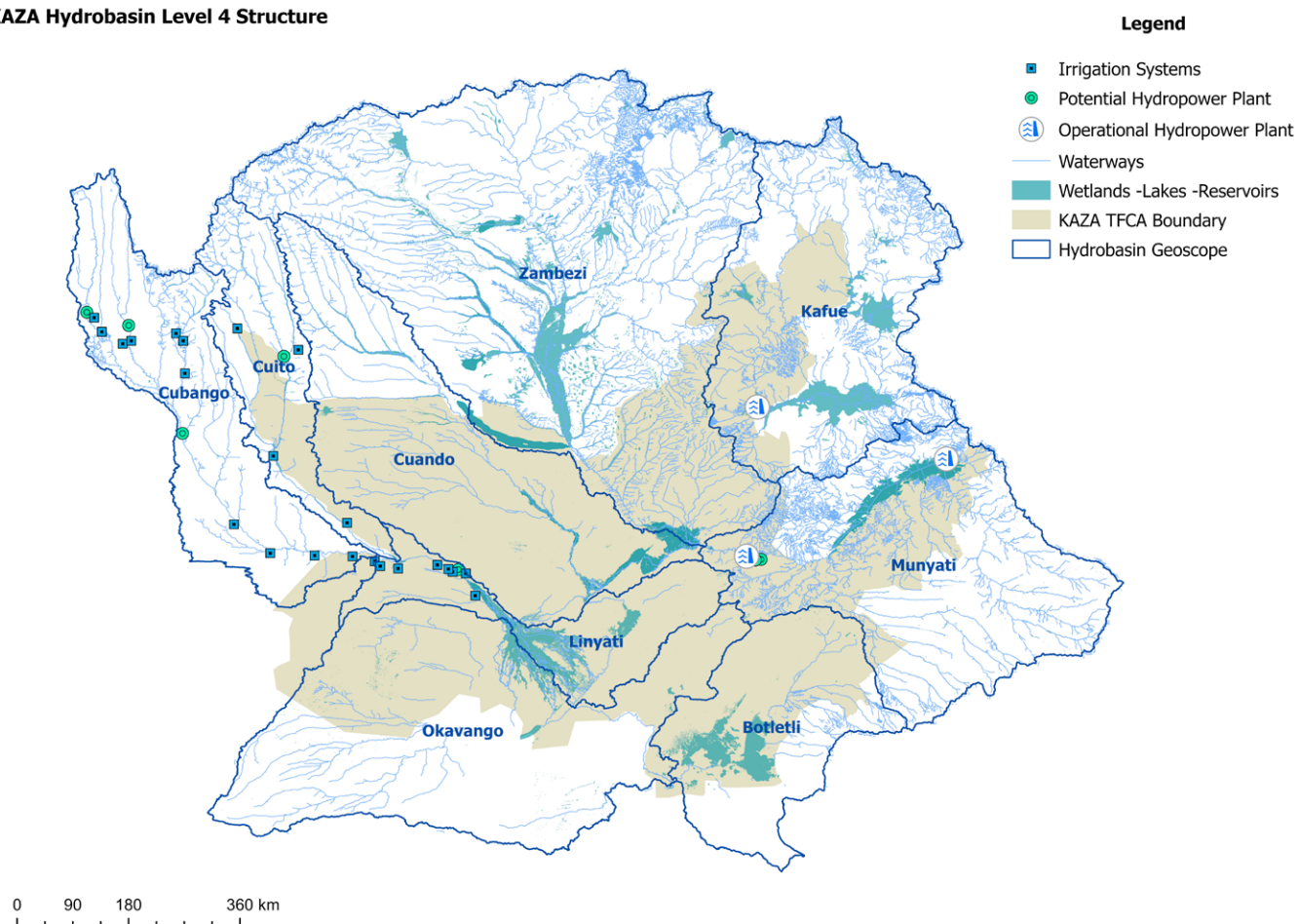


Figure 30. Overview of existing irrigation systems and proposed and existing hydropower dams in the KAZA region.

Source: Data extracted from the KAZA database, 2024.

PERSISTENT SERVICE INFRASTRUCTURE GAPS

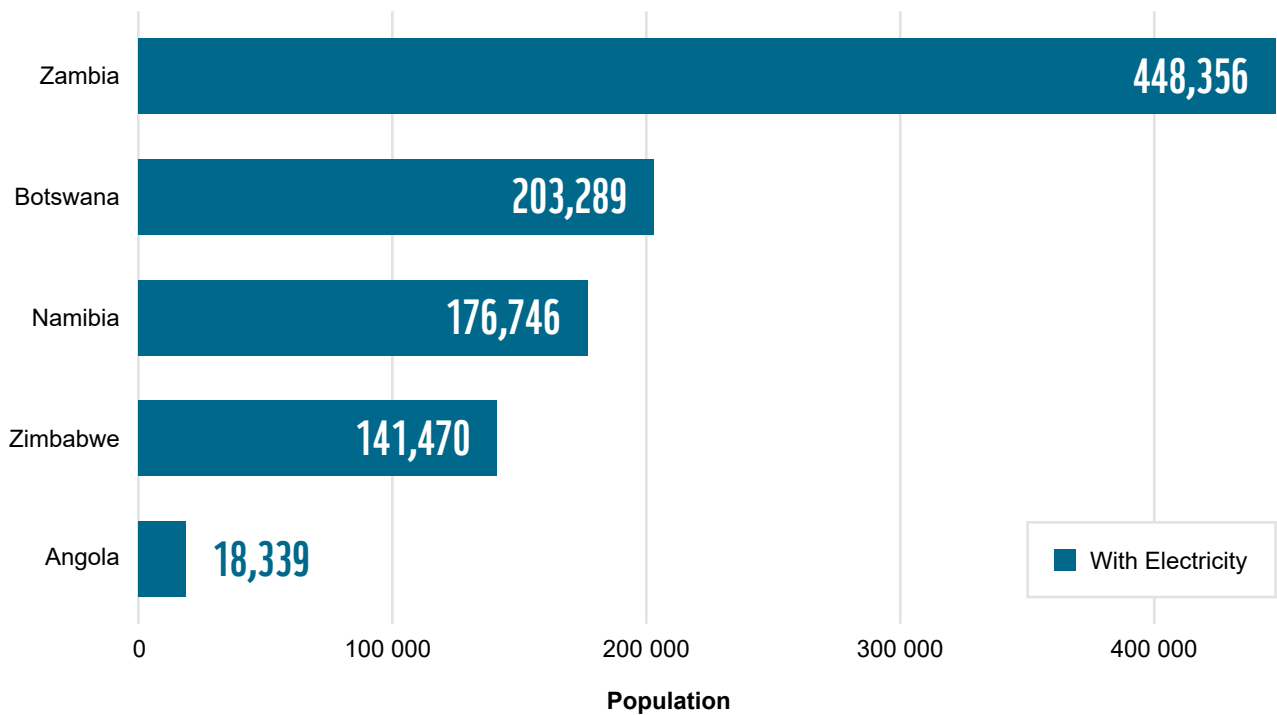
Despite increased investment in transport and energy infrastructure, substantial service infrastructure gaps remain across the KAZA landscape. Many rural and remote communities continue to experience limited access to reliable electricity, clean water and sanitation systems, digital connectivity, healthcare infrastructure and communication services. These deficits constrain economic opportunities, reduce resilience, and reinforce spatial inequalities across the region.



Access to electricity

Electricity access remains highly uneven across KAZA, with many rural areas experiencing unreliable supply and frequent power outages (Moyo et al., 2022). Limited extension of national grid systems has resulted in continued dependence on diesel generators and biomass energy sources, particularly in remote areas (IEA, 2021). Figure 31 illustrates disparities in electricity access across the region.

Improving electricity access is essential for supporting economic activities, healthcare systems, water supply infrastructure, and education services (Benayed et al., 2024).



Data Source: Khavari, B., et al. (2020). Population clusters for sub-Saharan Africa. Mendeley Data, V6. DOI: 10.17632/z9zfhzk8cr.6

Figure 31. Population with access to electricity in KAZA TFCA.
Source: Khavari, B., et al (2020).

Renewable energy potential

The KAZA region has substantial renewable energy potential, particularly for solar energy development. High levels of solar irradiance create significant opportunities for decentralised energy systems and off-grid electrification (Moyo, 2022). Figure 32 illustrates the region’s solar energy potential.

Solar technologies could support rural electrification, solar-powered water systems, healthcare infrastructure and climate-resilient local economies, while expanding renewable energy infrastructure could reduce dependence on biomass and fossil fuels while contributing to climate mitigation objectives (Bimenyimana et al., 2019).



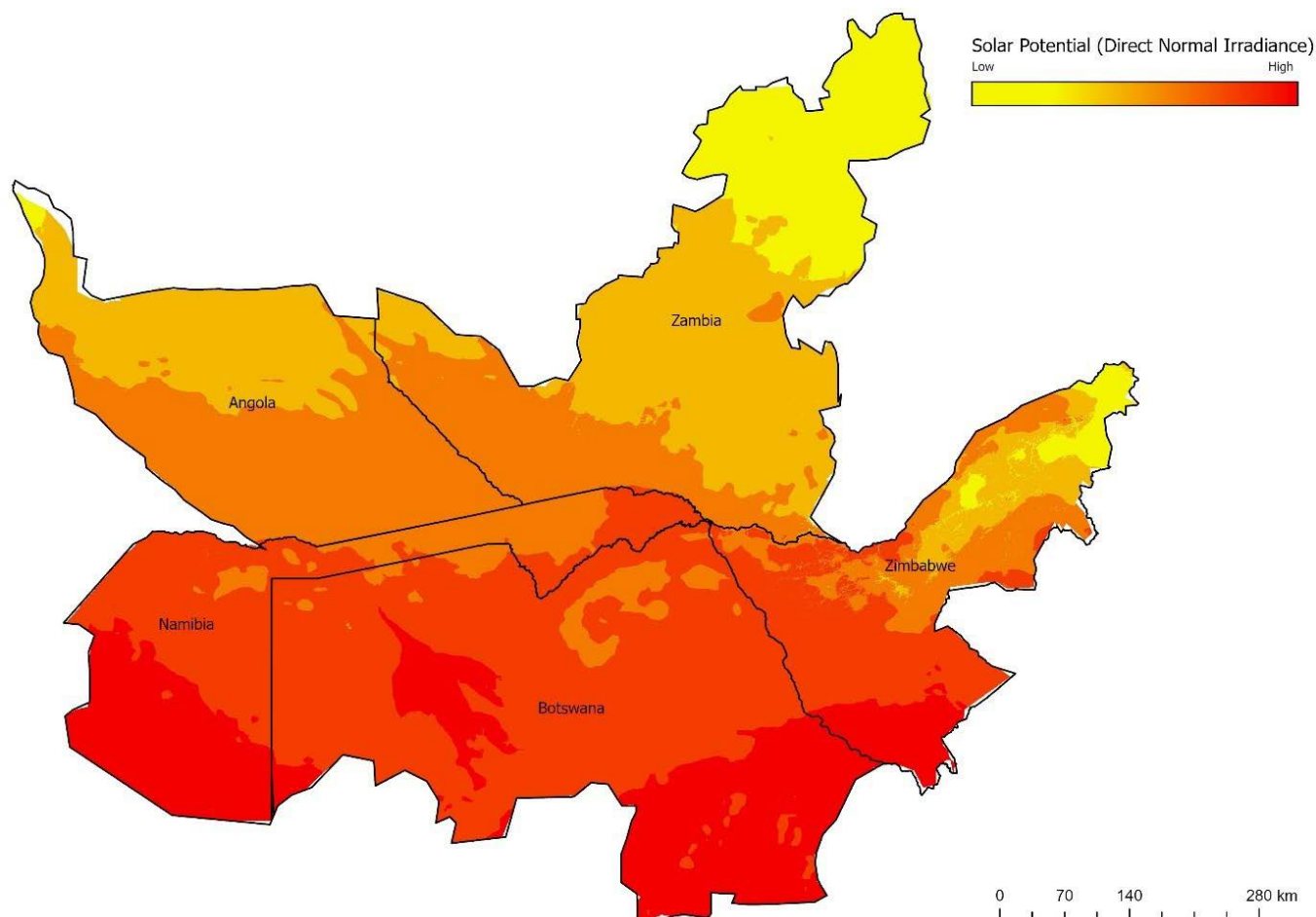


Figure 32. An illustration of potential solar energy development in KAZA. Data extracted from global solar atlas, 2024¹⁰.

Clean water and sanitation systems

Access to clean water, sanitation systems, and internet connectivity remains limited across many parts of KAZA. According to the World Health Organization (2015), less than half of the rural population in parts of Southern Africa has access to improved drinking water and sanitation services.

The KAZA countries are among the lowest scoring countries on the Environmental Performance Index for drinking water and sanitation¹¹. The rapid urbanization and inefficiency of government systems to supply safe and clean piped water to all citizens have exacerbated the problem. Furthermore, the availability of data on the status of water and sanitation services in the region are also limited, making it difficult to monitor and address the problem effectively. Investments in infrastructure, policy reforms, and community-based initiatives are needed to improve access to these essential services and ensure the overall well-being of the region's population.

Digital Connectivity

Internet connectivity is another critical area where KAZA faces significant challenges. Many rural communities in the region lack reliable internet access, which limits opportunities for economic development, education, and healthcare (Clyton-Jones, 2024). The absence of widespread digital infrastructure hampers the region's ability to integrate into the global economy and leverage technological advancements (Kelly et al., 2012). Improved internet connectivity can enhance access to educational resources, telemedicine, and e-commerce, thus addressing some of the socio-economic disparities in KAZA (UNCTAD, 2023).

¹⁰ <https://globalsolaratlas.info/>

¹¹ <https://epi.yale.edu/measure/2024/H2O>

POOR CONNECTIVITY

Despite its ecological significance and tourism potential, KAZA continues to face major connectivity challenges. Limited transport infrastructure, poor road conditions, few flights, and restricted passenger access constrain movement within and across the region.

Limited linear infrastructure

Linear infrastructure—including roads, railways, and bridges—remains underdeveloped in many parts of KAZA, particularly in remote areas (Cumming, 2008; Moyo, 2019). Figure 33 illustrates the main road and railway connections across the KAZA landscape. Limited connectivity restricts tourism development, market access, service delivery, and movement of goods and people (World Bank, 2021). Seasonal flooding and challenging terrain further reduce accessibility in some areas, particularly during the rainy season (Nangolo, 2024). The resulting isolation has significant implications for local communities, who struggle to access essential services, markets, and employment opportunities.

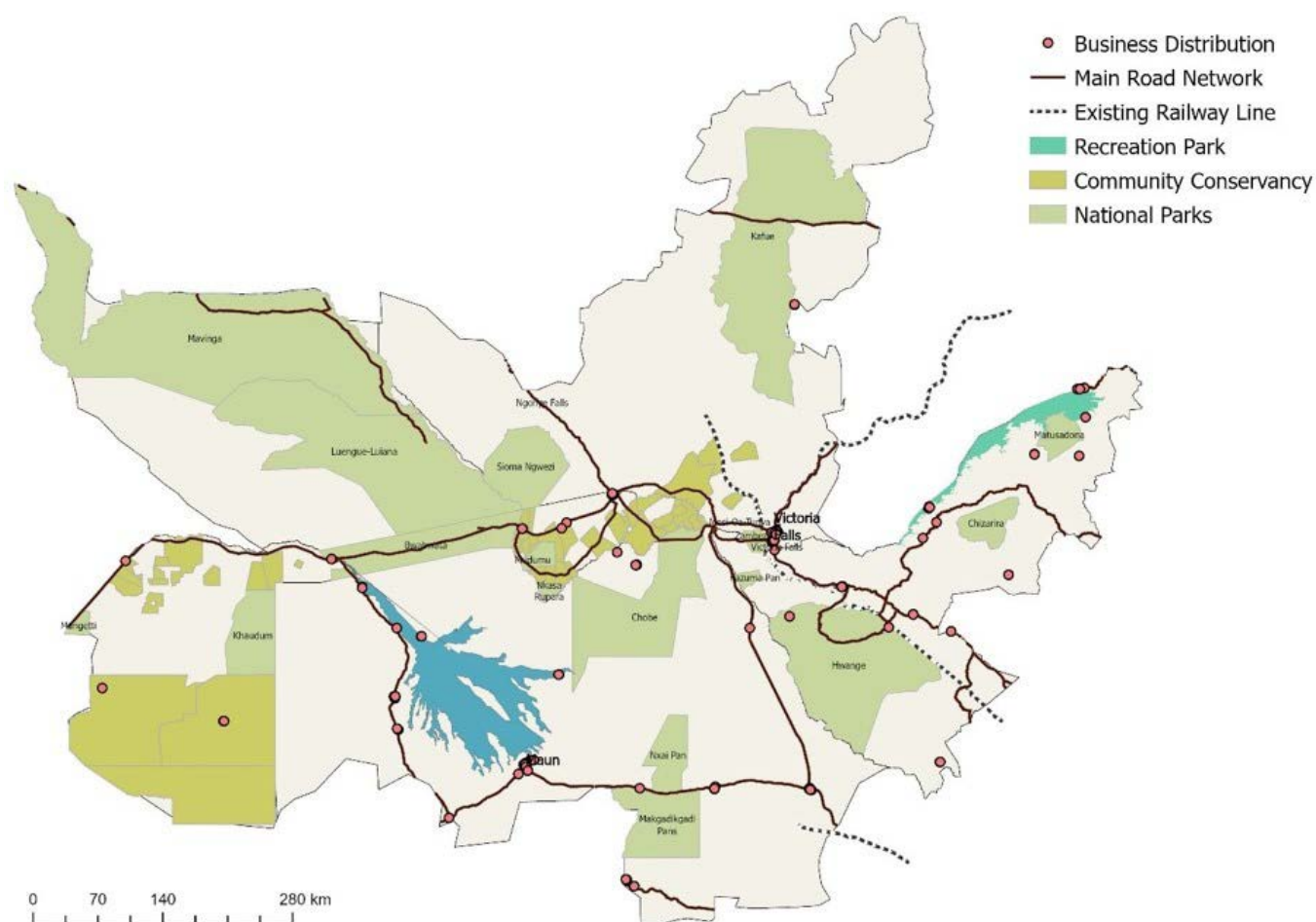
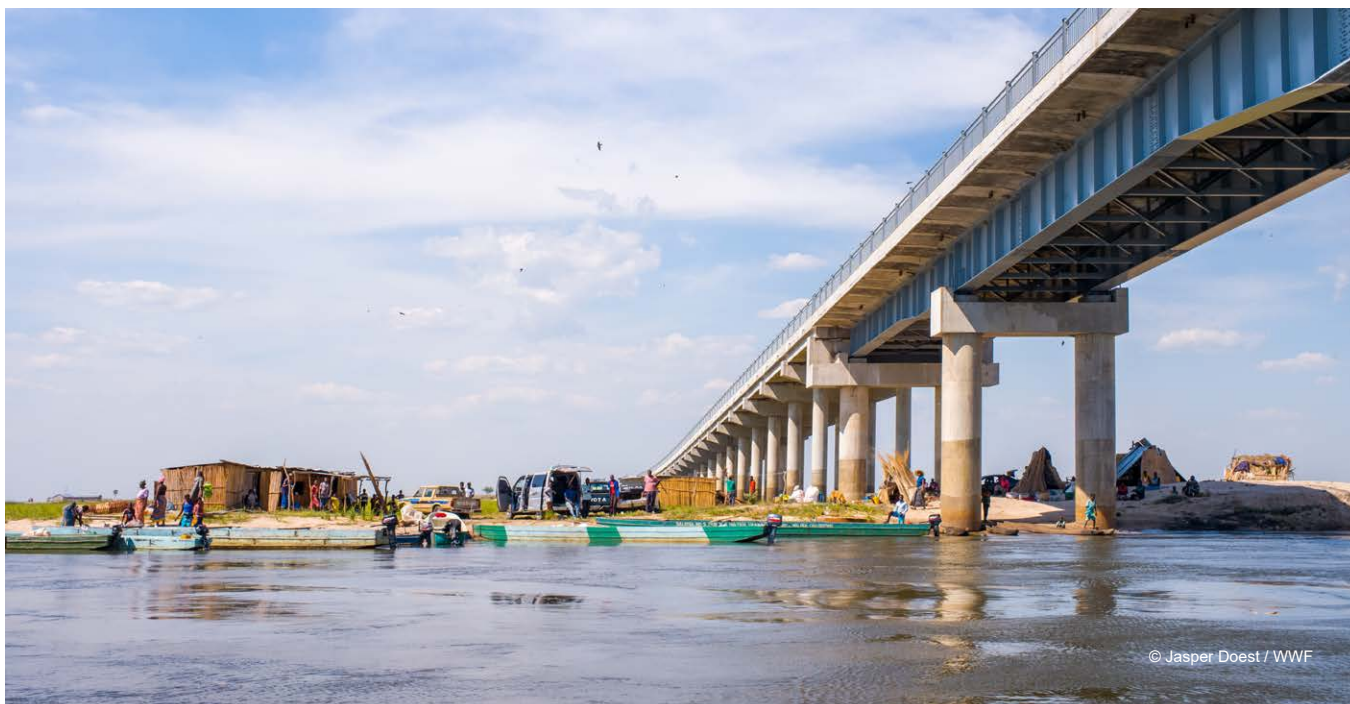


Figure 33. Main roads and railway connections in the KAZA.

Source: Data extracted from the KAZA database, (2024).



5.3. CHALLENGES AND OPPORTUNITIES FOR GREEN GROWTH

Infrastructure development within the KAZA TFCA presents both major opportunities and significant sustainability challenges. Improved infrastructure can support regional integration, economic diversification, tourism development, service delivery, and access to markets. Poor connectivity and road conditions may even affect the ability of conservation organizations to manage and monitor wildlife effectively, restraining anti-poaching efforts and the implementation of conservation projects (Kavango Zambezi Transfrontier Conservation Area, 2014).

At the same time, poorly planned infrastructure can undermine ecological integrity, disrupt wildlife movement, and increase pressure on natural resources. Achieving a green growth pathway therefore requires infrastructure systems that are economically productive, socially inclusive, climate resilient, and environmentally sustainable.

Public-private partnerships could play a crucial role in financing and implementing these infrastructure projects, particularly in areas where tourism has the potential to generate significant revenue. Additionally, integrating KAZA's infrastructure development with broader regional initiatives, such as the SADC Infrastructure Development Plan, could enhance connectivity and facilitate cross-border collaboration (SADC, 2012). Such efforts would improve access to KAZA and contribute to the region's overall economic development and integration.

REGIONAL INTEGRATION AND ECONOMIC DEVELOPMENT

Infrastructure investment has significant potential to strengthen regional trade, tourism, and economic diversification across KAZA. Improved transport corridors, energy systems, and communication networks can enhance market access, reduce transaction costs, and stimulate economic activity. Regional corridor developments such as the Lobito Corridor and Walvis Bay–Ndola–Lubumbashi Development Corridor illustrate the potential of infrastructure to support regional integration and cross-border trade. However, uneven infrastructure development continues to create disparities in access to services, economic opportunities, and investment across the region.

ENVIRONMENTAL RISKS AND ECOSYSTEM FRAGMENTATION

Large-scale infrastructure development can create substantial environmental risks, particularly within ecologically sensitive and transboundary landscapes. Roads, railways, dams, pipelines, and settlements can contribute to habitat fragmentation, disruption of wildlife corridors, deforestation, altered hydrological systems and increased human–wildlife conflict. These pressures can undermine biodiversity conservation, tourism potential, and ecosystem resilience. Reducing these risks will require stronger environmental safeguards, integrated spatial planning, and strategic environmental assessments (SEAs).

RENEWABLE ENERGY AND CLIMATE RESILIENCE

The KAZA region has considerable potential for renewable energy development, particularly solar energy. Expanding renewable energy systems could improve rural electrification, strengthen energy security, and reduce dependence on fossil fuels and biomass energy sources. At the same time, increasing dependence on hydropower creates vulnerabilities related to climate variability and drought. A more diversified and climate-resilient energy mix will therefore be important for long-term sustainability and energy security.

SERVICE INFRASTRUCTURE AND INCLUSIVE DEVELOPMENT

Access to electricity, clean water, sanitation systems, healthcare infrastructure, and digital connectivity remains highly uneven across KAZA, particularly in rural areas. Improving access to basic infrastructure services is critical for reducing poverty, improving public health, supporting education, strengthening local enterprises and enhancing resilience. Expanding infrastructure access in underserved areas could support more inclusive and balanced regional development.

GOVERNANCE, SPATIAL PLANNING, AND CROSS-BORDER COORDINATION

Infrastructure development within transboundary conservation landscapes requires strong governance systems and coordination across sectors and countries. Weak spatial planning, fragmented policy implementation, and limited cross-border coordination can result in infrastructure development that undermines conservation objectives and ecosystem connectivity. Strengthening regional coordination, integrating infrastructure planning with conservation priorities, and harmonising policies across KAZA member states will therefore be essential.



© Gareth Bentley / WWF-US

5.4. KEY CONCLUSION AND RECOMMENDATIONS

KEY CONCLUSIONS

Infrastructure development is central to economic growth, regional integration, and service delivery within the KAZA TFCA. Significant infrastructure deficits remain across the region, particularly in relation to electricity access, clean water and sanitation, digital connectivity, and transport infrastructure in rural and remote areas. Investments in transport corridors, energy systems, water infrastructure, and digital connectivity present significant opportunities to strengthen trade, tourism, and livelihoods.

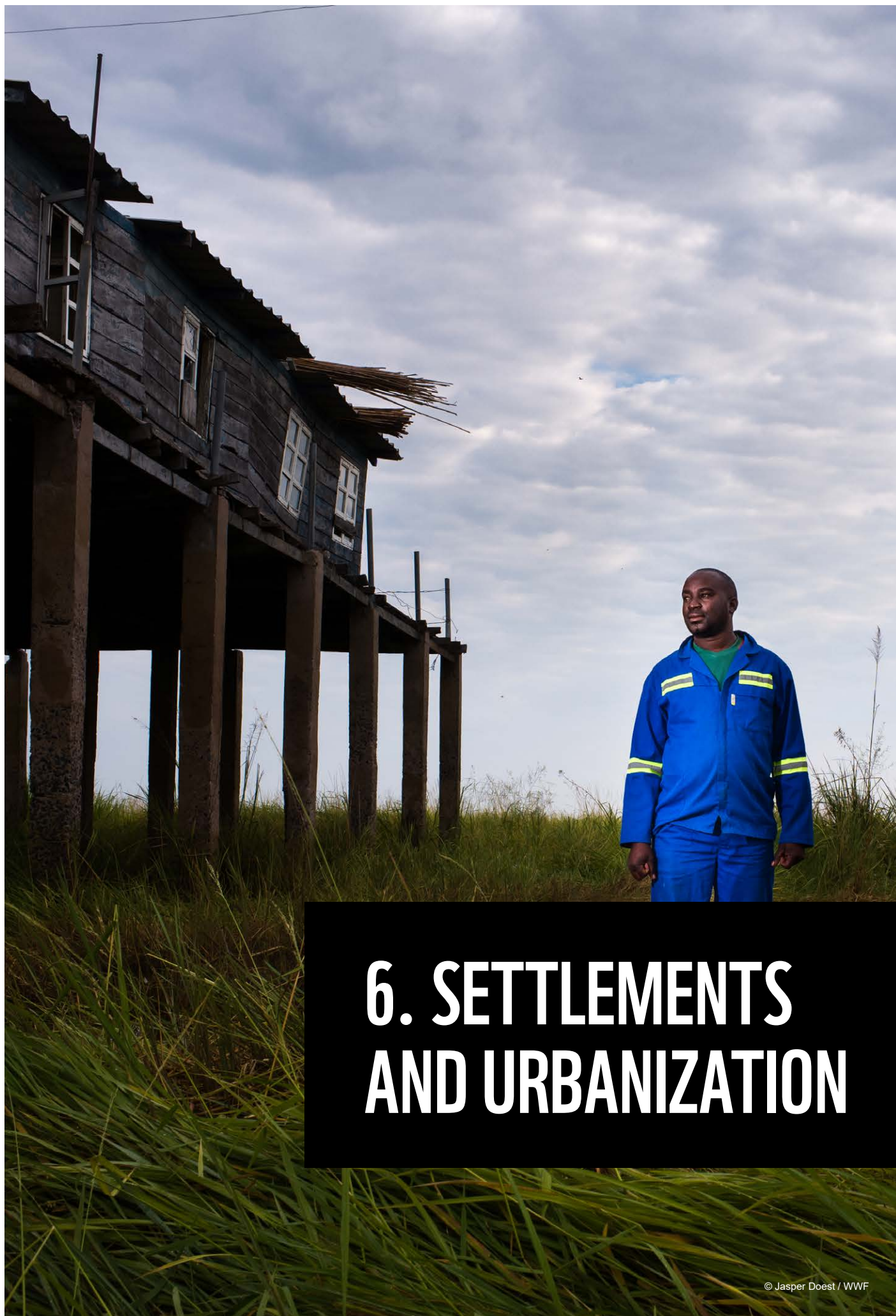
At the same time, infrastructure expansion within ecologically sensitive landscapes presents major environmental and governance challenges. Poorly planned infrastructure can contribute to habitat fragmentation, biodiversity loss, disruption of wildlife corridors, and increased pressure on water systems and natural resources. The long-term sustainability of infrastructure development within KAZA will therefore depend on integrated planning approaches that balance economic development objectives with conservation priorities, climate resilience, and social inclusion.

KEY RECOMMENDATIONS

Based on this analysis, several strategic recommendations to advance green growth in the infrastructure sector can be defined:

- 1 Strengthen integrated spatial planning:** Align infrastructure development with conservation priorities, wildlife corridors, and regional land-use planning frameworks.
- 2 Implement Strategic Environmental Assessments (SEAs):** Ensure that large-scale infrastructure projects are supported by comprehensive environmental and social assessments.
- 3 Improve regional connectivity and mobility:** Invest in transport infrastructure that strengthens regional integration while minimising ecological disruption.
- 4 Promote climate-resilient and green infrastructure:** Support infrastructure systems that incorporate sustainability principles and nature-based solutions.

- 5 Expand renewable energy development:** Invest in solar, wind, and other renewable energy systems to strengthen energy security and reduce greenhouse gas emissions.
- 6 Improve access to basic infrastructure services:** Expand access to electricity, water, sanitation, healthcare infrastructure, and digital connectivity in underserved communities.
- 7 Strengthen infrastructure maintenance systems:** Improve road maintenance, water infrastructure management, and energy system reliability across the region.
- 8 Strengthen regional coordination and policy harmonization:** Enhance cross-border collaboration on infrastructure planning, environmental management, and regional development initiatives.
- 9 Support ecosystem restoration in infrastructure development areas:** Implement restoration measures in landscapes affected by roads, dams, mining corridors, and settlements.
- 10 Promote public-private partnerships (PPPs):** Leverage partnerships to finance sustainable infrastructure development and improve long-term infrastructure management.



6. SETTLEMENTS AND URBANIZATION

6.1. OVERVIEW OF THE SECTOR

The Kavango-Zambezi Transfrontier Conservation Area (KAZA TFCA) has an estimated population of approximately 3 million people, increasing from around 2 million in 2001, with an average annual population growth rate of 2.4% over the last decade (KAZA TFCA, 2014). More than one-third of the population is estimated to live below the poverty line (Geris et al., 2022).

Settlement patterns across KAZA are predominantly rural and closely linked to access to water resources, fertile land, transport corridors, and economic opportunities. Livelihoods are largely based on subsistence agriculture, livestock production, fishing, small-scale trade, natural resource use, and, in some areas, tourism and mining activities. Population growth, settlement expansion, and increasing urbanisation are reshaping the landscape and placing growing pressure on natural resources, wildlife habitats, and ecosystem services. These dynamics have significant implications for land-use planning, conservation, infrastructure development, and sustainable economic growth across the KAZA region.

At the same time, settlement systems and population growth also present opportunities for inclusive green growth through improved service delivery, community-based natural resource management (CBNRM), sustainable livelihoods, and nature-based economic development.

ANGOLA

In Angola's southeastern province of Cuando Cubango, population density remains relatively low, ranging from approximately 1–5 people per square kilometre. Settlements are predominantly rural and village-based, with livelihoods centred on subsistence agriculture, fishing, and the collection of non-timber forest products (NTFPs), including wild fruits, honey, and medicinal plants. Limited access to healthcare, education, clean water, and transport infrastructure contributes to high levels of poverty and vulnerability. Approximately 75% of households lack access to safe drinking water (World Bank, 2019). Climate variability and droughts further exacerbate food insecurity and livelihood vulnerability. At the same time, the Angolan component of KAZA presents opportunities for sustainable land management, eco-tourism, and community-based conservation initiatives (FAO, 2020; KAZA Secretariat, 2019).

BOTSWANA

Settlement patterns in Botswana's KAZA landscape are strongly influenced by major water systems such as the Okavango Delta, Chobe River, and Zambezi River, which support agriculture, livestock production, tourism, and domestic water supply. Most settlements remain rural, although urban centres such as Maun have experienced significant growth due to tourism and associated economic activities. Rural settlements continue to face challenges related to infrastructure access, service delivery, and employment opportunities, contributing to migration towards urban centres. The concentration of settlements along transport corridors and near water resources also increases interactions between people, livestock, and wildlife.

NAMIBIA

Namibia's KAZA region encompasses the Kavango East and Zambezi regions, where settlement patterns are concentrated along river systems such as the Okavango and Zambezi Rivers. These water systems support agriculture, livestock production, fishing, and domestic use (Twyman et al., 2017). Settlements are generally small and dispersed, with livelihoods based on subsistence agriculture, livestock rearing, fishing, and small-scale trade (Mwombola, 2017). Namibia's Community-Based Natural Resource Management (CBNRM) programmes have also influenced settlement patterns by supporting conservancies and community participation in conservation and eco-tourism initiatives. However, increasing population pressure is contributing to land scarcity, resource competition, and growing pressure on ecosystems.

ZAMBIA

Zambia's KAZA region is predominantly rural, with communities concentrated along rivers and floodplains, particularly near the Zambezi and Kwando river systems. Livelihoods are primarily based on agriculture, fishing, and livestock production (UNEP, 2021). Environmental pressures linked to agricultural expansion, charcoal production, and deforestation are contributing to land degradation, soil erosion, and biodiversity loss. Combined with high population growth and widespread poverty, these dynamics are increasing pressure on land and water resources. Climate variability and recurrent droughts further affect settlement stability and livelihood security (Sedano et al 2022).

ZIMBABWE

Settlement patterns within Zimbabwe's KAZA landscape are predominantly rural, with livelihoods centred on subsistence agriculture, livestock production, tourism, and small-scale mining. Urban centres such as Victoria Falls and Hwange have experienced population growth associated with tourism and mining-related employment opportunities (Munjaide, 2019).

Settlement distribution is strongly influenced by the availability of fertile soils and water resources, as well as efforts to avoid areas of high human–wildlife conflict (Mutanga et al., 2015). However, increasing agricultural expansion, fuelwood dependence, and environmental degradation are contributing to deforestation, soil erosion, and pressure on ecosystem services. Economic instability and limited infrastructure continue to contribute to high levels of poverty and vulnerability, particularly in rural areas.

6.2. TRENDS AND DEVELOPMENTS

Settlement systems and urbanization dynamics within the KAZA TFCA are shaped by several interconnected demographic, environmental, and socio-economic trends. These trends have important implications for conservation, land-use planning, infrastructure development, and sustainable livelihoods.

BOX 8: SETTLEMENTS AND URBANIZATION

1. Expansion of settlements
2. Increasing urbanisation and population pressure
3. Rising human–wildlife conflict
4. Uneven land tenure systems and community empowerment

EXPANDING SETTLEMENTS

One of the most significant trends within the KAZA landscape is the expansion of settlements along road and railway networks. Figure 35 illustrates the extent to which settlement growth is increasingly concentrated along transport corridors and near key infrastructure routes. While improved infrastructure can enhance accessibility, economic integration, and service delivery, it also facilitates encroachment into previously undisturbed landscapes. As settlements expand along transport corridors, wildlife habitats become increasingly fragmented, resulting in disruption of migration routes, habitat loss, increased human–wildlife conflict and growing pressure on ecosystem services (Stoldt et al., 2020).



© Jasper Doest / WWF

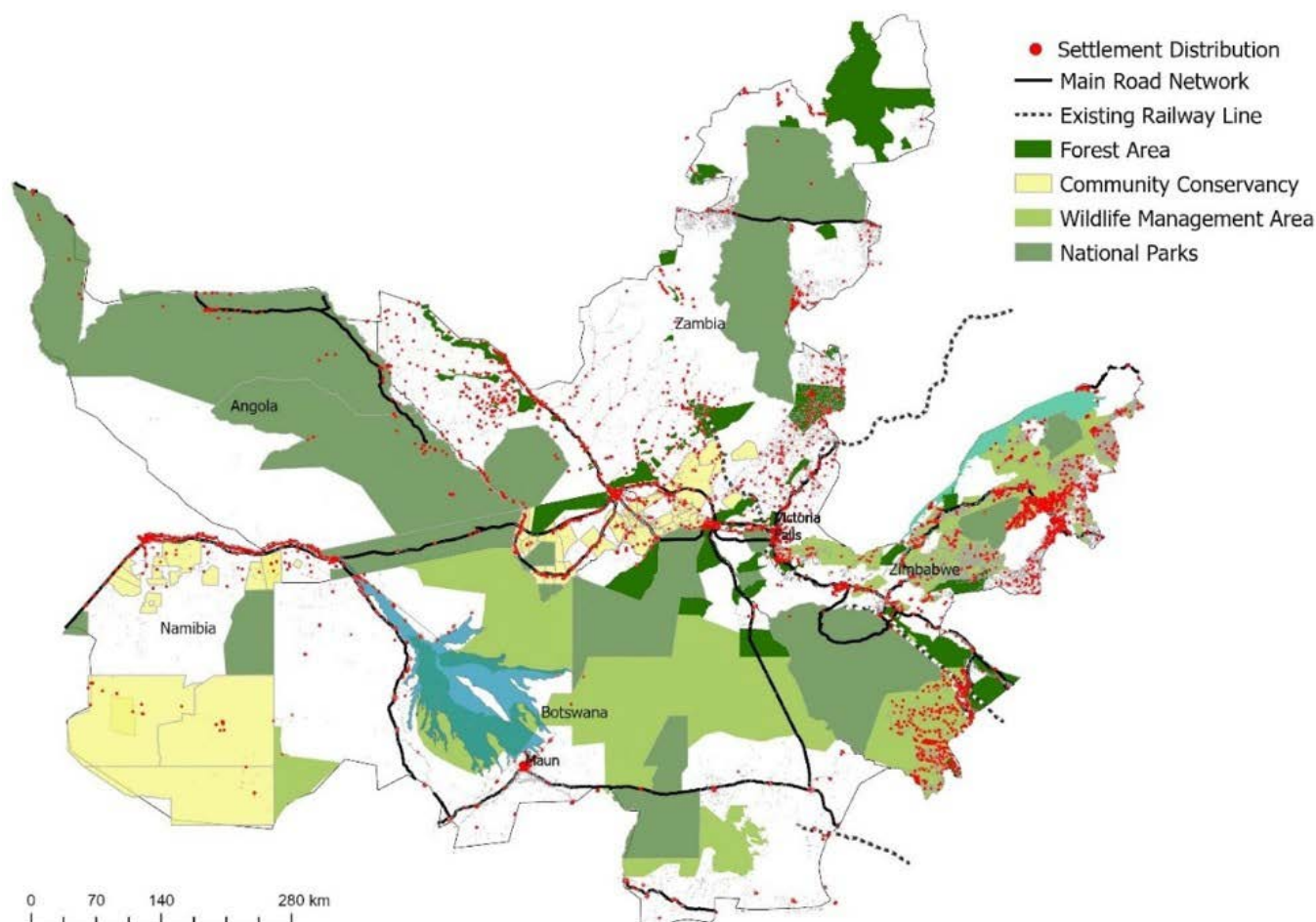


Figure 35. Expansion of settlements along road networks.

Source: Data extracted from the KAZA database, 2024.

Settlement growth is also associated with increased demand for agricultural land, infrastructure, fuelwood, water, and other natural resources. These cumulative pressures contribute to land conversion and environmental degradation across the region. The ecological impacts of settlement expansion are reflected in wildlife distribution patterns. Figure 36 demonstrates the relationship between built-up areas and elephant distribution within the KAZA landscape. Areas with higher settlement density show significantly lower elephant presence, illustrating how expanding human settlements and related human activities such as livestock keeping can reduce habitat connectivity and alter wildlife movement patterns (Bussière et al., 2023; Sirko et al., 2021). The expansion of settlements into wilderness areas also contributes to heightened human-wildlife conflict, as expanding settlements encroach on wildlife habitats, particularly in regions with high elephant populations.

The growth of settlements goes hand in hand with an increase in demand for food production and other services, driving further conversion of lands for agricultural expansion and infrastructure developments. The effects of such are further described in chapters 3 and 5 of this report. Urbanization places further pressure on natural resources such as fuelwood, water, and agricultural land, exacerbating ecosystem degradation and biodiversity loss.

Collaborative land-use planning is necessary to mitigate the cumulative effects of these developments on the environment. These dynamics highlight the importance of integrated land-use planning approaches that balance infrastructure development and settlement growth with biodiversity conservation and ecological connectivity.

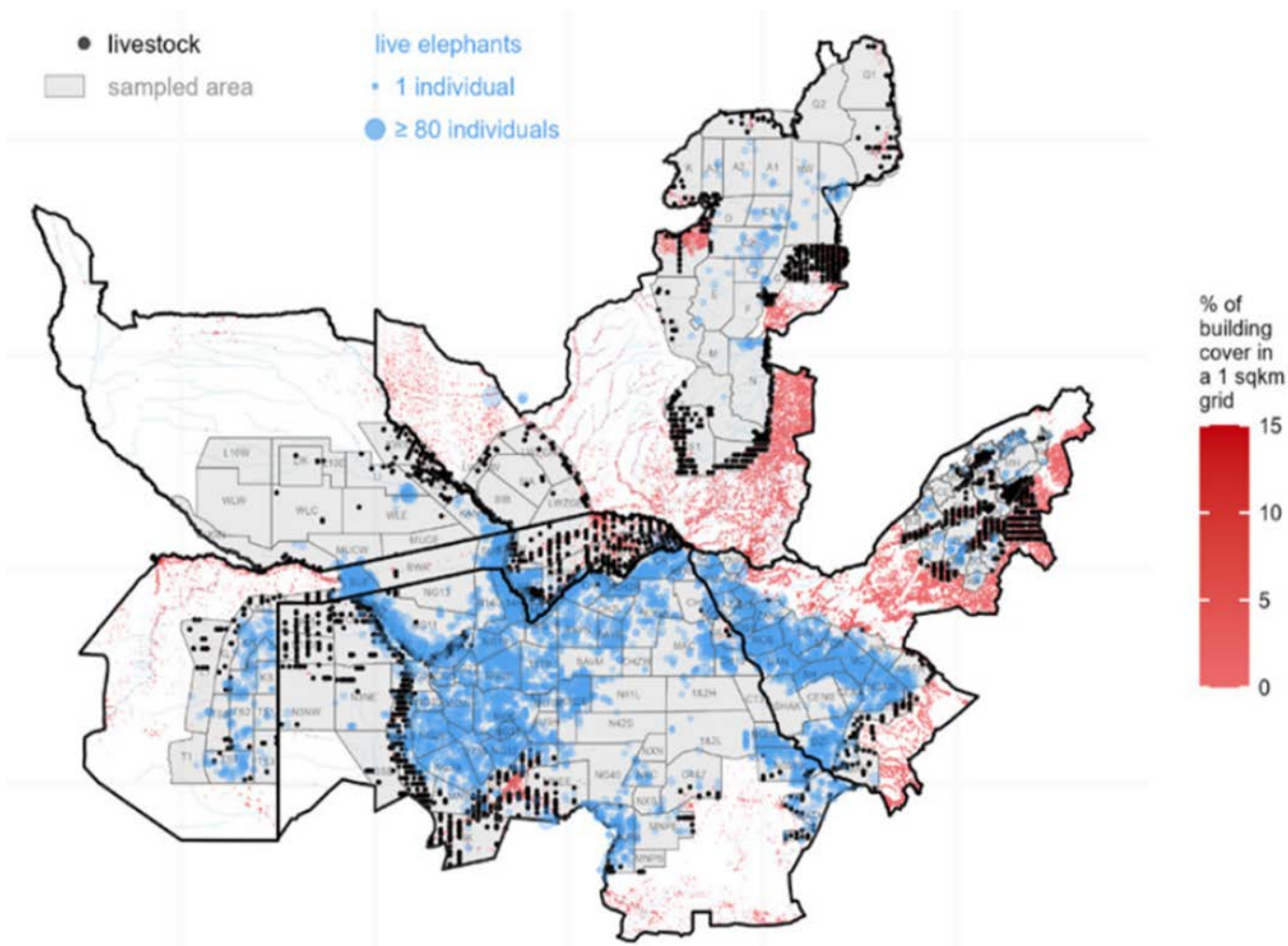
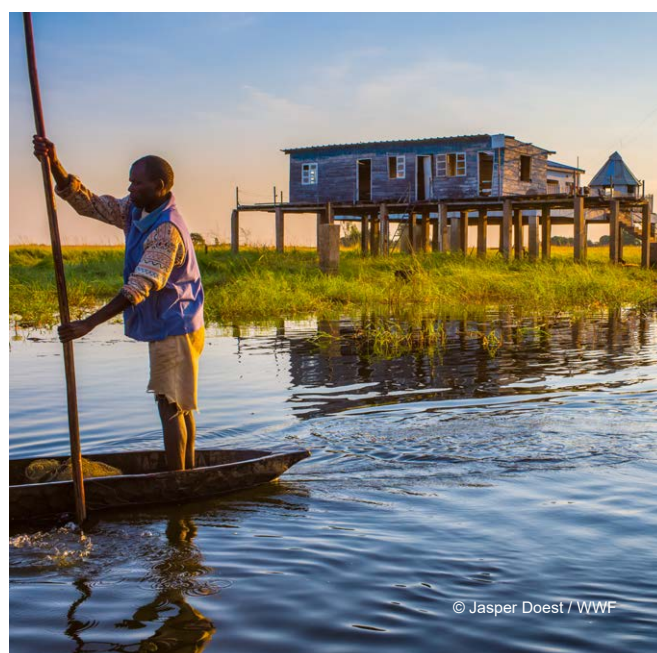


Figure 36. Live elephants (bulls and family herds) and livestock observations in the KAZA TFCA survey area during the 2022 elephant survey (Bussière et al., 2023), overlaid on a human settlement density map created from the Open Buildings dataset (Sirko et al., 2021).

INCREASING URBANIZATION

Although KAZA remains predominantly rural, urbanisation is increasing across the region. Currently, approximately 98.1% of the population resides in rural areas, while only 0.2% of the landscape is classified as urban and 1.7% as peri-urban (Khavari et al., 2020). This urban growth is driven by natural population increase, rural-to-urban migration and economic opportunities such as tourism and mining.

However, urbanisation is often occurring in the context of weak or poorly enforced planning systems, particularly in smaller towns and peri-urban settlements (Dodman et al., 2017). As a result, many urban areas experience unplanned expansion, inadequate infrastructure, limited service provision, poor housing conditions and increasing pressure on land and water resources. Without improved urban planning and investment in infrastructure, rapid urbanisation may intensify environmental degradation and increase vulnerability to climate-related risks.



© Jasper Doest / WWF

INCREASING HUMAN-WILDLIFE CONFLICTS

Human–wildlife conflict (HWC) remains one of the most significant socio-ecological challenges within the KAZA TFCA. Expansion of settlements, agriculture, and livestock production into wildlife areas has increased interactions between people and wildlife, particularly elephants and large carnivores. A recent survey highlighted that conflicts involving elephants are particularly prevalent, with these species often straying into agricultural lands, causing substantial crop damage and property loss (Kauffman et al., 2021).

Elephants frequently move across national borders and require extensive ranges, resulting in recurrent crop damage, property destruction, and competition over water and grazing resources. Figure 35 illustrates the overlap between elephant distribution, livestock presence, and human settlement density within the KAZA landscape. Livestock predation by lions, hyenas, and other predators is also a major concern in communities located near wildlife corridors and protected areas (KAZA TFCA, 2016). These conflicts create economic losses for households, undermine local support for conservation initiatives, and increase pressure for retaliatory actions against wildlife.

Addressing HWC requires integrated approaches that combine improved land-use planning, community engagement, mitigation measures and stronger coexistence strategies.

UNEVEN LAND TENURE SYSTEMS AND COMMUNITY EMPOWERMENT

Land tenure systems and access to natural resources vary significantly across the KAZA member states. In many areas, insecure land tenure limits communities' ability to manage and benefit from natural resources effectively (Odendaal et al., 2020). Communities with insecure land rights are often more vulnerable to land degradation, encroachment by commercial agriculture and mining, displacement and exclusion from conservation and development benefits. This situation affects local communities' livelihoods and has implications for conservation, as communities with insecure land rights may have little incentive to engage in sustainable resource management practices.

At the same time, the effectiveness of Community-Based Natural Resource Management (CBNRM) systems varies considerably across the region. In some countries, well-established CBNRM programmes have generated positive conservation and livelihood outcomes, while in others, weak governance, limited financial returns, and insufficient technical capacity continue to constrain effectiveness (Ministry of Environment and Tourism, 2013). The disparity in the effectiveness of CBNRM schemes often reflects broader socio-economic and political differences between the countries and varying levels of external support from governments and non-governmental organisations (NGOs).

Limited business development skills, market access, and financial resources also constrain the growth of community-based enterprises related to tourism, conservation, and sustainable natural resource use. While communities have significant potential to engage in and benefit from eco-tourism and related enterprises, the lack of entrepreneurial skills, access to capital, and market knowledge often hinder local businesses' successful establishment and growth (Scheyvens, 1999).



© Gareth Bentley / WWF-US

6.3. CHALLENGES AND OPPORTUNITIES FOR GREEN GROWTH

Settlement growth and urban development within the KAZA TFCA present both major development opportunities and significant sustainability challenges. While population growth can contribute to economic activity, labour availability, and market expansion, increasing settlement pressure also creates risks related to environmental degradation, land-use conflict, and growing demand for infrastructure and services. Achieving a green growth pathway therefore requires approaches that improve livelihoods and service delivery while maintaining ecosystem integrity and supporting conservation objectives.

POVERTY, LIVELIHOODS, AND SERVICE DELIVERY

Poverty remains a major challenge across the KAZA landscape, with more than one-third of the population estimated to live below the poverty line (Geris et al., 2022). Many rural communities have limited access to healthcare, education, clean water, sanitation systems, electricity, and transport infrastructure. Improving access to services and economic opportunities is therefore critical for reducing vulnerability and strengthening resilience. At the same time, settlement systems provide opportunities to support local enterprise development, strengthen regional markets, improve service delivery and promote nature-based economic activities linked to tourism and sustainable resource management.

MANAGING SETTLEMENT EXPANSION AND RELATED ENVIRONMENTAL DEGRADATION

Settlement expansion, agricultural encroachment, and infrastructure development are increasing pressure on forests, water systems, and wildlife habitats across KAZA. These pressures contribute to habitat fragmentation, deforestation, soil erosion, biodiversity loss and disruption of wildlife corridors. The cumulative effects of settlement growth are particularly visible in areas surrounding major transport corridors and protected areas. Integrated spatial planning and sustainable settlement development will therefore be essential to reducing environmental degradation and maintaining ecological connectivity.

HUMAN-WILDLIFE COEXISTENCE

As settlements and agricultural activities expand into wildlife areas, interactions between people, livestock, and wildlife are increasing. Human–wildlife conflict creates economic losses, food insecurity, safety risks and negative perceptions towards conservation initiatives. At the same time, growing demand for land, water, fuelwood, and grazing resources is intensifying resource competition across the landscape. Opportunities exist to strengthen coexistence approaches through wildlife-compatible land-use planning, community-based conservation, compensation mechanisms and improved conflict mitigation systems.

URBANISATION AND INFRASTRUCTURE PRESSURES

Urbanisation is accelerating across parts of KAZA, particularly around tourism and mining centres. However, urban growth is frequently occurring in the context of weak planning systems and limited infrastructure investment. As a result, many urban settlements experience inadequate housing, poor sanitation, insufficient water systems and limited access to services. Improved urban planning, infrastructure investment, and climate-resilient settlement design will be important to ensuring that urban growth contributes positively to sustainable development outcomes.

GOVERNANCE, LAND TENURE, AND COMMUNITY EMPOWERMENT

Secure land tenure and effective community governance systems are central to achieving sustainable settlement and land-use outcomes within KAZA. Where communities have secure rights and benefit-sharing mechanisms, there are stronger incentives for sustainable natural resource management and conservation participation. However, uneven land tenure systems, limited technical capacity, and varying effectiveness of CBNRM programmes continue to constrain community empowerment across the region. Strengthening local governance systems, improving community participation, and expanding business development support could significantly improve socio-economic and conservation outcomes.

6.4. KEY CONCLUSIONS AND RECOMMENDATIONS

KEY CONCLUSIONS

Settlement growth and urbanisation are reshaping the KAZA landscape and creating increasing pressure on land, water resources, wildlife habitats, and infrastructure systems. While population growth and urbanisation present opportunities for economic development and regional integration, they also contribute to habitat fragmentation, environmental degradation, and rising human–wildlife conflict.

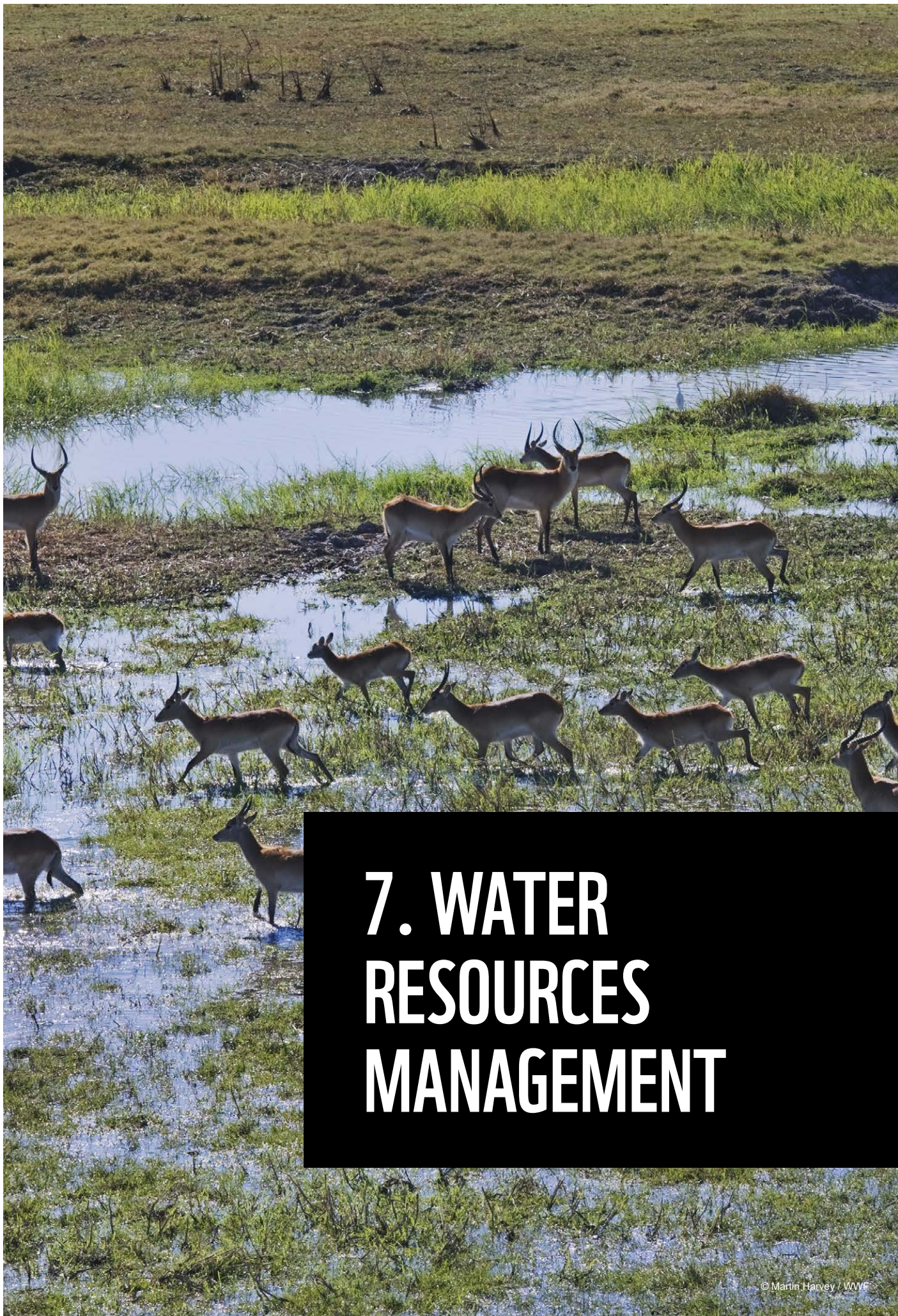
Poverty, weak infrastructure, insecure land tenure, and uneven access to services continue to constrain sustainable development across much of the region. At the same time, community-based natural resource management systems, nature-based livelihoods, and improved land-use planning present important opportunities to strengthen resilience and support more sustainable development pathways.

KEY RECOMMENDATIONS

The long-term sustainability of settlement systems within KAZA will depend on integrated approaches that balance human development needs with conservation priorities and ecosystem integrity. Several specific recommendations can be made in this regard:

- 1 Strengthen integrated land-use planning:** Align settlement expansion, infrastructure development, and conservation priorities through coordinated spatial planning approaches.
- 2 Improve access to basic services:** Expand access to clean water, sanitation, electricity, healthcare, education, and digital connectivity in underserved communities.
- 3 Promote sustainable and climate-resilient settlement development:** Support settlement planning approaches that reduce environmental pressures and improve resilience to climate variability and natural hazards.
- 4 Strengthen human–wildlife conflict mitigation systems:** Expand coexistence strategies, compensation mechanisms, and community-based mitigation measures.

- 5 Support community-based natural resource management (CBNRM):** Strengthen governance systems, technical capacity, and benefit-sharing mechanisms within community conservation initiatives.
- 6 Improve land tenure security:** Strengthen land rights and improve community access to land and natural resource management systems.
- 7 Strengthen local economic opportunities and green enterprises:** Support skills development, entrepreneurship, and access to finance for sustainable community-based enterprises.
- 8 Promote nature-based infrastructure and energy solutions:** Expand renewable energy systems, energy-efficient technologies, and nature-based solutions for rural settlements.
- 9 Improve urban planning and infrastructure investment:** Strengthen planning systems for growing urban and peri-urban settlements to reduce environmental degradation and improve service delivery.
- 10 Strengthen regional coordination and policy harmonisation:** Enhance cooperation across KAZA member states on settlement planning, land management, migration, and natural resource governance.



7. WATER RESOURCES MANAGEMENT

7.1. OVERVIEW OF THE SECTOR

Water resources are fundamental to the ecological integrity, economic productivity, and social well-being of the Kavango-Zambezi Transfrontier Conservation Area (KAZA TFCA). Major river systems such as the Zambezi, Okavango, Cuando, Chobe, and Kwando sustain wetlands, floodplains, savannas, wildlife populations, agricultural systems, fisheries, tourism economies, and local livelihoods across the region.

The Zambezi River Basin, the largest river basin in Southern Africa, spans approximately 1.39 million km² across eight countries and contributes roughly 50% of the region's available surface water, with an average flow of approximately 3,600 m³ per second. The basin supports hydropower generation, irrigation, fisheries, domestic and industrial water supply, biodiversity conservation, and tourism activities throughout the region.

Similarly, the Okavango River Basin covers approximately 700,000 km² across Angola, Namibia, and Botswana and includes the globally significant Okavango Delta, one of the world's largest inland deltas. The basin contributes an estimated 6–7% of Southern Africa's freshwater resources and supports over one million people, as well as extensive wetland and floodplain ecosystems. Approximately 95% of the Delta's water originates in Angola.

The Cuvelai Basin, extending across Angola and Namibia, provides essential freshwater resources for rural communities and supports subsistence agriculture and domestic water supply, despite contributing a relatively small proportion of regional freshwater resources.

Collectively, these river systems provide 50–60% of the freshwater resources supporting ecosystems and livelihoods within the KAZA region (Dudgeon et al., 2006; Balian et al., 2010; Naidoo et al., 2016).

Water resources within KAZA play a critical role in sustaining biodiversity and ecological connectivity as well as in supporting agriculture, fisheries and other livelihoods activities. This includes groundwater, a critical resource in rural areas not close to large rivers or water supply networks. Tourism and other economic activities are highly dependent on water resources as many visitors are drawn to KAZA's iconic wetlands and riverine environments, such as the Okavango Delta and the Zambezi River. Finally, hydropower generation is already a key source of energy in parts of the basin, with plans for expansion.

The strategic importance of water in KAZA extends beyond ecological and economic functions. It also plays a central role in transboundary cooperation and regional stability. Complex legal and institutional frameworks govern the shared water resources to ensure equitable and sustainable use among the countries involved. However, despite the importance of water systems, their distribution and availability over time are not well mapped out and documented (Tupie et al, 2015). Also, limited incentives exist to protect these critical water systems, putting them at risk of degradation.

Growing pressure from climate change, population growth, agricultural expansion, hydropower development, mining, and urbanisation is increasing stress on water systems and highlighting the importance of integrated water resource management (IWRM).

ANGOLA

Angola plays a critical role in the KAZA hydrological system through the headwaters of the Cubango and Cuito rivers, which sustain downstream flows into the Okavango Delta. These river systems are essential for maintaining ecological processes and water availability across the broader KAZA landscape. Water resources in Angola are primarily used for agriculture, domestic consumption, and emerging hydropower development. Irrigated agriculture is increasingly important for food production, particularly in southern provinces. At the same time, several proposed hydropower projects may significantly influence downstream water availability and ecosystem functioning. Angola faces challenges related to the sustainable management of its water resources, particularly in balancing hydropower development with ecological conservation. Opportunities exist to strengthen water-use efficiency, improve catchment management, and enhance participation in transboundary water governance initiatives.

BOTSWANA

Botswana's KAZA region includes the Okavango Delta and the Chobe River system, both of which are internationally important ecological and economic assets. The Delta supports wildlife, tourism, fisheries, flood-recession agriculture, and domestic water use. Tourism associated with the Okavango Delta contributes significantly to Botswana's economy. Botswana faces growing challenges related to water scarcity, increasing demand from tourism and agriculture, and climate variability. Opportunities exist to strengthen water conservation strategies, improve efficiency, and expand participation in regional water management initiatives.

NAMIBIA

Namibia's KAZA region depends heavily on the Kavango River and the Kwando-Linyanti-Chobe river system for domestic water supply, agriculture, fisheries, and tourism. These water systems are particularly important given Namibia's arid climate and limited rainfall. Water supports irrigation agriculture, tourism activities, and local livelihoods in the Kavango East and Zambezi regions. Tourism, particularly in the Zambezi region, relies on water for maintaining wildlife habitats and supporting recreational activities. In addition, Namibia uses water for hydropower generation, though on a smaller scale compared to other KAZA countries. The country faces ongoing challenges related to water scarcity and competition between agricultural, domestic, and ecological water needs. Improving irrigation efficiency and strengthening transboundary water cooperation remain important priorities.

ZAMBIA

The Zambezi River dominates Zambia's KAZA landscape and supports agriculture, fisheries, tourism, and hydropower generation. Other important water systems include the Kafue and Luangwa rivers. Hydropower generation along the Zambezi River is also central to national energy systems, while tourism around Victoria Falls contributes significantly to the economy. Growing demand from agriculture, hydropower, and infrastructure development is increasing pressure on water resources and highlighting the need for improved water management systems and regional coordination.

ZIMBABWE

Zimbabwe shares the Zambezi River system with Zambia and relies heavily on water resources for agriculture, hydropower generation, tourism, and domestic use. Water from the Zambezi River is used for agriculture, particularly in the northern regions, while tourism, particularly around Victoria Falls, relies on the river to attract visitors and support related businesses. Lake Kariba is one of Africa's largest reservoirs and plays a central role in electricity generation and fisheries. Zimbabwe faces increasing challenges related to water allocation, hydropower reliability, droughts, and climate variability. Opportunities exist to improve irrigation efficiency, strengthen water infrastructure, and expand regional water cooperation initiatives.



© Martin Harvey / WWF

7.2. TRENDS AND DEVELOPMENTS

Water systems within the KAZA TFCA are shaped by several interconnected environmental, economic, and governance trends. These dynamics have important implications for biodiversity conservation, livelihoods, regional stability, and long-term economic development.

BOX 9: WATER RESOURCE MANAGEMENT TRENDS

1. Increasing water demand
2. Degradation of watersheds and aquatic ecosystems
3. Conflicting land use and transboundary water governance
4. Pollution and declining water quality

INCREASING WATER DEMAND

Water demand within the KAZA region is increasing rapidly due to population growth, agricultural expansion, tourism development, mining activities, and industrialisation. Agriculture remains the largest consumer of water within the region, accounting for more than 70% of total water use (Senzanje et al., 2020). Expansion of irrigation schemes, particularly in Zambia and Namibia, is increasing pressure on river systems such as the Zambezi, Kavango, and Chobe rivers (Turpie et al., 2020). Increasing urbanisation and tourism development are also contributing to rising water demand, particularly in areas already facing seasonal water scarcity. Climate change and increasing climate variability are further intensifying pressure on already constrained water systems

Without improved water management systems and efficiency measures, growing demand is likely to increase competition between sectors and intensify risks related to water scarcity, ecosystem degradation, and reduced downstream flows.

DEGRADATION OF WATERSHEDS AND AQUATIC ECOSYSTEMS

The KAZA landscape contains interconnected watersheds, that are essential for regulating water flows, maintaining biodiversity, and supporting agriculture, tourism, fisheries, and local livelihoods. Figure 37 illustrates the major watersheds across the KAZA TFCA.

However, watershed degradation is increasing due to deforestation, unsustainable agricultural practices, overgrazing, dam construction and land conversion. These activities disrupt hydrological systems, alter sediment transport, fragment aquatic habitats, and reduce water quality and ecosystem resilience (Stagnari et al., 2016).

Wetland systems such as the Okavango Delta and Barotse Floodplain play critical ecological functions, including water filtration, flood regulation, fisheries support, and biodiversity conservation. Their degradation therefore has significant ecological and socio-economic implications.

Protecting and restoring watersheds is essential for maintaining water security and ecosystem services across the region.



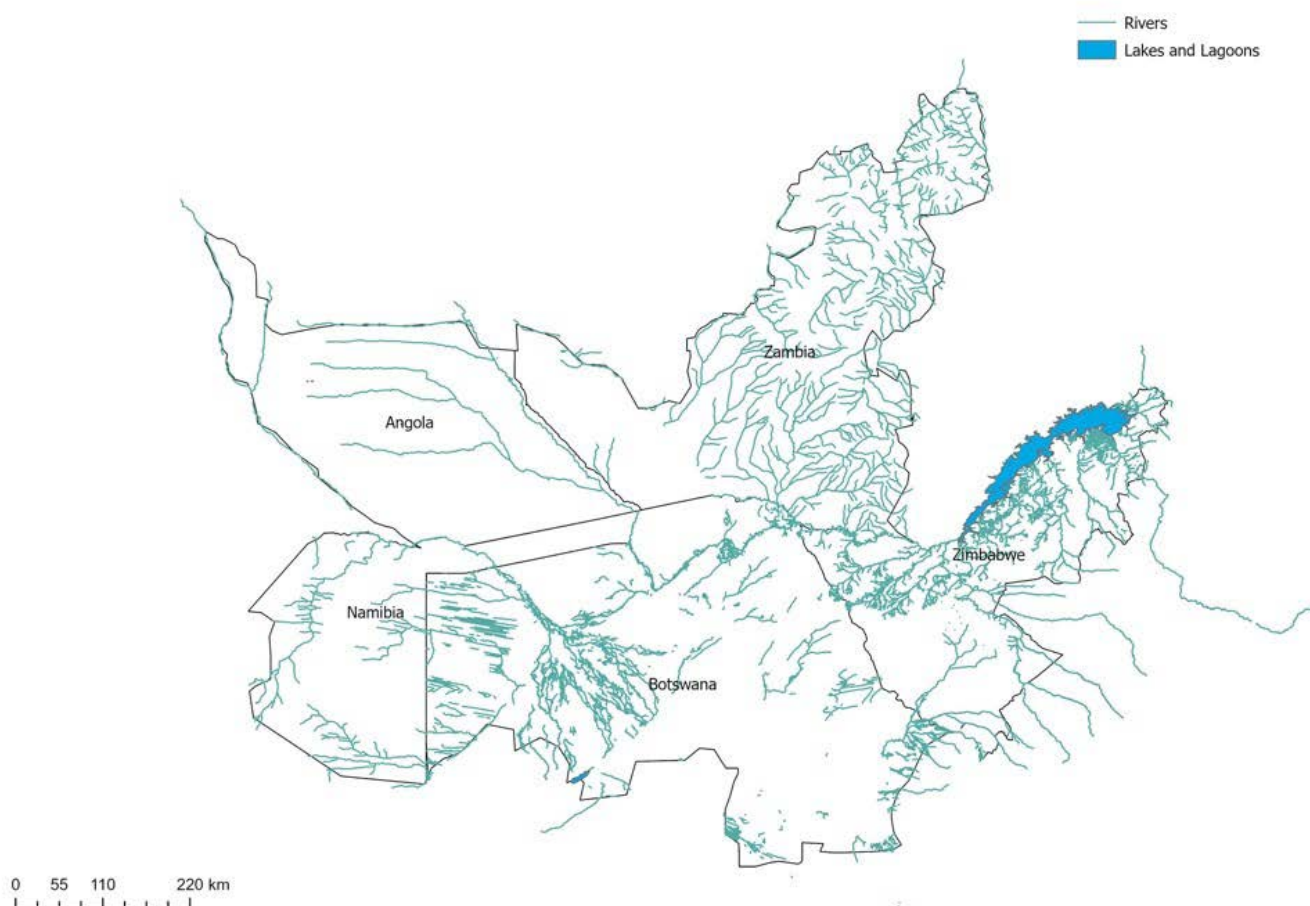


Figure 37. Watersheds in the KAZA TFCA region

Source: original map created using data from the FAO AQUASTAT database¹³

CONFLICTING LAND USE AND TRANSBOUNDARY WATER GOVERNANCE

Water governance within KAZA is inherently complex due to the transboundary nature of major river systems and competing national priorities. Upstream countries may prioritise irrigation expansion, hydropower development, and water abstraction, while downstream countries are often more concerned with maintaining river flows for ecosystem sustainability, agriculture, tourism, and fisheries (Kistin et al., 2008). These competing interests can create tensions regarding water allocation and use, particularly during drought periods or where upstream activities affect downstream water availability and quality (Smith and Winterman, 2022). The lack of a comprehensive and enforceable regional water management framework can exacerbate these inherent tensions, leading to unilateral actions by some states that further strain diplomatic relations (de Bruin, 2023).

Regional institutions such as the Zambezi Watercourse Commission (ZAMCOM) and the Permanent Okavango River Basin Water Commission (OKACOM) play important roles in supporting transboundary cooperation and water governance. However, challenges remain regarding equitable water allocation, enforcement mechanisms, harmonised governance frameworks and integrated planning approaches. Strengthening transboundary governance systems will therefore be critical to ensuring sustainable and equitable water management across the KAZA landscape.

¹³ <https://data.apps.fao.org/catalog//iso/7707086d-af3c-41cc-8aa5-323d8609b2d1>.



© Martin Harvey / WWF

POLLUTION AND DECLINING WATER QUALITY

Declining water quality is an increasing concern across the KAZA region, affecting biodiversity, fisheries, tourism, public health, and long-term water security across the region. Major sources of pollution include agricultural runoff, untreated sewage, mining effluents, industrial waste and sedimentation associated with land degradation.

The extensive use of fertilisers and pesticides in commercial agriculture, particularly within the Zambezi Basin, contributes to nutrient loading, eutrophication, and algal blooms (Jones et al., 2009). Mining and industrial activities also contribute to contamination by heavy metals and other pollutants. Weak waste management systems and inconsistent environmental enforcement further exacerbate pressures on riverine ecosystems and water quality.

7.3. CHALLENGES AND OPPORTUNITIES FOR GREEN GROWTH

Water resources are central to the ecological functioning and economic development of the KAZA TFCA. Sustainable management of water systems will therefore be fundamental to achieving a green growth pathway across the region.

At the same time, increasing water demand, environmental degradation, and governance challenges are placing growing pressure on freshwater systems and creating risks for livelihoods, biodiversity, and regional stability.

WATER SECURITY AND ECONOMIC DEVELOPMENT

Water systems underpin major economic sectors across KAZA, including agriculture, fisheries, tourism, hydropower generation, and domestic water supply. Growing populations, expanding agriculture, and increasing industrial activities are intensifying demand for water resources, creating pressure on river systems and groundwater supplies. At the same time, improved water management and investment in water-efficient technologies present significant opportunities to strengthen food security, improve agricultural productivity, support tourism and enhance regional economic resilience.

WATERSHED DEGRADATION AND ECOSYSTEM RESILIENCE

Deforestation, wetland degradation, unsustainable farming practices, and infrastructure development are reducing the ecological integrity of watersheds across the KAZA landscape. These pressures threaten biodiversity, water quality, fisheries, flood regulation systems and ecosystem resilience. Protecting and restoring critical watersheds and wetlands therefore represents a major opportunity to strengthen ecosystem services, improve climate resilience, and support long-term water security.

CLIMATE CHANGE AND WATER VULNERABILITY

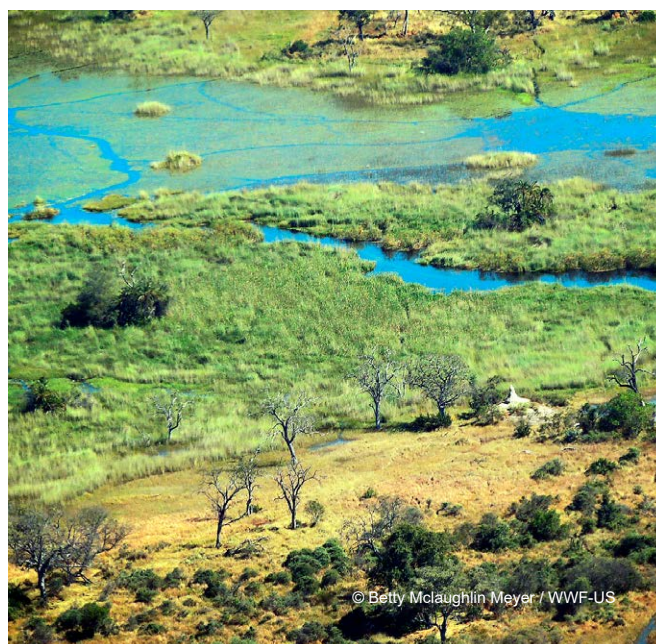
Climate change is expected to increase rainfall variability, drought frequency, and evaporation rates across much of Southern Africa. These dynamics are likely to reduce river flows, increase water scarcity, affect hydropower reliability and intensify competition between sectors and countries. Strengthening climate adaptation measures, improving water storage systems, and promoting water-efficient practices will therefore be essential for building resilience.

TRANSBOUNDARY GOVERNANCE OF WATER RESOURCES

The shared nature of KAZA's river systems creates both governance challenges and opportunities for regional cooperation. Competing water demands between upstream and downstream countries may increase tensions, particularly during drought periods and in areas of growing agricultural or hydropower development. At the same time, institutions such as ZAMCOM and OKACOM provide important platforms for strengthening regional cooperation, integrated water resource management (IWRM), and coordinated planning. Strengthening transboundary governance systems could significantly improve long-term water security and regional stability.

WATER QUALITY, POLLUTION, AND HUMAN HEALTH

Pollution from agriculture, mining, settlements, and industrial activities is contributing to declining water quality across the KAZA region. Poor water quality affects ecosystem health, fisheries, tourism, public health and access to safe drinking water. Opportunities exist to strengthen pollution control systems, improve wastewater management, and enhance monitoring and enforcement mechanisms to protect water resources and ecosystem integrity.



© Betty McLaughlin Meyer / WWF-US

7.4. KEY CONCLUSIONS AND RECOMMENDATIONS

KEY CONCLUSIONS

Water resources are central to the ecological integrity, economic productivity, and social well-being of the KAZA TFCA. Major river systems such as the Zambezi, Okavango, and Cuando support biodiversity, agriculture, fisheries, tourism, hydropower generation, and local livelihoods across the region. However, growing pressure from population growth, agricultural expansion, mining, hydropower development, tourism, and climate change is increasing stress on water systems and watersheds across the KAZA landscape.

Agriculture currently accounts for more than 70% of total water use within the region, while increasing pollution, watershed degradation, and declining water quality are threatening ecosystem services and long-term water security. The transboundary nature of KAZA's water systems further complicates governance and water allocation, particularly where competing national priorities affect upstream and downstream flows.

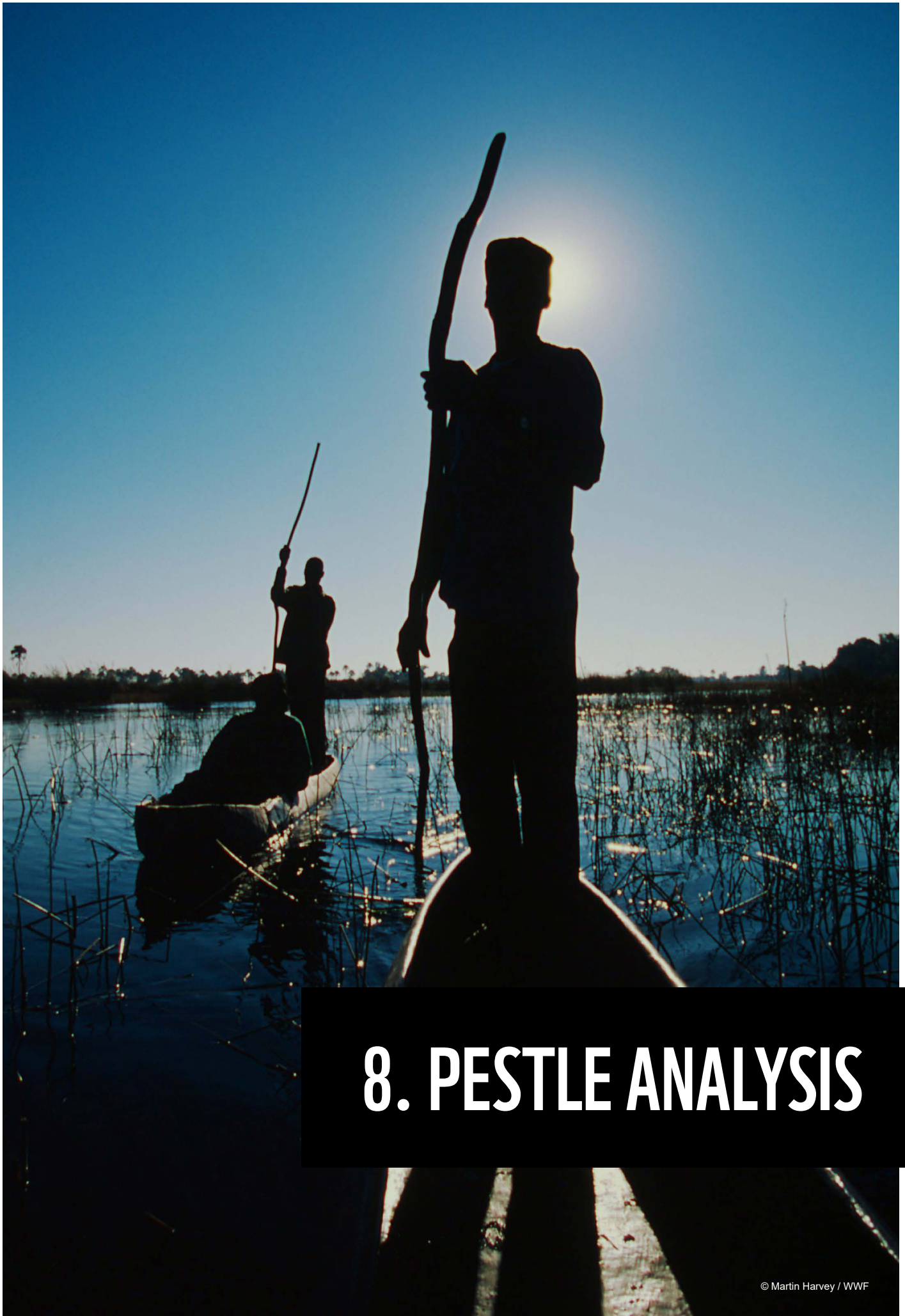
At the same time, opportunities exist to strengthen integrated water resource management, improve water-use efficiency, restore degraded ecosystems, and enhance regional cooperation through existing transboundary governance mechanisms. The long-term sustainability of KAZA's water resources will depend on integrated approaches that balance economic development, ecological sustainability, and equitable access to water resources.

KEY RECOMMENDATIONS

A number of recommendations can be made to secure the viability of KAZA's water resources to sustain green growth:

- 1 Strengthen Integrated Water Resource Management (IWRM):** Develop and implement integrated water management frameworks that address cross-sectoral and transboundary water dependencies.
- 2 Strengthen transboundary water governance:** Enhance regional cooperation through institutions such as ZAMCOM and OKACOM to improve equitable water allocation and coordinated planning.

- 3 Promote sustainable water-use practices:** Expand water-efficient irrigation systems, rainwater harvesting, and drought-resistant agricultural practices.
- 4 Protect and restore watersheds and wetlands:** Strengthen conservation and restoration of critical river systems, wetlands, and floodplains.
- 5 Improve pollution control and water quality management:** Strengthen wastewater treatment, pollution monitoring, and environmental enforcement systems.
- 6 Invest in sustainable water infrastructure:** Expand water storage, supply, and distribution infrastructure while minimising ecological impacts.
- 7 Strengthen monitoring and data systems:** Improve monitoring of water quantity, water quality, groundwater systems, and ecosystem health.
- 8 Support climate adaptation and resilience planning:** Develop strategies to address climate-related variability in water availability and hydrological systems.
- 9 Strengthen community participation and awareness:** Promote community engagement, education, and local participation in water resource management decisions.
- 10 Integrate water management with broader land-use planning:** Ensure that agricultural expansion, infrastructure development, mining, and settlement growth are aligned with sustainable water resource management objectives.



8. PESTLE ANALYSIS

The preceding chapters examined sector-specific opportunities, constraints, and sustainability considerations related to tourism, agriculture, extractive industries, infrastructure, water resources, and settlements within the KAZA TFCA. Together, these chapters demonstrate that the region's development trajectory is shaped by a complex interaction between economic growth objectives, ecological sustainability, governance systems, and social dynamics.

Building on these sectoral assessments, this chapter provides a cross-cutting analysis of the broader enabling environment for green growth through a Political, Economic, Social, Technological, Legal, and Environmental (PESTLE) framework.

Rather than reassessing individual sectors, the analysis focuses on the systemic drivers, institutional conditions, governance arrangements, and external pressures that influence the region's ability to implement sustainable and inclusive green growth pathways.

The PESTLE framework highlights the interconnections between sectors and identifies the broader conditions required to support resilient economic development, biodiversity conservation, climate adaptation, and regional cooperation across the KAZA landscape. A schematic overview of the different dimensions of the analysis is presented in Figure 38.

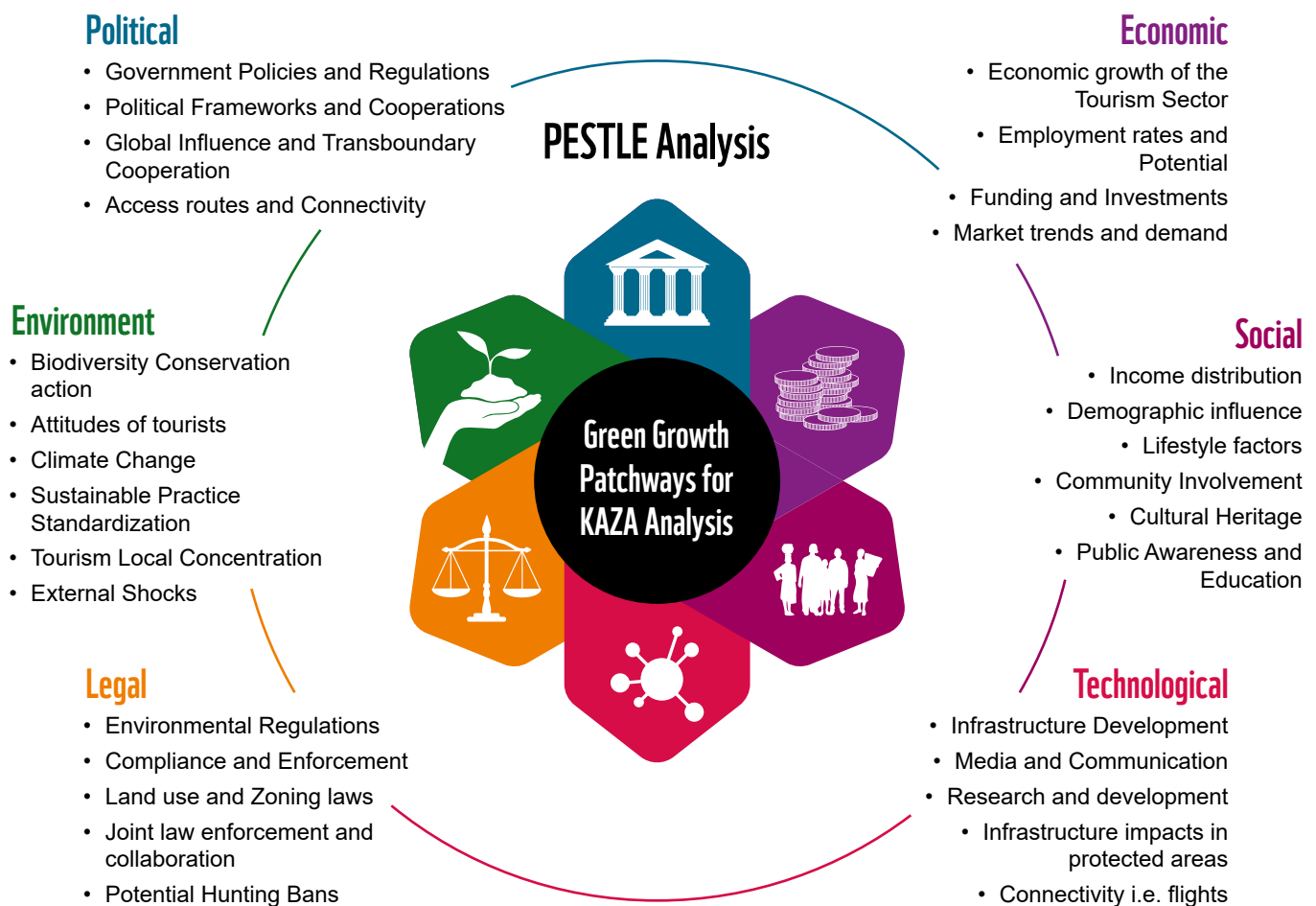


Figure 38. KAZA PESTLE Analysis



8.1. POLITICAL

Political cooperation and governance frameworks are central to advancing green growth within the KAZA TFCA. The transboundary nature of the landscape requires coordinated approaches to conservation, infrastructure development, tourism management, water governance, and land-use planning across the five KAZA Partner States.

The KAZA Treaty provides the overarching framework for regional cooperation and establishes the institutional foundation for transboundary conservation and sustainable development. Supporting mechanisms include the KAZA TFCA Master Integrated Development Plan (IDP), the KAZA Livelihoods Diversification Strategy, and the various existing Conservation Strategies. Together, these frameworks seek to strengthen regional coordination, promote integrated planning, enhance livelihood opportunities, and maintain ecological connectivity across the landscape.

Political coordination is further supported through governance structures such as:

- the KAZA Ministerial Committee,
- the Committee of Senior Officials (COSO),
- the Joint Management Committee,
- and national-level coordination structures.

These institutions provide important platforms for policy harmonisation, strategic planning, financial oversight, and regional cooperation.

At the same time, differing national priorities, uneven institutional capacity, and inconsistencies in policy implementation continue to create governance challenges across the region. While some Partner States prioritise tourism and conservation-led development, others place stronger emphasis on agricultural expansion, mining, energy development, or infrastructure growth. These differing priorities can create tensions regarding land use, water allocation, wildlife management, and infrastructure planning. Political instability, administrative fragmentation, and limited enforcement capacity in some areas further constrain implementation of regional strategies and integrated land-use planning approaches.

Nevertheless, the political dimension also presents significant opportunities for strengthening regional integration and advancing green growth objectives. Existing institutional frameworks such as SADC, the KAZA Secretariat, OKACOM, ZAMCOM, provide a strong basis for improved transboundary governance, coordinated development planning, harmonised environmental standards, integrated water management and regional conservation initiatives. Strengthening political coordination and policy alignment across sectors and countries will therefore be essential to implementing the green growth pathways identified in this report.

8.2. ECONOMIC

The KAZA TFCA possesses significant economic potential based on its globally important biodiversity, natural resources, tourism assets, agricultural systems, and regional trade corridors. However, the region's economic structure also reflects several vulnerabilities linked to climate variability, infrastructure constraints, environmental degradation, and uneven distribution of economic benefits.

Nature-based sectors, including tourism, agriculture, fisheries, forestry, and wildlife economies, remain central to livelihoods and economic activity across the region. Tourism is one of the most significant economic sectors, generating employment, foreign exchange earnings, and investment opportunities linked to wildlife, protected areas, and iconic destinations such as Victoria Falls and the Okavango Delta. At the same time, tourism growth remains constrained by limited regional connectivity, restrictive visa systems, uneven infrastructure development and vulnerability to climate variability and external economic shocks. In addition, the influx of affluent tourists can also inflate local living costs, exacerbating challenges in equitably distributing economic benefits among local communities.

Agriculture remains critical for food security and rural livelihoods but faces increasing pressure from climate change, land degradation, water scarcity, and competition for land and natural resources. Similarly, mining and extractive industries contribute significantly to national economies and export revenues, yet often generate environmental pressures and social trade-offs where extraction overlaps with ecologically sensitive landscapes and community lands.

Infrastructure development and regional trade corridors present major opportunities for economic diversification and regional integration. Investments in transport systems, energy infrastructure, digital connectivity, and cross-border trade corridors have the potential to improve market access, support tourism and agriculture, facilitate regional trade and strengthen economic resilience. However, uneven infrastructure access and limited service delivery continue to constrain development opportunities in many rural and remote areas.

A major challenge across the KAZA region relates to equitable benefit sharing and economic inclusion. While tourism, mining, agriculture, and infrastructure projects may generate substantial economic value, benefits are not always distributed evenly across communities and regions. Economic leakages, limited local value addition, and insufficient community participation often reduce the extent to which local populations benefit from economic growth.

Finally, sustainable water management is essential to support tourism, agricultural productivity, fishery and community livelihoods in general. Competition for water resources between agricultural use, tourism, and mining activities can create tensions, underscoring the need for effective transboundary water management agreements to promote collaboration among member states.

At the same time, the region possesses significant opportunities to transition towards more inclusive and sustainable economic pathways through:

- sustainable tourism,
- climate-smart agriculture,
- sustainable fisheries,
- renewable energy development,
- sustainable forest economies,
- ecosystem restoration,
- and other nature-based enterprises.

Sustainable financing mechanisms such as the KAZA Fund, together with regional investment partnerships and green finance initiatives, may provide important opportunities to support long-term green growth and economic resilience.

Figure 39 illustrates the interconnected economic components of a green growth pathway within the KAZA landscape and highlights the linkages between environmental sustainability, livelihoods, infrastructure, tourism, agriculture, and inclusive economic development.



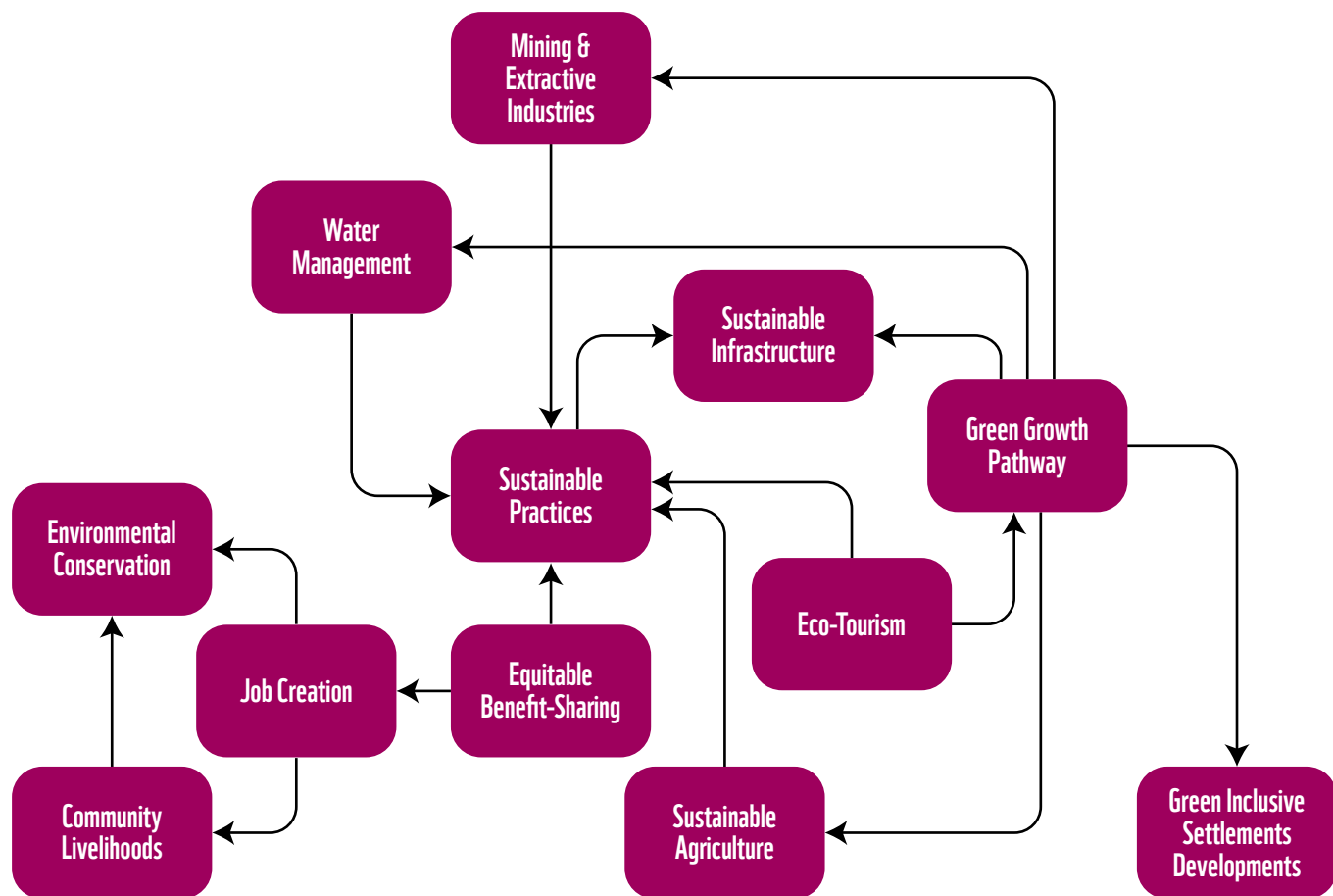
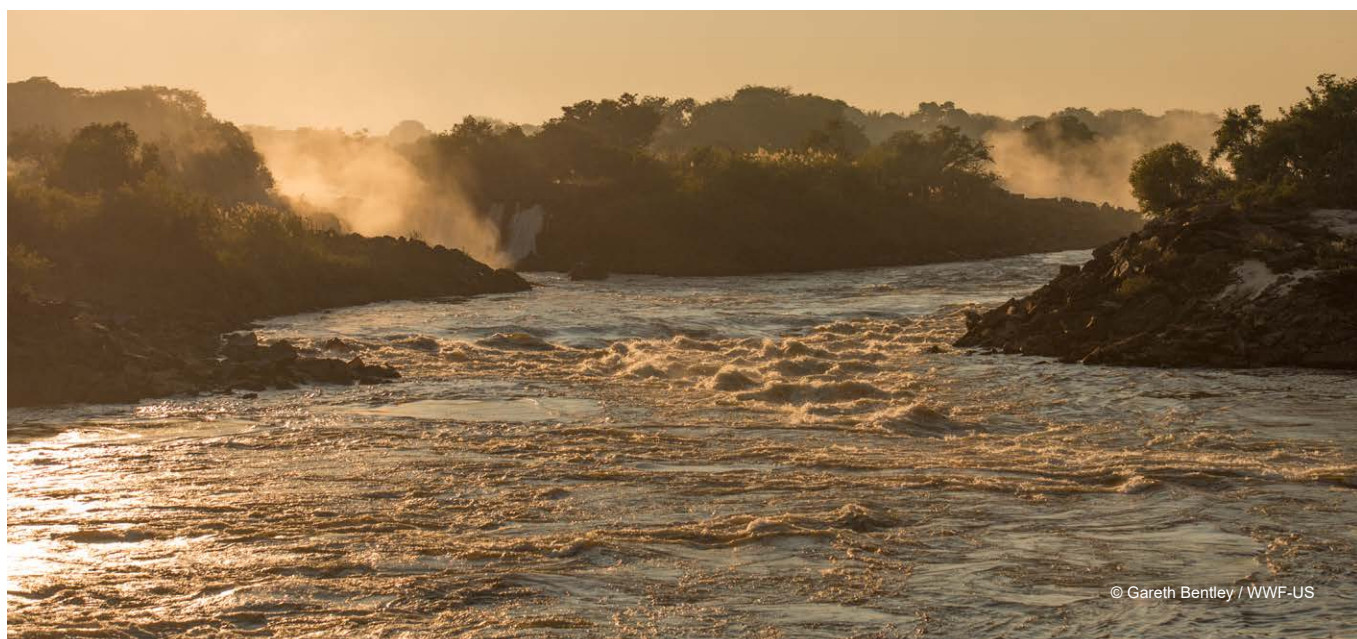


Figure 39. Economic income potential and growth pathway for the KAZA.



© Gareth Bentley / WWF-US



8.3. SOCIAL

Social dynamics are central to the long-term sustainability of the KAZA TFCA and strongly influence the region's ability to implement inclusive green growth pathways. The region's population is predominantly rural, with many communities dependent on agriculture, livestock, fisheries, natural resource use, tourism, and informal economic activities for livelihoods and food security. The KAZA region continues to face significant socio-economic challenges, including widespread rural poverty, unequal access to infrastructure and services, limited employment opportunities, and high levels of vulnerability to climate and environmental change.

At the same time, population growth, settlement expansion, and urbanisation are increasing pressure on land, water systems, forests, and wildlife habitats across the landscape. In many areas, competition for natural resources is contributing to human–wildlife conflict, land degradation and growing pressure on ecosystem services. Human–wildlife conflict remains a particularly important challenge within KAZA, especially in areas where agricultural expansion and settlement growth overlap with wildlife corridors and protected areas. These conflicts can undermine local support for conservation initiatives where communities experience crop losses, livestock predation, or restricted access to land and resources.

At the same time, the region's biodiversity, cultural heritage, and conservation landscapes create important opportunities for community-based tourism, sustainable natural resource management, local enterprise development, and diversified livelihoods. Community-Based Natural Resource Management (CBNRM) systems have demonstrated the potential to strengthen local participation in conservation and improve livelihood opportunities, although effectiveness varies considerably across countries and landscapes.

In the tourism sector, the influx of wealthy tourists can sometimes disrupt local cultural values and social structures, necessitating careful management and community engagement to mitigate such impacts. However, preserving local culture is crucial to maintaining the region's rich heritage, which commercialization can threaten.

A further social challenge relates to unequal distribution of economic benefits. Tourism, mining, and infrastructure projects may generate substantial revenue, but local communities do not always receive equitable benefits through employment, revenue sharing, or access to services. Youth unemployment, limited technical skills, and restricted access to finance further constrain opportunities for inclusive economic participation, particularly in rural areas.

Strengthening social inclusion within green growth pathways will therefore require:

- improved service delivery, such as water supply, sanitation and energy,
- stronger community participation,
- equitable benefit-sharing systems,
- investment in education and skills development,
- and support for community-led enterprises and sustainable livelihoods.

Maintaining cultural heritage and social cohesion while supporting economic transformation will also be critical to ensuring long-term sustainability across the KAZA landscape.

8.4. TECHNOLOGICAL

Technology and innovation represent important enabling conditions for sustainable development and green growth across the KAZA TFCA. Advances in digital systems, renewable energy technologies, environmental monitoring, climate information systems, and communication infrastructure have the potential to improve resource management, strengthen connectivity, and enhance resilience across multiple sectors. Technological innovations are increasingly supporting wildlife monitoring and anti-poaching systems, climate and hydrological monitoring, precision farming, water management, renewable energy deployment, tourism marketing and spatial planning.

Technologies such as Geographic Information Systems (GIS), remote sensing, drones, and data analytics can significantly improve the management of wildlife corridors, water systems, land-use planning, and environmental monitoring across transboundary landscapes. Similarly, digital tourism platforms, online booking systems, and virtual marketing tools are improving the visibility and accessibility of KAZA's tourism destinations. Renewable energy technologies—particularly solar energy systems—also present major opportunities for improving rural electrification, reducing dependence on biomass energy, and supporting climate-resilient local economies.

At the same time, unequal access to technology, limited digital infrastructure, and insufficient technical capacity remain major constraints across much of the region. Many rural communities continue to experience limited internet connectivity, unreliable electricity access, and inadequate access to technological services and training.

Strengthening technological capacity across the KAZA region will therefore require:

- investment in digital infrastructure,
- expanded access to renewable energy,
- improved technical training,
- regional knowledge-sharing systems,
- and stronger partnerships between governments, research institutions, and the private sector.

Technology should therefore be viewed not only as a development tool, but also as a strategic enabler of integrated green growth pathways across the KAZA landscape.



© Jasper Doest / WWF

8.5. LEGAL

The legal and institutional framework underpinning the KAZA TFCA provides an important foundation for transboundary conservation, regional cooperation, and sustainable development. A range of international conventions, regional agreements, and national legal frameworks shape environmental governance, wildlife management, water resource management, land-use planning, and economic development across the region.

At the regional level, the SADC Protocol on Wildlife Conservation and Law Enforcement (1999) and the SADC Wildlife Policy and Development Strategy (1997) provide important frameworks for cooperation on conservation and natural resource management. Additional international agreements relevant to KAZA include the Convention on Biological Diversity (CBD), the Ramsar Convention on Wetlands, CITES, the Convention on Migratory Species (CMS), the United Nations Framework Convention on Climate Change (UNFCCC) and the United Nations Convention to Combat Desertification (UNCCD). Transboundary water governance is further supported through institutions such as the Permanent Okavango River Basin Water Commission (OKACOM), and the Zambezi Watercourse Commission (ZAMCOM). These frameworks collectively support regional cooperation on biodiversity conservation, water management, tourism development, and environmental protection. An overview of relevant legal frameworks is presented in Table 2.

However, despite the existence of relatively strong legal and institutional frameworks, significant implementation challenges remain. Variations in national legislation, differing enforcement capacity, inconsistent environmental standards, and weak cross-sectoral coordination can undermine effective transboundary management and sustainable resource governance.

Differences in land tenure systems, environmental impact assessment procedures, mining regulations, tourism and agricultural policies and natural resource management frameworks may also create barriers to coordinated planning and policy harmonisation. Illegal wildlife trade, illegal logging, unregulated mining, and encroachment into protected areas continue to highlight weaknesses in enforcement systems across parts of the region.

At the same time, opportunities exist to strengthen legal harmonisation and improve regional governance systems through:

- enhanced policy harmonization and coordination,
- improved enforcement mechanisms,
- stronger transboundary agreements,
- and more integrated approaches to land-use planning and environmental management.

Strengthening legal alignment across sectors and countries will therefore be essential to supporting the long-term sustainability and resilience of the KAZA TFCA.



Table 2. Overview of fundamental conventions and policy frameworks relevant to the KAZA region¹⁴

LAWS/POLICIES	SECTOR OF IMPACT	COUNTRIES INVOLVED
SADC PROTOCOL ON WILDLIFE CONSERVATION AND LAW ENFORCEMENT (1999)	Wildlife Conservation, Tourism	Angola, Botswana, Namibia, Zambia, Zimbabwe
SADC WILDLIFE POLICY AND DEVELOPMENT STRATEGY (1997)	Wildlife Conservation, Tourism	Angola, Botswana, Namibia, Zambia, Zimbabwe
REVISED AFRICAN CONVENTION ON THE CONSERVATION OF NATURE AND NATURAL RESOURCES (2013)	Biodiversity, Agriculture	African Union Member States
UNESCO MAN AND THE BIOSPHERE PROGRAMME (1971)	Biodiversity, Tourism	International (UNESCO Member States)
CONVENTION ON WETLANDS (RAMSAR CONVENTION) (1971)	Water Resource Management	International (Ramsar Member States)
WORLD HERITAGE CONVENTION (1972).	Conservation, Tourism	International (UNESCO Member States)
CITES (CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES OF WILD FAUNA AND FLORA) (1973)	Wildlife Conservation	International (CITES Member States)
CONVENTION ON MIGRATORY SPECIES (1979)	Wildlife Conservation	International (CMS Member States)
CONVENTION ON BIOLOGICAL DIVERSITY (1992)	Biodiversity, Agriculture	International (CBD Member States)
UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (1992)	Climate Change, Environment	International (UNFCCC Member States)
UNITED NATIONS CONVENTION TO COMBAT DESERTIFICATION (1994)	Land Use, Agriculture	International (UNCCD Member States)
SOUTHERN AFRICAN ROCK ART PROJECT (SARAP)	Cultural Heritage	Angola, Botswana, Namibia, Zambia, Zimbabwe
PERMANENT OKAVANGO RIVER BASIN COMMISSION (OKACOM)	Water Resource Management	Angola, Botswana, Namibia
ZAMBEZI WATERCOURSE COMMISSION (ZAMCOM)	Water Resource Management	Angola, Botswana, Namibia, Zambia, Zimbabwe

¹⁴ [https://www.fao.org/faolex/results/en/?query=country:\(BWA\)%20AND%20typeoftext:\(A%20NOT%20P\)](https://www.fao.org/faolex/results/en/?query=country:(BWA)%20AND%20typeoftext:(A%20NOT%20P))

8.6. ENVIRONMENTAL

The ecological integrity of the KAZA landscape underpins the region's tourism economy, water systems, agricultural productivity, climate resilience, and globally significant biodiversity. Environmental sustainability is therefore not only a conservation objective, but also a fundamental economic and development imperative for the region. KAZA contains some of the most significant transboundary ecosystems in Southern Africa, including the Okavango Delta, the Zambezi River system, extensive savanna and woodland ecosystems, major wildlife corridors and globally important elephant populations.

However, these ecosystems are increasingly under pressure from deforestation, agricultural expansion, mining and infrastructure development, settlement growth, pollution, unsustainable resource use, poaching and climate change. In particular, habitat fragmentation and disruption of wildlife corridors are becoming increasingly important concerns as transport corridors, settlements, and agricultural expansion continue to reshape the landscape.

In addition, water systems are facing growing pressure from increasing abstraction, pollution, watershed degradation and climate variability. Competing demands between agriculture, tourism, hydropower generation, mining, and settlements are intensifying pressure on freshwater resources and ecological systems. Climate change is expected to further increase drought frequency, rainfall variability, water stress and ecosystem vulnerability across the region.

Despite these pressures, the KAZA TFCA also presents major opportunities for integrated landscape management, ecosystem restoration, sustainable tourism, climate adaptation, and conservation-based economic development. The transboundary nature of the landscape creates opportunities for:

- coordinated biodiversity conservation,
- integrated water resource management,
- shared climate adaptation strategies,
- and collaborative environmental governance.

Strengthening ecosystem resilience and maintaining ecological connectivity will therefore be fundamental to supporting both conservation objectives and long-term economic sustainability across the KAZA region.

8.7. CONCLUSIONS AND RECOMMENDATIONS

KEY CONCLUSIONS

The PESTLE analysis demonstrates that achieving green growth within the KAZA TFCA will depend not only on sector-specific interventions, but also on the broader enabling environment that shapes governance systems, investment conditions, institutional capacity, infrastructure development, social inclusion, and environmental sustainability.

The analysis highlights the strong interdependence between sectors and the importance of integrated approaches to land-use planning, infrastructure development, water governance, conservation, and economic development. Expanding agriculture, mining, infrastructure, tourism, and settlement growth are increasingly competing for access to land, water, and ecosystem resources, creating cumulative pressures across the KAZA landscape.

At the same time, the region possesses globally significant ecological assets and substantial opportunities for sustainable and inclusive economic development through sustainable tourism, climate-smart agriculture, renewable energy, sustainable forest product value chains, ecosystem restoration and community-based natural resource management. Realising these opportunities will require:

- stronger regional cooperation,
- improved policy harmonisation,
- enhanced institutional capacity,
- increased investment in sustainable infrastructure and technology,
- stronger community participation,
- and more integrated transboundary governance systems.

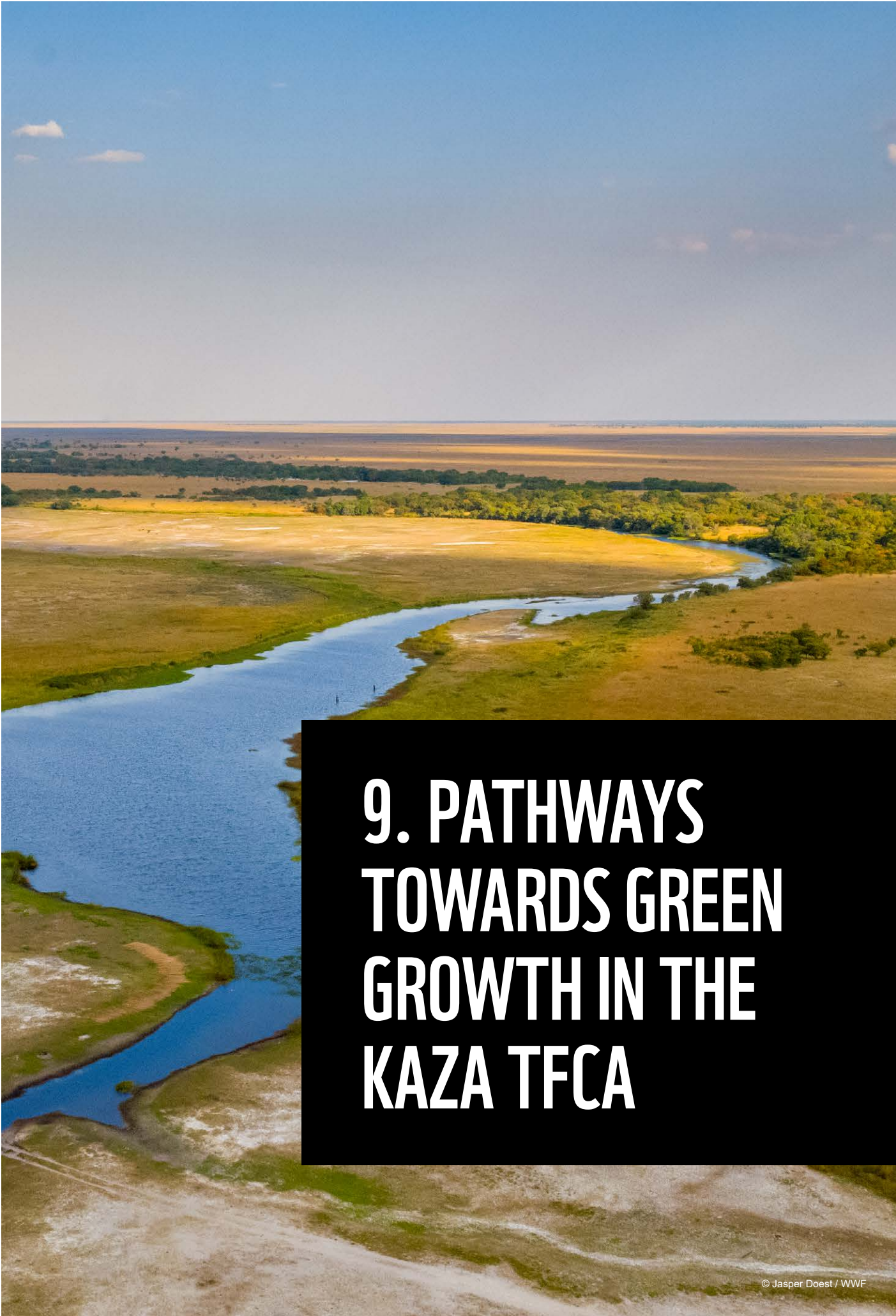
The PESTLE analysis therefore reinforces the importance of adopting coordinated green growth pathways that balance economic development objectives with biodiversity conservation, climate resilience, and social inclusion across the KAZA TFCA.

KEY RECOMMENDATIONS

A number of key recommendations may be derived from this analysis:

- 1 Strengthen regional coordination and policy harmonization:** Enhance cooperation across KAZA member states to improve alignment of policies related to land-use planning, infrastructure development, water governance, conservation, tourism, and natural resource management.
- 2 Promote integrated spatial planning approaches:** Strengthen integrated land-use planning systems that balance economic development objectives with biodiversity conservation, ecological connectivity, and climate resilience.
- 3 Strengthen transboundary governance institutions:** Support the institutional capacity of regional mechanisms such as the KAZA Secretariat, OKACOM, and ZAMCOM to improve coordination, monitoring, and implementation of regional initiatives.

- 4 Improve environmental governance and enforcement:** Strengthen environmental impact assessment systems, monitoring mechanisms, and enforcement capacity to address illegal resource extraction, land degradation, pollution, and encroachment into protected areas.
- 5 Expand sustainable financing mechanisms:** Mobilise investment for green growth initiatives through mechanisms such as the KAZA Fund, climate finance, biodiversity finance, and public-private partnerships.
- 6 Strengthen community participation and benefit-sharing:** Improve inclusion of local communities in planning, decision-making, and benefit-sharing systems related to tourism, conservation, infrastructure, and natural resource management.
- 7 Invest in climate resilience and adaptation:** Strengthen climate adaptation strategies across sectors, including water management, agriculture, infrastructure planning, ecosystem restoration, and disaster preparedness.
- 8 Improve regional infrastructure and connectivity:** Promote sustainable infrastructure systems that support regional integration, trade, tourism, and service delivery while minimising ecological impacts.
- 9 Expand access to technology and innovation:** Support digital infrastructure, renewable energy systems, environmental monitoring technologies, and regional knowledge-sharing platforms to strengthen green growth implementation.
- 10 Strengthen data systems, monitoring, and research:** Improve regional data collection, environmental monitoring, and cross-sector information systems to support evidence-based planning and adaptive management. Promote regional knowledge-sharing platforms and the replication of best practices across sectors and member states to strengthen green growth implementation and institutional learning.

An aerial photograph showing a wide, winding river with blue water flowing through a vast, flat landscape. The land is a mix of green grass and dry, yellowish-brown patches. In the distance, a line of trees separates the foreground from a flat horizon under a clear blue sky with a few wispy clouds.

9. PATHWAYS TOWARDS GREEN GROWTH IN THE KAZA TFCA

© Jasper Doest / WWF



© James Morgan / WWF-US

9.1. INTRODUCTION

The preceding chapters highlighted the complex interactions between economic development, environmental sustainability, infrastructure expansion, social dynamics, and governance systems across the KAZA TFCA. Together, these analyses demonstrate that achieving green growth within KAZA will require not only sector-specific interventions, but also more integrated and coordinated approaches that recognise the interdependence between ecosystems, livelihoods, infrastructure systems, regional cooperation, and economic development.

The KAZA landscape contains globally significant biodiversity and ecological systems that underpin tourism, agriculture, water security, fisheries, climate resilience, and local livelihoods. At the same time, the region faces increasing pressure from climate change, population growth, infrastructure expansion, land-use change, resource extraction, and growing competition for land and water resources.

Many of the region's most significant opportunities and risks emerge through interactions between sectors, ecosystems, and governance systems. Agricultural expansion affects wildlife corridors and tourism systems; infrastructure development influences ecological connectivity and settlement patterns; watershed degradation affects agriculture, fisheries, hydropower generation, and biodiversity; and climate change acts as a cross-cutting pressure affecting nearly all sectors simultaneously.

While sector-specific interventions remain essential, the pathways presented in this chapter seek to complement sectoral strategies through more integrated approaches that strengthen synergies across sectors, improve resilience, and support coordinated landscape-scale development.

Building on the sectoral and PESTLE analyses, the chapter outlines five integrated pathways towards green growth in the KAZA TFCA:

1. Strengthening the Nature-Based Economy
2. Sustainable Land and Water Management
3. Green Infrastructure and Regional Connectivity
4. Inclusive Livelihoods and Community Empowerment
5. Regional Cooperation, Policy Harmonisation, and Knowledge Systems

Together, these pathways provide a strategic framework for aligning conservation objectives with sustainable economic development across the KAZA landscape.

9.2. SYSTEMS INTERACTIONS AND STRATEGIC TRADE-OFFS

Green growth within the KAZA TFCA requires balancing multiple and sometimes competing objectives related to economic growth, conservation, infrastructure development, livelihoods, water use, and land management. Understanding these interactions and trade-offs is therefore central to developing effective and realistic green growth strategies.

One of the most significant trade-offs relates to land use and ecological connectivity. Expansion of agriculture, settlements, mining, and transport infrastructure can support economic growth, improve market access, and strengthen livelihoods, but may also contribute to habitat fragmentation, disruption of wildlife corridors, deforestation, and increased human–wildlife conflict. Maintaining ecological connectivity is particularly important within KAZA given the transboundary movement of wildlife populations, especially elephants and large carnivores. Integrated spatial planning and wildlife-compatible land-use systems will therefore be essential to balancing development and conservation objectives.

Water allocation and resource competition present another critical challenge. Water systems within KAZA simultaneously support agriculture, tourism, fisheries, hydropower generation, settlements, and ecosystem functioning. Growing demand from irrigation, hydropower, mining, tourism, and urbanisation is increasing competition for water resources and may affect downstream ecosystems and communities. Balancing water allocation between economic sectors and ecological needs will therefore require strengthened Integrated Water Resource Management (IWRM), improved efficiency, and stronger transboundary cooperation.

The relationship between economic growth and environmental sustainability also presents important strategic considerations. Sectors such as tourism, mining, infrastructure, and agriculture generate significant economic opportunities, employment, and public revenue. However, without effective safeguards and planning systems, these activities may also increase environmental degradation and climate vulnerability. The challenge is therefore not whether development should occur, but how development can be structured in ways that maintain ecosystem services, strengthen resilience, support equitable benefit sharing, and reduce long-term environmental costs.

Social inclusion and conservation objectives are similarly interconnected. Conservation initiatives can generate substantial economic and ecological benefits, but may also create tensions where local communities experience limited access to resources, insufficient benefit sharing, or increasing human–wildlife conflict. At the same time, community-based conservation systems and nature-based enterprises can provide important opportunities for livelihoods, local empowerment, and conservation incentives. Strengthening social inclusion and equitable participation will therefore be essential to ensuring long-term support for green growth pathways.

These interactions highlight the importance of integrated and adaptive approaches that manage trade-offs while maximising synergies across sectors, landscapes, and governance systems.



© Patrick Bentley / WWF-US

9.3. **PATHWAY 1: STRENGTHENING THE NATURE-BASED ECONOMY**

STRATEGIC RATIONALE

The KAZA TFCA possesses globally significant biodiversity, wildlife populations, wetlands, forests, and landscapes that form the foundation of a substantial nature-based economy. Tourism, sustainable wildlife management, fisheries, forest products, and ecosystem services already contribute significantly to livelihoods, government revenues, and regional economic activity.

At the same time, many of these sectors remain vulnerable to climate change, environmental degradation, limited infrastructure, and uneven local benefit sharing. Strengthening the nature-based economy therefore provides opportunities not only to diversify livelihoods and stimulate economic growth, but also to strengthen conservation incentives, improve ecosystem resilience, and support long-term sustainability across the landscape.

STRATEGIC PRIORITIES

Strategic priorities under this pathway include strengthening sustainable tourism systems and regional tourism circuits; promoting diversified tourism products and local value addition; supporting sustainable forest product value chains; strengthening wildlife-based economies and conservation finance mechanisms; and expanding ecosystem restoration initiatives that generate both ecological and socio-economic benefits.



© Patrick Bentley / WWF-US

STRATEGIC INTERVENTIONS

Achieving this pathway will require targeted investment in tourism infrastructure, destination marketing, and regional tourism coordination. Improved benefit-sharing systems and stronger community participation in tourism and natural resource management will be important to ensure more inclusive economic outcomes.

Strengthening conservation financing mechanisms, including biodiversity finance, ecosystem service payments, and conservation trust funds, will also be critical to supporting long-term sustainability. In parallel, support will be needed for small-scale enterprises, local processing industries, and market access for sustainable forest products, community-based tourism initiatives and other forms of 'bankable' nature-based ventures.

Regional coordination on tourism standards, wildlife management, and conservation planning will further strengthen the resilience and competitiveness of the nature-based economy.

WHAT SUCCESS WOULD LOOK LIKE

Success under this pathway would include a more diversified and resilient nature-based economy characterised by stronger regional tourism circuits, increased local value addition, improved community revenues, and stronger incentives for conservation across the landscape.

Tourism growth would increasingly support local employment and regional economic integration, while sustainable forest product value chains, ecosystem restoration initiatives and other nature-based solutions would contribute to both livelihoods and biodiversity conservation. Improved ecological integrity and stronger conservation financing systems would support the long-term sustainability of wildlife populations, wetlands, forests, and protected areas that underpin the KAZA economy.

9.4. PATHWAY 2: SUSTAINABLE LAND AND WATER MANAGEMENT

STRATEGIC RATIONALE

Agriculture, settlements, tourism, fisheries, and energy systems all depend on functioning ecosystems and sustainable water resources. However, agricultural expansion, watershed degradation, deforestation, unsustainable land management practices, and climate variability are increasing pressure on land and water systems across the KAZA landscape.

Sustainable land and water management is therefore central to food security, biodiversity conservation, climate resilience, and long-term economic sustainability. Integrated management of ecosystems, watersheds, agricultural systems, and wildlife landscapes will be essential to reducing environmental degradation while supporting livelihoods and economic development.

STRATEGIC PRIORITIES

Strategic priorities include promoting climate-smart agriculture and agroecological approaches; improving water-use efficiency and sustainable irrigation systems; protecting and restoring watersheds, wetlands, and riparian systems; reducing land degradation and deforestation; strengthening integrated land-use planning; and improving human–wildlife coexistence systems.

STRATEGIC INTERVENTIONS

Implementation will require strengthened agricultural extension services, technical support, and investment in climate-resilient farming systems. Improved transboundary water governance and stronger Integrated Water Resource Management (IWRM) systems will be essential to balancing competing water demands and maintaining ecological flows (see also Pathway 5).

Investment in watershed restoration, wetland protection, sustainable livestock systems, and ecosystem rehabilitation will also be required to strengthen ecosystem resilience and reduce land degradation. In parallel, improved land-use planning systems and monitoring frameworks will be needed to support more coordinated management of agricultural expansion, settlements, infrastructure development, and wildlife corridors.

WHAT SUCCESS WOULD LOOK LIKE

Success under this pathway would include more resilient agricultural systems, improved water security, reduced land degradation, and healthier ecosystems across the KAZA landscape.

Climate-smart agriculture and improved land management practices would support food security and rural livelihoods while reducing pressure on forests and wildlife habitats. Improved watershed protection and water governance would strengthen hydrological resilience, fisheries, tourism systems, and biodiversity conservation. Human–wildlife conflict would be reduced through more compatible land-use systems and improved coexistence approaches.



© Jasper Doest / WWF

9.5. **PATHWAY 3: GREEN INFRASTRUCTURE AND REGIONAL CONNECTIVITY**



STRATEGIC RATIONALE

Infrastructure development is essential for improving regional integration, trade, tourism, service delivery, and economic diversification across the KAZA TFCA. At the same time, poorly planned infrastructure can contribute to habitat fragmentation, environmental degradation, settlement expansion into ecologically sensitive areas, and increased climate vulnerability.

A green infrastructure pathway therefore seeks to promote infrastructure systems that are environmentally sustainable, climate resilient, socially inclusive, and supportive of ecological connectivity.

STRATEGIC PRIORITIES

Strategic priorities include developing climate-resilient transport systems and regional trade corridors; expanding renewable energy infrastructure; improving digital connectivity; strengthening ecological considerations in corridor planning; improving rural access to infrastructure services; and promoting sustainable urban and settlement planning approaches.

STRATEGIC INTERVENTIONS

Implementation will require integrated spatial planning systems that align infrastructure development with conservation priorities and ecological connectivity objectives. Strategic Environmental Assessments (SEAs) and strengthened environmental safeguards will be important to reducing the ecological impacts of infrastructure expansion.

Investment in renewable energy systems, digital infrastructure, climate-resilient transport systems, and sustainable settlement planning will also be essential. Public-private partnerships and improved regional infrastructure coordination mechanisms could support financing and implementation of strategic infrastructure investments.

WHAT SUCCESS WOULD LOOK LIKE

Success under this pathway would include improved regional connectivity, stronger trade integration, expanded access to energy and services, and more climate-resilient infrastructure systems across the region.

Infrastructure development would increasingly support tourism, agriculture, trade, and local livelihoods while minimising impacts on wildlife corridors, watersheds, and biodiversity. Renewable energy systems and improved digital connectivity would strengthen resilience, support local economic development, and reduce dependence on environmentally harmful energy sources.

9.6. **PATHWAY 4: INCLUSIVE LIVELIHOODS AND COMMUNITY EMPOWERMENT**



STRATEGIC INTERVENTIONS

Implementation will require stronger local institutional capacity, improved technical training, and expanded support for community-led enterprises linked to tourism, agriculture, natural resource management, and restoration activities.

Investment in healthcare, education, water supply, digital connectivity, and social infrastructure will also be important to improving resilience and economic participation in rural areas. Strengthening land rights and improving community participation in land-use planning and natural resource governance will further support more inclusive and sustainable development outcomes.

Access to finance, markets, and business development support will also be critical for strengthening local entrepreneurship and livelihood diversification.

STRATEGIC RATIONALE

Long-term sustainability within the KAZA TFCA depends on ensuring that communities benefit meaningfully from conservation and green growth initiatives. Poverty, unequal access to services, limited employment opportunities, insecure land tenure, and vulnerability to climate change continue to constrain socio-economic development across much of the region.

Strengthening inclusive livelihoods and community empowerment is therefore essential to reducing vulnerability, improving social inclusion, strengthening local support for conservation, and supporting more equitable development outcomes across the KAZA landscape.

STRATEGIC PRIORITIES

Strategic priorities include strengthening Community-Based Natural Resource Management (CBNRM) systems; improving benefit-sharing mechanisms; supporting youth employment and skills development; promoting local enterprise development; strengthening land tenure security; improving access to finance and markets; and expanding access to social infrastructure and services.

WHAT SUCCESS WOULD LOOK LIKE

Success under this pathway would include stronger community participation in conservation and development initiatives, improved rural livelihoods, greater economic inclusion, and reduced vulnerability across the KAZA landscape.

Communities would derive greater and more equitable benefits from tourism, natural resource management, restoration initiatives, and other green economy activities. Improved service delivery, expanded employment opportunities, and stronger local enterprises would contribute to improved well-being and resilience, while strengthened CBNRM systems and land tenure arrangements would support strong stewardship of natural resources and ecosystems.

9.7. **PATHWAY 5: REGIONAL COOPERATION, POLICY HARMONISATION, AND KNOWLEDGE SYSTEMS**

STRATEGIC RATIONALE

The transboundary nature of the KAZA TFCA requires coordinated governance systems, harmonised policies, and strong regional cooperation mechanisms. Many of the region's key challenges, including wildlife management, water governance, infrastructure planning, tourism development, climate adaptation, and land-use management, cannot be addressed effectively through isolated national approaches.

Strengthening regional cooperation and knowledge systems is therefore fundamental to implementing integrated green growth pathways across KAZA.

STRATEGIC PRIORITIES

Strategic priorities include strengthening transboundary governance mechanisms; harmonising policies and environmental standards; improving regional data systems and monitoring frameworks; promoting regional research and innovation; strengthening knowledge-sharing platforms; supporting best practice exchange across sectors and countries; and improving regional financing mechanisms.



STRATEGIC INTERVENTIONS

Implementation will require stronger institutional capacity within regional coordination structures, including the KAZA Secretariat and associated transboundary governance institutions. Improved policy coordination and harmonisation across sectors and member states will also be necessary to support more integrated planning and implementation.

Investment in regional monitoring systems, research partnerships, data-sharing platforms, and knowledge management systems will strengthen evidence-based decision-making and adaptive management. At the same time, sustainable financing mechanisms and long-term political commitment will be essential to maintaining momentum and supporting implementation across the region.

WHAT SUCCESS WOULD LOOK LIKE

Success under this pathway would include stronger regional coordination, improved policy alignment, enhanced transboundary governance systems, and more effective implementation of integrated green growth initiatives across KAZA.

Regional institutions would play a stronger coordinating role in areas such as conservation, tourism, water governance, infrastructure planning, and environmental management. Improved monitoring systems, stronger research partnerships, and expanded knowledge-sharing platforms would support adaptive management and replication of successful approaches across sectors and countries.



9.8. SECTORAL CONTRIBUTIONS TO THE GREEN GROWTH PATHWAYS

The five pathways outlined above are closely interconnected and collectively support transformation across all major sectors within the KAZA TFCA. While each pathway has a particular strategic focus, successful implementation will depend on coordinated action across sectors and governance systems.

Table 3 illustrates the primary interfaces between the pathways and the sectoral analyses presented in this report. Together, these pathways provide a framework for aligning sectoral development priorities with broader regional objectives related to sustainability, resilience, biodiversity conservation, and inclusive economic development.

Table 3. Overview of interfaces between the strategic pathways and sectoral analyses

PATHWAY 1: NATURE-BASED ECONOMY	PATHWAY 2: LAND & WATER MANAGEMENT	PATHWAY 3: GREEN INFRASTRUCTURE & CONNECTIVITY	PATHWAY 4: INCLUSIVE LIVELIHOODS & COMMUNITY EMPOWERMENT	PATHWAY 5: REGIONAL COOPERATION & KNOWLEDGE SYSTEMS
TOURISM				
Diversified tourism products, conservation finance, ecosystem restoration	Ecosystem protection, watershed management, landscape resilience	Regional connectivity, sustainable tourism infrastructure	Community tourism, local employment, benefit sharing	Regional tourism coordination, harmonised standards
AGRICULTURE				
Sustainable value chains, agroforestry, ecosystem services	Climate-smart agriculture, sustainable irrigation, land restoration	Rural infrastructure, renewable energy, market access	Livelihood diversification, extension support, local enterprises	Regional agricultural cooperation, knowledge exchange
EXTRACTIVE INDUSTRIES				
Sustainable forest product value chains, restoration initiatives	Reduced land degradation, improved water management	Environmental safeguards, regional corridor planning	Community participation, local benefit sharing	Harmonised standards, regional monitoring systems
INFRASTRUCTURE				
Tourism access, conservation-compatible infrastructure	Watershed protection, climate resilience	Renewable energy, transport systems, digital connectivity	Improved service delivery, rural access	Regional infrastructure coordination, planning systems
SETTLEMENTS				
Nature-based enterprises, sustainable local economies	Sustainable land-use planning, water security	Climate-resilient settlements, social infrastructure	Social inclusion, land tenure security, local governance	Cross-border planning coordination, data systems
WATER RESOURCES				
Wetland conservation, ecosystem services	IWRM, watershed restoration, ecological flows	Water infrastructure, climate resilience	Community water access, local resilience	Transboundary water governance, regional monitoring

9.9. CROSS-CUTTING ENABLING CONDITIONS

Successful implementation of the green growth pathways will depend on several cross-cutting enabling conditions that support coordination, investment, institutional effectiveness, and long-term sustainability across the KAZA landscape.

INTEGRATED SPATIAL PLANNING

Integrated spatial planning systems are required to align infrastructure development, agriculture, settlements, tourism, and conservation objectives while maintaining ecological connectivity and reducing land-use conflicts across the region.

STRONG REGIONAL GOVERNANCE AND POLICY HARMONISATION

Improved coordination and policy alignment across KAZA member states will be essential to supporting transboundary conservation, water governance, infrastructure planning, tourism development, and sustainable natural resource management.

SUSTAINABLE FINANCING MECHANISMS

Long-term implementation will require diversified financing mechanisms, including public investment, climate finance, carbon and biodiversity finance, conservation trust funds, public-private partnerships, and blended finance approaches.

INVESTMENT IN INFRASTRUCTURE AND TECHNOLOGY

Strategic investment in renewable energy, transport systems, digital infrastructure, environmental monitoring systems, and climate-resilient technologies will support economic diversification, resilience, and regional integration.

STRENGTHENED INSTITUTIONAL CAPACITY

Effective implementation will depend on strong institutions at regional, national, and local levels, supported by technical capacity development, training, and improved coordination mechanisms.

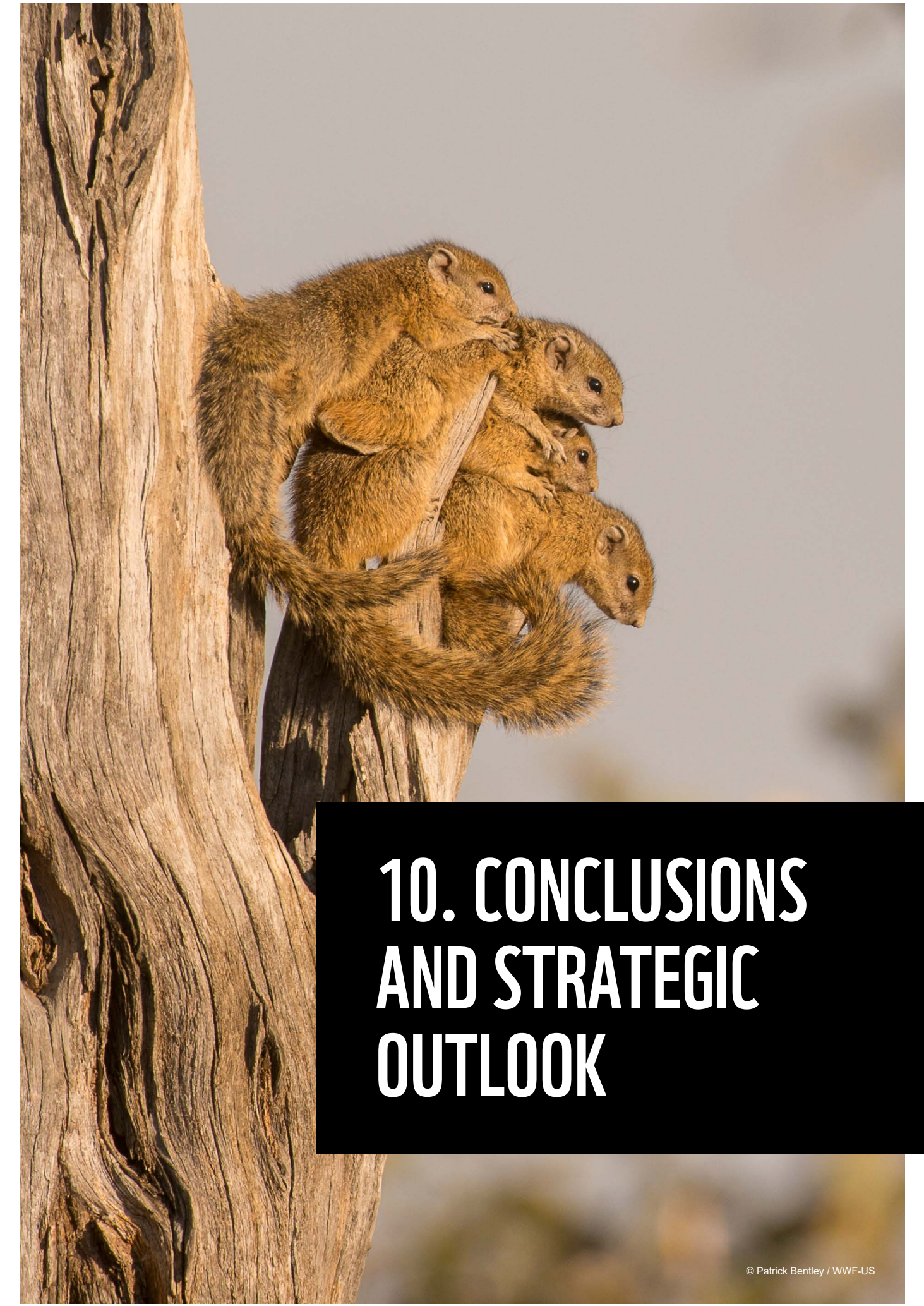
MONITORING, RESEARCH, AND KNOWLEDGE SYSTEMS

Improved environmental monitoring, socio-economic data systems, regional research partnerships, and knowledge-sharing platforms will strengthen evidence-based planning, adaptive management, and replication of best practices across sectors and countries.

INCLUSIVE STAKEHOLDER PARTICIPATION

Successful green growth pathways will require meaningful participation by communities, governments, the private sector, civil society, research institutions, and development partners in planning, implementation, and decision-making processes.





10. CONCLUSIONS AND STRATEGIC OUTLOOK

10.1. OVERALL CONCLUSIONS

The Kavango-Zambezi Transfrontier Conservation Area (KAZA TFCA) represents one of the most significant transboundary conservation and development landscapes in Africa. Spanning five countries and encompassing globally important ecosystems, river systems, wildlife populations, forests, wetlands, and cultural landscapes, KAZA holds substantial potential to support sustainable economic development, biodiversity conservation, climate resilience, and regional integration.

The analyses presented throughout this report demonstrate that the region's economies, livelihoods, and long-term development prospects remain fundamentally dependent on natural capital and ecological integrity. Tourism, agriculture, fisheries, forestry, water resources, wildlife economies, and many local livelihood systems all rely on the health and resilience of the broader landscape. At the same time, infrastructure development, settlements, extractive industries, and expanding regional trade corridors are increasingly shaping land-use dynamics and economic transformation across the region.

The report highlights that KAZA faces a complex set of interconnected opportunities and challenges. Climate change, population growth, infrastructure expansion, agricultural intensification, settlement growth, and increasing pressure on water and land resources are creating cumulative pressures on ecosystems, wildlife corridors, and ecological connectivity. These dynamics are further compounded by uneven institutional and financial capacity, infrastructure deficits, differing national development priorities, and persistent socio-economic inequalities across the region.

At the same time, the report demonstrates that KAZA possesses significant opportunities to pursue integrated green growth pathways that align conservation objectives with economic development and social inclusion. The region's globally significant biodiversity, transboundary water systems, renewable energy potential, nature-based tourism assets, and extensive experience with community-based natural resource management provide a strong foundation for more sustainable and resilient development pathways.

A central finding of the report is that achieving green growth within KAZA will require moving beyond fragmented sectoral approaches towards more integrated landscape-scale planning and governance systems. While sector-specific interventions remain essential, many of the region's key opportunities and risks emerge through interactions between sectors, ecosystems, infrastructure systems, and governance arrangements. Agricultural expansion affects wildlife corridors and water systems; infrastructure development shapes ecological connectivity and settlement patterns; watershed degradation affects tourism, fisheries, agriculture, and hydropower systems; and climate change acts as a cross-cutting pressure affecting nearly all sectors.

The report further demonstrates that long-term sustainability within KAZA will depend on:

- maintaining ecological connectivity and ecosystem integrity;
- strengthening climate resilience and sustainable resource management;
- improving regional coordination and policy harmonisation;
- expanding inclusive economic opportunities and community participation; and
- strengthening governance, financing, and knowledge systems across the region.

The five integrated pathways presented in this report — strengthening the nature-based economy; sustainable land and water management; green infrastructure and regional connectivity; inclusive livelihoods and community empowerment; and regional cooperation, policy harmonisation, and knowledge systems — provide a strategic framework for balancing conservation and development objectives across the KAZA landscape. Collectively, these pathways recognise that biodiversity conservation and economic development should not be viewed as competing objectives, but rather as mutually reinforcing components of long-term regional sustainability and resilience.

10.2. STRATEGIC IMPLICATIONS FOR GREEN GROWTH IN THE KAZA TFCA

The findings of this report carry several important strategic implications for the future development trajectory of the KAZA TFCA.

First, ecological integrity must increasingly be recognised as a foundational economic asset rather than solely a conservation concern. The long-term viability of tourism, agriculture, fisheries, water systems, and many rural livelihood systems depends directly on the maintenance of healthy ecosystems, functioning watersheds, wildlife corridors, and climate-resilient landscapes. Environmental degradation therefore represents not only an ecological risk, but also a growing economic and social risk for the region.

Second, regional integration and transboundary cooperation will become increasingly important as pressures on land, water, energy systems, and natural resources intensify. Many of the challenges identified throughout this report, including wildlife management, watershed protection, infrastructure planning, climate adaptation, and human–wildlife conflict, cannot be addressed effectively through isolated national approaches. Strengthening regional governance systems, policy harmonisation, and coordinated planning mechanisms will therefore be central to the long-term success of the KAZA initiative.

Third, infrastructure and development decisions made over the coming decades will play a defining role in shaping the future ecological and economic trajectory of the region. Transport corridors, hydropower systems, mining developments, settlements and agricultural expansion all present important economic opportunities, but may also create long-term environmental and social consequences if not carefully planned and managed. The report therefore highlights the importance of integrated spatial planning, Strategic Environmental Assessments (SEAs), and climate-resilient systems that balance economic development objectives with ecological sustainability.

Fourth, strengthening inclusive development and local participation will be essential to ensuring long-term support for conservation and green growth initiatives. Persistent poverty, unequal access to services, limited employment opportunities, and uneven benefit sharing continue to constrain resilience and socio-economic development across much of the region. Communities living within and around conservation landscapes will need to experience tangible and equitable benefits from tourism, natural resource management, restoration initiatives, and other green economy activities if conservation objectives are to remain socially and politically sustainable over the long term.

Fifth, climate change is likely to become an increasingly important driver of ecological, economic, and social transformation across the KAZA landscape. Increasing drought frequency, rainfall variability, water stress, ecosystem degradation, and climate-related disasters will affect agriculture, tourism, hydropower generation, infrastructure systems, and settlement stability. Strengthening climate adaptation, ecosystem restoration, and resilience-building measures will therefore need to become central components of future planning and investment strategies.

Finally, the report demonstrates that the KAZA TFCA possesses considerable potential to position itself as an internationally significant model for integrated conservation and green growth. The region's scale, biodiversity, transboundary governance structures, and combination of conservation and development objectives create unique opportunities for innovation, regional collaboration, and sustainable landscape management. Realising this potential, however, will require sustained political commitment, long-term investment, strengthened institutions, and continued collaboration between governments, communities, regional organisations, development partners, civil society, and the private sector.



© S Felton / WWF



© Jasper Doest / WWF

10.3. LOOKING AHEAD

The KAZA TFCA occupies a unique position as both a globally significant conservation landscape and a region with substantial development potential. The choices made over the coming decades regarding land use, infrastructure development, water management, energy systems, tourism, agriculture, and natural resource governance will play a defining role in shaping the future sustainability and resilience of the region.

The challenge facing KAZA is therefore not whether development should occur, but how development can be pursued in ways that maintain the ecological systems, biodiversity, and ecosystem services upon which long-term economic prosperity and human well-being ultimately depend. Achieving this balance will require a shift towards more integrated and adaptive approaches that recognise the interdependence between conservation, livelihoods, infrastructure systems, climate resilience, and economic development. It will also require moving beyond short-term sectoral priorities towards longer-term landscape-scale planning and regional cooperation frameworks that can accommodate both ecological and socio-economic change.

At the same time, the report demonstrates that the region possesses many of the assets required to support such a transition. KAZA's globally significant biodiversity, extensive transboundary ecosystems, regional cooperation mechanisms, and emerging experience with integrated natural resource management provide a strong foundation for future action.

By strengthening regional cooperation, investing in sustainable and inclusive development pathways, maintaining ecological connectivity, and supporting resilient local economies, KAZA has the potential to become an internationally significant example of how conservation and development objectives can be pursued in mutually reinforcing ways across a large transboundary landscape. In this regard, the KAZA TFCA should not only be viewed as a conservation initiative, but increasingly as a regional platform for sustainable development, resilience-building, and long-term green growth in Southern Africa.

REFERENCES

- 2030 Water Resources Group (2009). *Charting our water future: Economic frameworks to inform decision making*. McKinsey & Company. Munich, Germany.
- Addison-Wesley. Tschardtke, T., Clough, Y., Wanger, T. C., Jackson, L., Motzke, I., Perfecto, I., Vandermeer, J., & Whitbread, A. (2012). Global food security, biodiversity conservation and the future of agricultural intensification. *Biological Conservation*, 151(1), 53–59.
- African Development Bank Group (2022). *Annual report 2021*. Retrieved October 2024 from <https://www.afdb.org/en/documents/annual-report-2021>.
- African Development Bank. (2022). *Annual Report 2021*. African Development Bank - Building Today, a Better Africa Tomorrow.
- African Union (2021). *Green Recovery Action Plan 2021-2027*. African Union, Addis Ababa, Ethiopia.
- Ahmad, M. I., & Ma, H. (2020). Climate change and livelihood vulnerability in mixed crop–livestock areas: The case of Province Punjab, Pakistan. *Sustainability*, 12(2), 586.
- Allen, C. (2012). *A green economy knowledge-sharing platform: Exploring options*. UNCS Secretariat. In E. Barbier, A global green new deal: A guidebook to the green economy. Issue 1: Green economy, green growth, and low-carbon development – History, definitions, and a guide to recent publications. Division for Sustainable Development, UNDESA. Retrieved from Altieri, M. A. (1999). The ecological role of biodiversity in agroecosystems. *Agriculture, Ecosystems & Environment*, 74(1-3), 19–31.
- Altieri, M. A. (1999). The ecological role of biodiversity in agroecosystems. *Agriculture, Ecosystems & Environment*, 74(1-3), 19–31.
- Altieri, M. A. (2002). Agroecology: The science of natural resource management for poor farmers in marginal environments. *Agriculture, Ecosystems & Environment*, 93(1-3), 1–24.
- Altieri, M. A., & Toledo, V. M. (2011). The agroecological revolution in Latin America: Rescuing nature, ensuring food sovereignty and empowering peasants. *Journal of Peasant Studies*, 38(3), 587–612.
- Angelsen, A. (2010). Policies for reduced deforestation and their impact on agricultural production. *Proceedings of the National Academy of Sciences*, 107(46), 19639–19644.
- Arnold, M., Powell, B., Shanley, P., & Sunderland, T. C. H. (2011). EDITORIAL: Forests, biodiversity and food security. *The International Forestry Review*, 13(3), 259–264.
- Ashley, C., & Roe, D. (2002). Making tourism work for the poor: Strategies and challenges in southern Africa. *Taylor & Francis Journals*, 19(1), 61–82.
- Ashton, P., & Turton, A. (2009). Water and security in Sub-Saharan Africa: Emerging concepts and their implications for effective water resource management in the Southern African region. *South African Journal of Science*, 105(9-10), 314–318.
- Atlas of Namibia Team. (2022). *Atlas of Namibia: Its land, water and life* (pp. 323–349). Namibia Nature Foundation.
- Balian, E., Harrison, I., Butchart, S., Chambers, P., Cordeiro, J., Cumberlidge, N., de Moor, F., Gascon, C., James, H., Kalkman, V., van Dijk, P. P., & Yeo, D. (2010). Chapter 2. Diversity of species in freshwater systems. In R. A. Mittermeier, T. Farrell, I. J. Harrison, A. J. Uppgren, & T. Brooks (Eds.), *Freshwater – the essence of life* (pp. 50–89). Barbier, E. B. (2009, January 1). *A global green new deal*. Cambridge University Press and UNEP.
- Banda, A. M. (2023). *Land use change, its effects on ecosystem services and livelihoods in the wetland of Barotse Floodplain of Zambezi River Sub-basin*. Zambia University of Zambia.
- Barouki, R., Kogevinas, M., Audouze, K., Belesova, K., Bergman, A., Birnbaum, L., Boekhold, S., Denys, S., Desseille, C., Drakvik, E., Frumkin, H., Garric, J., Destoumieux-Garzon, D., Haines, A., Huss, A., Jensen, G., Karakitsios, S., Klanova, J., Koskela, I.-M., & Laden, F. (2021). The COVID-19 pandemic and global environmental change: Emerging research needs. *Environment International*, 146(106272), 106272.

- Belcher, B., Ruiz-Pérez, M., & Dufour, D. (2005). *Strategic Approaches to NTFP Commercialization. Non-Timber Forest Products in the Global Context*.
- Benayed, W., Awijen, H., Bousnina, R., & Chroufa, M. A. (2024). Infrastructure for sustainable energy access in Sub-Saharan Africa: Leveraging social factors and natural capital. *Journal of Cleaner Production*, 470.
- Biggs, D., Cooney, R., Roe, D., Dublin, H. T., Allan, J. R., Challender, D. W. S., & Skinner, D. (2016). Developing a theory of change for a community-based response to illegal wildlife trade. *Conservation Biology*, 31(1), 5–12.
- Bimenyimana, S., Asemota, G., & Niyonteze, J. D. (2019). Photovoltaic solar technologies: Solution to affordable, sustainable, and reliable energy access for all in Rwanda. *International Journal of Photoenergy*.
- Booth, S., Li, X., Baring-Gould, I., Kollanyi, D., Bharadwaj, A., & Weston, P. (2018). A product of the USAID-NREL partnership productive use of energy in African micro-grid: Technical and business considerations, USAID-NREL Partnership.
- Botswana Chamber of Mines (2023, December 18). Home – BCM, Botswana Chamber of Mines, Mining and Exploration. BCM, Botswana Chamber of Mines, Mining and Exploration.
- Buckley, R. (2011). Tourism and environment. *Annual Review of Environment and Resources*, 36(1), 397–416.
- Buckley, R. C. (2011). Tourism and environment. *Annual Review of Environment and Resources*, 36(1), 397–416. <https://doi.org/10.1146/annurev-environ-041210-132637>
- Bussi re, E.M.S. and Potgieter, D. (2023) *KAZA Elephant Survey 2022*, Volume I: Results and Technical Report, KAZA TFCA Secretariat, Kasane, Botswana.
- Caretta, M. A., Mukherji, A., Arfanuzzaman, M., Betts, R. A., Gelfan, A., Hirabayashi, Y., Lissner, T. K., Liu, J., Lopez Gunn, E., Morgan, R., Mwanga, S., & Supratid, S. (2022). Water. In H.-O. P rtner, D. C. Roberts, M. Tignor, E. S. Poloczanska, K. Mintenbeck, A. Alegria, M. Craig, S. Langsdorf, S. L schke, V. M ller, A. Okem, & B. Rama (Eds.), *Climate change 2022: Impacts, adaptation and vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 551–712). Cambridge University Press.
- Challinor, A. J., Watson, J., Lobell, D. B., Howden, S. M., Smith, D. R., & Chhetri, N. (2014). A meta-analysis of crop yield under climate change and adaptation. *Nature Climate Change*, 4(4), 287–291. <https://doi.org/10.1038/nclimate2153>
- Challinor, A., Watson, J., Lobell, D. et al. A meta-analysis of crop yield under climate change and adaptation. *Nature Clim Change* 4, 287–291 (2014). <https://doi.org/10.1038/nclimate2153>
- Chamber of Mines of Namibia (2025). *Annual Review 2024*.
- Chamber of Mines of Namibia. (2023). *Annual report 2023*. Chamber of Mines of Namibia.
- Chang, D., Bu, N., Zhang, N., & Xiao, H. (2024). Climate change and tourism demand: Risks for extreme heat? *Heliyon*, 10(17), e37186.
- Chidumayo, E. (2018). Long term impacts of crop cultivation and tree shading on *Piliostigma thonningii* (Schumacher) Milne-Redhead population, growth and biomass production after charcoal production in central Zambia. *Global Ecology and Conservation*, 13. Chidumayo, E. N. (1997). *Miombo ecology and management* (pp. 70–83). Intermediate Technology Publications.
- Chidumayo, E. N. (2013). Forest degradation and recovery in a miombo woodland landscape in Zambia: 22 years of observations on permanent sample plots. *Forest Ecology and Management*, 291, 269–294. <https://doi.org/10.1016/j.foreco.2012.11.031>
- Chidumayo, E. N. (2020). *Forest degradation and charcoal production in southern Africa*. Forest Ecology Journal, 14(2), 123–134.
- Chidumayo, E. N., & Gumbo, D. J. (2010). *The dry forests and woodlands of Africa* (pp. 19–21). Earthscan. https://www.cifor-icraf.org/publications/pdf_files/Books/BGumbo1001.pdf
- Chidumayo, E. N., & Gumbo, D. J. (2013). The environmental impacts of charcoal production in tropical ecosystems of the world: A synthesis. *Energy for Sustainable Development*, 17(2), 86–94. Research Gate. <https://doi.org/10.1016/j.esd.2012.07.004>
- Child, B. (2019). *Sustainable governance of wildlife and community-based natural resource management*.
- Chindengwike, J. D. (2023). Relationship between public expenditure and economic development in Sub-Saharan Africa countries: The VECM. *Journal of Global Economy*, 19(1), 47–69. <https://doi.org/10.1956/jge.v19i1.674>
- Chirisa, I., Mavhima, B., Nyevera, T., Chigudu, A., Makochekanwa, A., Matai, J., Masunda, T., Chandaengerwa, E. K., Machingura, F., Moyo, S., Chirisa, H., Mhloyi, M., Murwira, A., Mhandara, L., Katsande, R., Muchena, K., Manjeya, E., Nyika, T., & Mundau, L. (2021). The impact and implications of COVID-19: Reflections on the Zimbabwean society. *Social Sciences & Humanities Open*, 4(1), 1–7.

- Chirozva, C. (2019). Livelihoods and land use dynamics in Zimbabwe's KAZA region: A rural development perspective. *African Journal of Ecology*, 57(3), 415–428.
- CIRAD (2020). Adapting crop fertilization in Africa to the climate change context. CIRAD.
- CIRAD (2024). Working together for tomorrow's agriculture. CIRAD. CITES. (1973, March). *Convention on international trade in endangered species of wild fauna and flora*. Cites.org. <https://cites.org/eng/disc/text.php>
- CITES (1983). Text of the Convention. Retrieved October 2024, from <https://cites.org/eng/disc/text.php>.
- Clayton-Jones, K. (2024). Meeting in-person needs of elders living in rural communities by utilizing apps and internet access. *Innovation in Aging*, 8, 282–282.
- Coldrey, K., & Turpie, J. (2020). Climate Change Vulnerability and Adaptation Assessment for Protected Areas of the Kavango–Zambezi (KAZA) Landscape: Final Report. Anchor Environmental Consultants Report No: AEC 1910/2. Prepared for WWF-Madagascar.
- Cumming, D. H. M. (2008). *Large scale conservation planning and priorities for the Kavango-Zambezi Transfrontier Conservation Area* [Report prepared for Conservation International]. Curtis, P. G., Slay, C. M., Harris, N. L., Tyukavina, A., & Hansen, M. C. (2018). Classifying drivers of global forest loss. *Science*, 361(6407), 1108–1111.
- Curtis, P. G., Slay, C. M., Harris, N. L., Tyukavina, A., & Hansen, M. C. (2018). Classifying drivers of global forest loss. *Science*, 361(6407), 1108–1111. <https://doi.org/10.1126/science.aau3445>
- De Bruin, S. P., Schmeier, S., van Beek, R., & Gulpen, M. (2023). Projecting conflict risk in transboundary river basins by 2050 following different ambition scenarios. *International Journal of Water Resources Development*, 39(1), 7–32. <https://doi.org/10.1080/07900627.2023.2184650>.
- De Cauwer, V. (2017). Distribution and potential of commercial timber species under the influence of unregulated logging in southern Africa. *Forest Ecology and Management*, 404, 256–267.
- De Cauwer, V., Fichtler, E., Beeckman, H., Graz, F. P., Mertens, J., Van Holsbeeck, S., & Muys, B. (2017). Predicting site productivity of the timber tree *Pterocarpus angolensis* Southern Forests, a *Journal of Forest Science*.
- De Vente, J., Reed, M. S., Stringer, L. C., Valente, S., & Newig, J. (2016). How does the context and design of participatory decision-making processes affect their outcomes? Evidence from sustainable land management in global drylands. *Ecology and Society*, 21(2). <https://www.jstor.org/stable/pdf/26270377.pdf>
- Debswana (2023). Debswana Diamonds Social Impact Over the Years – Debswana. Debswana.com.
- Dodman, D., Leck, H., Rusca, M., & Colenbrander, S. (2017). African urbanisation and urbanism: Implications for risk accumulation and reduction. *International Journal of Disaster Risk Reduction*, 26, 7–15.
- Domingos, M. (2023, November 29). Angola signs US\$6 billion agreement with Canadian company for copper prospecting. [kietoeconomia].
- Dube, K., Nhamo, G. (2019). Climate change and potential impacts on tourism: evidence from the Zimbabwean side of the Victoria Falls, Environment, Development and Sustainability: A Multidisciplinary Approach to the Theory and Practice of Sustainable Development, Springer, vol. 21(4), pages 2025–2041, August.
- Dudgeon, D., Arthington, A. H., Gessner, M. O., Kawabata, Z.-I., Knowler, D. J., Lévêque, C., Naiman, R. J., Prieur-Richard, A.-H., Soto, D., & others. (2007). Freshwater biodiversity: Importance, threats, status and conservation challenges. *Freshwater Biology*, 81(2), 163–182.
- Earth.org. (2022.). Plastic pollution and its impact on animals. Retrieved October 2024, from
- Evenson, R. E., Gollin, D. (2003). Assessing the impact of the Green Revolution, 1960 to 2000. *Agricultural Sciences*, 6(1), 758–762.
- Falkenmark, M., & Widstrand, C. (1992). Population and water resources: A delicate balance. *Population Bulletin*, 47(3), 1–36.
- FAO (2020). Global Forest Resources Assessment 2020: Zambia, FAO, Rome, Italy.
- FAO (2021). The State of Food and Agriculture (2021) (pp. 4–45), FAO, Rome, Italy.
- Fawcett, D., Sitch, S., Ciais, P., Wigneron, J. P., Silva Junior, C. H. L., Heinrich, V., Vancutsem, C., Achard, F., Bastos, A., Yang, H., Li, X., Albergel, C., Friedlingstein, P., & Aragão, L. E. O. C. (2022). Declining amazon biomass due to deforestation and subsequent degradation losses exceeding gains. *Global Change Biology*, 29(4), 1106–1118.

- Fearnside, P. (2017). Deforestation of the Brazilian Amazon. *Oxford Research Encyclopedia of Environmental Science*, 45(3), 8–15.
- Ferguson, K., & Hanks, J. (2010). Fencing impacts: A review of the environmental, social and economic impacts of game and veterinary fencing in Africa with particular reference to the Great Limpopo and Kavango-Zambezi Transfrontier conservation areas (pp. 83–151).
- Foley, J. A., Ramankutty, N., Brauman, K. A., Cassidy, E. S., Gerber, J. S., Johnston, M., Mueller, N. D., O'Connell, C., Ray, D. K., West, P. C., Balzer, C., Bennett, E. M., Carpenter, S. R., Hill, J., Monfreda, C., Polasky, S., Rockström, J., Sheehan, J., Siebert, S., & Tilman, D. (2011). Solutions for a cultivated planet. *Nature*, 478(7369), 337–342.
- Food and Agriculture Organization of the United Nations (2009). The state of food and agriculture (p. 30). Sales and Marketing Group.
- Food and Agriculture Organization of the United Nations (2020). The state of the world's forests 2020. www.fao.org.
- Food and Agriculture Organization of the United Nations (FAO), World Food Programme (WFP), & European Commission. (2020). *Global report on food crises: Joint analysis for better decisions*.
- Food and Agriculture Organization of the United Nations (n.d.). FOSA country report - Botswana. Retrieved from Food and Agriculture Organization. (2009). The State of World Fisheries and Aquaculture 2008 New horizons in challenging times. In *Food and Agriculture Organization* (pp. 1–2).
- Fritz, S., Laso Bayas, J. C., See, L., Schepaschenko, D., Hofhansl, F., Jung, M., Dürauer, M., Georgieva, I., Danylo, O., Lesiv, M., & McCallum, I. (2022). A continental assessment of the drivers of tropical deforestation with a focus on protected areas. *Frontiers in Conservation Science*, 3.
- Galotto, L., Gerrard, S. P., & Acosta, L. A. (2020). *GGGI's concept for the green growth index: Comparative assessment of relevant global green growth indices green growth performance measurement* (pp. 18–30). Global Green Growth Institute.
- Geist, H. J., & Lambin, E. F. (2002). Proximate causes and underlying driving forces of tropical deforestation.
- Geris, J., Comte, J.-C., Franchi, F., Petros, A. K., Tirivarombo, S., Selepeng, A. T., & Villholth, K. G. (2022). Surface water-groundwater interactions and local land use control water quality impacts of extreme rainfall and flooding in a vulnerable semi-arid region of Sub-Saharan Africa. *Journal of Hydrology*, 609.
- Gheorghiu, A. (2021). Threatening Africa's Eden – Oil and gas plans loom over the world's largest nature conservation area. *Energy Transition – The Global Energiewende*.
- GIZ. (2020). *Sector brief: Namibia – Agriculture*. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).
- Global Forest Watch (2022). *Global deforestation rates & statistics by country*. www.globalforestwatch.org.
- Global Forest Watch (2023). *Global deforestation rates & statistics by country*. World Resources Institute. Retrieved February 3, 2025, from <https://www.globalforestwatch.org/dashboards/global/>
- Goodwin, H. (2007). Measuring and reporting the impact of tourism on poverty. In R. Thomas & M. Hall (Eds.), *Developments in tourism research* (1st ed., pp. 14). Routledge. <https://doi.org/10.4324/9780080551685>
- Gössling, S. (2003). *Tourism and development in tropical islands: Political ecology perspectives*. Researchgate.net, Edward Elgar Publishing.
- Grobler, J. (2020). 'They are finishing the trees': Chinese companies and Namibian elites make millions illegally logging the last rosewoods. *The Investigative Reporting Project*.
- Günther, F., Mischo, H., & Ellmies, R. (2018). Mine design of an underground fluorspar mine in Okorusu, Namibia. *Research Gate*, 70(2).
- Hatfield, J. L., Boote, K. J., Kimball, B. A., Ziska, L. H., Izaurralde, R. C., Ort, D., Thomson, A. M., & Wolfe, D. (2011). Climate impacts on agriculture: Implications for crop production. *Agronomy Journal*, 103(2), 351–370.
- Hlangwani, E., Hal, P., Moganedi, K., & Dlamini, B. (2023). The future of African wild fruits: A drive towards responsible production and consumption of the marula fruit. *Frontiers in Sustainable Food Systems*, 7. Hosonuma, N., Herold, M., De Sy, V., De Fries, R. S., Brockhaus, M., Verchot, L., Angelsen, A., & Romijn, E. (2012). An assessment of deforestation and forest degradation drivers in developing countries. *Environmental Research Letters*, 7(4), 044009.
- Hulke, C. (2023, August 8). Can conservation and agriculture work together for inclusive regional development in the Zambezi Region? Conservation Namibia. <https://conservationnamibia.com/blog/conservation-and-agriculture.ph>

- IEA (2021), World Energy Balances.
- IEA (2021). World energy outlook 2021. In www.iea.org (pp. 211–245).
- International Energy Agency (2021). *World energy outlook 2021* (revised).
- International Labour Organization (2008). *Green jobs: Towards decent work in a sustainable, low-carbon world* (full report).
- International Monetary Fund (2024). *Botswana: 2024 Article IV Consultation*. Washington, DC: IMF.
- International Monetary Fund (2025). *Selected Issues Paper: Harnessing Angola's Non-Oil Economic Growth*. Washington, DC: IMF.
- International Renewable Energy Agency (2020). *Renewable capacity statistics 2020*. Irena.org.
- International Tropical Timber Organization (2018). *ITTO annual report 2017*. In ITTO.
- Jagger, P., Jennifer Zavaleta Cheek, Miller, D., Ryan, C., Priya Shyamsundar, & Sills, E. (2022). The role of forests and trees in poverty dynamics. *Forest Policy and Economics*, 140.
- Jose, S. (2009). Agroforestry for ecosystem services and environmental benefits: An overview. *Agroforestry Systems*, 76(1), 1–10.
- Kalaba, F. K., Quinn, C. H., & Dougill, A. J. (2013). Contribution of forest provisioning ecosystem services to rural livelihoods in the Miombo woodlands of Zambia. *Population and Environment*, 35(2), 159–182.
- Kalvelage, L., Revilla Diez, J., & Bollig, M. (2021). Do tar roads bring tourism? Growth corridor policy and tourism development in the Zambezi region, Namibia. *The European Journal of Development Research*, 33(4), 1000–1021.
- Kamwi, J. M., Endjala, J., & Siyambango, N. (2020). Dependency of rural communities on non-timber forest products in the drylands of southern Africa: A case of Mukwe Constituency, Kavango East Region, Namibia. *Trees, Forests and People*, 2.
- Karra, K., Kontgis, C., et al. (2021). Global land use/land cover with Sentinel-2 and deep learning. IGARSS 2021-2021 IEEE International Geoscience and Remote Sensing Symposium, IEEE.
- Kasztelan, A. (2017). Green growth, green economy, and sustainable development: Terminological and relational discourse. *Prague Economic Papers*, 26(4), 487–499.
- Kauffman, M. J., Cagnacci, F., Chamaillé-Jammes, S., Hebblewhite, M., Hopcraft, J. G. C., Merkle, J. A., Mueller, T., Mysterud, A., Peters, W., Roettger, C., Steingisser, A., Meacham, J. E., Abera, K., Adamczewski, J., Aikens, E. O., Bartlam-Brooks, H., Bennitt, E., Berger, J., Boyd, C., Côté, S. D., Debeffe, L., Dekrout, A. S., Dejid, N., Donadio, E., Dziba, L., Fagan, W. F., Fischer, C., Focardi, S., Fryxell, J. M., Fynn, R. W. S., Geremia, C., González, B. A., Gunn, A., Gurarie, E., Heurich, M., Hilty, J., Hurley, M., Johnson, A., Joly, K., Kaczensky, P., Kendall, C. J., Kochkarev, P., Kolpaschikov, L., Kowalczyk, R., van Langevelde, F., Li, B. V., Lobora, A. L., Loison, A., Madiri, T. H., Mallon, D., Marchand, P., Medellín, R. A., Meisingset, E., Merrill, E., Middleton, A. D., Monteith, K. L., Morjan, M., Morrison, T. A., Mumme, S., Naidoo, R., Novaro, A., Ogutu, J. O., Olson, K. A., Oteng-Yeboah, A., Ovejero, R. J. A., Owen-Smith, N., Paasivaara, A., Packer, C., Panchenko, D., Pedrotti, L., Plumptre, A. J., Rolandsen, C. M., Said, S., Salemgareyev, A., Savchenko, A., Savchenko, P., Sawyer, H., Selebatso, M., Skroch, M., Solberg, E., Stabach, J. A., Strand, O., Sutor, M. J., Tachiki, Y., Trainor, A., Tshipa, A., Virani, M. Z., Vynne, C., Ward, S., Wittemyer, G., Xu, W., & Zuther, S. (2021). Mapping out a future for ungulate migrations: Limited mapping of migrations hampers conservation. *Science*, 372(6542), 566–569.
- Kavango Zambezi Transfrontier Conservation Area (2014). *Master integrated development plan 2015-2020*.
- Kavango Zambezi Transfrontier Conservation Area (2019). About KAZA.
- Kavango Zambezi Transfrontier Conservation Area Secretariat (2019). *State of Kavango Zambezi Transfrontier Conservation Area 2006–2019*. KAZA TFCA.
- Kavango-Zambezi Transfrontier Conservation Area (KAZA-TFCA). (2016). *Assessment of the human-wildlife conflict mitigation measures being implemented by the Kavango-Zambezi Transfrontier Conservation Area (KAZA TFCA) partner countries* [Report to the KAZA TFCA Secretariat].

- KAZA TFCA Secretariat (2023). *Livelihoods Diversification Strategy*, KAZA TFCA Secretariat, Kasane, Botswana.
- Kelly, T., & Rossotto, C. M. (Eds.). (2012). *Broadband strategies handbook*. The World Bank.
- Kewuyemi, Y. O., Kesa, H., Chinma, C. E., & Adebo, O. A. (2020). Fermented edible insects for promoting food security in Africa. *Insects*, 11(5), 283.
- Khavari, B., Korkovelos, A., Sahlberg, A., Fusco-Nerini, F., & Howells, M. (2020). PopClusters. *Mendeley Data*, 6.
- Khavari, B., Korkovelos, A., Sahlberg, A., Fusco-Nerini, F., & Howells, M. (2020). PopClusters. *Mendeley Data*, 6.
- Kistin, E., Ashton, P. J., Earle, A., Malzbender, D., Neal, M., & Turton, A. (2008). An overview of the content and historical context of the international freshwater agreements that South Africa has entered into with neighbouring countries. *International Environmental Agreements*, 9(1), 1–21.
- Lal, R. (2003). Soil erosion and the global carbon budget. *Environment International*, 29(4), 437–450.
- Laurance, W., & Balmford, A. (2013). Land use: A global map for road building. *Nature*, 495, 308–309.
- Lavelle, J.-J. (2019). *Digging deeper for benefits: Rural local governance and the livelihood and sustainability outcomes of devil's claw (Harpagophytum spp.) harvesting in the Zambezi Region, Namibia*.
- Levy, M. (2020). "Environmental Impacts of the COVID-19 Pandemic: A Perspective from the Field." *Environmental Science & Policy*.
- Li, Y., Ismail, M. A., & Aminuddin, A. (2024). How has rural tourism influenced the sustainable development of traditional villages? A systematic literature review. *Heliyon*, 10(4), e25627.
- Liebman, M., & Schulte, L. A. (2015). Enhancing agroecosystem performance and resilience through increased diversification of landscapes and cropping systems. *Elementa: Science of the Anthropocene*, 61(3).
- Lin, B. B. (2011). Resilience in agriculture through crop diversification: Adaptive management for environmental change. *BioScience*, 61(3), 183–193.
- Lindsey, P. A., Nyirenda, V. R., Barnes, J. I., Becker, M. S., McRobb, R., Tambling, C. J., Taylor, W. A., Watson, F. G., & t'Sas-Rolfes, M. (2014). Underperformance of African protected area networks and the case for new conservation models: Insights from Zambia. *PLOS ONE*, 9(5).
- Lindsey, P. A., Roulet, P. A., & Romañach, S. S. (2007). Economic and conservation significance of the trophy hunting industry in sub-Saharan Africa. *Biological Conservation*, 134(4), 455–469.
- Lindsey, P., Allan, J., Brehony, P., Dickman, A., Robson, A., Begg, C., Bhammar, H., Blanken, L., Breuer, T., Fitzgerald, K., Flyman, M., Gandiwa, P., Giva, N., Kaelo, D., Nampindo, S., Nyambe, N., Steiner, K., Parker, A., Roe, D., Thomson, P., Trimble, M., Caron, A., & Tyrrell, P. (2020). Conserving Africa's wildlife and wildlands through the COVID-19 crisis and beyond. *Nature Ecology & Evolution*, 4, 1300–1310.
- Mabhaudhi, T., Chimonyo, V. G. P., Hlahla, S., Massawe, F., Mayes, S., Nhamo, L., & Modi, A. T. (2019). Prospects of orphan crops in climate change. *Planta*, 250(3), 695–708.
- Magombeyi, M., & Villholth, K. G. (2021). *Sustainable groundwater development and management for humans, wildlife, and economic growth in the Kavango Zambezi Transfrontier Conservation Area (KAZA-GROW) 2021-2022: Water scarcity vulnerability map of the Kwando River Basin and Kwando River Wildlife Dispersal Area* (Report). September 25, 2021.
- Mason, S. J., & Goddard, L. (2001). Probabilistic precipitation anomalies associated with ENSO. *Bulletin of the American Meteorological Society*, 82(4), 619–638.
- Mbaiwa, J., & Stronza, A. (2010). The effects of tourism development on rural livelihoods in the Okavango Delta, Botswana. *Journal of Sustainable Tourism*, 18(5), 635–656.
- Mbavha, B., Paul, N., Ndirangu, M., Oh, D., Njukang, A., Lee, C., Choi, Y.-S., & Kim, D. (2024). Case studies for honeybee breeding research: Beekeeping status in Zimbabwe. *Journal of Apiculture*, 39, 141–150.
- McElwee, P., Calvin, K., Campbell, D., Cherubini, F., Grassi, G., Korotkov, V., Le Hoang, A., Lwasa, S., Nkem, J., Nkonya, E., Saigusa, N., Soussana, J., Taboada, M. A., Manning, F., Nampanzira, D., & Smith, P. (2020). The impact of interventions in the global land and agri-food sectors on nature's contributions to people and the UN sustainable development goals. *Global Change Biology*, 26(9), 4691–4721.
- Meierdiercks, K. L., Finewood, M. H., & Bennett, C. (2024). Defining the term watershed to reflect modern uses and functions as inter- and intra-connected socio-hydrologic systems. *Journal of Environmental Studies and Sciences*, 14.

- Mendelsohn, J. M., & Obeid, S. E. (2003). *Sand and water* (1st ed., pp. 78–89). Struik Publishers.
- Mendelsohn, J., Jarvis, A., & Robertson, T. (2013). *A profile and atlas of the Cuvelai-Etosha basin* (pp. 125–147). RAISON. <https://jaroconsultancy.com/a-profile-and-atlas-of-the-cuvelai-etosha-basin/>
- Mining Technology (2011). Boseto Copper Project, Ngamiland, Kalahari Copper Belt. Retrieved from <https://www.mining-technology.com/projects/boseto-copper/>
- Ministry of Environment and Tourism (2013). *National policy on community-based natural resource management*. Directorate of Parks and Wildlife Management.
- Ministry of Finance and National Planning (2022). *Eighth National Development Plan (8NDP) 2022-2026*. Zambia Embassy. https://www.zambiaembassy.org/sites/default/files/documents/8NDP_2022-2026.pdf.
- Ministry of Mineral Resources and Petroleum. (2023). *Angola Mining Conference and Exhibition 2023: Focusing on critical minerals for the global clean energy transition*. AME Trade Ltd
- Montero-Botey, M., Kivuyo, E., Sitati, N., & Perea, R. (2024). Deforestation and water availability as main drivers of human-elephant conflict. *Global Ecology and Conservation*, 54, e03068.
- Moyo, C., Mishi, S., & Newadi, R. (2022). Human capital development, poverty, and income inequality in the Eastern Cape province. *Development Studies Research*, 9, 36–47. DOI:
- Moyo, R. K. (2019). *Connecting people and nature in the Kavango-Zambezi Transfrontier Conservation Area: A study of power, scale, and multiple perspectives in Southern Africa* (Doctoral thesis, Macquarie University). <https://doi.org/10.25949/19443176.v1>
- Muimba-Kankolongo, A. (2018). Food crop production by smallholder farmers in Southern Africa: Challenges and opportunities for improvement (1st ed., pp. 5–21). Academic Press
- Mulenga, B., Songwe, V., & Davies, R. (2020). Building resilience in Southern Africa: Agricultural responses to climate change. *African Journal of Agricultural Research*, 15(7), 1029–1036.
- Müller, A., Olesen, J., Smith, L., Davis, J., Gattinger, A., Lampkin, N., & Niggli, U. (2009). Reducing global warming: The potential of organic agriculture. *Research Gate*.
- Munang, R., Thiaw, I., Alverson, K., Mumba, M., Liu, J., & Rivington, M. (2013). Climate change and ecosystem-based adaptation: A new pragmatic approach to buffering climate change impacts. *Current Opinion in Environmental Sustainability*, 5(1), 67–71.
- Munjaidi, K. F. (2019). *Victoria Falls: The resilience of tourism development in Zimbabwe under situations of fragility* (1965 to 2015) (Doctoral thesis, University of Brighton).
- Mutanga, C. N., Vengesayi, S., Muboko, N., & Gandiwa, E. (2015). Towards harmonious conservation relationships: A framework for understanding protected area staff-local community relationships in developing countries. *Journal for Nature Conservation*, 25, 8–16.
- Muthelo, P., Banda, T., & Nkonde, S. (2022). Deforestation trends in KAZA: Impact of charcoal production. *African Environmental Studies*, 29(1), 45–59.
- Mutondoro, F. (2024). *Navigating Zimbabwe's lithium industry: Opportunities, challenges, and the conundrum of a shifting global landscape*. Zimbabwe Environmental Law Association.
- Mwombola, E. W. (2017). *An assessment of food production, processing, and storage at community level in Kavango East region: A case study of Ndiyona, Mashare, and Rundu Rural East constituencies* (Master's thesis, University of Namibia).
- Naidoo, R., Weaver, L. C., Diggle, R. W., Matongo, G., Stuart-Hill, G., & Thouless, C. (2016). Complementary benefits of tourism and hunting to communal conservancies in Namibia. *Conservation Biology*, 30(3), 628–638.
- Namibia Airports Company (2021). Integrated strategic business plan for years 2021/2 2025/6.
- Nangolo, N. (2024). Kavango, Zambezi rural residents blast govt over poor roads: Provide urgent funding for roads, leaders say. [*NamibianSun*].
- NASA LP DAAC (2024). MOD11A2 v6: MODIS Land Surface Temperature & Emissivity 8-Day Global 1km.
- Ngoma, H., Finn, A., & Kabisa, M. (2023). Climate shocks, vulnerability, resilience and livelihoods in rural Zambia. *Climate and Development*, 3–12.
- Nott, K., Nott, A., & Newton, D. (2019). *Namibian indigenous forest/timber industry: A critical assessment of the economic and environmental sustainability with reference to Zambia and Angola*. October 2019.
- Nutrition and Food Security Alliance of Namibia (NAFSAN). (2024). *Namibia's Strategy for the Transformation of the Agri-food Sector (STAS)*. Nutrition and Food Security Alliance of Namibia.

- Odendaal, W., & Werner, W. (Eds.). (2020). *Neither here nor there: Indigeneity, marginalisation, and land rights in post-independence Namibia*. Retrieved from
- Ogut, J. O., Piepho, H.-P., & Dublin, H. T. (2014). Reproductive seasonality in African ungulates in relation to rainfall. *Wildlife Research*, 41(4), 323.
- Olivieri, F., Koop, S. H. A., Van Leeuwen, K., & Hofman, J. (2022). Enhancing governance capacity to ensure a long-term water supply: The case of Windhoek, Namibia. *SciProfiles*, 14(4), 2387.
- Organisation for Economic Co-operation and Development (2011). *Towards green growth*. OECD.
- Pacheco, P., Mo, K., Dudley, N., Shapiro, A., Aguilar-Amuchastegui, N., Ling, P.Y., Anderson, C. and Marx, A. (2021). *Deforestation fronts: Drivers and responses in a changing world*. WWF, Gland, Switzerland
- Pallet, J., Mendelsohn, J., & Mukumbuta-Guillemain, I. (2022). Cuando state of the basin report. *Research Gate*, 13–25.
- Parker, A., Roe, D., & Thomson, P. (2020). Conserving Africa's wildlife and wildlands through the COVID-19 crisis and beyond. *Nature Ecology & Evolution*, 4, 1300–1310.
- Pinto, F., Bellamy, J.-J., & Carlsen, A. M. S. (2012). Comparative experience examples of inclusive green economy approaches in undp's support to countries. In United Nations Development Programme (pp. 3–11). Potts, S. G., Biesmeijer, J. C., Kremen, C., Neumann, P., Schweiger, O., & Kunin, W. E. (2010). Global pollinator declines: Trends, impacts and drivers. *Trends in Ecology & Evolution*, 25(6), 345–353.
- Putten, I., Boschetti, F., Fulton, E., Smith, A., & Thebaud, O. (2014). Individual transferable quota contribution to environmental stewardship: A theory in need of validation. *Ecology and Society*, 19(2).
- ReconAfrica (2020). *Kavango Basin review & global benchmarking*. Reid, W. V. (2005). Ecosystems and human well-being synthesis. Millennium Assessment Organization; Island Press. <https://www.millenniumassessment.org/documents/document.356.aspx.pdf>
- Republic of Namibia, Zambezi Regional Council. (2024). *Economic sector*. Retrieved from RIPA, M. (2023). *Parliamentary question | Commission position concerning the "sustainability" of trophy hunting | E-001394/2023 | European Parliament*. Europa.eu. https://www.europarl.europa.eu/doceo/document/E-9-2023-001394_EN.html
- Rogerson, C., & Visser, G. (2012). Rethinking South African urban tourism research. *Tourism Review International*, 15, 77–90. Rudel, T. K. (2013). The national determinants of deforestation in sub-Saharan Africa. *Philosophical Transactions of the Royal Society: Biological Sciences*, 368(1625).
- SADC, AHEAD (2021). *Guidelines on Commodity-Based Trade Approaches for Managing Foot and Mouth Disease Risk in Beef in the SADC Region*. 4th Edition. Southern African Development Community, Animal & Human Health for the Environment and Development, Gaborone, Botswana & New York, USA.
- Salman, M., Hanae Suzuki, H., Ahmad, W., Giusti, S., Ali, A., Mwale, S., Chikuta, S., Nawa, M., Daka, A., Sitali, M., Mukanga, M., Chitambi, M., Chilala Mucheelo, M. and Lwatula, C. (2022). Efficient agricultural water use and management in paddy fields in Zambia – National outlook. Rome, FAO.
- Scheyvens, Regina. (1999). Ecotourism and the Empowerment of Local Communities. *Tourism Management*. 20. 245–249. Schmiedel, U., & Jurgens, N. (2010). *Biodiversity in Southern Africa* (Vol. 2, pp. 190–243). Klaus Hess Publishers. https://www.researchgate.net/publication/236626113_Biodiversity_in_southern_Africa_Volume_2_Patterns_and_processes_at_regional_scale
- Sedano, F., Mizu-Siampale, A., Duncanson, L., & Liang, M. (2022). Influence of charcoal production on forest degradation in Zambia: A remote sensing perspective. *Remote Sensing*, 14.
- Sekonya, G. (2016). *Mopane worm use, livelihoods and environmental change in Limpopo Province, South Africa* (Master's dissertation).
- Selelo, O. T., Danso-Abbeam, G., & Ogundeji, A. A. (2024). Impact of agroecological practices on farm performance in Botswana. *Renewable Agriculture and Food Systems*, 39, 4–9.
- Senzanje, A., & Dirwai, T. L. (n.d.). *Water and agriculture in the Zambezi River basin: Characterization of current agricultural activities, future potential irrigation developments, and food security to face climate variability in the Zambezi River basin [Report submitted to the EU-Joint Research Commission on assessing water-energy-food-ecosystem (WEFE) interdependencies across the Zambezi River basin: Agriculture and water]*.
- Shackleton, R. T., Le Maitre, D. C., van Wilgen, B. W. (2015). Use of non-timber forest products from invasive alien *Prosopis* species (mesquite) and native trees in South Africa: Implications for management. *Forest Ecosystems*, 2, 16.

- Shackleton, S. E., & Pandey, A. (2014). The Role of Non-Timber Forest Products in Rural Livelihoods in the KAZA Region. *Environmental Management*, 53(1), 1-14.
- Simpson, M. C. (2008). Community benefit tourism initiatives—a conceptual oxymoron? *Tourism Management*, 29(1), 15–18.
- Sirko, Wojciech & Kashubin, Sergii & Ritter, Marvin & Annkah, Abigail & Bouchareb, Yasser & Dauphin, Yann & Keyzers, Daniel & Neumann, Maxim & Cisse, Moustapha & Quinn, John (2021). Continental-Scale Building Detection from High Resolution Satellite Imagery.
- Smith, D., & Winterman, K. (2022). Models and mandates in transboundary waters: Institutional mechanisms in water diplomacy. *Water*, 14(17), 2662. <https://doi.org/10.3390/w14172662>
- Southern African Development Community (2012). *SADC regional infrastructure development master plan*.
- Southern African Development Community (2022). *SADC Macroeconomic Report 2022*. SADC Secretariat, Gaborone, Botswana.
- Spenceley, A. (2020). *COVID-19 and Impacts on Protected Area Tourism in the Great Limpopo TFCA and the Kavango Zambezi TFCA Dr Anna Spenceley TFCA Network Steering Committee webinar on “Building a resilient tourism sector in SADC TFCAs”* (pp. 7–16).
- Stagnari, F., Jan, S., Galieni, A., & Pisante, M. (2016). *Sustainable agricultural practices for water quality protection*. In D. J. H. Teixeira da Silva (Ed.), *Water stress and crop plants* (Chapter 6). Wiley.
- Steffen, W., Richardson, K., Rockstrom, J., Cornell, S. E., Fetzer, I., Bennett, E. M., Biggs, R., Carpenter, S. R., de Vries, W., de Wit, C. A., Folke, C., Gerten, D., Heinke, J., Mace, G. M., Persson, L. M., Ramanathan, V., Reyers, B., & Sorlin, S. (2015). *Planetary boundaries: Guiding human development on a changing planet*. *Science*, 347(6223). <https://www.kavangozambezi.org/>
- Stoldt, M., Göttert, T., Mann, C., & Zeller, U. (2020). *Transfrontier conservation areas and human-wildlife conflict: The case of the Namibian component of the Kavango-Zambezi (KAZA) TFCA*. *Scientific Reports*, 24(3), 7–11.
- Sunderland, T. C. H., Ndoye, O., & Nasi, R. (2011). *Forest Products and Non-Timber Forest Products in the KAZA Region: Value Chains and Market Linkages*. World Bank Publications.
- Sunderland, T., & O'Connor, A. (2020). Forests and food security: a review. *CAB Reviews: Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources*, 15(019).
- Syampungang, S., W. Chirwa, P., K. Akinnif, F., & C. Ajayi, O. (2010). The potential of using agroforestry as a win-win solution to climate change mitigation and adaptation and meeting food security challenges in southern Africa. *Agricultural Journal*, 103(6), 450–462.
- The Chamber of Mines of Zimbabwe. (2022). *Annual report 2022*. The Chamber of Mines of Zimbabwe.
- Thornton, P. K. (2014). *Impacts of climate change on length of growing period*. International Food Policy Research Institute, 56–57.
- Thurlow, J., Dorosh, P., & Davis, J. (2021). The impact of climate change on agriculture and food security in Southern Africa. *Food Policy*, 101(5), 102–112.
- Tilman, D., Cassman, K. G., Matson, P. A., Naylor, R., & Polasky, S. (2002). Agricultural sustainability and intensive production practices. *Nature*, 418(6898), 671–677.
- Todaro, M. P., & Smith, S. C. (2011). *Economic development* (11th ed.). Prentice Hall. ISBN: 978-0-13-801388-2.
- Trans-Kalahari Corridor. (2023). *13th Joint Law Enforcement Operation (JLEO) hosted in Swakopmund, Namibia*. Trans-Kalahari Corridor Secretariat.
- Tscharntke, T., Clough, Y., Wanger, T. C., Jackson, L., Motzke, I., Perfecto, I., Vandermeer, J., & Whitbread, A. (2012). Global food security, biodiversity conservation and the future of agricultural intensification. *Biological Conservation*, 151(1), 53–59.
- Turrall, H., Burke, J., & Faurès, J.-M. (2011). *Climate change, water, and food security* (FAO Water Report No. 36). Food and Agriculture Organization of the United Nations (FAO).
- U.S. International Trade Administration (2026). *Zimbabwe – Mining and Minerals*.
- United Nations Conference on Trade and Development (UNCTAD). (2023). *Trade and development report 2023: Growth, debt, and climate: Realigning the global economy*.
- United Nations Educational, Scientific and Cultural Organization (2021). *UN World Water Development Report 2021: Valuing water*. United Nations. <https://www.unwater.org/publications/un-world-water-development-report-2021>

- United Nations Environment Programme (2021). *Ecosystem conservation and community livelihood enhancement in North Western Zambia*.
- United Nations Environment Programme. (2019). *Emissions gap report 2019*. UNEP - UN Environment Programme.
- United Nations Environment Programme. (2021). 2021 *Global status report for buildings and construction: Towards a zero-emission, efficient and resilient buildings and construction sector*. In unep.org.
- United Nations World Tourism Organization (2021). World tourism barometer data. Retrieved October 2024, from <https://www.unwto.org/un-tourism-world-tourism-barometer-data>.
- United Nations World Tourism Organization (2023). *UNWTO and AFCAC partner around air connectivity in Africa*.
- Vic Falls Bits n Blogs. (2024). Focus on Victoria Falls as unrealistic tourism destination goals emerge.
- Vincent, J. R., Curran, S. R., & Ashton, M. S. (2021). Forest restoration in low- and middle-income countries. *Annual Review of Environment and Resources*, 46(1), 289–317. Vincent, K., Conway, D., & New, M. (2020). *Climate change and rural livelihoods in Southern Africa: Understanding the vulnerability and capacity of smallholder farmers to climate change*. *Journal of Rural Studies*, 74, 1-10.
- Vincent, K., Conway, D., & New, M. (2020). Climate change and rural livelihoods in Southern Africa: Understanding the vulnerability and capacity of smallholder farmers to climate change. *Journal of Rural Studies*, 74, 1-10.
- Wanda, F., Oya, C., & Monreal, B. (2023). Building Angola: A Political Economy of Infrastructure Contractors in Post-War Angola. *Journal of Southern African Studies*, 49(1), 25–47.
- Wildlife Conservation Society. (2020). Wildlife conservation society. WCS.org.
- World Bank (2006). *Financial systems and economic cycles*. IMF.
- World Bank (2014). Lao PDR development report 2014: Expanding productive employment for broad-based growth. World Bank.
- World Bank (2019). *World development report 2019: The changing nature of work*. World Bank.
- World Bank (2020). *COVID-19 impacts on food security and nutrition*. World Bank. <https://www.worldbank.org/en/news/statement/2020/04/21/joint-statement-on-covid-19-impacts-on-food-security-and-nutrition>
- World Bank (2025). *Zambia's Copper Opportunity: Can the Workforce Keep Up?*
- World Bank (2025b). *Angola Country Economic Memorandum: Moving Beyond Oil*.
- World Bank (2026). *World Development Indicators: Agriculture, Forestry and Fishing, Value Added (% of GDP)*. Washington, DC: World Bank.
- World Health Organization (2015). *WHO World Water Day Report, 2015*. Retrieved from http://www.who.int/water_sanitation_health/takingcharge.html
- WWF & Climate Crowd (2022). *Community-driven solutions to help people and nature in a changing climate: Communities outside conservancies and national parks, Zambezi Region, Namibia*.
- WWF (2016). WWF Policy and Considerations on Trophy Hunting. In *wwf.panda.org* (pp. 1–3). https://wwf.panda.org/discover/our_focus/wildlife_practice/species_news/wwf_and_trophy_hunting/
- WWF (2021). *Conservation highlights of 2021*. World Wildlife Fund.
- Zambia Environmental Management Agency (2021). *2020 Annual report*. Directorate of Planning, Information and Research.
- Zimbabwe Tourism Authority (2024). *Tourism Authority Tourism Trends and Statistics (Annual) – Zimbabwe a World of Wonders 2024*, Zimbabwe Tourism Authority, Harare, Zimbabwe.
- Zulu, L. C., & Richardson, R. B. (2013). Charcoal, livelihoods, and poverty reduction: Evidence from sub-Saharan Africa. *Energy for Sustainable Development*, 17(2), 127–137.

ANNEX: OVERVIEW OF STRATEGIC PATHWAYS FOR GREEN GROWTH

STRATEGIC PRIORITIES	STRATEGIC INTERVENTIONS REQUIRED	WHAT SUCCESS WOULD LOOK LIKE
PATHWAY 1. STRENGTHENING THE NATURE-BASED ECONOMY		
• Strengthen sustainable tourism systems and regional tourism circuits • Promote diversified tourism products and local value addition • Support sustainable forest product value chains such as NTFPs • Strengthen wildlife-based economies and conservation finance • Expand ecosystem restoration initiatives	• Invest in tourism infrastructure, destination marketing, and regional tourism coordination • Improve benefit-sharing systems and community participation in tourism and natural resource management • Strengthen biodiversity finance, ecosystem service payments, and conservation trust funds • Support small-scale enterprises, local processing industries, and market access for sustainable forest products • Strengthen regional coordination on tourism standards, wildlife management, and conservation planning	• More diversified and resilient nature-based economy • Stronger regional tourism circuits and increased local value addition • Improved community revenues and local employment • Stronger incentives for conservation and sustainable resource management • Improved ecological integrity and strengthened conservation financing systems
PATHWAY 2. SUSTAINABLE LAND AND WATER MANAGEMENT		
• Promote climate-smart agriculture and agroecological approaches • Improve water-use efficiency and sustainable irrigation systems • Protect and restore watersheds, wetlands, and riparian systems • Reduce land degradation and deforestation • Strengthen integrated land-use planning • Improve human–wildlife coexistence systems	• Strengthen agricultural extension services and technical support • Invest in climate-resilient farming systems and sustainable grazing systems • Strengthen Integrated Water Resource Management (IWRM) and transboundary water governance • Invest in watershed restoration, wetland protection, and ecosystem rehabilitation • Improve land-use planning systems and monitoring frameworks • Support coexistence and conflict mitigation approaches	• More resilient agricultural systems and improved food security • Improved water security and healthier watersheds • Reduced land degradation and deforestation • Stronger ecosystem resilience and biodiversity conservation • Reduced human–wildlife conflict through compatible land-use systems

STRATEGIC PRIORITIES	STRATEGIC INTERVENTIONS REQUIRED	WHAT SUCCESS WOULD LOOK LIKE
PATHWAY 3. GREEN INFRASTRUCTURE AND REGIONAL CONNECTIVITY		
• Develop climate-resilient transport systems and regional trade corridors • Expand renewable energy infrastructure • Improve digital connectivity • Strengthen ecological considerations in corridor planning • Improve rural access to infrastructure services • Promote sustainable urban and settlement planning	• Strengthen integrated spatial planning systems • Implement Strategic Environmental Assessments (SEAs) and environmental safeguards • Invest in renewable energy systems, digital infrastructure, and climate-resilient transport systems • Promote sustainable settlement planning approaches • Strengthen public-private partnerships and regional infrastructure coordination mechanisms	• Improved regional connectivity and trade integration • Expanded access to energy and infrastructure services • More climate-resilient infrastructure systems • Infrastructure development that minimises impacts on wildlife corridors and ecosystems • Improved digital connectivity and stronger local economic development
PATHWAY 4. INCLUSIVE LIVELIHOODS AND COMMUNITY EMPOWERMENT		
• Strengthen Community-Based Natural Resource Management (CBNRM) systems • Improve benefit-sharing mechanisms • Support youth employment and skills development • Promote local enterprise development • Strengthen land tenure security • Improve access to finance and markets • Expand access to social infrastructure and services	• Strengthen local institutional capacity and technical training • Support community-led enterprises linked to tourism, agriculture, natural resource management, and restoration • Invest in healthcare, education, water supply, digital connectivity, and social infrastructure • Strengthen land rights and community participation in land-use planning and resource governance • Improve access to finance, markets, and business development support	• Stronger community participation in conservation and development initiatives • Improved rural livelihoods and greater economic inclusion • Reduced vulnerability and strengthened local resilience • Expanded employment opportunities and stronger local enterprises • Improved stewardship of natural resources and ecosystems through strengthened CBNRM systems
PATHWAY 5. REGIONAL COOPERATION, POLICY HARMONISATION, AND KNOWLEDGE SYSTEMS		
• Strengthen transboundary governance mechanisms • Harmonise policies and environmental standards • Improve regional data systems and monitoring frameworks • Promote regional research and innovation • Strengthen knowledge-sharing platforms • Support best practice exchange across sectors and countries • Improve regional financing mechanisms	• Strengthen institutional capacity within regional coordination structures • Improve policy coordination and harmonisation across sectors and member states • Invest in regional monitoring systems, research partnerships, and data-sharing platforms • Strengthen knowledge management systems and adaptive management approaches • Support sustainable financing mechanisms and long-term political commitment	• Stronger regional coordination and improved policy alignment • Enhanced transboundary governance systems • More effective implementation of integrated green growth initiatives • Improved monitoring, research collaboration, and knowledge-sharing systems • Greater replication of successful approaches across sectors and member states



kaza

Kavango Zambezi Trans Frontier
Conservation Area



Working to sustain the natural
world for the benefit of people
and wildlife.

together possible™

panda.org

© 2026

© 1986 Panda symbol WWF - World Wide Fund for Nature (Formerly World Wildlife Fund)

® "WWF" is a WWF Registered Trademark. WWF, Avenue du Mont-Bland,
1196 Gland, Switzerland. Tel. +41 22 364 9111. Fax. +41 22 364 0332.

For contact details and further information, please visit our international
website at www.panda.org