SOUTHERN AFRICAN DEVELOPMENT COMMUNITY CLIMATE CHANGE OUTLOOK 2023 - DRAFT REV_0

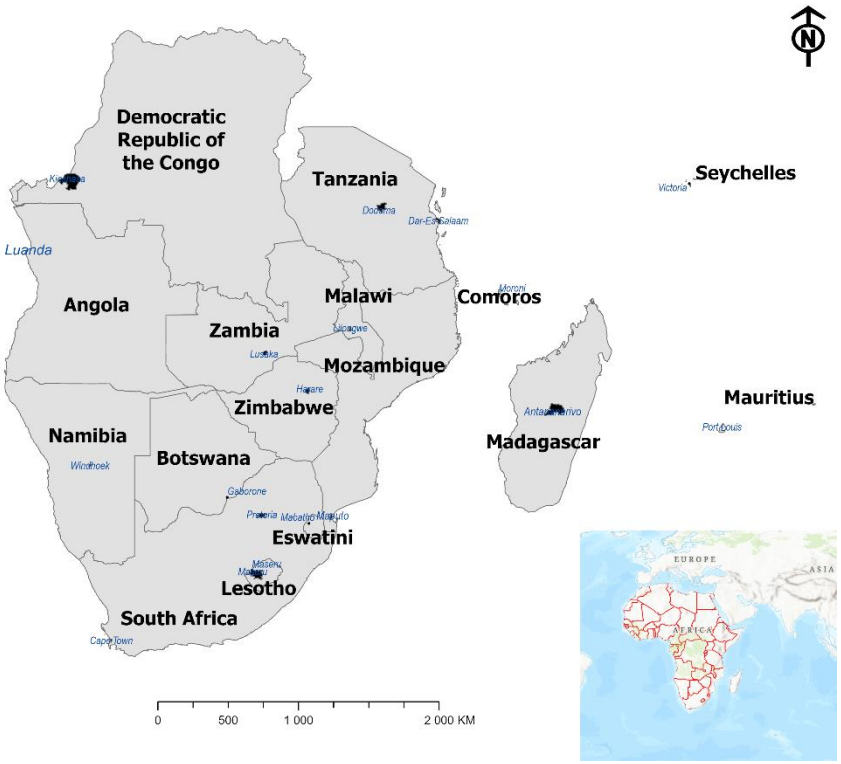

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Table of Contents

List of Figures

List of Tables

List of Boxes

Acronyms

ACCCA	Advancing Capacity to support Climate Change Adaptation
AfDB	African Development Bank
ACTN	African Conservation Tillage Network
AGRA	Alliance for a Green Revolution in Africa
AIMS	Agricultural Information Management System
AMCEN	African Ministerial Conference on the Environment
AU	African Union
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeit
CA	Conservation Agriculture
CAADP	Comprehensive Africa Agriculture Development Programme
CARWG	Conservation Agriculture Regional Working Group
CCARDESA	Centre for Coordination of Agricultural Research and Development for Southern Africa
CBD	Convention on Biological Diversity
CDM	Clean Development Mechanism
CIDA	Canadian International Development Agency
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLACC	Climate Strengthening in Least Developed Countries for Adaptation to Climate Change
CLIMTRAIN	Climate Change Training Programme
COMESA	Common Market for East and Southern Africa
COP	Conference of the Parties
CSA	Climate Smart Agriculture
CSC	Climate Services Centre
CSIR	Council for Scientific and Industrial Research
CRIDF	Climate Resilient Infrastructure Development Facility
CSAG	Climate System Analysis Group
DEA	Department of Environmental Affairs/ Development and Energy in Africa
DRC	Democratic Republic of Congo
EEZ	Exclusive Economic Zone
EMDAT	Emergency Events Database

ENSO	El Niño Southern Oscillation
EU	European Union
FANR	Food, Agriculture and Natural Resources
FANRPAN	Food, Agriculture and Natural Resources Policy Analysis Network
FAO	Food and Agricultural Organisation
GAP	Good Agricultural Practice
GEF	Global Environment Facility
GHG	Green House Gas Emissions
GDP	Growth Domestic Product
GCM	Global Circulation Models
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GME	Greater Mahale Ecosystem
GVI	Global Vision International
HATAB	Hotel and Tourism Association of Botswana
HDI	Human Development Index
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome
IAEA	International Atomic Energy Agency
IFAD	International Fund for Agricultural Development
IFRC	International Federation of Red Cross and Red Crescent Societies
IDA	International Development Association
IDRC	International Development Research Centre
IPCC	Intergovernmental Panel on Climate Change
INDC	Intended Nationally Determined Contribution
IOM	International Organisation for Migration
ITCZ	Intertropical Convergence Zone
ICT	Information Communications Technology
IUCN	International Union for the Conservation of Nature's
ROSA	Regional Office for Southern Africa
IUU	Illegal unreported unregulated
JICA	Japan International Cooperation Agency
IWRM	Integrated Water Resource Management

KAZA	Kavango Zambezi Transfrontier Conservation Area
KPI	Key Performance index
LCDs	Least developed Countries
LCBCCAP	Lake Chilwa Basin Climate Change Adaptation programme
LEAD SEA	Leadership for Environment and Development Southern and Eastern Africa
LHWP	Lesotho Highlands Water Project
LMMA	Locally Managed Marine Areas
LULUCF	Land Use, Land Use Change and Forestry
MDGs	Millennium Development Goals
MODIS	Moderate Resolution Imaging Spectroradiometer
MOESDDBM	Ministry of Environment, Sustainable Development, and Disaster and Beach Management
MID	Maurice Île Durable
MIDSA	Migration Dialogue for Southern Africa
NAP	National Adaptation Plan
NAPA	National Adaptation Plan of Action
NASA	National Aeronautics and Space Administration
NGO	Non-Governmental Organisation
NEPAD	New Partnership for Africa's Development
NDC	Nationally Determined Contributions
NDVI	Normalized difference vegetation index
NMHS	National Meteorological and/or Hydrological Services
NIDM	National Institute of Disaster Management
OCHA	Office for Coordination of Humanitarian Affairs
OPDs	Organ of Politics Defence and Security
PHE	Population Health and Environment
ProBEC	Programme for Basic Energy and Conservation
RAP	Regional Agricultural Policy
REASAP	Regional Energy Access Strategy and Action Plan
REDD	Reduction in Emission from Deforestation and Degradation
REWC	Regional Early Warning Centre

RISDP	Regional Indicative Strategic Development Plan
RSMC	Regional Specialised Meteorological Centre
RVAA	Regional Vulnerability Analysis and Assessment
RVAC	Regional Vulnerability Assessment Committee
SADC	Southern African Development Community
SADC	MAPP SADC Multi-country Agricultural Productivity Programme
SADCC	Southern Africa Development Coordination Conference
SAEON	South African Environmental Observation Network
SAIAB	South African Institute of Aquatic Biodiversity
SANBI	South African National Biodiversity Institute
SANParks	South African National Parks
SARCOF	Southern African Regional Climate Outlook forum
SARDC	Southern African Research and Documentation Centre
SARPCCO	Southern African Regional Police Chief Cooperation Organisation
SARUA	Southern African Universities Association
SDGs	Sustainable Development Goals
SIDA	Swedish International Development Agency
SIDs	Small Island Developing States
SSA	Sub-Saharan Africa
SNMS	Seychelles National Meteorological Services
SSTs	Sea Surface Temperatures
SRO	Sub-Regional Organisation
SWEDESD	Swedish international Centre for Education and Sustainable Development
TEBA	The Employment Bureau of Africa
TFCA	Transfrontier Conservation Areas
TNC	The Nature Conservancy
UNCBD	United Nations Convention on Biodiversity
UNDP	United Nations Development Programme
UNCCD	United Nations Convention to Combat Desertification
UNFCCC	United Nations Framework Convention on Climate Change
WMO	World Meteorological Organisation

WRI	Water Research Institute
WWF	World Wildlife Fund

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FOREWORD

PREFACE

EXECUTIVE SUMMARY

Understanding the state of the region's environment and climate conditions is crucial to ensuring sustainable development for our future generations. The Regional Climate Change Outlook aims to increase resilience of natural resource and socio-economic sectors to the impacts of Climate Change in the SADC region through deepening access to knowledge on various scenarios on climate change adaptation and mitigation interventions. This report captures the state, trends, impacts, outlook, resilience and mitigation strategies in each of the thematic areas and sectors covered which include water resources, land and agriculture, fisheries, biodiversity, energy, land-use, and use change and forestry, transport, tourism, mining, and human settlements and health etc. Strategies to increase adaptation include promotion of climate-resilient infrastructure investments and developing green and resilient economies for sustainable development, including emerging issues like COVID19 and issues to do with Loss and damage.

The rapid assessment of climatic conditions for the SADC region contributes towards attaining SADC Vision 2050, which seeks to achieve *Strengthened climate change resilience* and *improved disaster risk management in support of regional resilience* in the region. This report also contributes towards the Regional Indicative Strategic Development Plan (RISDP) 2020-30 strategic priority on crosscutting issues that include gender, youth, environment and climate change and disaster risk management.

Climate Change poses severe challenges to economic as well as socio-economic development of the SADC region. This is especially the case for countries on the African continent due to dependence on natural resources and rain-fed agriculture, for subsistence and economic growth, trade, industry and food security. The 2023 Climate Change Yearbook for the SADC region has therefore been documented in order to establish progress made by the region over the past few years in addressing such issues. Being the second Yearbook on climate change issues within the SADC region, the Yearbook ought to bring to speed all issues around climate change. The Yearbook divides issues into various themes presented as chapters which are:

- Climate Change Impacts and Challenges/opportunities in the region,
- Policy and Legislative Frameworks,
- Response to Disaster, Conflict and Security,
- Response to Environment and Ecosystems,
- Response to Agriculture, Livelihoods and Food Security,
- Response to Climate Change and Shaping the Green Economy Transition Agenda, and
- Response to Climate Change and Shaping the Blue Economy Transition Agenda.

The Yearbook highlights the impacts of climate change that are already being felt in the region, including the challenges and opportunities faced by countries. There are various programmes that have been put in place which are meant for climate change mitigation and adaptation. Intended Nationally Determined Contributions have been submitted to the United Nationals Framework Convention on Climate Change for all members states and include both mitigation and adaptation components. From the policy, protocol and project review it is evident that there are many initiatives that have been undertaken by SADC in addressing climate change and integrating mitigation and adaptation projects into various sectors. A number of challenges around climate change have been addressed through these policies. SADC policy makers and negotiators may wish to consider these challenges when developing and refining their adaptation policies, as well as their negotiating positions under the international climate change process post COP 27 held in Egypt.

A number of disasters have already occurred in the region and have been highlighted in this report. Conflict and migration issues in the region and how they have been propagated by climate change have also been reviewed. The good news is that the SADC region currently enjoys relative peace and Member States are working towards a development path that will ensure human security and achievement of their development goals. Climate change will be a challenge to tackle at regional and local scales which affects security, puts countries at risk of disasters and affects human migration. There is need for a holistic approach aimed at addressing poverty, joblessness, scarce resources and rehabilitating destroyed infrastructure as well as promoting peace and security. In this regard, at regional level there are many initiatives including institutions and guiding regulations and protocols that have already been put in place.

Under the pillar, environment and climate change and disaster risk management, climate change resilience and the need to scale up climate adaptation and mitigation measures is emphasized. The climate change assessment will add value into the intervention areas of the Global Climate Change Alliance Plus (GCCA+) Programme being implemented by SADC, the Revised SADC Climate Change Strategy & Action Plan, Africa Environment Outlook (AEO) process, which in turn forms part of the Global Environment Outlook (GEO) report. The Regional Climate Change Outlook report will raise awareness on sectoral impacts of the Climate Change facing the region, practiced and potential resilience and mitigation strategies being undertaken, with the goal of increasing resilience to future crises. The purpose being to inform policy and decision making on development and promote resilience to impacts as well as enhancing livelihoods and food security of communities.

By creating awareness on resilience and mitigation strategies, the report will contribute towards SADC efforts in implementing the provisions of the Paris Agreement, particularly Article 2 which states the need to increase the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions in a manner that does not threaten food production.The knowledge collected and generated in the development of the Regional Climate Change Outlook report will be widely availed to decision-makers, government agencies, academia, civil society, media and other institutions in the region to facilitate policy formulation and various interventions to address the impacts of climate change. The aim being to ensure they make informed contributions to strategies nationally, regionally and globally.

A healthy ecosystem and solid land management decisions are key in the management of climate change impacts. If ecosystems are degraded, it impacts humans in many ways including increasing poverty. Hence, one of the key recommendations is that a holistic and multi-disciplinary approach such as ecosystems and population health and Environment (PHE) approach be continuously utilised as is currently happening. This will help build resilience to climate change and meet multiple needs at same time.

Adaptation for the biodiversity sector can be through provision of corridors for migration of species, removal of invasive alien species and promoting an ecosystem-based approach to biodiversity conservation through data collection and information dissemination. Many efforts have been made to ensure the sustainable use of biodiversity in the region. A notable effort is the SADC Regional Biodiversity Strategy, which was developed in 2009, with strategies aimed at enhancing the region's economic and business base by adding value to its biological resources and engaging in "Bio-trade". In addition, they address the poverty-environment governance challenges expressed in the Regional Indicative Strategic Development Plan (RISDP), the New Partnership for Africa's Development (NEPAD) and the Sustainable Development Goals (SDGs).

Agriculture is a sector of major importance within the SADC region. Close to 70% of the SADC population depend on agriculture for food, sustenance of livelihoods, income generation and means of employment. The chapter on agriculture, livelihoods and food security is integrally linked to the performance of the regional economy meaning that performance and sustainable growth of the agriculture sector influences food security, economic growth and social stability in the SADC region. Climate change impacts on agricultural resources, production and people are interrelated.

Furthermore, it is now apparent that climate change is impacting the soil and water resources, within the region, which are important for crop production, which in turn impacts on the lives of many people as a result of decreased agricultural activity and a decrease in food security. The transformation of agricultural practices to climate smart agriculture is critical to achieve the goals of sustainable development. The FAO have developed a detailed Climate Smart Agriculture (CSA) sourcebook which is a valuable source for policy makers in agriculture, forestry and fisheries at both national and regional levels. It emphasises the need for food systems to become more resilient at every scale from farming to the global food system. The components of climate smart agriculture include: Water Management, Soil Management, Genetic resources, Crop Production and Forestry, livestock and food value chains. Water management is at the centre of climate change adaptation in agricultural productivity. Some water management technologies include water harvesting in field methods, enhancing soil moisture retention such as increase in organic matter and soil coverage, watershed management, efficient irrigation systems and use of grey water for irrigation. However, there is still a need to embed CSA into existing policies and plans within most SADC countries and the need to strengthen the necessary policy and institutional frameworks for implementation.

Knowledge and awareness around the Green and Blue Economy is also discussed in this Yearbook in detail. In most countries there is currently no agreed-upon definition of what the Green Economy actually means in relation to the national context and how it can complement the activities that are currently implemented under the umbrella of sustainable development or climate change. Lack of awareness is not only a factor hampering public institutions in advancing the Green Economy; it also has a number of significances for society in general. There is much to be done to raise awareness of the importance of managing growth without jeopardising a country's natural capital at all levels of society, including schools, universities and the general public.

Most of the initiatives, projects and programmes that are currently developed or implemented focus on agriculture and environmental aspects in the main. This not only applies to government, but to a large extent also to donor- driven programmes. A balance needs to be struck in climate change project development between other productive sectors and sustainable agriculture and natural resources management. These discussions are key for food security within the region.

Glossary of Terms

Adaptation: refers to adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts.

Agroforestry: The combination of forestry with agriculture to create more biologically diverse, sustainably productive, and profitable patterns of land-use.

Anthropogenic: Caused by humans, relating to or resulting from the influence of humans on the natural world.

Biodiversity: The variety of life on Earth, including diversity at the genetic level, among species and among ecosystems and habitats.

Cholera: An intestinal infection that results in frequent watery stools, cramping abdominal pain, and eventual collapse from dehydration.

Climate Smart Agriculture: CSA as defined by the FAO is "CSA is an approach to developing the technical, policy and investment conditions to achieve sustainable agricultural development for food security under climate change."

Conservation Agriculture: A method of agricultural production that conserves natural resources through integrated soil and water management.

Coping capacity: The degree to which adjustments in practices, processes or structures can moderate or offset the potential for damage, or take advantage of opportunities.

Crop Diversification: This refers to the practice of planting a wide variety of food crops in the same farm, to avert the danger of large-scale crop losses.

Drought: The phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land re- source production systems

Ecosystem: Refers to the complex relationships between all the organisms living in a particular area and the non-living physical features of the environment (water, sunlight, air) in which these organisms interact.

El Niño: Identified with a basin-wide warming of the tropical Pacific Ocean east of the dateline. This event has a great impact on the wind, sea surface temperature, and precipitation patterns in the tropical Pacific.

Green Economy: Defined by UNEP as resulting in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities.

Greenhouse Gases (GHGs): Gaseous constituents of the atmosphere that absorb and emit radiation at specific wave- lengths within the spectrum of infrared radiation emitted by the Earth's surface, atmosphere and clouds.

IPCC: An acronym for the Intergovernmental Panel on Climate Change. This is a scientific group created by the United Nations to evaluate the risks of anthropogenic climate change.

La Niña: The cold phase of ENSO is called La Niña. (See El Nino Above)

RAMSAR: The RAMSAR convention is an international treaty providing for the protection and sustainable usage of wetlands. A RAMSAR site is a wetland that is under the protection of this convention.

Small Island Developing States: Small Island Developing States (SIDS) are a distinct group of developing countries facing specific social, economic and environmental vulnerabilities.

Tropical Cyclone: A storm system characterised by a large low-pressure centre with strong winds and heavy rain. Tropical cyclones strengthen when water evaporated from the ocean is released as the saturated air rises, resulting in condensation of water vapour contained in the moist air.

UNFCCC: An acronym for the United Nations Framework Convention on Climate Change. This is an international environmental treaty produced at the United Nations Conference on Environment and Development in 1992. The objective of the treaty is to stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent anthropogenic climate change. The term UNFCCC also refers to the UN Secretariat that supports the working of this convention.

Vector Borne Diseases: Diseases that are transmitted between humans, or between humans and animals, by insects or other arthropods. Malaria and Sleeping Sickness are both examples of vector-borne diseases.

1. Introduction

1.1 Background on the Region

The Southern African Development Community (SADC) has existed since 1980, when it was formed as a loose alliance of nine majority-ruled Southern African countries known as the Southern African Development Coordination Conference (SADCC), with the primary goal of coordinating development projects in order to reduce economic dependence on apartheid South Africa. Angola, Botswana, Lesotho, Malawi, Mozambique, Swaziland, the United Republic of Tanzania, Zambia, and Zimbabwe are the founding members (African Union, n.d.). SADCC was founded on April 1, 1980, in Lusaka, Zambia, following the passage of the Lusaka Declaration - Southern Africa: Towards Economic Liberation.

The organization was transformed from a Coordinating Conference to a Development Community (SADC) on August 17, 1992, in Windhoek, Namibia, when the Declaration and Treaty were signed at the Summit of Heads of State and Government, giving the organization legal status (African Union, n.d.).

Angola, Botswana, the Democratic Republic of the Congo, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South Africa, Swaziland, the United Republic of Tanzania, Zambia, and Zimbabwe are members of the SADC, with headquarters located in Gaborone, Botswana (African Union, n.d.).

The main goals of the Southern African Development Community (SADC) are to achieve economic development, peace and security, and growth, alleviate poverty, improve the standard and quality of life of Southern African peoples, and assist the socially disadvantaged through Regional Integration. These goals will be met through enhanced regional integration based on democratic values, as well as equitable and sustainable development (SADC, n.d.).

Southern Africa is experiencing an increased intensity in hydro meteorological hazards such as droughts, tropical cyclones and floods. The increasing intensity and frequency of hydro meteorological hazards is mainly attributed to the impacts of climate change. Given the changes in climate, the SADC region needs to strategically consider responses and address the impacts of climate change on socio-economic development. The hydro-meteorological hazards tend to be the most common triggers of disasters in the SADC Region.

While effective climate change resilience and adaptation strategies exist in southern Africa, there has been little documentation and reporting of effective practices in the region, resulting in low uptake and scaling up of the strategies in other affected areas. It is against this background that SADC seeks to bridge the gap that exists and ensure that these effective practices are fully reported on and shared for implementation in other areas in southern Africa. There is also a need to accelerate sustainable development that is socially, environmentally, and economically resilient. There is need to raise awareness of the changing climate, as well as sectoral adaptation and mitigation strategies being undertaken in the region to increase resiliency against the climate change and variability. The Regional Climate Change Outlook, through the assessments, analyses, and reports, contribute towards increasing resilience of the region to climate change, droughts and floods, and deforestation, among others, and more recently emerging threats such as zoonotic diseases like Covid-19.

Figure 1: The SADC Region Countries

The objectives of SADC, as stated in Article 5 of the SADC Treaty (1992) are to: Achieve development and economic growth, alleviate poverty, enhance the standard and quality of life of the people of Southern Africa and support the socially disadvantaged through Regional Integration;

- Evolve common political values, systems and institutions.
- Promote and defend peace and security.
- Promote self-sustaining development on the basis of collective self-reliance, and the inter-dependence of Member States.
- Achieve complementarity between national and regional strategies and programmes.
- Promote and maximise productive employment and utilisation of resources of the region.
- Achieve sustainable utilisation of natural resources and effective protection of the environment.
- Strengthen and consolidate the long-standing historical, social and cultural affinities and links among the people of the Region.

The Regional Climate Change Outlook report will provide gender disaggregated data that illustrates how men and women are affected differently and hence respond differently to climate change impacts. The report will tap into the importance of indigenous knowledge in weather forecasting in building resilience to climate change, as well as the different roles of men and women in natural resource management as the custodians of indigenous knowledge in terms of climate resilient strategies. Sector specific socio-economic impacts and mitigation

strategies must be better understood, as well as their impact on the environment. Appropriate resilience and mitigation strategies will be captured to promote and advance such practices.

The Outlook will provide an update of climate change issues in southern Africa and thus it will fulfil one of the UNFCCC Article 4 intervention areas: "*Formulate, implement, publish and regularly update national and regional programmes containing measures to mitigate climate change and measures to facilitate adequate adaptation to climate change*". The Outlook will help policy-makers and decision-makers to take into consideration climate change in their policies, thus also fulfilling Article 4 which states: "Take climate change considerations into account, to the extent feasible, in their relevant social, economic and environmental policies and actions". By creating awareness on climate resilience and mitigation strategies the report will contribute to SADC efforts towards implementing Paris Agreement, particularly Article 2 which states the need to increase the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions in a manner that does not threaten food production. The Outlook also contributes towards SADC efforts in implementing the Regional Indicative Strategic Development Plan (RISDP) (2020-2030) and Revised SADC Climate Change and Action Plan as a proven measure to fight climate change, and enhance resilient, low-carbon development path and equitable society. It will inform the emerging Climate Migration policies that are intended to enhance early warning and facilitation of evacuation procedures in case of disasters.

1.2. Climate Impacts Summary

Climate change is a major development challenge of our time. The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as a change in climate that is attributed directly or indirectly to human intervention that alters the composition of the global atmosphere and beyond the natural climate variability observed over a comparable time period (SADC, 2015).

The extreme climatic events experienced by the SADC region, particularly droughts, are having a negative impact on the population and economy of the Southern African region. For example, drought has caused a drastic population decline in different southern African countries such as Lesotho, Malawi, Namibia and Madagascar. Agricultural production is declining, exacerbating food insecurity in the region. In developing small island states, extreme weather events are causing sea level rise, leading to salt intrusion and contamination of coastal freshwater aquifers (SADC, 2015). In addition, much of the major agricultural land is located on coastal plains threatened by rising sea levels. Sea-level rise is projected to inundate certain low-lying coastal areas, affecting coastal wetlands and mangrove areas that are important breeding grounds for fish and other marine life. Thunderstorms and tropical cyclones, sandstorms and dust storms occur regularly on the continent, increasing desertification, scarcity of freshwater resources, climatic changes, and disruption of agricultural production (SADC, 2015).

1.4 Report Structure and Chapter Overviews

The SADC region is located between the equator and mid- latitudes and is confined to the Indian Ocean on the East coast and the Atlantic Ocean on the West Coast (Davis, 2011). The relief over the SADC region ranges from sea-level to a plateau at about 1250m and extends to

mountains which exceed 3000m in height (Davis, 2011). These factors lead to different climate types in the region i.e. coastal desert at about 32°S on the border of Angola and Namibia, a temperate climate over the central interior plateau, a subtropical climate over low lying coastal regions in the South east and the Southern part of South Africa displaying a Mediterranean environment (Davis, 2011).

This report is a culmination of several reports that have been documented for each of the 16 SADC countries and is structured in a similar fashion with the individual country reports in order to capture the key issues from each of the countries.

1.4.1 Chapter 2: Climate Change Impacts, Challenges and Opportunities in the Region

Chapter 2 details the Climate change impacts, challenges and opportunities within the SADC Region. Widespread poverty within the SADC region makes the region highly vulnerable, while inversely vulnerability has also increased poverty in the region. Climate change may also affect food production which will impact on the food security status of the region. Impacts are hard felt in the region ranging from (to name a few) floods and droughts, disruption of livelihoods, constrained agricultural production, coastal flooding and erosion and sea level rise in Small Island Developing States (SIDs), health impacts, and water scarcity. Challenges of climate change may reduce the ability to respond to disasters and the related costs thereof. Some of these challenges for the region include lack of expertise, weak institutional capacity, policy guidance which remains unclear in terms of adaptation actions and inadequate data and funding. SIDs are particularly vulnerable. Warming of sea surface temperatures around SIDs has been detected and this trend may persist. In addition to the projected impacts and challenges the chapter also addresses the opportunities climate change offers that SADC Member States can take advantage of.

1.4.2 Chapter 3: Policies and Legislative Frameworks in the Region

Chapter 3 discusses issues around policies and legislative framework on climate change in the SADC region. This highlights if climate change issues are receiving much needed political attention. The SADC Member States commitment towards sustainable development is well reflected in the SADC Treaty, 1992. Member States contribution towards addressing climate change issues are also shown in the Member States commitment in climate change negotiations and ratifications of international environmental agreements such as the UNFCCC, Kyoto Protocol, United Nations Convention to Combat Desertification (UNCCD) and the United Nations Convention on Biological Diversity (UNCBD). SADC is a collective entity and remains committed towards promoting sustainable development. Some of the regional strategies and policies put in place acknowledge the issues around climate change. Such strategies include the Regional Indicative Strategic Development Plan, 2020 (RISDP), The SADC Climate Change Agenda, the Climate Change Adaptation Strategy for the Water Sector, Regional Biodiversity Strategy and the SADC Climate Change Strategy and Action Plan to name a few. Relevant climate change programmes in the region also include the programme on climate change adaptation and mitigation in the Eastern and Southern Africa (COMESA-EAC-SADC). Member States have also shown commitment towards enhancing agriculture as a means of improving access to food in the region.

1.4.3 Chapter 4: Disasters, Conflict and Migration

Countries that depend on natural resources experience stress related to climate change which impacts on the status of natural resources. Climate change is expected to increase disasters and climate induced windstorms, wildfires, droughts and floods which have already been manifested globally. Poorly designed disaster reduction and climate change adaptation and mitigation strategies may cause conflicts, while countries which are fragile and affected by conflicts experience shocks and stresses related to climate induced natural hazards simultaneously affecting lives and livelihoods. This intricately connected web of climate change, disaster, conflict and security hazards require integrated approaches and interventions which include preparedness, disaster risk reduction and resilience building.

The SADC region is vulnerable to a range of natural disasters and since disasters affect all SADC member states and some cut across political boundaries, a regional approach is best suited to deal with this. Such disasters include locust infestations and transboundary animal diseases as well as insecurity situations which have been experienced in the region. Floods cause not only loss of human life but also livestock death, infrastructure damage and lead to a great upsurge of waterborne diseases, like cholera which in recent times has shown its head in South Africa and Zimbabwe.

1.4.4 Chapter 5: Environment and Ecosystems

Chapter 5 discusses the environment and ecosystems by analysing six key aspects of environment and ecosystems in the SADC region namely: biodiversity, water resources, forests, fisheries, coastal ecosystems and major transboundary ecosystems and how the SADC region has responded to climate issues affecting these sectors. Ecosystems worldwide are under threat from climate change impacts that alter their makeup and functioning thereby impacting on the services and benefits that they provide to people. Much of Africa's economic growth is dependent on climate- sensitive sectors such as agriculture, forestry and fisheries, as are the livelihood prospects of a majority of the region's population. Although climate change is happening at a global scale, ecological impacts are local and vary from place to place. Conserving ecosystems and managing the environment sustainably is essential for effective adaptation and mitigation of these impacts.

1.4.5 Chapter 6: Agriculture, Livelihoods and Food Security

Chapter 6 focuses on the responses from SADC in addressing the climate change issues affecting agriculture in the region. The importance of Agriculture is still key and focus towards this aspect is once again noted. The agriculture sector is of major social as well as economic importance in the SADC region. The population in Africa is predicted to double by 2050 which implies that crop production will need to increase two to threefold to feed the growing population. Climate change within the SADC region is already impacting soil and water resources which are important for crop production, and these in turn impact on the lives of people as a result of decreased agricultural productivity and a concomitant decrease in food security. This interrelationship also indicates the need to consider climate change impacts and proposed strategies in a 'landscape approach' and not in isolation. It should also be noted that agricultural production does not end at the farm gate, but the entire food value chain offers scope for building climate resilience, adaptation and mitigation.

1.4.6 Chapter 7: Climate Change and Shaping the Green Economy Transition Agenda

The Green Economy as defined in the context of South Africa is a "system of economic activities related to the production, distribution and consumption of goods and services that result in improved human well-being over the long term, while not exposing future generations to significant environmental risks or ecological scarcities" (National Framework for Sustainable Development, 2008). The Green Economy refers to inter-linked developmental outcomes which means growing economic activity (which leads to investment, jobs and competitiveness) in the green industry sector. Transitioning to a Green Economy is one of many adaptation options which SADC member countries can consider in the face of climate change. SADC is seizing the opportunity towards transitioning to a Green Economy through the development of the regional Green Economy Strategy and Action Plan. The transition is expected to generate sustainable economic growth, while enabling job creation and social upliftment and protecting vital resources. Income generation and employment growth within the Green Economy are driven by both private and public investments that reduce carbon emissions while enhancing resource and energy efficiency, conserving biodiversity and ecosystems. The key component of the Green Economy is to drive efficient resource management. It is characterised by significantly increased investment in green sectors, supported by enabling policy reforms Climate change is an opportunity which presents itself as a motivation for green growth. The chapter focuses on the experience of South Africa in transitioning to a green economy in particular as South Africa provides lessons for the rest of the region.

1.4.7 Chapter 8: Climate Change and Shaping the Blue Economy Transition Agenda

The blue economy refers to the sustainable use of ocean resources for economic growth, improved livelihoods and jobs, and ocean ecosystem health. The Southern African Development Community (SADC) region has a vast coastline of over 13,000 km and a maritime area of over 6.5 million km2, which offers immense opportunities for blue economy development. However, the region also faces many challenges, such as climate change, marine pollution, illegal fishing, piracy and insecurity, and weak governance and institutional capacity.

To address these challenges and harness the potential of the blue economy, the SADC region has adopted various policies and strategies, such as the SADC Protocol on Fisheries, the SADC Maritime Security Strategy, and the 2050 Africa's Integrated Maritime Strategy. The SADC region also collaborates with regional and international partners, such as the African Union, the Indian Ocean Commission, and the European Union, to promote blue economy initiatives and projects. The SADC region's blue economy is therefore a key driver for regional integration, economic diversification, and social development.

1.4.8 Chapter 9: Emerging Issues and Trends

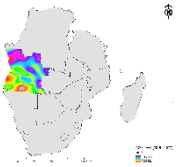
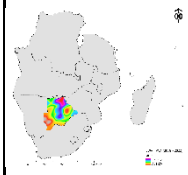
A number of recent events like COVID-19 have caused a ripple effect on emerging issues within the Climate Change cycles. These issues are likely to have a huge impact within the SADC Region in the near future. An example of issues discussed include sudden eruption of disease within the region and the required management protocols. These are discussed in Chapter 9.

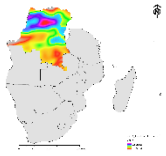
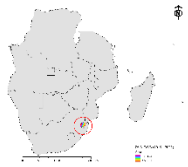
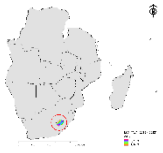
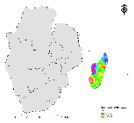
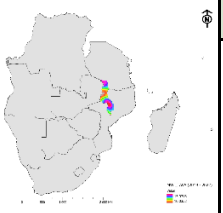
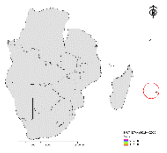
1.4.9 Chapter 10: Conclusion and Recommendations

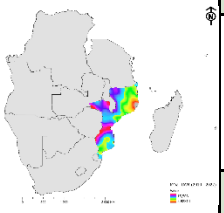
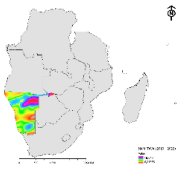
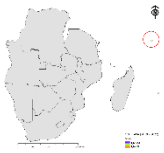
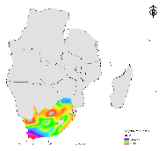
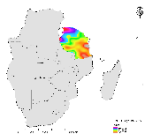
The overall conclusion chapter for the Yearbook offers recommendations around policy development and planning for climate change. It also details the gaps i.e.; what the region should be doing which they are presently not doing. Important lessons learnt including the need for long term planning to address climate change impacts are drawn in this chapter.

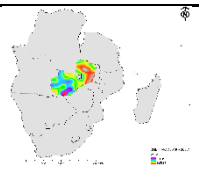
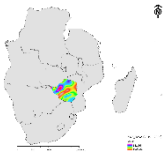
1.3 Regional Statistics (Latest)

Table 1: Key Statistics for the SADC Region Countries

SADC 	**GDP: GDP:** $ 753.15 Billion	**HDI:**
	Population: 379.69 Million (2022)	**Literacy Rate:**
	Land Area (sq.km): 9 781 604 sq.km	**Natural Resources:**
	Main Economic Activities:	
Angola 	**GDP:** US$ 67,4 billion (2021)	**HDI:** 0.4 (2020)
	Population: 34,503,774(2021)	**Literacy Rate:** 62.4%
	Land Area (sq.km): 129,979,825.5	**Natural Resources:** Diamonds, oil products, gas, fish, wildlife, agricultural products, sea and marine sources
	Main Economic Activities: Oil, gas and mining industry, agriculture, manufacturing, construction, tourism, wholesale, and retail trade	
Botswana 	**GDP:** $ 16,61 billion (2021)	**HDI:** 0.4
	Population: 2,588,423 (2021)	**Literacy Rate:** 87.5% (2013)
	Land Area (sq.km): 566 730 sq.km	**Natural Resources:** Diamonds, copper, nickel, cattle and wildlife.
	Main Economic Activities: Mining, Agriculture (Subsistence farming and Livestock), and Tourism.	
Comoros 	**GDP:** 1.296 billion USD (2021**)**	**HDI:** 0.558
	Population: 821 625 (2021)	**Literacy Rate:** 61.99%
	Land Area (sq.km): 1 246 700 sq.km	**Natural Resources:** vanilla (mostly on Grande Comore and Anjouan), perfume plants (particularly ylang-ylang on Anjouan), coconuts (mostly on Mohéli), coffee, cloves, cacao, and other crops cover much of the islands.
	Main Economic Activities: Agriculture, Fishing and Forestry.	
DRC	**GDP:** $ 12,236.6 (2021)	**HDI:** 0.48 (2020)

	**Population**: 5.7 million (2021)	**Literacy Rate:**80.02% (2021)
	Land Area (sq.km): 2,345,408 sq.km	**Natural Resources:** Arable land, Wildlife, Forests, Minerals (copper, oil, cobalt, gold, silver, zinc, manganese, tin)
	Main Economic Activities: Mining, Agriculture (Subsistence farming and Livestock), manufacturing, Fishing	
Eswatini	**GDP:** $ 4.743 Billion	**HDI:** 0.597
	**Population:** 1.16 Million (2020)	**Literacy Rate:** 89.28 %
	Land Area (sq.km): 17 364 sq.km	**Natural Resources:** sugar, food products, wood pulp and wildlife
	Main Economic Activities: Agriculture, forestry, mining and manufacturing	
Lesotho	**GDP:** $ 5.762 Billion	**HDI:** 0.514
	**Population:** 2.281 Million (2021)	**Literacy Rate:** 81.02%
	Land Area (sq.km): 30 355 sq.km	**Natural Resources:** diamonds, wildlife, mohair, wool and water
	Main Economic Activities: agriculture, livestock, manufacturing and mining	
Madagascar	**GDP:** $ 442.12 Billion	**HDI:** 0.501
	**Population:** 28.92 million (2022)	**Literacy Rate:** 77.25%
	Land Area (sq.km): 587 295 sq.km	**Natural Resources:** graphite, chromites, mica, bauxite, quartz, semi-precious stones, coffee, textiles, livestock, timber
	Main Economic Activities: Agriculture, Forestry, seafood industry, glassware, sugar, textiles, cement, tourism, paper, petroleum, and mining.	
MALAWI	**GDP**: 12.97 USD Billion	**HDI:** 0.512
	**Population:** 20,853,241 (2023)	**Literacy Rate:** 65.75%
	Land Area (sq.km): 118,484 square kilometers	**Natural Resources:** uranium, phosphates (apatite), bauxite, kaolinitic, coal, kyanite, limestones, rare earths (including strontianite and monazite), graphite, sulphides (pyrite and pyrrhotite), titanium minerals, and vermiculite.
	Main Economic Activities: Agriculture, Mining and Quarry, Manufacturing, Tourism, Financial and Professional Services, Transport and Communication.	
Mauritius	**GDP** $ 12.62 Billion (2014)	**HDI:** 0.771
	**Population:** 1.21 Million (2014)	**Literacy Rate:** 90%
	Land Area (sq.km): 2030 sq.km	**Natural Resources:** sugar cane, beaches, sea, flora, fauna and other marine resources

	Main Economic Activities: Financial Services, Business services, Tourism	
Mozambique 	**GDP:** $ 15.78 Billion	**HDI:** 0.446
	Population: 32,077,072 (2021)	**Literacy Rate:** 63%
	Land Area (sq.km): 801, 590 sq.km	**Natural Resources:** coking coal, thermal coal, graphite, iron ore, titanium, apatite, marble, bentonite, bauxite, kaolin, copper, gold, rubies, and tantalum.
	Main Economic Activities: Agriculture, fishing and forestry	
Namibia 	**GDP:** $ 12.31 Billion	**HDI:** 0.615
	Population: 2,53 million (2021)	**Literacy Rate:** 92.25 %
	Land Area (sq.km): 824 292 sq.km	**Natural Resources:** Diamonds, uranium, copper, zinc, lead, oil products, gas, fish, wild-life, agricultural products, sea and marine sources.
	Main Economic Activities: Agriculture, Livestock, Fisheries, Mining and Quarrying, Manufacturing, Construction, Wholesale, Tourism, and Service Industries.	
Seychelles 	**GDP:** 1. 406 billion	**HDI:** 0.756
	Population: 91 530 Million (2014)	**Literacy Rate** 96%
	Land Area (sq.km): 455 sq.km	**Natural Resources:** Fish, copra, cinnamon trees.
	Main Economic Activities: fishing, tourism, processing of coconuts and vanilla, coir (coconut fibre) rope, boat building, printing, furniture, and beverages	
SOUTH AFRICA 	**GDP:** $ 419.02 Billion (2021)	**HDI:** 0.709
	Population: 59.40 Million (2021)	**Literacy Rate:** 95.33%
	Land Area (sq.km): 1 213 090 sq.km	**Natural Resources:** Diamonds, Gold, Platinum, Iron Ore, Chromium, Copper, coal, oil products, gas, fish, wild-life, agricultural products, sea and marine sources.
	Main Economic Activities: Agriculture, Automotive industry, Health care, Mining, Transport, Construction, Manufacturing, Tourism and Fisheries, Wholesale, retail trade,Telecommunication and Business Activities.	
Tanzania 	**GDP:** $ 67.84 Billion	**HDI:** 0.549
	Population: 63.59 Million (2021)	**Literacy Rate:** 81.90%
	Land Area (sq.km): 945 087 sq.km	**Natural Resources:** Diamonds, gold, coal, gas, fish, wild-life, agricultural products, sea and marine sources.
	Main Economic Activities: Agriculture, Forestry, Fishing, Tourism, Manufacturing, Mining and Quarrying, Construction, Wholesale and retail trade.	
Zambia	**GDP:** $ 22.15 Billion	**HDI:** 0.565
	Population: 19473.125 million	**Literacy Rate:** 86.75%

	(2021)	
	Land Area (sq.km): 743,390 sq.km	**Natural Resources: s**ugar, food products, wood pulps and wildlife.
	Main Economic Activities: Industry, agriculture, and Tourism,	
Zimbabwe	**GDP:** $ 28.37 billion (2021)	**HDI:** 0.593
	**Population:** 15,463,969 Million (2023)	**Literacy Rate:** 89.70%
	Land Area (sq.km): 386,850 sq.km	**Natural Resources:** gold, platinum group metals (PGM), chrome, coal, diamonds, and lithium, asbestos, nickel, tobacco.
	Main Economic Activities: Mining agricultural land, water, natural vegetation, and wildlife	

1.4 Climate Change and Programmes

As the world grapples with the challenges posed by global climate change, Southern Africa is particularly vulnerable to the effects of climate change. Over the coming decades, the Southern African Development Community (SADC) region is expected to experience higher land and ocean surface temperatures than in the past, which will affect rainfall, wind as well as precipitation and the duration and intensity of weather phenomena (SADC, n.d.).

Since climate change adaptation involves many factors for progress in Southern Africa, SADC participates in several international conventions and programs on climate change including:

- The United Nations Framework Convention on Climate Change, which advocates for reducing emissions to reduce global temperatures, and provides guidance on how to deal with the effects of climate change.
- The Ramsar Convention on Wetlands, specifically aimed at the conservation of wetlands of international importance; it also includes a resolution covering climate change impacts, adaptation and mitigation.
- The Convention on Biological Diversity has produced many decisions and technical documents describing the link between biodiversity and climate change mitigation.
- Adaptation in the Water Sector: The main objective of the strategy is to reduce the impacts of climate change through the development and adaptive management of water resources in the Southern African region. SADC intends to achieve this by developing all aspects of the water sector as a means to reduce climate vulnerability and ensure that water management practices adapt to climate change. climate change increases (SADC, n.d.).

There are different programmes noteworthy that are being practised by some of the southern African countries like the Climate Smart Agriculture in Tanzania, Zambia and Mozambique. The climate smart agriculture program seeks to promote smart agricultural activities that can withstand the harsh conditions that are brought about by climate change, it involves different practices which includes (i) conservation agriculture, (ii) agroforestry, (iii) water management etc. (Thierfelder, et al., 2016). Malawi as a nation that is highly dependent on the agricultural sector and that is highly affected by climate change can also adopt this program. The Research and Development from Botswana is also another program noteworthy as it aims to explore innovative research with the aim of

advancing the understanding of physical, chemical and biological components of the earth system, the causes and consequences of climate and land use change, and vulnerability and resilience to such changes (Botswana Climate Change Network, n.d.).

2 Climate Change Impacts, Challenges and Opportunities in the Region

2.1 Challenges

Impacts on Agriculture and Water Sector

Agriculture and water sectors remain vital in driving economic transformation, sustainable livelihoods, and advancement in developing nations within the southern Africa and the complete globe (Nhemachena, et al., 2020). Along with the water sector, agricultural development is critical for economic development and achievement of the Sustainable Development Goals (SDGs). Be that as it may, climate change and variability threaten to derail these efforts and offset economic development plans to attain food and water security, reduce poverty, and achieve sustainable development. Anticipated changes in climate incorporate recurring climate extremes like droughts, flooding, and outbreaks of pests and diseases exposing the region to the vulnerabilities of the changing environment (Nhemachena, et al., 2020). In expansion, the agriculture sector still faces challenges to provide sustainable livelihoods to millions who depend on the sector and guaranteeing national and regional food security in numerous African nations.

The changing climate exacerbates water stress and hydrologic inconstancy particularly in semi-arid such as Namibia, a few parts of South Africa and Botswana, and arid regions that incorporate Southern Africa. Variability in water resources influences accessibility of water for competing economic sectors and natural ecosystems. The impacts of climate change and variability on water resources have noteworthy impacts on the execution of the agriculture. In Southern Africa, such impacts are as of now derailing economic growth and advancement and proceed to increase the vulnerability of over 60% of the populace living in rural regions depending on agriculture and natural resources for their livelihoods (Nhemachena, et al., 2020).

The agriculture sector is critical for the regional economy of Southern Africa, contributing approximately 17% of the region's Gross Domestic Product (GDP) and up-to 28% GDP when middle incomes nations are excluded. The sector moreover bolsters over 60% of the populace depending on agriculture and natural systems for their livelihoods. The execution of agriculture has implications for the welfare of millions and developmental outcomes such as food security, poverty reduction, and achievement of sustainable development goals (Nhemachena, et al., 2020).

Table 2: Climate Change Challenges, Vulnerable Sectors and Vulnerability Challenges within SADC per Member State

	Climate Variability and Change Impacts	Angola	Botswana	DR	Lesotho	Madagascar	Malawi	Mauritius	Mozambique	Namibia	Seychelles	South Africa	Swaziland	Tanzania	Zambia	Zimbabwe
Challenges associated with climate variability, global warming and climate change	Floods	✓	✓			✓	✓	✓	✓	✓	✓	✓		✓		
	Drought	✓	✓	✓	✓		✓			✓	✓	✓	✓		✓	
	Extreme Events					✓		✓	✓		✓	✓				
	Hydrological Changes	✓										✓			✓	
	Soil /Coastal Erosion	✓				✓					✓	✓		✓		
	Water Stress		✓		✓	✓		✓		✓		✓		✓		✓
	Heatwaves		✓	✓						✓		✓				
	Declining water Quality				✓		✓					✓			✓	
	Sea Level Rise					✓		✓	✓	✓	✓			✓		
	↑ Sea Surface Temperatures (SST)	✓				✓		✓	✓	✓	✓	✓		✓		
	Mangrove Destruction	✓				✓		✓	✓		✓	✓		✓		
	Outbreak of vector borne diseases	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	↑ Temperatures	✓		✓	✓	✓			✓	✓			✓	✓	✓	✓
	Salt water intrusion							✓		✓	✓	✓	✓			
	Changing Precipitation Patterns		✓	✓	✓	✓		✓	✓	✓					✓	✓
	Receding shorelines					✓		✓				✓				
	Wind storms /Stormsurges					✓			✓	✓	✓			✓		
	Destruction of coral reefs					✓		✓			✓					
	Tidal Surges							✓				✓				
	Coastal Inundation					✓		✓	✓	✓	✓			✓		
	Water Pollution	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Vulnerable Sectors	Biodiversity	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Water Resources	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Forests	✓		✓		✓		✓					✓			
	Fisheries					✓		✓	✓		✓	✓				
	Coastal Ecosystems	✓				✓		✓	✓		✓	✓		✓		
	Transboundary Major Ecosystems	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Agriculture/Food security	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Health	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Human Settlements and Infrastructure	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Small Islands					✓		✓			✓					
	Energy	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

	Climate Variability and Change Impacts	Angola	Botswana	DR	Lesotho	Madagascar	Malawi	Mauritius	Mozambique	Namibia	Seychelles	South Africa	Swaziland	Tanzania	Zambia	Zimbabwe
	Ecotourism	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Coastal Zone Management	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Trade and Industry	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Vulnerability and Challenges	Adaptive capacity of Communities	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Livelihood Disruption	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Urban Infrastructure	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Technology needs	✓		✓				✓	✓				✓	✓	✓	✓
	Funding		✓					✓	✓	✓			✓	✓	✓	✓
	Human capacity Constraints								✓	✓						
	Capacity Building								✓		✓		✓	✓	✓	✓
	Institutional capacity									✓	✓					
	Economic Rigidity	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Gender Equality	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Poverty	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	HIV/AIDS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Natural Resource Dependency	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Adapted from Eriksen et al (2008)

Water

Changes to water resources can have a big impact on the world and our lives. Flooding is an increasing issue as our climate is changing. Compared to the beginning of the 20th century, there are both stronger and more frequent abnormally heavy precipitation events across the world, conversely, drought is also becoming more common.

Food

Food supply depends on climate and weather conditions and although farmers and researchers may be able to adapt some agricultural techniques and technologies or develop new ones, some changes will be difficult to manage. Increased temperatures, drought and water stress, diseases, and weather extremes create challenges for the agricultural sector.

Human health

Climate change is already impacting human health; changes in weather and climate patterns can put lives at risk. Heat is one of the deadliest weather phenomena; as ocean temperatures rise, hurricanes are getting stronger and wetter, which can cause direct and indirect deaths. Dry conditions lead to more wildfires, which bring many health risks and higher incidences of flooding can lead to the spread of waterborne diseases, injuries, and chemical hazards. The

most vulnerable groups, including children, the elderly, people with preexisting health conditions, outdoor workers, people of color, and people with low income, are at an even higher risk because of the compounding factors from climate change.

Infrastructure

Physical infrastructure includes bridges, roads, ports, electrical grids, broadband internet, and other parts of our transportation and communication systems. It is often designed to be in use for years or decades, and many communities have infrastructure that was designed without future climate in mind. But even newer infrastructures can be vulnerable to climate change. Extreme weather events that bring heavy rains, floods, wind, snow, or temperature changes can stress existing structures and facilities. Increased temperatures require more indoor cooling, which can put stress on an energy grid. Sudden heavy rainfall can lead to flooding that shuts down highways and major business areas. Coastal infrastructure, such as roads, bridges, water supplies, and much more, is at risk as sea level rise can also lead to coastal erosion and high-tide flooding.

Figure 2: A depiction of climate change-Flooding in Comoros

2.2 Opportunities Brought About by Climate Change

Despite the negative impacts brought by climate change, there are some positive impacts or positive opportunities associated with climate change in the SADC Region. Tourism is of great significance to developing countries; the small island economies which are most dependent on tourism tend to be middle income and contain few of the worlds' poor.

2.3 Conclusions and Recommendations

3 Policies and Legislative Frameworks in the Region

3.1 International Commitments to Conventions and Policies in the SADC Region

As there is a direct relation between global average temperatures and the concentration of greenhouse gases in the atmosphere, the key for the solution to the climate change problem rests in decreasing the number of emissions released into the atmosphere and in reducing the current concentration of carbon dioxide (CO2) by enhancing sinks (e.g., increasing the area of forests). Efforts to reduce emissions and enhance sinks are referred to as "mitigation".

The Convention requires all Parties, keeping in mind their responsibilities and capabilities, to formulate and implement programmes containing measures to mitigate climate change. Such programmes target economic activity with an aim to incentivize actions that are cleaner or disincentive those that result in large amounts of GHGs. They include policies, incentives schemes and investment programmes which address all sectors, including energy generation and use, transport, buildings, industry, agriculture, forestry and other land use, and waste management. Mitigation measures are translated into, for example, an increased use of renewable energy, the application of new technologies such as electric cars, or changes in practices or behaviours, such as driving less or changing one's diet. Further, they include expanding forests and other sinks to remove greater amounts of CO2 from the atmosphere, or simply making improvements to a cookstove design.

UNFCC and KYOTO Protocol

Under the UNFCCC, and notably under the Kyoto Protocol, developed counties have set economy-wide caps for their national emissions, while developing countries have generally focused on specific programmes and projects.

Following the 2009 Copenhagen Accord and the 2010 Cancun Agreements developed countries have communicated quantified economy-wide emission targets for 2020 and developing countries have agreed to implement nationally appropriate mitigation actions (NAMAs) with support from developed countries. In addition, developed country Parties to the Kyoto Protocol – at the end of the first commitment period under the Protocol (2008-2012) – adopted a second commitment period with targets for 2013-2020, in the form of the Doha Amendment. For developing countries the Kyoto Protocol's clean development mechanism (CDM) has been an important avenue of action for these countries to implement project activities that reduce emissions and enhance sinks.

In the process leading up to the Paris Conference all countries, developed and developing, prepared intended nationally determined contributions (INDCs), which outline national efforts to reduce emissions and increase resilience. As a result, a diversity of efforts was communicated, including absolute and relative quantified national targets, sectoral targets and programmes, and others. The new concept of INDCs was eventually formalized under the Paris Agreement as nationally determined contributions (NDCs), and Parties are requested to prepare and communicate successive NDCs every five years.

Parties to the Convention have also cooperated increasingly to reduce GHG emissions from deforestation in developing countries. Developing countries are encouraged to contribute to mitigation actions in the forest sector by undertaking activities to reduce emissions from deforestation and forest degradation, conserve forest carbon stocks, implement sustainable

management of forests and enhance forest carbon stocks(REDD-plus). The Paris Agreement also recognizes the importance of sinks, including forests and encourages Parties to implement and support the existing framework of guidance and decisions that has been elaborated on REDD-plus under the Convention over the years.

Emissions from fuels used for international aviation and maritime transport contribute increasingly to global emissions. To address these emissions, there has been ongoing work in the International Civil Aviation Organization and the International Maritime Organization, as well as cooperation between these two organizations and the UNFCCC.

All over the world, many measures are being taken to mitigate climate change by countries trying to live up to their commitments under the Convention, the Kyoto Protocol and the Paris Agreement. According to the Convention, Parties shall take into consideration the specific needs and concerns of developing country Parties arising from the impacts of response measures, a call that is echoed similarly by the Paris Agreement. The Kyoto Protocol commits Parties to strive to minimize adverse economic, social and environmental impacts on other Parties, especially developing country Parties. In order to facilitate assessment and analysis such impacts, and with the view to recommending specific actions, the Conference Of the Parties (COP)has established a forum on the impact of the implementation of response measures under the Convention, which is also to serve the Paris Agreement.

3.2 SADC Policies and Strategies

The Southern African Development Community (SADC) has acknowledged the significance of promoting sustainable utilization and administration of the natural environment as a pivotal strategy in mitigating the challenges of poverty and food insecurity. The concept of sustainable development entails the integration of economic development with the welfare of the population of the respective region and the environment that serves as a critical source of livelihood for many individuals. The present study observes that the repercussions of climate change have an extensive reach and substantial impact, which exert influence on an array of sectors including agriculture, infrastructure, human health, terrestrial and marine ecosystems, as well as water resources, amongst others, throughout the region. Climate aberrations have the capability of impeding the years of investment and advancements in national development. Addressing disaster risk, relief programmes, and other responses to climate disasters may necessitate nations to shift limited resources originally designated for other developmental priorities.

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Although there has been some encouraging progress observed in environmental management within the region, certain factors such as climate change impacts, land degradation, deforestation, loss of biodiversity, pollution, inadequate provision of clean water and

sanitation services, and suboptimal urban conditions still pose challenges to the pursuit of sustainable development. The region's sustainable socio-economic development is impeded by various environmental challenges and societal conditions. The aforementioned factors are interconnected with elevated levels of impoverishment, wherein the underprivileged populations are both susceptible to and contributors of ecological deterioration. The deterioration of the environment poses a significant threat to the progression of economic development and has a direct impact on the sustenance of individuals' means of subsistence.

In order to address sustainable development, SADC has established four main environmental policy goals:

- Protect and improve the wellbeing, environment and employments of the individuals of southern Africa with need to the destitute larger part;
- Reduce greenhouse gas emissions and increase resilience of ecosystems and people in the region;
- Preserve the natural heritage, biodiversity and life supporting ecosystems in southern Africa; and
- Support regional economic development on an equitable and sustainable basis through Blue, Green and Circular Economy approaches.

The establishment of the Environment and Climate Change Programme, operating under the jurisdiction of the Food, Agriculture and Natural Resources Directorate, aims to promote the judicious and sustainable utilization of land-based resources, with a view to enhancing the welfare of present and future generations, while fostering economic resilience

3.3 Other Regional Protocols

- **The Ramsar Convention on Wetlands.**

The Ramsar Convention on Wetlands provides the framework for the conservation and wise use of all wetlands through local and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world.

- **The Convention on Biological Diversity.**

The Convention on Biological Diversity is designed to achieve a tripartite set of goals which includes (i) the preservation and protection of biological diversity, encompassing (generic diversity, species diversity, and habitat diversity) which is of paramount importance, (ii) the sustainable utilization of biological diversity, (iii) the equitable and just distribution of benefits emanating from the exploitation of generic resources (BMUV, 2022).

- **SADC Protocol on Forestry (2002)**

The SADC Protocol on Forestry of 2002 aims to advance the development, preservation, sustainable management, and utilisation of all categories of forests and trees, engage in the exchange of forest commodities, attain efficient environmental preservation, and safeguard the interests of both present and future generations, SADC (2002).

The community is cognizant of the fact that a considerable number of residents in the locality rely on forests as their primary source of income. Hence, the significance of sustainable forest management cannot be overstated as it plays a crucial role in poverty reduction. Moreover,

the community acknowledges the pivotal role played by forest communities, women, and the private sector in forest management planning, implementation, and the development of industries that are reliant on forests, SADC (2002).

The protocol thus offers direction concerning the execution of national forest evaluations as well as policies, programs, and legislation at the national level. It is recommended that Member States enact policies and mechanisms that facilitate the full and meaningful involvement of local populations, particularly women, in forest management endeavours. Furthermore, due consideration should be given to preserving and acknowledging the traditional knowledge specific to forest ecosystems. From the perspective of poverty eradication, it is advisable for Member States to endeavour towards establishing significant forest-based industries within their respective territories, SADC (2002).

- **Paris Agreement, 2015**

Requires all countries to set emissions-reduction pledges. Governments set targets, known as nationally determined contributions (NDCs), with the goals of preventing the global average temperature from rising 2°C.

- **Protocol on environmental management for Sustainable Development**

The Protocol aims to promote sustainable utilisation and trans-boundary management of the environment and natural resources. The Protocol covers environmental issues such as climate change, waste and pollution, management of chemicals, biodiversity and natural heritage, sustainable land management, marine and inland resources, as well as cross-cutting issues on gender, science, technology, trade and investment, all of which are critical for sustainable development of the region.

- **Protocol on Fisheries**

This Protocol aims at conservation and sustainable use of living aquatic resources and aquatic ecosystems that are of interest to the members of SADC that are a Party to this Protocol. The Protocol shall apply to resources within the jurisdiction of State Parties, resources outside their jurisdiction that may be of interest to State Parties and fishing by nationals of State Parties and activities related thereto.

- **Protocol on Shared water resources**

SADC's Regional Water Policy and Strategy (RWPS) is designed to support the implementation of the SADC Protocol on Shared Watercourses as the key legal instrument for promoting regional cooperation regarding water related issues (SADC 2007). As outlined in the RWPS (2007), the implementation of the Protocol should be supported by the following key activities:

- Strengthen the SADC Water Division as the implementing organisation responsible for promoting, coordinating and monitoring the Protocol.
- Negotiate bilateral and multilateral agreements between Watercourse States within the framework of the SADC Protocol, which include mechanisms for the peaceful resolution of disputes.

- Strengthen shared watercourse institutions to promote good governance and cooperation between Watercourse States
- Strengthen the capacity of Member States to implement the Protocol through harmonisation of national laws and policies, national institutional development, and training of personnel.

SADC protocol on Gender and development: seek to promote gender equality and women's empowerment in the region, and the SADC Regional Infrastructure Development Master Plan, which aims to improve infrastructure and connectivity throughout the region.

3.4 Regional Responses to Climate Change Challenges and Impacts

The SADC Climate Change Strategy and Action Plan aims to provide a broad outline for harmonized and coordinated Regional and National actions to address and respond to the impacts of climate change in line with global and continental objectives. The strategy takes cognizance for the need of enhanced adaptation to the impacts of climate change bearing in mind the diverse and gender differentiated levels of vulnerabilities that are more pressing for the region. However, it also aims to trigger and support nationally, and regionally appropriate mitigation actions given mitigations' potential opportunities for sustainable development. The Climate Change Strategy shall guide the implementation of the Climate Change Programme over a Fifteen-year period (2015 - 2030). The Strategy will provide a short, medium to long term framework for implementing elaborate and concrete climate change adaptation and mitigation programmes and projects. The strategy is divided into 3 categories:

(i) Climate Change Adaptation,
(ii) Climate Change Mitigation, and
(iii) Means of implementation and monitoring and evaluation.

The SADC Region recognises that actions to mitigate climate change should be carried out in a manner that promotes sustainable regional economic growth, ensures environmental integrity and foster social equity. Various policy instruments to encourage GHG mitigation are already in place within the region. Key policy instruments include the SADC Treaty; the Regional Indicative Strategic Development Plan, Protocol on Environmental Management for Sustainable Development, the Protocol on Forestry and the decisions from the SADC Extra Ordinary Summit on Poverty and Development (2008), as well as the Regional Green Economy Strategy and Action Plan for Sustainable Development.

SADC Treaty: This Treaty sets out the main objectives of SADC - to achieve development and economic growth, alleviate poverty, enhance the standard and quality of life of the peoples of Southern Africa and support the socially disadvantaged through regional integration.

The regional indicative development plan: The SADC Regional Indicative Strategic Development Plan (RISDP 2020-2030) and SADC Vision 2050 are two strategic plans which seek to further deepen Southern Africa regional integration and foster development.

The two strategic plans were approved by the 40th Ordinary SADC Summit in Maputo, Mozambique in 2020. They are both based on a firm foundation of Peace, Security and Democratic Governance, and premised on three interrelated pillars, namely: Industrial Development and Market Integration; Infrastructure Development in support of Regional Integration; and Social and Human Capital Development.

Protocol on Environmental Management for Sustainable Development: The Protocol aims to promote sustainable utilisation and trans-boundary management of the environment and natural resources. It covers environmental issues such as climate change, waste and pollution, management of chemicals, biodiversity and natural heritage, sustainable land management, marine and inland resources, as well as cross-cutting issues on gender, science, technology, trade and investment, all of which are critical for sustainable development of the region. The Protocol is important in that it reminds that environmental issues and social conditions if not managed sustainably undermine socio-economic development.

The Protocol on Forestry and the decisions from the SADC Extra Ordinary Summit on Poverty and Development (2008): The Protocol on Forestry provides a policy framework for sustainable forest management in the SADC region. Objectives addressed in this protocol include increasing public awareness of forestry and capacity building. More specifically, the framework addresses research gaps, laws, education and training, the harmonisation of regional sustainable management practises, increasing efficiencies of utilisation and facilitation of trade, equitable use of local forests and a respect for traditional knowledge and uses.

Forestry Programmes: SADC objectives for forestry sector management are integrated with the revised Regional Indicative Strategic Development Plan (RISDP 2020 - 2030) as well as into the priorities of the Food, Agriculture and Natural Resources (FANR) Directorate. The revised SADC Forestry Strategy (2020-2030) which operationalizes the Protocol on Forestry (2002) provides strategic framework for national and regional cooperation in addressing challenges facing management of the forest resources in the SADC region. The Strategy identifies the following as major challenges that forest sector is faced: - conversion of forest lands to other uses; Encroachment into forest areas both inside and outside forest protected areas; demand for energy from fuel wood and charcoal; limited capacity of government institutions responsible for forest management; Inadequate participation of local communities in productive forest management; Inadequate formal intra-regional trade in forest products between most Member States and climate change.

The SADC Forestry Strategy (2020-2030) designates the following strategic intervention areas in addressing aforementioned challenges:

- Forest Institutional capacity and governance;

- market and trade in timber and other forest products;
- Financial investments and private sector engagement;
- Protection, Restoration and Sustainable Management and Use of Forest Production Systems.

The Regional Green Economy Strategy and Action Plan for Sustainable Development: SADC Region is bestowed with forest resources as 41% of the SADC total land area is covered by natural forests that provide timber and non-timber forest products, as well as domestic wood energy. Furthermore, these forests provide habitat for wildlife and other forest biodiversity and economic benefits such as proceeds from tourism. Forests are also important for the provision of environmental goods and services including soil protection, water conservation, food, and climate change mitigation through carbon sequestration.

In promotion of the SADC Regional Economic Agenda, forests provide vital ecological services which are critical in development of the other sectors such to include Hydropower production, Agri-food systems, Water security, wildlife conservation, Tourism development, Fisheries, public health, resilient cites, global warming and Disaster risk reduction. Importantly, natural forests contribute significantly to the livelihoods and wellbeing of the majority of SADC population in rural areas.

3.5 The Importance of Incorporating Gender Dimensions in Adaptation Policies – A Country Case Study

Box 1: The Importance of Incorporating Gender Dimensions in Adaptation Policies: Mauritius case study

Socio-economic and gender analysis is an important step for gender-appropriate targeting of CSA. It can be used to understand the socially differentiated roles, responsibilities, priorities and resources of producers at the community and household levels, providing the kind of information needed for policy and programme development that addresses the types of inequalities that prevent women's access and control of resources When considering the influence of gender on the ability of individuals and communities to adapt to the effects of a changing climate on their agricultural development, and to mitigate the causes of climate change,

The result of the case study showed that rural women in particular are reported to be at high risk of negative impacts from climate change, this is because their household responsibilities such as childcare and the collection of firewood and water can make women particularly climate-sensitive, because they are taking on more agricultural work as men migrate for labour, because they have less access to agricultural resources such as land, extension services and inputs with which to adapt to variability and change, and because gendered social norms and roles can inhibit women's adaptive capacity.

Integrating considerations of gender into medium- and long-term adaptation can help to ensure that adaptation is effective and implementable on the ground. It can help to ensure that the implementation of adaptation activities will not exacerbate inequalities and other vulnerabilities, it can help to fulfil the specific needs of the most

vulnerable, and it can ensure the equal participation of men and women in the decision-making and implementation phases of these activities. Women can act as agents of change at different levels of the adaptation process.

3.6 Conclusion and Recommendations

4 Disasters, Conflict and Migration

The Southern African Development Community (SADC) is a region that faces various challenges related to disaster, conflict and migration. These challenges are interconnected and have implications for the social, economic and political stability of the region. This paragraph provides an overview of some of the main issues and trends in this regard.

Disaster: The SADC region is prone to natural hazards such as cyclones, floods, droughts and earthquakes, which can cause widespread damage and displacement. According to the Internal Displacement Monitoring Centre (IDMC), more than 1.2 million people were displaced by disasters in Southern Africa in 2019, mainly due to Cyclone Idai and Kenneth that hit Mozambique, Malawi and Zimbabwe (IDMC, 2019). Slow-onset disasters such as drought also affect millions of people in the region, especially in Botswana, Eswatini, Lesotho, Namibia and Zambia. These disasters exacerbate food insecurity, poverty and environmental degradation, and can trigger or worsen conflicts over scarce resources (SADC, 2019). Figure 3 highlights an example of these disasters in Madagascar recently.

(Source: https://insidemadagascar.org/en/notre-histoire/)

Figure 3: Damaged road network in Madagascar

Conflict: The SADC region has experienced several armed conflicts in its history, some of which are still ongoing or unresolved. The most prominent case is the Democratic Republic of the Congo (DRC), where a complex and protracted conflict has claimed millions of lives and displaced millions more since the 1990s. The conflict involves multiple armed groups, foreign interventions, ethnic tensions and competition over natural resources. Another case is Mozambique, where a low-intensity insurgency by a militant group known as Al-Shabaab has escalated since 2017 in the northern province of Cabo Delgado. The insurgency has caused

thousands of deaths and displacements, as well as attacks on infrastructure and humanitarian workers. The root causes of these conflicts include political instability, social inequality, poor governance, corruption and external interference.

Migration: The SADC region is characterized by diverse and dynamic migration patterns, driven by various factors such as economic opportunities, political instability, environmental hazards and cultural ties. According to the United Nations Department of Economic and Social Affairs (UN DESA), there were about 6.4 million international migrants in Southern Africa in 2020, representing 1.8 per cent of the total population (UN DESA, 2020). South Africa is the main destination country for migrants in the region, hosting about 2.9 million migrants in 2020. Most migrants in Southern Africa originate from within the region or from other parts of Africa, but there are also significant numbers of migrants from Asia and Europe. Migration can have positive impacts on development, such as remittances, skills transfer and cultural diversity, but it can also pose challenges such as irregular migration, human trafficking, xenophobia and social exclusion.

According to the SADC Disaster and Risk Management of 2022 it is said that the region still faces challenges when dealing with disaster management. Key disaster risk management challenges facing the SADC region include the following (Southern African Development Community Towards a Common Future , 2022):

- Institutional frameworks for Disaster Risk Reduction at the regional, national and, in some cases, local/community level, which are often under-funded and not coordinated;
- Lack of comprehensive and constantly updated risk assessments and analysis;
- Weak information and knowledge management systems, specifically in high risk areas; and
- The need to reduce underlying risk factors.

4.1 Disasters in the Region

Tropical Cyclones: Tropical cyclones caused extensive flooding in SADC Member States such as the Comoros, Madagascar, Malawi, Mozambique, South Africa, United Republic of Tanzania and Zimbabwe. Cyclone Idai, which hit the Region in 2019/2020, was recorded as one of the worst tropical storms to ever affect Africa and the southern hemisphere.

Droughts: Various countries within the region have been faced with droughts in the past five years due to climate change impacts.

5 Environment and Ecosystems

5.1 Biodiversity Responses

Southern Africa harbours exceptional biodiversity heritage of global importance. Biodiversity plays an important role to SADC countries population and GDP. Most of the rural population depend heavily on agriculture and timber for firewood whereas GDP depend on other resource such as plant and animal species for tourism. However, the increase in dependence on these resources results in pressure and climate change is worsening the situation.

Responses

Biodiversity in SADC region are protected through the protected areas such as national park, game reserves, botanical gardens, nature reserves and TransFrontier Conservation Areas. SADC country members also signed and ratified with CBD.

5.2 Responses in the Water Sector

Southern Africa has plentiful water resources, encompassing 15 transboundary river basins. Water is recognised as an important driver of socio-economic development within the SADC region as indicated in the SADC Water Policy and Strategy (2006). Optimal water management particularly supports the SADC development objectives on poverty reduction, food security, energy security and industrial development. However, water availability and water quality are critical concerns for many SADC Member States. Southern Africa experiences significant precipitation and is highly seasonal in most countries and the distribution varies between tropical areas in the north of the region and arid and semi-arid climates in southern and central regions (SADC, 2022).

Furthermore, various challenges in integrated water resources management exist in the region including, highly variable rainfall and uneven water distribution across the region, high water demands resulting in spatial and temporary scarcities. Rapid increase in population as well as competing agricultural and industrial affects water availability and scarcity that can ultimately lead to food insecurity. This is exacerbated by climate change (SADC, 2022).

Responses

Due to the region's growing population and its economic development response to climate change, SADC has designated a specific regulatory bodies, policies and strategies in response to climate change on water resources within the region:

- Revised Protocol on Shared Watercourses 2000
- Regional Water Policy 2005
- Regional Strategic Action Plan (RSAP) I
- Regional Strategic Action Plan 2 2005
- Regional Strategic Action Plan 3 (2011)
- SADC Climate Change Adaptation for the Water Sector 2011

5.3 Responses in Fisheries Sector

The fisheries sector in SADC countries, comprising marine and inland capture fisheries and aquaculture, generates a variety of benefits, including nutrition and food security, livelihoods, employment, exports and foreign currency, and conservation and biodiversity values that are of global significance. The fisheries sector in the Region contributes an average of about 3.5%

of the region' GDP and 11% of the region's agriculture GDP, with total average exports worth of USD152 million and average imports of USD100 million. The sector employs an average of 2.6 million people of the SADC population (SADC, 2022).

However, the region is currently experiencing challenges amongst others including fish diseases, limited technical skills and technologies, and limited funding that continue to affect the growth of aquaculture. In addition, fish stocks continue to dwindle due to challenges with illegal, unreported and unregulated (IUU) fishing, degradation of aquatic environments, climate change and lack of capacity to effectively manage fish stocks (SADC, 2022).

Responses

In order to optimize benefits from the fisheries and aquaculture SADC Heads of State in 2001 endorsed the SADC Protocol on Fisheries. The Protocol aims to promote responsible and sustainable use of the living aquatic resources and aquatic ecosystems of interest to State Parties, in order to (i) promote and enhance food security and human health, (ii) safeguard the livelihood of fishing communities, (iii) generate economic opportunities from nationals in the region, (iv) ensure that future generations benefit from these renewable resources; and (v) alleviate poverty with the ultimate objective of its eradication.

In 2008 SADC Ministers responsible for Marine fisheries signed a "Statement of Commitment to combat Illegal, Unreported and Unregulated (IUU) fishing" in support of Article 9 of the SADC Protocol on Fisheries. The SADC Statement of Commitment to combat IUU fishing, which is an Annex to the Protocol on Fisheries, is aimed at (a) improving regional and inter-regional cooperation with a view to eradicating IUU fishing, (b) strengthening fisheries governance and legal frameworks to eliminate IUU fishing, (c) developing regional plan of action in relation to IUU fishing, and (d) strengthening fisheries monitoring control and surveillance capacity regionally.

The Protocol is implemented through the Implementation Strategy which was approved in 2010 in Victoria Falls, Zimbabwe by the Ministers responsible for Environment and Natural Resources, and it consists of five areas of focus, a) aquaculture, b) management of shared fisheries resources, c) combating illegal, unreported and unregulated (IUU) fishing, d) small-scale/artisanal fisheries, and e) fish trade.

5.4 Coastal Ecosystems Responses

Despite their value, marine and coastal ecosystems are being degraded at a rapid rate. Coastal and island African countries are particularly vulnerable to the impacts of climate change as their communities are reliant on marine and coastal ecosystems to support their economies and the livelihoods of their people. Ocean ecosystems are increasingly impacted by climate change through more severe tropical storms, sea level rise and several other drivers (SAIIA, ND).

Responses

SADC ensure coastal and marine contexts include ecosystem protection and restoration, structural defence, as well as livelihood diversification as adaptation responses to climate change. SAIIA, with the support of the European Union under the Global Climate Change Alliance Plus (GCCA+) Programme and the SADC Secretariat, has implemented a project to strengthen the role of marine and coastal EbA in enhancing climate resilience within Southern Africa. This project specifically focused on enhancing the uptake of marine and coastal EbA in

the ten coastal and island countries within SADC, namely: Angola, Comoros, the Democratic Republic of the Congo, Madagascar, Mauritius, Mozambique, Namibia, Seychelles, South Africa, and the United Republic of Tanzania.

Focusing on research, dialogue, policy alignment and capacity building activities, the project sought to address the challenges of EbA policy uptake and implementation through the establishment of a regional community of practice that shares knowledge, innovative solutions and best practice case experiences across the region and globally.

5.5 Responses in Forestry Sector

SADC is one of the African regions that is abundant with forest resources where natural forests accounts for 41% of the SADC total land area. These natural forests provide a variety of socio-economic as well as ecological services. Among socio-economic benefits include timber and non-timber forest products, domestic wood energy, and tourism. Furthermore, these forests provide habitat for wildlife and other forest biodiversity as well as soil protection, water conservation, food, and climate change mitigation through carbon sequestration as ecological benefits (SADC, 2022).

Moreover, forests provide vital ecological services which are critical in development of the other sectors such to include hydropower production, agri-food systems, water security, wildlife conservation, tourism development, fisheries, public health, resilient cites, global warming and Disaster risk reduction. Importantly, natural forests contribute significantly to the livelihoods and wellbeing of the majority of SADC population in rural areas (SADC, 2022).

Despite the benefits provided by natural forests in SADC region, Southern Africa's abundant and valuable forest resources continue to face increasing pressure and threats. Most of the threats arise from, among others, large scale illegal harvesting and trade in timber and non-timber forest products, deforestations, and Climate Change. Generally, the sustainable management and utilization of all types of forests and tree has not been effective in the region, leading to accelerated deforestation. Forest management requires technological improvements as well as management of pests and diseases to increase productivity and counter the effects of deforestation (SADC, 2022).

Responses

SADC region demonstrated its effort to reduce the threats to forests. The region has Protocol on Forestry developed in 2002 which provides a policy framework for sustainable forest management in the SADC region. Objectives addressed in this protocol include increasing public awareness of forestry and capacity building. More specifically, the framework addresses research gaps, laws, education and training, the harmonisation of regional sustainable management practises, increasing efficiencies of utilisation and facilitation of trade, equitable use of local forests and a respect for traditional knowledge and uses (SADC, 2022).

The 2002 Protocol on Forestry is operationalizing in the revised SADC Forestry Strategy (2020-2030) which provides strategic framework for national and regional cooperation in addressing challenges facing management of the forest resources in the SADC region. Furthermore, SADC currently focuses on the implementation of the above programmatic areas in collaboration with International Cooperating Partners (ICP) (SADC, 2022).

6 Agriculture, Livelihoods and Food Security

The agriculture sector is estimated to contribute between 4% to 27% of Gross Domestic Product of the Region and crop production contribution is estimated at 61 per cent. Crops are the region's main source of food, employment and income despite many challenges affecting the sector including effects of climate change, rampant land degradation, competing priorities for resources such as rapid population growth and rising urbanization that mount pressure on agriculture to deliver food and raw materials beyond the current crop productivity levels. For the sector to meet the current needs, farmers need better access to inputs, finance, markets, and an enabling policy environment that affords them an opportunity to improve performance of crop production, while making it attractive and competitive.

6.1 Climate Smart Agriculture

Climate smart agriculture (CSA) is a set of practices and technologies that aim to increase the productivity, resilience and sustainability of agricultural systems in the face of climate change. CSA can also contribute to mitigating greenhouse gas emissions from agriculture and enhancing food security in the Southern African Development Community (SADC) region.

The SADC region is highly vulnerable to the impacts of climate change, such as rising temperatures, erratic rainfall, droughts, floods and pests. These impacts threaten the livelihoods and food security of millions of smallholder farmers who depend on rainfed agriculture and natural resources. According to a report by CCARDESA, climate change could reduce crop yields by up to 30% and livestock production by up to 50% by 2050 in the SADC region.

To cope with these challenges, CSA offers a range of options that can be tailored to the local context and needs of farmers. Some examples of CSA practices and technologies include:

- Conservation agriculture: This involves minimum tillage, mulching, crop rotation and intercropping to improve soil health, water retention and crop diversity.
- Improved varieties: This involves using drought-tolerant, pest-resistant and high-yielding crop varieties that are adapted to the changing climate conditions.
- Agroforestry: This involves integrating trees and shrubs with crops and livestock to provide multiple benefits such as shade, fodder, fuelwood, soil fertility and carbon sequestration.
- Irrigation: This involves using water-efficient methods such as drip irrigation, rainwater harvesting and micro-dams to increase crop production and reduce water stress.
- Livestock management: This involves improving animal health, nutrition and breeding to enhance livestock productivity and resilience.
- Climate information services: This involves providing timely and accurate weather forecasts, early warning systems and advisories to help farmers plan and manage their agricultural activities.

CSA is not a new concept in the SADC region. Several initiatives have been implemented by various actors such as governments, research institutions, development agencies and civil society organizations to promote CSA among smallholder farmers. For instance, the GIZ-supported project on Climate Resilience and Management of Natural Resources in the SADC Region works with municipalities to implement CSA and resource management measures in selected Transfrontier Conservation Areas (TFCAs). The project also supports access to

funding and knowledge sharing on climate-sensitive resource management and CSA locally, regionally and nationally.

However, there are still many barriers and challenges that limit the adoption and scaling up of CSA in the SADC region. These include poor access to resources such as land, water, seeds, inputs, credit and markets; lack of supportive policies and institutional frameworks; inadequate extension and advisory services; low awareness and capacity among farmers; gender inequalities; socio-cultural norms; and competing interests among stakeholders.

Therefore, there is a need for more concerted efforts and collaboration among all actors involved in the agricultural sector to address these barriers and challenges. This requires enhancing the enabling environment for CSA through policy formulation, implementation and coordination; strengthening the capacity of farmers, extension agents, researchers and decision makers; improving the availability and accessibility of information, knowledge and technologies; fostering innovation and learning platforms; ensuring gender equality and social inclusion; and mobilizing adequate financial resources.

By adopting CSA practices and technologies, smallholder farmers in the SADC region can improve their productivity, resilience and sustainability in the face of climate change. This can also contribute to achieving the Sustainable Development Goals (SDGs), especially those related to ending hunger, ensuring food security, combating climate change and promoting sustainable land use.

6.2 CSA programmes and activities in the Region

The SADC region has a large population that depends on agriculture for food security and livelihoods, and also hosts rich biodiversity and natural resources that need to be conserved. There are several programmes and initiatives that promote CSA in the SADC region, both at the regional and national levels. Some examples are:

- Regional Agricultural Policy (RAP 2014) which is supported by Regional Agricultural Investment Plan (RAIP) (2017 – 2022), and the Regional Food and Nutrition Security Strategy (FNSS) (2015 – 2025)
- Regional Crop Development Programme (RCDP 2019)
- SADC Regional Indicative Strategic Development Plan (RISDP 2020-2030)

6.3 Adoption of CSA technologies

Climate-Smart agriculture (CSA) (or climate resilient agriculture) is an integrated approach to managing landscapes to help adapt agricultural methods, livestock and crops to the effects of climate change and, where possible, counteract it by reducing greenhouse gas emissions from agriculture, at the same time taking into account the growing world population to ensure food security.

CSA has three pillars: increasing agricultural productivity and incomes; adapting and building resilience to climate change; and reducing or removing greenhouse gas emissions from agriculture. CSA lists different actions to counter the future challenges for crops and plants. With respect to rising temperatures and heat stress, e.g. CSA recommends the production of heat tolerant crop varieties, mulching, water management, shade house, boundary trees and appropriate housing and spacing for cattle. There are attempts to mainstream CSA into core government policies, expenditures, and planning frameworks. In order for CSA policies to be

effective, they must be able to contribute to broader economic growth, the sustainable development goals and poverty reduction. They must also be integrated with disaster risk management strategies, actions, and social safety net programmes.

CSA aims to simultaneously achieve three outcomes:

- Increased productivity: Produce more and better food to improve nutritional security and boost incomes, especially of 75 percent of the world's poor who live in rural areas and mainly rely on agriculture for their livelihoods.
- Enhanced resilience: Reduce vulnerability to drought, pests, diseases and other climate-related risks and shocks; and improve capacity to adapt and grow in the face of longer-term stresses like shortened seasons and erratic weather patterns.
- Reduced emissions: Pursue lower emissions for each calorie or kilo of food produced, avoid deforestation from agriculture and identify ways to absorb carbon out of the atmosphere.

Methods and assessment

The Food and Agriculture Organization has identified several tools for countries and individuals to assess, monitor and evaluate integral parts of CSA planning and implementation by the FAO. Some of these tools include:

- Modelling System for Agricultural Impacts of Climate Change (MOSAICC): This modelling system helps countries conduct inter-disciplinary climate change impact assessment on agriculture through simulations.
- Global Livestock Environmental Assessment Model (GLEAM): This simulates the interaction of activities and processes involved in livestock production (milk and meat production) and the environment. The model is designed to evaluate several environmental impact categories, such as greenhouse gas emissions, nutrient and water use, land use and land degradation and biodiversity interactions.
- Sustainability Assessment of Food and Agriculture (SAFA) system: The guideline of SAFA is a framework for sustainability performance assessment in the food and agriculture sector, including crop and livestock production, forestry and fisheries. The monitoring and evaluation of activities set baselines, define indicators, measure progress and evaluate successes and setbacks in CSA interventions.
- Economics and Policy Innovations for Climate-Smart Agriculture (EPIC): The programme works with governments, universities, research centres and other institutional partners in support of their transition to CSA through economic and policy analysis. It does this by identifying and harmonizing climate-smart agricultural policies, impacts analysis, effects, costs, and benefits as well as incentives and barriers to the adoption of climate-smart agricultural practices.
- Ex-Ante Carbon-balance Tool (EX-ACT): This appraisal system was developed by FAO. In the project development phase, it provides ex-ante estimates of the impact of agriculture and forestry development projects, programmes and policies on the carbon-balance.
- Climate Risk Management (CRM): This integrated approach addresses vulnerabilities to short-term climate variability and longer-term climate change within the framework of sustainable development. The key component of the FAO's CRM involves the provision of weather and climate information products for farmers,

fishers and livestock herders for the assessment of risks so as to improve opportunities at local level.

- Gender mainstreaming: In order to achieve CSA in a socially sustainable way; there is a need to understand the roles, capabilities and responsibilities of men and women to ensure equal access to CSA policies and practices benefits.
- Monitoring and Assessment of Greenhouse Gas Emissions and Mitigation Potential in Agriculture (MAGHG) project: This project falls under the MICCA (Mitigation of Climate Change in Agriculture) programme. Under this project, member countries are supported in gathering and reporting data on GHG emissions in the agriculture, forestry and other land use (AFOLU) sector for UNFCCC related reporting requirements.

Building the evidence base for CSA entails:

- stocktaking of current site-specific climate challenges and vulnerabilities, options for intervention and institutional capacities.
- collecting and analysing information to prioritize CSA options, while clearly identifying existing uncertainties.
- monitoring and evaluating implemented policies and practices, and sharing findings and lessons learned.

Expanding the evidence base contributes towards a better understanding of the challenges posed by climate change to the building of sustainable agri-food systems and improved rural livelihoods. It helps prioritize opportunities to work towards the SDGs and provides a foundation for monitoring and evaluating implemented policies and practices. Policymaking and implementation choices that are based on evidence help exploit opportunities to the fullest and limit risks. For certain areas of CSA, a valuable evidence base is now available − as demonstrated by the case studies in this chapter. For other areas, additional or updated evidence is needed to build enabling policy frameworks, strengthen national and local institutions, enhance funding and financing options, and implement effective practices at the field level.

Ideally, efforts to expand the evidence base for CSA implementation are guided by an understanding of site-specific challenges, opportunities, and barriers; they should embrace collaboration with partners and stakeholders and promote the sharing and combining of various types of knowledge. In addition, efforts to build evidence should identify the synergies and trade-offs between various CSA policies and practices and compare their impact to the baseline situation and to the impact of alternative interventions. Efforts to expand the evidence base on CSA greatly benefit from a good understanding of the institutional and financial requirements for CSA implementation.

Box 2: Assessing the role of livestock in building resilience to climate change in Zambia case study

Climate change impacts

In Southern Africa, the demand for animal products is projected to double between 2006 and 2050. The combination of high food insecurity, relatively low yields, high deforestation, and localized land degradation leaves Zambia particularly vulnerable to climate change. It is expected that the country will face rising temperatures, shortened growing seasons and increased frequency of severe climate events.

The model

FAO conducted a case study to better understand the role of livestock in building resilience in Zambia as there was a lack of large-scale, long-term assessments of livestock productivity under climate constraints. The Organization used a modelling framework that articulates data on:

• livestock generated by the Global Livestock Environmental Assessment Model (GLEAM)

• vegetation productivity generated under the DevCoCast project (dry matter productivity of natural vegetation); and

• agricultural yields through Global Agro-Ecological Zones (GAEZ).

GLEAM is a model that simulates the interaction of activities and processes involved in livestock production and the environment. It is designed to analyse multiple environmental dimensions, such as feed use, GHG emissions, land use and land degradation, nutrient and water use, and interaction with biodiversity. While many attempts have been made to quantify the mitigation potential of single technologies, few systematic studies exist for assessing "best-bet" options in different production systems and regions, and their impact on food security. The modelling framework compared feed requirements of livestock with feed availability from agricultural and natural vegetation to estimate potential deficits. The modelling framework was applied under two timeframes, 1999–2011 and 2012–2030, and under two scenarios: a baseline scenario and a drought scenario. Within each year, the wet and dry seasons were modelled separately. These scenarios reflected the growth of the sector by estimating the number of animals. The baseline scenario had the same overall vegetation biomass productivity as in the 1999–2011 time series. The drought scenario included three years of severe drought and seven years of mild drought, calibrated using the 1999–2011 time series. A drought year was defined as a year with low vegetation productivity, assuming a direct link between climate and vegetation productivity. Several improvement options targeted at the livestock sector were included in the modelling: for example, improved animal husbandry and health, as well as improved animal feed to increase productivity and mitigate GHG emissions. These options, together with modelling parameters and assumptions, were discussed with stakeholders in Zambia through a dedicated national workshop.

Project results

The results of this assessment study revealed the following benefits and trends in the livestock sector:

• The difference between the drought scenario and the baseline scenario in terms of productivity was limited, although it was found that the former led to lower production increases.

• Livestock can play an important role in building resilience by buffering climate variability and the corresponding variability in vegetation production. Livestock's buffering effect was most important in the drought scenario. In this scenario, the variability of vegetation production was highest and so was its difference in relation to the variability of livestock production.

• With improved practices, GHG emissions would increase by an additional 7 to 20 percent due to extra production gains and increases in animal numbers. However, by improving livestock productivity, improvement options would lead to a strong decrease in emission intensity (emissions per unit of product), from 21 to 36 percent.

Replication around the world

This modelling framework could be used in any country looking to assess its livestock productivity under specific climate constraints in order to better understand how to build resilience to climate change. The GLEAM model, in particular, has been used in six practical case studies in selected regions and livestock production systems, namely:

• mixed dairy production in South Asia.

• commercial pig production in East and Southeast Asia.

• specialized beef production in South America.

• small ruminant production in West Africa.

• mixed dairy production in Organisation for Economic Co-operation and Development (OECD) countries.

• mixed dairy production in East Africa.

Moving towards a more sustainable livestock sector requires a sound, evidence-based diagnostic of the undesired environmental side effects. Stakeholders can then identify and assess intervention areas and options. GLEAM is a key contributor to both processes.

7 Climate Change and Shaping the Green Economy

According to UNEP a green economy is defined as low carbon, resource efficient and socially inclusive. In a green economy, growth in employment and income are driven by public and private investment into such economic activities, infrastructure and assets that allow reduced carbon emissions and pollution, enhanced energy and resource efficiency, and prevention of the loss of biodiversity and ecosystem services (*Green Economy, UNEP - UN Environment Programme*).

8 Climate Change and Shaping the Blue Economy

The blue economy refers to the sustainable use of ocean resources for economic growth, improved livelihoods and jobs, and ocean ecosystem health. The Southern African Development Community (SADC) region has a vast coastline of over 13,000 km and a maritime area of over 6.5 million km^2, which offers immense opportunities for blue economy

development. However, the region also faces many challenges, such as climate change, marine pollution, illegal fishing, piracy and insecurity, and weak governance and institutional capacity.

To address these challenges and harness the potential of the blue economy, the SADC region has adopted various policies and strategies, such as the SADC Protocol on Fisheries, the SADC Maritime Security Strategy, and the 2050 Africa's Integrated Maritime Strategy. The SADC region also collaborates with regional and international partners, such as the African Union, the Indian Ocean Commission, and the European Union, to promote blue economy initiatives and projects. The SADC region's blue economy is therefore a key driver for regional integration, economic diversification, and social development.

8.1 Ocean Based Blue Economy for Small Island Developing States

The Southern African Development Community (SADC) region is home to several small island developing states (SIDS) that depend on the ocean for their livelihoods and development. These include Comoros, Madagascar, Mauritius, Seychelles and Tanzania.

The ocean offers immense opportunities for economic growth, social inclusion and environmental sustainability in these countries. However, there are also significant challenges and threats that need to be addressed, such as climate change, marine pollution, overfishing, piracy and illegal activities. The blue economy encompasses various sectors and activities that rely on marine and coastal resources, such as fisheries, aquaculture, tourism, transport, energy, biotechnology and mining. The blue economy also promotes regional cooperation and integration among SIDS and other coastal states in the SADC region.

The SADC Secretariat has been supporting the development and implementation of the blue economy agenda in the region through various initiatives and programmes. These include:

- The SADC Protocol on Fisheries, which provides a legal framework for cooperation and coordination on fisheries management and development among SADC member states.
- The SADC Regional Maritime Security Strategy, which aims to enhance maritime security and safety in the region by addressing issues such as piracy, illegal fishing, smuggling and human trafficking.
- The SADC Regional Aquaculture Strategy and Action Plan, which seeks to promote sustainable aquaculture development and trade in the region by providing policy guidance and technical support.
- The SADC Regional Tourism Programme, which fosters tourism development and diversification in the region by facilitating market access, product development and quality standards.
- The SADC Renewable Energy Strategy and Action Plan, which promotes the use of renewable energy sources in the region by creating an enabling environment and mobilizing resources.

The SADC Secretariat also facilitates dialogue and partnership among SIDS and other stakeholders, such as development partners, private sector, civil society and academia.

The SADC Secretariat recognizes the importance of enhancing the capacity and resilience of SIDS to benefit from the blue economy opportunities and address the challenges they face.

The SADC Secretariat is committed to providing technical assistance, policy guidance and advocacy support to SIDS in the region. The SADC Secretariat also encourages SIDS to share their best practices and lessons learned with other countries in the region and beyond.

8.2 Region's Positions on the Blue Economy

The burgeoning interest in sustainable ocean development and heightened attention towards the economic significance of the ocean have rendered a promising future for the Blue Economy. Several key trends are currently shaping the future development of the Blue Economy including:

- Sustainable Practices

  There is increasing recognition that sustainable practices are essential for the long-term viability of the Blue Economy. Adopting sustainable practices, such as ecosystem-based management and circular economy principles, is becoming more common.

- Technological Innovation

  New technologies like robotics, autonomous systems, and sensors are being developed to enable sustainable ocean development. These technologies can potentially increase efficiency and productivity while reducing the negative impacts of economic activities on the ocean.

- Ocean-Based Renewable Energy There is growing interest in ocean-based renewable energy, such as offshore wind and wave energy. This sector has the potential to create new jobs and provide a significant source of renewable energy to meet the growing demand for clean energy.

- Sustainable Tourism

  Sustainable tourism is becoming increasingly popular, and there is growing interest in developing marine tourism promoting sustainable ocean resource use.

- Blue Finance

  There is increasing interest in blue finance, which involves using innovative financial instruments to support sustainable ocean development. This includes impact investing, green bonds, and other forms of sustainable finance.

In conclusion, the future of the Blue Economy looks bright, with growing interest in sustainable practices, technological innovation, renewable energy, circular economy principles, sustainable tourism, and blue finance. The development of these sectors presents significant opportunities for businesses, governments, and civil society to work together to promote sustainable development while preserving the ocean's health.

Box 3: Balancing Conservation and Exploitation of Fisheries Resources

The fishery sector plays a leading role on the island's economy with an annual production capacity of $750 million equivalent to more than 7% of the national gross domestic product (GDP) and a contribution of 6.6% to the total exports.

It is also critical to the nutritional health and food security of Malagasy people, contributing around 20% to their animal protein consumption. Fishing and aquaculture support almost 1.5 million people in Madagascar, most of whom come from coastal areas.

This segment of the population is often among the most vulnerable and marginalized communities, with a majority without other assets such as a land that could allow them to diversify their revenues. Fishermen start very young, from the age of 11 to 15.

According to a 2012 national survey, around two-thirds of the fishermen do not attend school and only 6% go beyond primary school. Although fishing is essential for the Madagascar economy, as well as for the livelihood of several thousand individuals, this sector faces numerous and complex challenges. One of the most fundamental issues is finding ways to balance conservation and exploitation of fisheries resources.

Madagascar received $74.15 million in funding from the World Bank, the Global Environment Facility, and the Japan Policy and Human Resources Development Fund in 2017. The SWIOFish 2 Project aims to improve the exploitation of fisheries resources at national and community levels and provide alternative livelihoods for fishermen in ultra-priority areas. The project focuses on five strategic fishing areas in Madagascar, including Ambaro Bay, Ampasindava Bay, Antongil Bay, and the Melaky region. The project supports village associations to ensure responsible resource management and species survival by reinforcing fishermen's awareness on authorized fishing areas, seasons, and gear that respect marine habitats. The project also aims to resolve governance and productivity concerns in the fishing sector, removing obstacles that hinder private investment and harm the viability of fishing enterprises. These interventions aim to restore wealth from the offshore fisheries sector, create value chains through regional collaboration, and benefit national economies.

Source: Madagascar: Balancing Conservation and Exploitation of Fisheries Resources

9 Emerging Issues and Trends

A number of recent events like COVID-19 have caused a ripple effect on emerging issues within the Climate Change cycles. These issues are likely to have a huge impact within the SADC Region in the near future. An example of such issues include sudden eruption of disease within the region and the required management protocols.

10 Recommendations and Conclusions

Despite the fact that developed nations are largely accountable for the phenomenon of climate change and have predominantly contributed to the global emissions, individuals from economically deprived regions in Africa will undergo the most significant ramifications and incur the costs associated with the disastrous consequences of climate change. Additionally, the potential ramifications of climate change on a wider spectrum of human security and

impoverishment are potentially profound, given the substantial reliance of many African communities on rain-fed farming as a means of livelihood. The phenomenon of climate change is exacerbating the issue of water scarcity within the African continent.

The potential for violent conflict within regions where inhabitants reside in precarious and unsettled states that render them susceptible to the consequences of climate change is a palpable threat. As global warming, contamination, and equitable distribution of water persist as noted in the SADC region, the accessibility and management of freshwater reserves demand significant attention. Failure to address these challenges adequately may forge far-reaching repercussions on societal stability. The potential for water conflicts becomes an imminent threat between neighbouring countries unless prompt action is taken towards negotiating agreements for the allocation of reservoirs, rivers, and subterranean aquifers. Water, regarded as a vital element crucial to sustaining human life, additionally plays an indispensable role in an extensive spectrum of human endeavours, encompassing agriculture, industrial production and power generation, and serves as a significant conduit for transportation of individuals and commodities. Furthermore, it is common for water to hold considerable emotional and symbolic significance, coupled with its vital role in maintaining the integrity of natural ecological systems.

Recommendations

The implementation of CSA which includes irrigation systems has been observed to lead to the cultivation of more crops, which in turn increases the yield of agricultural produce. Beyond the primary goal of improving agricultural productivity, irrigation has the potential to serve as a foundation for economic development in rural areas with limited resources and opportunities. The intervention may serve to alleviate a contributing factor to the phenomenon of rural-urban migration by targeting specific geographical regions or locales.

The urgency to address the matter of alternative energy sources, such as solar, hydro, and wind power, has become apparent in light of the prevailing challenges associated with deforestation, overgrazing, drought, and soil degradation in various regions across the region.

The phenomenon of environmental change exhibits the potential to induce migration. The accelerated process of deforestation in the region, primarily for purposes such as cultivation, construction timber and wood fuel, has led to a consequential increase in the migration of individuals from rural to urban areas. This migration trend has contributed to a multitude of societal challenges, including poor access to electricity and power supplies, increasing levels of pollution, inadequate provision of clean water, limited employment opportunities, substandard education and health provision, a scarcity of efficient sewerage systems and a deficit of shelter within the continent's urban centres. In the given context, the reduction of emissions resulted from deforestation and degradation demonstrates a promising approach to accomplish mitigation, adaptation, and economic gains alongside preserving indispensable ecosystem services within the rural areas.

If adaptation strategies in agricultural production systems are extensively implemented, they hold significant potential to counteract the adverse effects of climate change, and may even capitalize on the favourable ones, thereby reversing the present course of rural-urban migration in the region. Moreover, it is imperative that efforts pertaining to environmental education and awareness seek to enhance the general public's comprehension and knowledge regarding the relevant community of concern and the shared ecological system fostered by

the environment. The effectiveness is amplified when educational institutions are incorporated in initiatives aimed at fostering consciousness. Efforts to provide environmental education to the public, primary and secondary schools, and universities are crucial in addressing the environmental challenges faced by Southern Africa countries, particularly with the aim of promoting sustainability for future generations.

In summary, climatic alterations have begun to impact individuals throughout the region, thus necessitating prompt and decisive measures to prevent the further exacerbation of poverty relief initiatives. Failure to act with urgency may lead to the nullification of such efforts.

The concepts of adaptation, mitigation, and compensation are frequently discussed in the scholarly discourse on climate change. The inability to arrive at a fair and just agreement regarding negotiations on climate change may lead to grave repercussions, especially for the Southern Africa, as well as for the global community as a whole. Climate change constitutes a significant global challenge that necessitates prompt, collaborative, equitable, and mutually accountable action. In order to attain efficacious collaboration in relation to climate change matters, it will be crucial to incorporate pivotal stakeholders from the climate change community who have not yet been engaged.

Way Forward

The absence of prompt interventions to tackle climate change is anticipated to aggravate the occurrence of conflicts and natural calamities, thereby obstructing the progress of developmental ventures in the region. The governments of nations around the world bear the responsibility to engage in constructive efforts towards a universal

An agreement for climate change management must encompass an enabling policy framework that not only addresses the management, planning, and service delivery functions pertinent to adaptation but also facilitates and supports the efforts of local institutions and other actors. It is imperative for the concerned parties to ascertain that delegated administrative duties are duly supplemented with adequate resources and technical ability. Moreover, it is imperative for the SADC countries to allocate additional resources towards the enhancement of climate and meteorological information, as well as biophysical monitoring activities. Furthermore, they must establish early warning systems, reinforce preparedness measures and equip themselves with effective response mechanisms. It is essential that they integrate the aforementioned data into their strategic planning processes. The phenomenon of climate change presents promising prospects for the implementation of efficient and ecologically sound land management techniques, including reforestation, optimized water management, holistic approaches to soil fertility management, conservation agriculture, agroforestry, and enhanced rangeland management.

11 References

African Union, n.d. *African Union.* [Online]
Available at: https://au.int/en/recs/sadc
[Accessed 17 June 2023].

Botswana Climate Change Network, n.d. *Botswana Climate Change Network.* [Online]
Available at: https://www.botswanaclimatenetwork.org/programs
[Accessed 04 May 2023].

Nhemachena, C. et al., 2020. Climate Change Impacts on Water and Agriculture Sectors in Southern Africa: Threats and Opportunities for Sustainable Development. *Water,* 12(10).

SADC, 2015. *SADC Climate Change Strategy and Action Plan,* s.l.: s.n.

SADC, n.d. *Climate Change and Adaptation.* [Online]
Available at: https://www.sadc.int/pillars/climate-change-adaptation
[Accessed 17 June 2023].

SADC, n.d. *Southern Africa Development Community.* [Online]
Available at: http://www.sadc.int
[Accessed 17 June 2023].

Thierfelder, C. et al., 2016. Conservation agriculture and drought-tolerant germplasm: Reaping the benefits of climate-smart agriculture technologies in central Mozambique. *Renewable Agriculture and Food Systems,* Volume 31, pp. 414-428.

SADC, 2022. Towards a common future. Water. Available at: https://www.sadc.int/pillars/water-0. [Date accessed: 17 June 2023].

SADC, 2022. Towards a common future. Fisheries. Available at: https://www.sadc.int/pillars/fisheries#:~:text=The%20fisheries%20sector%20in%20the%20Region%20contributes%20an,of%20which%20more%20than%20a%20million%20benefit%20indirectly. [Date accessed: 17 June 2023].

SADC, 2022. Towards a common future. Environment and Climate Change. Available at: https://www.sadc.int/pillars/environment-climate-change-0. [Date accessed: 17 June 2023].

SAIIA, ND. The Global Climate Change Alliance Plus Initiative. Strengthening Marine and Coastal Ecosystem-based Adaptation (EbA) in the National Climate Responses of SADC's Coastal States. Available at: https://saiia.org.za/project/strengthening-marine-and-coastal-ecosystem-based-adaptation/. [Date accessed: 18 June 2023].

CCARDESA. (n.d.). Retrieved from https://www.ccardesa.org/climate-smart-agriculture

IDMC: AFRICA REPORT ON INTERNAL DISPLACEMENT. (2019). Retrieved from https://www.internal-displacement.org/sites/default/files/publications/documents/201912-Africa-report.pdf

Southern African Development Community Towards a Common Future . (2022). Retrieved from https://www.sadc.int/pillars/disaster-risk-management

United Nations Department of Economic and Social Affairs . (2020). Retrieved from https://www.un.org/en/desa/international-migration-2020-highlights

Angola

Adaptation Fund, 2021. Resilience building as climate change adaptation in drought-struck South-western African communities (Angola, Namibia). Available at: https://www.adaptation-fund.org/project/angola-and-namibia-resilience-building-as-climate-change-adaptation-in-drought-struck-south-western-african-communities/. [Date accessed: 26 May 2023].

ADPP, 2021. Integrated Development. Available at: https://www.adpp-angola.org/en/what-we-do/integrated-community-development. [Date accessed: 27 May 2023].

African Development Bank Group N,D. Angola Economic Outlook. https://www.afdb.org/en/countries/southern-africa/angola/angola-economic-outlook#:~:text=Recent%20macroeconomic%20and%20financial%20developments&text=Oil%20accounts%20for%2095%25%20of,price%20dropped%20to%20%2442.40%2Fbarrel. [Date accessed: 14 May 2023]

Barange, M., Bahri, T., Beveridge, M.C., Cochrane, K.L., Funge-Smith, S. and Poulain, F., 2018. Impacts of climate change on fisheries and aquaculture. United Nations' Food and Agriculture Organization, 12(4), pp.628-635.

Deforestation Front: Angola, ND. Available at: https://wwfint.awsassets.panda.org/downloads/deforestation_fronts_factsheet___angola.pdf. [Date accessed: 14 May 2023].

Drought in Angola report 202-2021. Situation Report 2020-2021 Causes, Responses, Solutions. Available at: https://secaangola.hypotheses.org/files/2022/04/Drought-in-Angola-Report-2022-compressed.pdf [Date accessed: 15 May 2023].
Drought Resilience Profiles: Angola, 2021. Country overview Available at: https://www.ciwaprogram.org/rcv1/drought-resilience-profile-angola/. [Date accessed: 14 May 2023].

Hapres, L., 2022. Africa Blue Economy Strategies Integrated in Planning to Achieve Sustainable Development at National and Regional Economic Communities (RECs).

Lloyds Bank, ND. Angola: Economic and Political Overview .https://www.lloydsbanktrade.com/en/market-potential/angola/economical-context#:~:text=The%20Angolan%20economy%20%2D%20the%20third,exports%20come%20from%20oil%20activities. [Date accessed: 14 May 2023].

LUANDA (2022). Angola's Economic Diversification and Development Potential are Inextricably Linked to Climate Resilience. Available at: https://www.worldbank.org/en/news/press-release/2022/12/07/angola-s-economic-diversification-and-development-potential-are-inextricably-linked-to-climate-resilience. [Date accessed: https://www.worldbank.org/en/news/press-release/2022/12/07/angola-s-economic-diversification-and-development-potential-are-inextricably-linked-to-climate-resilience].

Luanda-Angola Second National Communication, 2021. Ministry of Culture, Tourism and Environment National Direction of Environment and Climate Action. Available at: https://unfccc.int/sites/default/files/resource/ANGOLA%20SNC.pdf. [Date accessed: 15 May 2023].

Mutengwa, C.S., Mnkeni, P. and Kondwakwenda, A., 2023. Climate-Smart Agriculture and Food Security in Southern Africa: A Review of the Vulnerability of Smallholder Agriculture and Food Security to Climate Change. *Sustainability*, *15*(4), p.2882.

Nachmany, M., Fankhauser, S., Davidová, J., Kingsmill, N., Landesman, T., Roppongi, H., Schleifer, P., Setzer, J., Sharman, A., Singleton, C.S. and Sundaresan, J., 2015. The 2015 global climate legislation study: a review of climate change legislation in 99 countries: summary for policy-makers.

Nationally Determined Contribution of Angola, 2021.Available at: https://unfccc.int/sites/default/files/NDC/2022-06/NDC%20Angola.pdf.[Date accessed: 13 May 2023].

SADC Climate Change Strategy and Action Plan (2020-2030). SADC SECRETARIAT. Available at: https://www.sadc.int/sites/default/files/2021-11/SADC_Climate_Change_Strategy_and_Action_Plan-English.pdf. [Date accessed: 15 May 2023].

Takouleu, J.M., 2023. NGOLA: Luanda wants to produce 80% of its electricity from renewable sources. Afrik21. Available at: https://www.afrik21.africa/en/angola-luanda-wants-to-produce-80-of-its-electricity-from-renewable-sources/ [Date accessed: 27 May 2023].

UNDP, 2020. Ecosystem-Based Adaptation in Angola 2016-2020. Available at: https://www.unep.org/resources/factsheet/ecosystem-based-adaptation-angola-2016-2020. [Date accessed: 14 May 2023].

United States Agency for International Development, 2018. Climate Risk Profile: Angola. Available at: https://www.preventionweb.net/publication/climate-risk-profile-angola.[Date accessed: 15 May 2023].

World Bank Group, (2022) Angola Country Climate and Development Report. Available at: https://openknowledge.worldbank.org/entities/publication/f5d0bae7-8230-5d41-8466-b5031de9741e [Date accessed: 15 May 2023].

World Bank Group, (2022). Angola's Economic Diversification and Development Potential are Inextricably Linked to Climate Resilience. Available at: https://www.worldbank.org/en/news/press-release/2022/12/07/angola-s-economic-diversification-and-development-potential-are-inextricably-linked-to-climate-resilience. [Date accessed: 27 May 2023].

World Bank Group, 2022. Angola Country Climate and Development Report. CCDR Series. Available at: https://openknowledge.worldbank.org/handle/10986/38361. [Date accessed: 26 May 2023].

World bank, 2021.

Zinyengere, 2022.Climate-Smart Nuclear Solutions for Drought-Struck Angolan Cattle. Available at : https://maps.worldbank.org, [Date accessed: 25 May 2023].

Botswana

Abrahms, B., Carter, N.H., Clark-Wolf, T.J., Gaynor, K.M., Johansson, E., McInturff, A., Nisi, A.C., Rafiq, K. and West, L., 2023. Climate change as a global amplifier of human–wildlife conflict. Nature Climate Change, pp.1-11.

Adaptation at Scale in Semi-Arid Regions, 2018. Adapting to climate change

in semi-arid Botswana. Available at : http://www.assar.uct.ac.za/sites/default/files/image_tool/images/138/Botswana/ASSAR%20-%20Botswana%20final%20stakeholder%20report%20-%20November%202018%20-%20web%20version.pdf. [Date accessed: 26 May 2023].

Akinyemi, F.O. and Abiodun, B.J., 2019. Potential impacts of global warming levels 1.5 C and above on climate extremes in Botswana. Climatic Change, 154(3-4), pp.387-400.

Batisani, N., Pule-Meulenberg, F., Batlang, U., Matteoli, F. and Tselaesele, N., 2020. Retooling Smallholder Farming Systems for Climate Change Resilience Across Botswana Arid Zones. In *African Handbook of Climate Change Adaptation* (pp. 1-25). Cham: Springer International Publishing.

Botswana Climate Change Network. Accessed from:[https://www.botswanaclimatenetwork.org/programs, Date accessed: 04 May 2023].

BOTSWANA CLIMATE CHANGE RESPONSE POLICY Draft Version 2 (2017). Accessed from: https://info.undp.org/docs/pdc/Documents/BWA/DRAFT%20CLIMATE%20CHANGE%20RESPONSE%20POLICY%20%20version%202%20(2).doc). Date accessed: [12 May 2023].

Botswana: Floods Batisani, N. and Yarnal, B., 2010. Rainfall variability and trends in semi-arid Botswana: implications for climate change adaptation policy. *Applied Geography*, *30*(4), pp.483-489.

Common wealth network, ND. Find Fisheries expertise in Botswana. Available at : https://www.commonwealthofnations.org/sectors-botswana/business/fisheries/. [Date accessed: 10 May 2023].

Du Plessis, A.J.E. and Rowntree, K.M., 2003. Water resources in Botswana with particular reference to the savanna regions. *South African Geographical Journal*, *85*(1), pp.42-49.

Easton-Calabria, E., Climate Profiles of Countries in Southern Africa: Botswana.

Emergency Plan of Action (EPoA) Botswana: Floods, 2018. International Federation of Red Cross and Red Crescent Societies. www.ifrc.org.

Food, Agriculture, and Natural Resources Policy Analysis Network (FANRPAN) (2017), Available at: http://www.jstor.com/stable/resrep16457. [Date accessed: 09 May 2023].

Hambira, W.L., Saarinen, J. and Moses, O., 2020. Climate change policy in a world of uncertainty: changing environment, knowledge, and tourism in Botswana. African Geographical Review, 39(3), pp.252-266.

Hambira, W.L., Saarinen, J., Atlhopheng, J.R. and Manwa, H., 2021. Climate Change, Tourism, and Community Development: Perceptions of Maun Residents, Botswana. Tourism Review International, 25(2-3), pp.105-117.

Hambira, W.L., Saarinen, J., Atlhopheng, J.R. and Manwa, H., 2021. Climate Change, Tourism, and Community Development: Perceptions of Maun Residents, Botswana. Tourism Review International, 25(2-3), pp.105-117.

Khonga, E.B., 2019. Climate change and plant pathogen biodiversity: The case of witches' broom outbreak on Vachellia xanthophloea (Benth.) Banfi & Galasso) in Botswana. *Botswana Journal of Agriculture and Applied Sciences*, *13*(2), pp.1-7.

Makwatse, K., Modie, L., Mpalo, M. and Blaser Mapitsa, C., 2022. Gender and Equity Considerations for Building Climate Resilience: Lessons from Rural and Periurban Botswana. *Sustainability*, *14*(17), p.10599.

Michelle, T., 2020. THE ECONOMIC DEVELOPMENT OF BOTSWANA. Политика, экономика и инновации, (3 (32)), p.17.

Mogomotsi, P.K., Sekelemani, A. and Mogomotsi, G.E., 2020. Climate change adaptation strategies of small-scale farmers in Ngamiland East, Botswana. Climatic Change, 159(3), pp.441-460.

Mohamed, I.A., 2015. National biodiversity strategy and action plan 2016-2025.

Motsholapheko, M.R. and Ngwenya, B.N., 2021. Access to water resources and household vulnerability to malaria in the Okavango Delta, Botswana. In African Handbook of Climate Change Adaptation (pp. 1227-1246). Cham: Springer International Publishing.

Nonjinge, G., 2018. Amidst drought, only half of Batswana are aware of climate change.

Richard, 2021. Zebra Migration Botswana: everything you need to know. Available at: https://farandwild.travel/wilder/article/zebra-migration-botswana-everything-you-need-to-know. Date Accessed: [12 May 2023].

SADC, 2000. Revised Protocol on Shared Watercourses 2000. Available at: https://www.sadc.int/document/revised-protocol-shared-watercourses-2000-english. [Date accessed: 20 May 2023].

SADC, 2002. Protocol on Forestry 2002. Available at: https://www.sadc.int/document/protocol-forestry-2002. [Date accessed: 20 May 2023].

SADC, 2023. Protocol on Fisheries 2006. Available at: https://www.sadc.int/document/protocol-fisheries-2006. [Date accessed: 20 May 2023].

SADC, 2023. Revised SADC Protocol on Gender and Development. Available at: https://www.sadc.int/document/revised-sadc-protocol-gender-and-development-english. [Date accessed: 20 May 2023].

Thobega, K., 2022. Drought drives elephants to southern Botswana. Botswana GuardianSun. Available at: https://guardiansun.co.bw/news/drought-drives-elephants-to-southern-botswana/news. Date accessed: [11 May 2023].

UNDP-Botswana, 2020. Call for Applications-Biogas project. Available at: https://www.undp.org/botswana/publications/call-applications-biogas-project. [Date accessed: 25 May 2023].

Urich, P., Li, Y. and Masike, S., 2021. Climate Change, Biodiversity, and Tipping Points in Botswana. In *African Handbook of Climate Change Adaptation* (pp. 1193-1226). Cham: Springer International Publishing.

Comoros

Andréfouët, S., Muller-Karger, F.E., Robinson, J., Kranenburg, C.J., Torres-Pulliza, D., Spraggins, S.A., Murch, B.(2006). Global assessment of modern coral reef extent and diversity for regional science and management applications: a view from space. In: Proc 10th Int Coral Reef Symp, pp. 1732–1745.

Amaratunga, Dilanthi, Richard Haigh, Chamindi Malalgoda, and Nuwan Dias. (2017). Synthesis Report of Legal, Policy and Science Approaches Within the Frame of CCA and DRR: Global Perspectives: Global Disaster Resilience Centre, University of Huddersfield.

Aura, O.V. et al. (2018) Integration of Mapping and Socio-Economic Status of Cage Culture: Towards Balancing Lake-Use and Culture Fisheries in Lake Victoria, Kenya. Aquaculture Research, 49, 532-545.

Anthony, K.R.N., Marshall, P.A., Abdulla, A., Beeden, R., Bergh, C., Black, R., Eakin, M.C., Game, E.T., Gooch, M., Graham, N.A.J., Green, A., Heron, S.F., Hooidonk, R.V., Knowland, C., Mangubhai, S., Marshall, N., Maynard, J.A., McGinnity, P., McLeod, E., Mumby, P.J., Nyström, M., Obura, D.O., Oliver, J., Possingham, H.P., Pressey, R.L., Rowland, G.P., Tamerlander, J., Wachenfeld, D., Wear, S.(2015). Operationalizing resilience for adaptive coral reef management under global environmental change. Glob. Chang. Biol. 21 (1), 48–61.

Ateweberhan, M., McClanahan, T.R., Graham, N.A.J., Sheppard, C.R.C. (2011). Episodicheterogeneous decline and recovery of coral cover in the Indian Ocean. Coral Reefs 30, 739–752.

Audru, J.-C., Bitri, A., Desprats, J.F., Dominique, P., Eucher, G., Hachim, S., Jossot, O., Mathon, C., Nédellec, J.-L., Sabourault, P., Sedan, O., Stollsteiner, P., Terrier-Sedan, M. (2010) Major natural hazards in a tropical volcanic island: a review for Mayotte Island, Comoros archipelago, Indian Ocean. Eng. Geol. 114 (3–4), 364–381.

Banwell, Nicola, Shannon Rutherford, Brendan Mackey, and Cordia Chu. (2018). "Towards Improved Linkage of Disaster Risk Reduction and Climate Change Adaptation in Health: A Review." International Journal of Environmental Research and Public Health **15**: 15.

Becker, Per, Magnus Hagelsteen, and Marcus Abrahamsson. (2021). "'Too Many Mice Make no Lining for Their Nest'–Reasons and Effects of Parallel Governmental Structures for Disaster Risk Reduction and Climate Change Adaptation in Southern Africa." Jàmbá **13**(1): 8.

Becker, Per, Marcus Abrahamsson, and Magnus Hagelsteen. (2013). "Parallel Structures for Disaster Risk Reduction and Climate Change Adaptation in Southern Africa." Jàmbá **5**: 1– 5.

Begum, Rawshan Ara, Md Sujahangir Kabir Sarkar, Abdul Hamid Jaafar, and Joy Jacqueline Pereira. (2014)."Toward Conceptual Frameworks for Linking Disaster Risk Reduction and Climate Change Adaptation." International Journal of Disaster Risk Reduction **10**: 362– 73.

Belay, Daniel, and Gutema Fekadu. (2021) "Influence of Social Capital in Adopting Climate Change Adaptation Strategies: Empirical Evidence from Rural Areas of Ambo District in Ethiopia." Climate and Development **13**(2021): 1– 12.

Bellwood, D.R., Hughes, T.P., Folke, C., Nyström, M. (2004) Confronting the coral reef crisis. Nature 429 (6994), 827–833.

Bellwood, D.R., Goatley, C.H.R., Brandl, S.J., Bellwood, O. (2014) Fifty million years of herbivory on coral reefs: fossils, fish and functional innovations. Proc. R. Soc. B 281, 20133046.

Belokurov, A., Baskinas, L., Biyo, R., Clausen, A., Dudley, N., Guevara, O., Lumanog, J., Rakotondrazafy, H., Ramahery, V., Salao, C., Stolton, S., Zogib, L. (2016) Climate Adaptation Methodology for Protected Areas (CAMPA): Coastal and Marine. (160 pp.).

Birkmann, Jörn, and Joanna Pardoe. (2014) " Climate Change Adaptation and Disaster Risk Reduction: Fundamentals, Synergies and Mismatches." Adapting to Climate Change. edited by Bruce C. Glavovic and Gavin P. Smith, 41– 56. Dordrecht:Springer, Science and Business Media.

Birrell, C.L., McCook, L.J., Willis, B.L. (2008) Effects of benthic algae on the replenishment of corals and the implications for the resilience of coral reefs. Oceanogr. Mar.Biol. 46, 25–63.

Booth, Laura., Kevin Fleming, Jaime Abad, Lynn, A. Schueller, Mattia Leone, Anna Scolobig, and Audrey Baills. (2020). "Simulating Synergies Between Climate Change Adaptation and Disaster Risk Reduction Stakeholders to Improve Management of Transboundary Disasters in Europe." International Journal of Disaster Risk Reduction **49**: 101668.

Britton, Neil R. (2006) "Getting the Foundation Right: In Pursuit of Effective Disaster Legislation for the Philippines." In 2nd Asian Conference on Earthquake Engineering, 10–11. Citeseer.

Bruno, J.F., Precht, W.F., Vroom, P.S., Aronson, R.B., 2014. Coral reef baselines: how much macroalgae is natural? Mar. Pollut. Bull. 80 (1–2), 24–29.

Burke, L., Reytar, K., Spalding, M.D., Perry, A., 2011. Reefs at Risk Revisited. World Resources Institute, Washington DC, USA (130 pp.).

Chabanet, P., Bigot, L., Nicet, J.B., Durville, P., Massé, L., Mulochau, T., Russo, C., Tessier,E., Obura, D., 2016. Coral reef monitoring in the Iles Eparses, Mozambique Channel (2011−2013). Acta Oecol. 1–11.

Cinner, J.E., McClanahan, T.R., Graham, N., Daw, T.M., Maina, J., Stead, S.M., Wamukota, A., Brown, K., Bodin, Ö.(2012) Vulnerability of coastal communities to key impacts of climate change on coral reef fisheries. Glob. Environ. Chang. 22,12–20.

Cinner, J.E., Huchery, C., MacNeil, M.A., Graham, N., McClanahan, T.R., Maina, J.,Maire, E., Kittinger, J.N., Hicks, C.C., Mora, C., Allison, E.H., D'Agata, S., Hoey, A.,Feary, D.A., Crowder, L., Williams, I.D., Kulbicki, M., Vigliola, L., Wantiez, L., Edgar,G., Stuart-Smith, R.D., Sandin, S.A., Green, A.L., Hardt, M.J., Beger, M., Friedlander,A., Campbell, S.J., Holmes, K.E., Wilson, S.K., Brokovich, E., Brooks, A.J., Cruz-Motta, J.J., Booth, D.J., Chabanet, P., Gough, C., Tupper, M., Ferse, S., Sumalia, U.,Mouillot, D. (2022) CONSTITUTION of the FEDERAL ISLAMIC REPUBLIC OF THE COMOROS

Coles, S.L., Jokiel, P.L. (1978) Synergistic effects of temperature, salinity and light on the hermatypic coral Montipora verrucosa. Mar. Biol. 49 (3), 187–195.

Conway, Declan., Robert J. Nicholls, Sally Brown, Mark G. L. Tebboth, William Neil Adger, Bashir Ahmad, Hester Biemans, et al. (2019). " The Need for Bottom-Up Assessments of Climate Risks and Adaptation in Climate-Sensitive Regions." Nature Climate Change **9**(7): 503– 11.

Cowburn, B. (2016) Coral Reefs and Climate Change in the Indian Ocean: A Case Study of Watamu Marine National Park and Other Indian Ocean Locations (PhD Thesis). University of Oxford, UK (287 pp.).

Creswell, John W. (2014). A Concise Introduction to Mixed Methods Research. SAGE Publications.

Creswell, John W., and Vicky L. Plano Clark. (2011). "Choosing a Mixed Methods Design." Designing and Conducting Mixed Methods Research, 53– 106.

Erftemeijer, P.L.A., Riegl, B., Hoeksema, B.W., Todd, P.A. (2012) Environmental impacts of dredging and other sediment disturbances on corals: a review. Mar. Pollut. Bull. 64 (9), 1737–1765.

Fabricius, K.E. (2005) Effects of terrestrial runoff on the ecology of corals and coral reefs: review and synthesis. Mar. Pollut. Bull. 50 (2), 125–146.

Faure, G., Guillaume, M., Payri, C. (1984). Sur un phénomène remarquable de blanchiment et de mortalité massive des madréporaires d et de mortalité massive des madréporaires dans le complexe recifal de l'ile Mayotte (SW Ocean Indien). C. R. Acad. Sc. Paris 299 (15), 637–642.

Fox, H.E., Holtzman, J.L., Haisfield, K.M., McNally, C.G., Cid, G.A., Mascia, M.B., Parks, J.E., Pomeroy, R.S.(2014) How are our MPAs doing? Challenges in assessing global patterns in marine protected area performance. Coast. Manag. 42 (3), 207–226.

Freed, S., Granek, E.F (2014) Effects of human activities on the world's most vulnerable coral reefs: Comoros case study. Coast. Manag. 42 (3), 280–296.

Gough, C. (2012) Assessment of the vulnerability to climate change of the traditional fishing communities of Nosy Hara, northwest Madagascar: part of the capacity for adaptation to climate change, Madagascar. In: WWF Project MG 950.

Government of Comoros, (2019) Report to the UNFCCC regarding Comoros' participation in Global Climate Observing Systems (GCOS) and on systematic observation in Comoros. December 2002. Comoros

Government of Comoros, Comoros' Third National Communication to the UNFCCC: Chapter 3—Climate Change Vulnerability and Adaptation; Ministry of Agriculture, Climate Change and Environment: Comoros

Government of Comoros, 2020 Comoros' National Climate Change Policy; Ministry of Environment, Energy and Climate,Comoros.

Graham, N., McClanahan, T.R., MacNeil, M.A., Wilson, S.K., Cinner, J.E., Huchery, C., Holmes, T.H., 2017. Human disruption of coral reef trophic structure. Curr. Biol. 27 (2), 231–236.

Green, A.L., Bellwood, D.R. (2009). Monitoring functional groups of herbivorous reeffishes as indicators of coral reef resilience. In: IUCN Working Group on Climate Change and Coral Reefs. IUCN, Gland, Switzerland, pp. 1–70.

Harris, J.L., Estradivari, E., Fox, H.E., McCarthy, O.S., Ahmadia, G.N. (2017) Planning for the future: incorporating global and local data to prioritize coral reef conservation. Aquat. Conserv. Mar. Freshwat. Ecosyst. 27 (S1), 65–77.

Hawlitschek, O., Brückmann, B., Berger, J., Green, K., Glaw, F. (2001). Integrating field surveys and remote sensing data to study distribution, habitat use and conservation status of the herpetofauna of the Comoro Islands. ZooKeys 144, 21–79.

Heron, S.F., Maynard, J.A., van Hooidonk, R., Eakin, C.M. (2016) Warming trends and bleaching stress of the world's coral reefs 1985–2012. Sci. Rep. 6, 38402.

Hughes, T.P., Rodrigues, M.J., Bellwood, D.R., Ceccarelli, D., Hoegh-Guldberg, O., McCook, L., et al. (2007). Phase shifts, herbivory, and the resilience of coral reefs to climate change. Curr. Biol. 17, 360–365.

Jouffray, J.B., Nyström, M., Norström, A.V., Williams, I.D., Wedding, L.M., Kittinger, J.N.,Williams, G.J. (2015). Identifying multiple coral reef regimes and their drivers across the Hawaiian archipelago. Philos. Trans. R. Soc. Lond. Ser. B Biol. Sci. 370 (1659), 20130268.

Knowlton, N., Jackson, J.B.C. (2008) Shifting baselines, local impacts, and global change on coral reefs. PLoS Biol. 6 (2), e54.

Kohler, K.E., Gill, S.M. (2006) Coral Point Count with Excel extensions (CPCe): a visual basic program for the determination of coral and substrate coverage using random point count methodology. Comput. Geosci. 32, 1259–1269.

Leech, Nancy L., Anthony J. Onwuegbuzie, and Julie P. Combs. (2011). "Writing Publishable Mixed Research Articles: Guidelines for Emerging Scholars in the Health Sciences and Beyond." International Journal of Multiple Research Approaches **5**: 7– 24.

Lei, Yongdeng, and Jing'ai Wang. (2013). "A Preliminary Discussion on the Opportunities and Challenges of Linking Climate Change Adaptation With Disaster Risk Reduction." Natural Hazards **71**: 1587– 97.

Liu, G., Strong, A.E., Skirving, W. (2003). Remote sensing of sea surface temperaturesduring 2002 Barrier Reef coral bleaching. EOS Trans. Am. Geophys. Union 84 (15),B. Cowburn et al. Marine Pollution Bulletin 133 (2018) 956–969 968

Tashakkori, Abbas, and Charles Teddlie. (2010). Amara. Thousand Oaks, Califonia:SAGE Publications.

UN Climate Change Secretariat. (2017). Opportunities and options for integrating climate change adaptation with the Sustainable Development Goals and the Sendai Framework for Disaster Risk Reduction 2015–2030. Bonn: United Nations Climate Change Secretariat.

World Meteorological Organization. (2020). 2020 State of Climate Services: Risk Information and Early Warning Systems. WMO.

Democratic Republic of Congo

African Biodiversity Collaborative Group, 2020. How ABCG is Implementing Community Forestry in the Democratic Republic of Congo: WRI's Natural Resources Policy Specialist Explains. Available at: https://abcg.org/how-abcg-is-implementing-community-forestry-in-the-democratic-republic-of-congo-wris-natural-resources-policy-specialist-explains/.[Date accessed: 11 June 2023].

Balasha, A.M., 2019. Drivers of adoption of integrated pest management among small-scale vegetable farmers in Lubumbashi, DR Congo. American Journal of Rural Development, 7(2), pp.53-59.

Climate Risk Profile: Congo, Democratic Republic (2021): The World Bank Group. Available at: https://climateknowledgeportal.worldbank.org/sites/default/files/2021-06/15883-WB_Congo%2C%20Democratic%20Republic%20Country%20Profile-WEB.pdf.[Date accessed: 07 June 2023].

Climate Risk Profile: Congo, Democratic Republic the World Bank Group. (2021). Retrieved from: https://climateknowledgeportal.worldbank.org/sites/default/files/2021-06/15883-WB_Congo%2C%20Democratic%20Republic%20Country%20Profile-WEB.pdf

Climate Risk Profile: Congo, Democratic Republic The World Bank Group. (2021). Retrieved from: https://climateknowledgeportal.worldbank.org/sites/default/files/2021-06/15883-WB_Congo%2C%20Democratic%20Republic%20Country%20Profile-WEB.pdf

Democratic Republic of Congo: Second National Communication to the UNFCCC. (2009). Retrieved from: https://unfccc.int/sites/default/files/resource/Executive%20Summary.pdf

DRC National Adaptation Plan, 2021. National Adaptation Plan to Climate Change (2022-2026). Available at: https://unfccc.int/sites/default/files/resource/DRC-NAP_EN.pdf. [Date accessed: 09 June 2023].

DRC-Disaster Relief Emergency Fund Operation, 2023. Democratic Republic of Congo (DRC) – Flood Sud Kivu/Kalehe. Available at: https://reliefweb.int/report/democratic-republic-congo/drc-flood-sud-kivukalehe-dref-operation-ndeg-mdrcd040. [Date accessed:11 June 2023].

Interactive Country Fiches, ND. Country in a nutshell. Available at: https://dicf.unepgrid.ch/democratic-republic-congo. [Date accessed: 07 June 2023].

Mangaza, L., Sonwa, D.J., Batsi, G., Ebuy, J. and Kahindo, J.M., 2021. Building a framework towards climate-smart agriculture in the Yangambi landscape, Democratic Republic of Congo (DRC). *International Journal of Climate Change Strategies and Management*, *13*(3), pp.320-338.

Sonwa, D., Mangaza, L., Batsi, G. and Ebuy, J., 2020. Preliminary reflections of the potential of climate smart agriculture (CSA) in the Tshopo Province (DRC). *Challenges of Development and Natural Resource Governance in Africa*, pp.219-233.

UNEP, 2021. Overview on the process of adaptation to climate change in the Democratic Republic of the Congo. Available at: https://unfccc.int/sites/default/files/resource/NAP-Process_DRC.pdf. [Date accessed: 11 June 2023].

UNICEF, 2021. Children in DRC at 'extremely high risk' of the impacts of the climate crisis. Available at: https://www.unicef.org/drcongo/en/press-releases/children-drc-extremely-high-risk-impacts-climate-crisis. [Date accessed: 10 June 2023].

UNICEF, 2023. UNICEF DRC responds to deadly floods in Kalehe in South Kivu province. Available at: https://www.unicef.org/drcongo/en/press-releases/unicef-responds-deadly-floods-kalehe. [Date accessed: 11 June 2023].

USAID, 2023. Climate risks to resilience & food security in bureau for humanitarian assistance geographies Democratic Republic of the Congo. Available at: https://reliefweb.int/report/democratic-republic-congo/democratic-republic-congo-climate-risks-resilience-food-security-bureau-humanitarian-assistance-geographies?gclid=CjwKCAjw1YCkBhAOEiwA5aN4AS1rSiQpQQlxRW4ViJqjSJ5AqpfpEPZjZLS44_Jgz3Yb5_3_bJNbnBoCTl0QAvD_BwE. [Date accessed: 07 June 2023].

USAID: Climate Risks in Food for Peace Geographies – Democratic Republic of the Congo. (2017). Retrieved from: https://www.climatelinks.org/sites/default/files/asset/document/20170222_USAID%20ATLAS_DRC%20Food%20Security%20Climate%20Screening.pdf

Wetlands International, 2021. Uganda, DR Congo, Tanzania Sign Memoranda to Manage Transboundary Wetlands for Nile Basin. Available at: https://africa.wetlands.org/en/news/uganda-dr-congo-tanzania-sign-memoranda-to-manage-transboundary-wetlands-for-nile-basin/. [Date accessed: 10 June 2023].

World Bank Group, 2018. Fact Sheet: Mai Ndombe Redd+ Initiative in DRC. Available at: https://www.worldbank.org/en/country/drc/brief/fact-sheet-mai-ndombe-redd-initiative-in-drc. [Date accessed: 10 June 2023].

World Bank Group, 2021. Climate Change Knowledge Portal. Available at: https://climateknowledgeportal.worldbank.org/country/congo-dem-rep/vulnerability. [Date accessed: 07 June 2023].

Eswatini

African Press, 2023. RFM 1-Megawatt solar plant near completion. Available: https://www.africa-press.net/eswatini/all-news/rfm-1-megawatt-solar-plant-near-completion. [Date access: 27 May 2023].

UNDP Eswatini, 2021. COP26: Eswatini Pledges to Increase Renewable Energy. Available at: https://www.undp.org/eswatini/news/cop26-eswatini-pledges-increase-renewable-energy. [Date: 27 May 2023].

FAO, 2019. Fishery and Aquaculture Country Profiles Eswatini. Available at: https://www.fao.org/fishery/en/facp/swz?lang=en#fisheriesstatistics. [Date accessed: 24 May 2023].

Government of Eswatini, 2021. Eswatini Initial Adaptation Communication to the United Nations Framework Agreement on Climate Change. Tfwala, S.S., Mabaso, S.D., and Groenewald, M. (Editors)

Government of Swaziland, 2018. Programme Framework for Affordable Renewable Energy in Swaziland (PARES). Ministry of Tourism and Environmental Affairs, Mbabane, Eswatini

International Finance Corporation, 2022. CREATING MARKETS IN ESWATINI.

Kingdom of Eswatini, 2019. Eswatini's Sixth National Report to the CBD.

Kingdom of Eswatini, 2019. National Development Plan 2019/20-2021/22.

Kingdom of Eswatini, 2020. Eswatini National Drought Plan.

Kingdom of Swaziland, 2016. NATIONAL CLIMATE CHANGE POLICY, 2016.

Mamba, H.S., Randhir, T.O. and Fuller, T.K., 2020. Community attitudes and perceptions concerning rhinoceros poaching and conservation: A case study in eSwatini. *African Journal of Wildlife Research*, *50*(1), pp.1-7.

Nap Global Network, 2021. Eswatini Outreach Programme: Strengthening Adaptation and Traditional Knowledge Systems to Enhance Resilience. Available at: https://napglobalnetwork.org/resource/eswatini-outreach-programme/. [Date: 20 May 2023].

National Disaster Management Agency, 2016. Assessment of the Socio-Economic Impact of the 2015/16 El Niño Drought in Swaziland.

National Disaster Management Agency, 2016. Assessment of the Socio-economic impact of the 2015/16 El Nino Drought in Swaziland. NDMA Swaziland.

Nhlengethwa, B., Singwane, S.S., Mabaso, S.D., van Zuydam, I.B. and Mamba, S.F., Assessment of Socio-economic Impacts of the Climate Smart Gardens Project in Low Income Residential Areas in Mbabane City, Eswatini. *International Journal of Agriculture, Forestry and Fisheries*. Vol. 8, No. 1, 2020, pp. 36-47.

RCRC (Red Cross Climate Centre), 2021. Climate Profiles of Countries in Southern Africa: Eswatini. The Hague: RCRC.

Roga, N.B., Ferguson, W. and Bagoora, F., 2017. Transboundary conservation areas in African mountains: Opportunities and challenges for addressing global change. *Earth Sciences*, *6*(6), p.117.

Smith, R.J., Easton, J., Nhancale, B.A., Armstrong, A.J., Culverwell, J., Dlamini, S.D., Goodman, P.S., Loffler, L., Matthews, W.S., Monadjem, A. and Mulqueeny, C.M., 2008. Designing a transfrontier conservation landscape for the Maputaland centre of endemism using biodiversity, economic and threat data. *Biological Conservation*, *141*(8), pp.2127-2138.

Southern Africa Drought Resilience Initiative, 2021. Drought Resilience Profiles- Eswatini.

World Bank Group, 2021. Climate Risk Profile: eSwatini

Lesotho

Bentley, L.K., Robertson, M.P. and Barker, N.P., 2019. Range contraction to a higher elevation: the likely future of the montane vegetation in South Africa and Lesotho. *Biodiversity and Conservation*, *28*, pp.131-153.

Braimoh, A., Branca, G., Zhao, Y., Huber Lee, A.T., Joyce, B. and Yates, D., 2019. Lesotho Climate-Smart Agriculture Investment Plan: Opportunities for Transitioning to More Productive, Climate-Resilient, and Low Carbon Agriculture.

CBD, 2009. CBD Fourth National Report- Lesotho. Accessed: 18 April 2023. Available from: https://www.cbd.int/doc/world/ls/ls-nr-04-en.pdf

Chatanga, P., Kotze, D.C., Janks, M. and Sieben, E.J.J., 2019. Classification, description and environmental factors of montane wetland vegetation of the Maloti-Drakensberg region and the surrounding areas. *South African Journal of Botany*, *125*, pp.221-233.

CIAT; World Bank. 2018. Climate-Smart Agriculture in Lesotho. CSA Country Profiles for Africa Series. International Center for Tropical Agriculture (CIAT); Washington, D.C. 28 p.

FRA, 2015. Global Forest Resources Assessment: Country Report- Lesotho. Food and Agriculture Organisation (FAO), Rome, Italy

Hoogendoorn, G., Stockigt, L., Saarinen, J. and Fitchett, J.M., 2021. Adapting to climate change: The case of snow-based tourism in Afriski, Lesotho. *African Geographical Review*, *40*(1), pp.92-104.

Kamara, J.K., Agho, K. and Renzaho, A.M., 2020. Combating recurrent hazards: evidence from rural Lesotho and Eswatini–a qualitative study. *Environmental Hazards*, *19*(5), pp.421-441.

LMS 2017. Lesotho's National Climate Change Policy. Ministry of Energy and Meteorology, Lesotho

Institute for Peace and Security Studies, 2019. PEACE & SECURITY REPORT: KINGDOM OF LESOTHO CONFLICT INSIGHT Volume 1. Addis Ababa University, Ethiopia.

Mohamed, A.A. and Mukwada, G., 2019. Temperature changes in the Maloti-Drakensberg region: an analysis of trends for the 1960–2016 Period. *Atmosphere*, *10*(8), p.471.

Mukwada, G., Taylor, S.J., Manatsa, D., Mahasa, P. and Robinson, G., 2020. Combating food insecurity in a rapidly changing mountain climate environment: insights from Lesotho. *Climatic Change*, *163*, pp.989-1006.

Olaleye AO, Tambi E, Bangali S, Odularu GOA (2016) *Likoti* Farming under Changing Climate in Lesotho: Agronomic Grain Yield versus Technical Efficiency. J Ecosys Ecograph S5:001. doi:10.4172/2157-7625.S5-001

Pelser, A. and Letsela, L., 2012. Mainstreaming sustainability into biodiversity conservation in Lesotho. *Environment, development and sustainability*, *14*, pp.45-65.

Southern African Development Community (SADC) Programme for Transfrontier Conservation Areas (TFCAs), Gaborone, Botswana, 2019

Southern African Drought Resilience Initiative, 2021. Drought Resilience Profiles- Lesotho. Accessed: 18 April 2023. Available from: https://europa.eu/capacity4dev/file/120917/download?token=2VqjCy4q

UNECA, 2020. Blue Economy, Inclusive Industrialization and Economic Development in Southern Africa. United Nations Economic Commission for Africa, Addis Ababa, Ethiopia

A. J. Van der Walt, J. A. Kruger & S. J. Roffe (2023) Fine-resolution analysis of the spatiotemporal characteristics of heatwaves in the Maloti-Drakensberg region, southern Africa: 1979–2021, Transactions of the Royal Society of South Africa, DOI: 10.1080/0035919X.2023.2175075

WFP (2020) WFP Lesotho country brief. WFP, Rome, Italy

World Bank. 2016. "Lesotho Water Security and Climate Change Assessment." World Bank, Washington, DC. License: Creative Commons Attribution CC BY 3.0 IGO

The World Bank Group, 2021. Climate Risk Profile: Lesotho

Climate Change Risk Profile: World Bank Group . (2021). Retrieved from https://climateknowledgeportal.worldbank.org/sites/default/files/202108/15930-WB_Lesotho%20Country%20Profile-WEB.pdf

Food and Agriculture Organization of the United Nations . (2008). Retrieved from https://www.fao.org/fishery/docs/DOCUMENT/fcp/en/FI_CP_LS.pdf

Lesotho's National Climate Change Policy: Ministry of Energy and Meteorology. (2017). Retrieved from https://www.gov.ls/download/national-climate-change-policy/

African Development Bank. (2020). Lesotho - Country Strategy Paper 2020-2024. Retrieved from https://www.afdb.org/en/documents/lesotho-country-strategy-paper-2020-2024

United Nations in Lesotho. (2021). Lesotho Socio Economic Response Plan. Retrieved from https://lesotho.un.org/en/127332-lesotho-socio-economic-response-plan

Ministry of Health Lesotho. (2020). Lesotho Preparedness and Response Plan. Retrieved from https://www.afro.who.int/sites/default/files/202003/Lesotho%20COVID19%20Preparedness%20and%20Response%20Plan.pdf

Ministry of Education Lesotho. (2020). The National COVID-19 Education Sector Response Plan 2020. Retrieved from https://www.globalpartnership.org/sites/default/files/2020-06/lesotho-covid19-response-plan.pdf

World Food Programme. (2019). Lesotho country strategic plan (2019 – 2024). Retrieved from https://www.wfp.org/operations/ls02-lesotho-country-strategic-plan-2019-2024

World Bank. (2020). Lesotho COVID-19 Emergency Preparedness and Response Project. Retrieved from http://documents1.worldbank.org/curated/en/172291589446261054/pdf/Lesotho-COVID-19-Emergency-Preparedness-and-Response-Project.pdf

Madagascar

"A green island turns red: Madagascans struggle through long drought." 17 Mar. 2022, https://www.reuters.com/world/africa/green-island-turns-red-madagascans-struggle-through-long-drought-2022-03-17/.

"Adapting agriculture to climate change - Deutsche Gesellschaft für ...." https://www.giz.de/en/worldwide/60509.html.

"Almost a third of lemurs now Critically Endangered - IUCN." 10 Jul. 2020, https://www.iucn.org/news/eastern-and-southern-africa/202007/almost-a-third-lemurs-now-critically-endangered-iucn-red-list.

"BMUV: Nature and Biological Diversity." https://www.bmuv.de/en/topics/nature-species-protection/nature-and-biological-diversity.

"Climate Smart Agriculture and Climate Change - IJCMAS." 03 Aug. 2019, https://www.ijcmas.com/8-3-2019/Santosh%20Kumari,%20et%20al.pdf.

"Climate-Smart Agriculture - World Bank." 05 Apr. 2021, https://www.worldbank.org/en/topic/climate-smart-agriculture.

"Country Profiles - Convention on Biological Diversity." https://www.cbd.int/countries/.

"Current and Potential Future Aftermath of Cyclone Freddy." 20 Mar. 2023, https://fluids.ai/2023/03/20/current-and-potential-future-aftermath-of-cyclone-freddy/.

"Ecosystem-based Adaptation | UNEP - UN Environment Programme." https://www.unep.org/explore-topics/climate-action/what-we-do/climate-adaptation/ecosystem-based-adaptation.

"Environment & Climate Change | SADC." https://www.sadc.int/pillars/environment-climate-change.

"Environment and Climate Change | Madagascar | U.S. Agency for ...." https://www.usaid.gov/madagascar/environment-and-climate-change.

"Fight against climate change, the challenge to accelerate the ... - UNICEF." 25 Nov. 2021, https://www.unicef.org/madagascar/en/press-releases/fight-against-climate-change-challenge-accelerate-implementation-sustainable.

"Food Security and Disaster Assistance | Madagascar | U.S. Agency for ...." https://www.usaid.gov/madagascar/food-security-and-disaster-assistance.

"Global Climate Change Alliance Plus (GCCA+) in the COMESA region: EU ...." https://sdgs.un.org/partnerships/global-climate-change-alliance-plus-gcca-comesa-region-eu-madagascar-climate-change.

"Literacy rate, adult total (% of people ages 15 and above) | Data." https://data.worldbank.org/indicator/SE.ADT.LITR.ZS.

"Madagascar - Migrants & Refugees Section." https://migrants-refugees.va/country-profile/madagascar/.

"Madagascar - Vulnerability | Climate Change Knowledge Portal - World Bank." https://climateknowledgeportal.worldbank.org/country/madagascar/vulnerability.

"Madagascar - Vulnerability | Climate Change Knowledge Portal - World Bank." https://climateknowledgeportal.worldbank.org/country/madagascar/vulnerability.

"Madagascar - Vulnerability | Climate Change Knowledge Portal." https://climateknowledgeportal.worldbank.org/country/madagascar/vulnerability.

"Madagascar | Convention on Wetlands - Ramsar." 31 Jan. 2017, https://www.ramsar.org/wetland/madagascar.

"Madagascar | International Organization for Migration." 10 Jan. 2022, https://www.iom.int/countries/madagascar.

"Madagascar | International Organization for Migration." 10 Jan. 2022, https://www.iom.int/countries/madagascar.

"Madagascar 2023 | countryeconomy.com." https://countryeconomy.com/countries/madagascar.

"Madagascar Crisis - SIHMA." https://sihma.org.za/Blog-on-the-move/madagascar-crisis.

"Madagascar Deforestation Rates & Statistics | GFW." Madagascar Deforestation Rates & Statistics | GFW

"Madagascar Immigration Statistics 1960-2023 | MacroTrends." https://www.macrotrends.net/countries/MDG/madagascar/immigration-statistics.

"Madagascar Overview: Development news, research, data | World Bank." 24 Mar. 2023, https://www.worldbank.org/en/country/madagascar/overview.

"Madagascar Signs Landmark Agreement with the World Bank to Reduce ...." 05 Feb. 2021, https://www.worldbank.org/en/news/press-release/2021/02/05/madagascar-signs-landmark-agreement-with-the-world-bank-to-reduce-poverty-deforestation-and-carbon-emissions.

"Madagascar: Adapting to impact of climate change - ESI-Africa.com." 25 Jan. 2023, https://www.esi-africa.com/news/madagascar-adapting-to-impact-of-climate-change/.

"Madagascar: Balancing Conservation and Exploitation of Fisheries Resources." 08 Jun. 2020, https://www.worldbank.org/en/news/feature/2020/06/08/madagascar-balancing-conservation-and-exploitation-of-fisheries-resources.

"Madagascar: country data and statistics - Worlddata.info." https://www.worlddata.info/africa/madagascar/index.php.

"Madagascar's extraordinary biodiversity: Evolution, distribution, and ...." https://www.science.org/doi/10.1126/science.abf0869. (Picture)

"MADGASCAR - lse.ac.uk." https://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/05/MADAGASCAR.pdf.

"Migration & Madagascar. IOM Development Fund's Support to ... - Medium." 05 Jul. 2017, https://medium.com/@UNmigration/migration-madagascar-b9c4f8547e4f.

"Protecting Forests and Reducing Emissions in Madagascar - World Bank Group." 23 Sept. 2015, https://www.worldbank.org/en/results/2015/09/23/protecting-forests-reducing-emissions-madagascar.

"Protocol on Forestry 2002 | SADC - Southern African Development Community." 17 Jul. 2002, https://www.sadc.int/document/protocol-forestry-2002.

"The United Nations Convention on Biological Diversity - BMUV." https://www.bmuv.de/en/topics/nature-species-protection/nature-and-biological-diversity/international-biological-diversity/the-united-nations-convention-on-biological-diversity.

"The World's Bank - An Evaluation of the World Bank Group's Global ...." 01 Apr. 2020, https://ieg.worldbankgroup.org/evaluations/world-bank-group-global-convening.

"Tropical Cyclone Freddy Operational Update (MDRMG020) - ReliefWeb." 13 Mar. 2023, https://reliefweb.int/report/madagascar/madagascar-tropical-cyclone-freddy-operational-update-mdrmg020.

"UNICEF Madagascar Humanitarian Situation Report (Cyclone FREDDY ...." 20 Apr. 2023, https://reliefweb.int/report/madagascar/unicef-madagascar-humanitarian-situation-report-cyclone-freddy-cheneso-31-march-2023.

"What is the Kyoto Protocol? | UNFCCC." 08 Dec. 2012, https://unfccc.int/kyoto_protocol.

"Winrock." https://winrock.org/wp-content/uploads/2021/08/Madagascar_Country_Profile-Final.pdf.

“Madagascar: Carbon Emissions Reduction Project in the Corridor Ankeniheny-Zahamena (CAZ) Protected Area” https://www.biocarbonfund.org/node/85 (Accessed on 11 May 2023)

Andriamanalinarivo, Remi Rolland; Faly, Aritiana Fabien et al. Madagascar, a country resilient to the effects of hazards and protected from damage for sustainable development. Contributing Paper to GAR 2019

Full Citation: V. (n.d.). Madagascar Deforestation Rates & Statistics | GFW. Madagascar Deforestation Rates & Statistics | GFW. https://www.globalforestwatch.org/dashboards/country/MDG

https://public.wmo.int/en/media/news/tropical-cyclone-freddy-hits-madagascar-and-mozambique

https://www.cbd.int/countries/profile/?country=mg

https://www.nairobiconvention.org/madagascar-country-profile/madagascar-ocean-economy-2/

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2610084/ “Climate change adaptation for conservation in Madagascar” published 2008 Jul 29

https://www.worldbank.org/en/news/infographic/2017/06/06/blue-economy

https://www.worldbank.org/en/news/feature/2020/06/08/madagascar-balancing-conservation-and-exploitation-of-fisheries-resources"Madagascar: Balancing Conservation and Exploitation of Fisheries Resources." 08 Jun. 2020, https://www.worldbank.org/en/news/feature/2020/06/08/madagascar-balancing-conservation-and-exploitation-of-fisheries-resources.

Malawi

"Blue Economy | United Nations Economic Commission for Africa." https://uneca.org/eastern-africa/blue-economy.

"Climate Change Adaptation in Malawi’s Fisheries Sector: Policy Brief" by the Ministry of Fisheries and AquaticResources(2019):
http://www.moa.gov.mw/images/PDF_Files/Fisheries/Policy_Brief_on_Climate_Change.pdf

"Climate Change and the Fisheries Sector in Malawi: Impacts, Vulnerabilities, and Adaptation Strategies" by Munthali, S. W., et al. (2017): https://www.mdpi.com/2071-1050/9/11/2120

"Climate-Smart Agriculture in Malawi-WorldBank.":

"Energy supply in Malawi: Options and issues - SciELO." http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S1021-447X2015000200003.

"Fisheries and Aquaculture Sector Development Plan 2018-2023" by the Ministry of Agriculture, Irrigation and Water Development (Malawi)

"Malawi - Energy | Privacy Shield." https://www.privacyshield.gov/article?id=Malawi-Energy.

"Malawi | History, Map, Flag, Population, Capital, Language ... - Britannica." 17 May. 2023, https://www.britannica.com/place/Malawi.

"Malawi | United Nations Development Programme." https://www.undp.org/malawi.

"Malawi- The World Factbook." 30 May. 2023, https://www.cia.gov/the-world-factbook/countries/malawi/.

"Nationally Determined Contributions Registry | UNFCCC." 23 Nov. 2016, https://unfccc.int/NDCREG.

"POWER AFRICA IN MALAWI | Power Africa | U.S. Agency for International ...." 21 Oct. 2019, https://www.usaid.gov/powerafrica/malawi.

"Road transport vehicles in South Africa towards 2050: Factors ... - SciELO." http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S1021-447X2018000300004.

“Everything is connected”: How a village in Malawi has adapted to ...." 11 Jan. 2023, https://www.concern.net/news/malawi-climate-smart-agriculture-1planet4all

“Ministry of Agriculture, Irrigation and Water Development, Republic of Malawi (2017). Malawi climate

Academic literature on the topic 'Climatic changes – Social aspects – Malawi' https://www.grafiati.com/en/

Bhave, A.G., Conway, D., Dessai, S., Dougill, A.J. and Mkwambisi, D., 2022. Stress-testing development pathways under a changing climate: water-energy-food security in the lake Malawi-Shire river system. Philosophical Transactions of the Royal Society A, 380(2221), p.20210134.

Bronstert, A., Mtilatila, L. and Vormoor, K., 2023. Impacts of climate change on hydrological extremes and hydropower production in tropical Africa: catchments of Lake Malawi and the Shire River in Malawi (No. EGU23-12047). Copernicus Meetings.

Chavula, G., & Fisher, E. (2017). Climate change and agriculture in Malawi: Interactions and policy implications. Wiley Interdisciplinary Reviews: Climate Change, 8(6), e483.

Climate Change is Putting Women & Girls in Malawi at Greater Risk of Sexual Violence, Tsitsi Matekaire and Tara Carey

Department of Disaster Management Affairs (DoDMA). (2019). National Disaster Risk Management Policy. Government of Malawi. Retrieved from http://www.dodma.gov.mw/wp-content/uploads/2019/06/National-Disaster-Risk-Management-Policy.pdf

Ehimen, E.A., Sandula, P.Y., Robin, T. and Gamula, G.T., 2023. Improving Energy Access in Low-Income Sub-Saharan African Countries: A Case Study of Malawi. Energies, 16(7), p.3106.

FAO. (2019). Climate Change and Food Security in Malawi. Retrieved from http://www.fao.org/3/ca4535en/ca4535en.pdf

Forests 2019; www.mdpi.com/journal/forests Article Forestry Policy, Conservation Activities, and Ecosystem Services in the Remote Misuku Hills of Malawi.

Gondwe, T., & Mataya, B. (2017). Climate Change and Food Security in Malawi: A Review of Policy and Institutional Frameworks. In Climate Change Impacts and Adaptation Strategies for Agriculture and Forestry in Africa (pp. 59-72). Springer.

https://climateknowledgeportal.worldbank.org/sites/default/files/201906/CSA%20_Profile_Malawi.pdf.

https://www.unhcr.org/mw/wp-content/uploads/sites/35/2020/09/2020_Malawi_CRRP.pdf

Joshua, M.D., Tompkins, E., Schreckenberg, K., Ngongondo, C., Gondwe, E. and Chiotha, S., 2022. Water policy and resilience of potable water infrastructure to climate risks in rural Malawi. Physics and Chemistry of the Earth, Parts A/B/C, 127, p.103155.

JUNE 30, 2022, MALAWI, NATIONAL PEACE ARCHITECTURE, NATIONAL PEACE POLICY, PEACE ARCHITECTURE, PEACE INFRASTRUCTURES.

Kumwenda, S., & Nhlema, C. (2019). Gender and climate change in Malawi: a case study of Nkhotakota district. Journal of Environmental Studies and Sciences, 9(1), 89-100.)

Malawi: IPC Acute Food Insecurity Analysis, November 2019 - March 2020, Issued January 2020

MAPPING LAND SUITABILITY FOR AGRICULTURE IN MALAWI: Agricultural Land Suitability Mapping; February 2017 Land Degradation and Development 28(7)

Ministry of Forestry and Natural Resources, Environmental Affairs Development: MALAWI'S STRATEGY ON CLIMATE CHANGE LEARNING, February 2021.

Ministry of Natural Resources, Energy and Mining (MoNREM). (2017). Malawi Nationally Determined Contributions (NDC).

Nancy G. Tembo, MP MINISTER OF FORESTRY AND NATURAL RESOURCE : MALAWI'S STRATEGY ON CLIMATE CHANGE LEARNING: February 2021.

NAPAS: Malawi Intensely Disseminates Policy Information: Paida Mpaso, October 18, 2018

Office for the Coordination of Humanitarian Affairs (OCHA). (2021). Malawi Humanitarian Response Plan 2021. Retrieved from https://reliefweb.int/report/malawi/malawi-humanitarian-response-plan-2021-january-december-2021

Otto, F.E., Zachariah, M., Wolski, P., Pinto, I., Nhamtumbo, B., Bonnet, R., Vautard, R., Philip, S., Kew, S., Luu, L.N. and Heinrich, D., 2022. Climate change increased rainfall associated with tropical cyclones hitting highly vulnerable communities in Madagascar, Mozambique & Malawi. Mozambique & Malawi, p.41.

Pretoria. South Africa. Vuna. Online: http://vuna-africa.com/." smart agriculture training manual for frontline agricultural extension staff. Vuna Training Manual.

Pullanikkatil, D., Mubako, S. and Muntshali, M.J. (2014) 'Advancing Green Economy through Technology TransferExperiences from Mala', Southern African Journal of Environmental Education, 30(2014), pp. 66–78. Available at: https://www.researchgate.net/publication/282333728_Advancing_Green_Economy_through_Technology_Transfer_Experiences_from_Malawi

Taulo, J. L., Gondwe, K. J., & Sebitosi, A. B. (2015). Energy supply in Malawi: Options and issues. Journal of Energy in Southern Africa, 26, 19-32. http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S1021-447X2015000200003&lng=en&nrm=iso>. ISSN 2413-3051.

United Nations High Commissioner for Refugees (UNHCR). (2020). Malawi Country Refugee Response Plan. Retrieved from:

Ziba, F. (2019). Disaster Risk Reduction and Response in Malawi. In Disaster Risk Reduction in Africa (pp. 99-116). Springer.

Mauritius

Anthony, M., Impavido, G., and Selm, B. (2020). "Barbados's 2018-19 Sovereign Debt Restructuring— A Sea Change?". International Monetary Fund. IMF Working Paper 20/34.

Climate Funds Update, 2022, “The Principles and Criteria of Public Climate Finance—A Normative Framework”.

ASCLME (2011). Policy and Governance Assessment for Marine and Coastal Resources for the Republic of Mauritius. National Report. 81 p.

ASCLME (2012a). National Marine Ecosystem Diagnostic Analysis. Mauritius. Contribution to the Agulhas and Somali Current Large Marine Ecosystems Project (supported by UNDP with GEF grant financing).

ASCLME Island States (2012b). Cost and Benefit Analysis Preliminary Report. Rakotobe Andriamanganiaina T. 26 p.

Baider, C., Florens, F. B. V., Baret, S., Beaver, K., Matatiken, D., Strasberg, D. and Kueffer, C. (2010). Status of plant conservation in oceanic islands of the Western Indian Ocean. Proceedings of the 4th Global Botanic Gardens Congress. 7 p.

Castro-de-la-Mata G. (2012). Partnersgip for marine protected areas in Mauritius and Rodrigues. Terminal evaluation. UNDP. 65 p.

Climate Change and Disaster Risk Management. The Journal of the Institution of Engineers Mauritius.

Cole, N., Goder, M., Vencatasamy, D., Mootoocurpen, R., Havery, S., Gamble, F., & Nundlaul, V. (2013) Restoration of Island Ecosystems in Mauritius: The Mauritius Reptile Recovery Programme Annual Report 2013. Durrell Wildlife Conservation Trust, Jersey, Channel Islands.

Environmentally Sensitive Areas Study (2009). Technical Report on Freshwater Wetland, Prepared for the Ministry of Environment and NDU, Government of Mauritius, Prepared by NWFS Consultancy and STEM Consulting Ltd.

Florens V. (2013). Conservation in Mauritius and Rodrigues: Challenges and Achievements from Two Ecologically Devastated Oceanic Islands. *Conservation Biology: Voices from the Tropics*, First Edition. Navjot S. Sodhi, Luke Gibson, and Peter H. Raven. © 2013 John Wiley & Sons, Ltd. Published 2013 by John Wiley & Sons, Ltd.

Florens V., Mauremootoo J. R., Fowler S. V., Winder L. & Baider C. (2010). Recovery of indigenous butterfly community following control of invasive alien plants in a tropical island’s wet forests. Biodivers Conserv (2010) 19:3835–3848.

GEF-UNDP-IMO GloBallast Partnerships Programme and WMU, (2013) Identifying and Managing Risks from Organisms Carried in Ships’ Ballast Water. GloBallast Monograph No. 21.
IOC, 2012. Management of the octopus fishery in Rodrigues. SMART Fiche 12. 4 p.

Ho, Sui-Jim, Fontana, S. (2021). “Sovereign Debt Evolution: The Natural Disaster Clause”. Emerging Markets Restructuring Journal. Issue No. 11.

International Capital Market Association (ICMA) (2021). “Green Bond Principles: Voluntary Process Guidelines for Issuing Green Bonds”.

International Monetary Fund (IMF) (2021a). “Mauritius: Tax Policy for a Changing World”. Fiscal Affairs Department. Technical Assistance Report.

International Monetary Fund (IMF) (2021b). “Fiscal Policies to Address Climate Change in Asia and the Pacific.” IMF Departmental Paper, Washington, DC.

International Monetary Fund (IMF) (2021c). “Unlocking Access to Climate Finance for Pacific Island Countries.” IMF Departmental Paper, Washington, DC.

Laurance, Susan, Baider, Claudia, Florens, F. B. Vincent, Ramrekha, Shyamduth, Sevathian, Jean-Claude, and Hammond, David S. (2012). Drivers of wetland disturbance and biodiversity impacts on a tropical oceanic island. Biological Conservation, 149 (1). pp. 136-142. Lim Tung O. J. (2014). The Adequacy of the Mauritian Biosafety Framework. Journal of African Law, 58, pp. 109-128.

Marine Reserve Status Reports (2011). Improving management effectiveness for the Marine Protected Areas of Rodrigues (Indian Ocean). Compiled by Desiré S., Hardman E., Klaus R. and Pasnin O., 52 p.

Maurice Ile Durable (2011). Environment – Preservation of biodiversity and natural resources. Final Report. Consultative workshops June-July 2012. Working group 2. 161 p. 79

Maurice Ile Durable Policy, Strategy and Action Plan. Ministry of Environment and Sustainable Development, Port Louis, Mauritius.

Mauritius Wildlife Foundation (2012). Annual report for 2011 and 2012. 46 p.

Maxted, N. and Kell, S.P., (2009). Establishment of a Global Network for the In Situ Conservation of Crop Wild Relatives: Status and Needs. FAO Commission on Genetic Resources for Food and Agriculture, Rome, Italy. 266 pp.

McClanahan TR, Maina J, Moothien Pillay R, Baker AC (2005), Effects of geography, taxa, water flow, and temperature variation on coral bleaching intensity in Mauritius. Marine Ecology Progress Series 298: 131–142

Ministry of Finance and Economic Development and Ministry of Environment and National Development Unit (2005). National Capacity Needs Self Assessment for Global Environmental Management - Republic of Mauritius. 149 p.

Ministry of Environment & Sustainable Development (2010). Technical Report on Freshwater Wetlands.

Moothien Pillay R, Terashima H, Kawasaki H (2002), The extent and intensity of the 1998 mass bleaching event on the reefs of Mauritius, Indian Ocean.Galaxea 4: 43–52

Moothien Pillay R., Bacha Gian S., Bhoyroo V. and Curpen S. (2012), Adapting Coral Culture to Climate Change: The Mauritian Experience. Western Indian Ocean J. Mar. Sci. Vol. 10, No. 2, pp. 155-167, 2012.

O'Leary M. J., Perry C. T., Beavington-Penney S. J., Turner J. R. (2009). The significant role of sediment bio-retexturing within a contemporary carbonate platform system: Implications for carbonate microfacies development. Sedimentary Geology. Volume 219, Issues 1–4, 15 July 2009, pp. 169–179.

Oliver, P. G. and Holmes, A. M. (2004). Cryptic Bivalves with descriptions of new species from the Rodrigues lagoon. *Journal of Natural History.* 38: 3175-3227.

PARETO (2012). Simian G. Nicet J.B., Jamon A., Cadinouche A., Barrere, A., Zubia M., Quod JP. Habitat mapping and biodiversity inventory of Blue Bay Marine Park. Consultancy services for UNDP / the Ministry of Fisheries and Rodrigues (AFRC). April 2012, 74 pages + appendices.

Perry C.T. & Berkeley, A. (2009) Intertidal substrate modification as a result of mangrove planting: impacts of introduced mangrove species on sediment microfacies characteristics. Estuarine, Coastal and Shelf Science 81: 225-237.

Pillay Moothien R, Terashima H., Venkatasami A. & Uchida H. (2002). Field Guide to Corals of Mauritius. Albion, Petite Riviere, Mauritius: Albion Fisheries Research Centre, Ministry of Fisheries.

Ramessur RT (2013) A Review of Coastal Zone Management Facing Climate Change and Natural Disasters in Mauritius. J Geogr Nat Disast S1: 003 doi: 10.4172/2167-0587.S1-003

Republic of Mauritius (1968). The Constitution of Mauritius. 81 p.

Republic of Mauritius (2007). National Environment Policy. Ministry of Environment and Sustainable Development.

Republic of Mauritius (2009). The National Invasive Alien Species Strategy for the Republic of Mauritius 2008-2017. 55 p.

Republic of Mauritius (2010). Fourth National Report on the Convention on Biological Diversity. Ministry of Environment and Sustainable Development. 78 p.

Republic of Mauritius (2011a). Mauritius Environment Outlook Report 2011. Ministry of Environment and Sustainable Development. 258 p.

Republic of Mauritius (2011b). Policy and Governance Assessment for Marine and Coastal Resources for the Republic of Mauritius. National Report. Mauritius Oceanography Institution. 81p.

Republic of Mauritius (2012). DRR Strategic Framework and Action Plan – Final Report. Ministry of Environment and Sustainable Development. 324 p. 80

Republic of Mauritius (2013a). Maurice Ile Durable Policy, Strategy and Action Plan. Ministry of Environment and Sustainable Development. 147 p.

Republic of Mauritius (2013b). Millennium Development Goals Status Report 2013. Government of Mauritius. 92 p.

Republic of Mauritius (2013c). National Climate Change Adaptation Policy Framework Report (NCCAPF). Ministry of Environment and Sustainable Development. 135 p.

Sookun A. & Weber J. L. (2013). Experimental Ecosystems / National Capital Accounts for Mauritius 2000-2010. Second Expert Group Meeting on Biodiversity for Poverty Eradication and Development. Convention on Biological Diversity, 4 – 6 December 2013 Chennai, India.

Statistics Mauritius (2012). Digest of Agricultural Statistics 2011. Ministry of Finance & Economic Development. 144 p.

Statistics Mauritius (2014). Digest of Agricultural Statistics 2013. Ministry of Finance & Economic Development. 145 p.

Statistics Mauritius (2014). Digest of statistics on Rodrigues 2013. Ministry of Finance & Economic Development. 145 p.

Steward, P. (2010). 2010 Rodrigues Warbler Acrocephalus rodericanus census: Onwards and Upwards. University of East Anglia.

Sookun A. and Weber J.L. (2013). Experimental ecosystems natural capital accounts. Mauritius case study. Methodology and preliminary results 2000-2010. Second Expert Group Meeting on Biodiversity for Poverty Eradication and Development, Convention on Biological Diversity, 4 – 6 December 2013, Chennai, India.

Sultan R. (2012). An economic valuation of the marine and coastal ecosystem in Mauritius. Western Indian Ocean Marine Highway Development and Coastal Contamination Prevention Project, Indian Ocean Commission and Ministry of Environment and Sustainable Development, Mauritius.

United Nations Environment Programme (2021). Adaptation Gap Report 2021: The gathering storm – Adapting to climate change in a post-pandemic world. Nairobi.
World Bank, Press Release: “Fiji Issues First Developing Country Green Bond, Raising $50 Million for Climate Resilience”.

Mozambique

Arndt, C., Strzepeck, K., Tarp, F., Thurlow, J., Fant, C. & Wright, L. 2011. Adapting to climate change: an integrated biophysical and economic assessment for Mozambique. Sustainability Science, 6, 7-20.

Asante, K., Brito, R., Brundrit, G., Epstein, P., Nussbaumer, P. & Patt, A. 2009. Study on the Impact of Climate Change on Disaster Risk in Mozambique.

Bambaige, A. 2007. National Adaptation Strategies to Climate Change Impacts. A Case Study of Mozambique. Human development report, 7.

Cabral, P., Augusto, G., Akande, A., Costa, A., Amade, N., Niquisse, S., Atumane, A., Cuna, A., Kazemi, K. & Mlucasse, R. 2017. Assessing Mozambique's exposure to coastal climate hazards and erosion. International journal of disaster risk reduction, 23, 45-52.

Cianciullo, S., Attorre, F., Trezza, F. R., Rezende, M., Ntumi, C., Campira, J., Munjovo, E. T., Timane, R. D., Riccardi, T. & Malatesta, L. 2023. Analysis of land cover dynamics in Mozambique (2001–2016). Rendiconti Lincei. Scienze Fisiche e Naturali, 1-12.

Eckstein, D. 2021. Global Climate Risk Index 2021 [Online]. Available: https://www.germanwatch.org/en/19777 [Accessed 19/04/2023 2023].

Fischel De Andrade, J. H. & De Lima Madureira, A. 2022. Protection in Natural Disasters: The Response to Cyclone Idai in Mozambique. Journal of Refugee Studies, 35, 686-703.

Gohl, S. E. 2008. Local Governance and Disaster Risk Management in Mozambique. University of the Western Cape.

Government of Mozambique 2021. Update of the First Nationally Determined Contribution to the United Nations Framework Convention on Climate Change, MOZAMBIQUE. In: ENVIRONMENT, M. O. L. A. T. (ed.). National Directorate of Climate Change of the Ministry of Land and Environment of Mozambique: Government of Mozambique.

Hast, M., Mharakurwa, S., Shields, T. M., Lubinda, J., Searle, K., Gwanzura, L., Munyati, S. & Moss, W. J. 2022. Characterizing human movement patterns using GPS data loggers in an area of persistent malaria in Zimbabwe along the Mozambique border. BMC infectious diseases, 22, 1-16.

Koivisto, J. E. 2014. A stakeholder analysis of the disaster risk reduction policy subsystem in Mozambique. Risk, Hazards & Crisis in Public Policy, 5, 38-58.

Macamo, C. 2021. After Idai: Insights from Mozambique for Climate Resilient Coastal Infrastructure. Policy Insights: African perspectives-Global insights, 110, 1-22.

Malatesta, L., Alves, T., Attorre, F., Brito, D., Cianciullo, S., Datizua, C., De Abreu, D., De Felici, S., De Sousa, C. & Langa, C. 2023. BioNoMo: the Biodiversity Network of Mozambique. Rendiconti Lincei. Scienze Fisiche e Naturali, 34, 69-80.

Michal Nachmany, S. F., Jana Davidová, Nick Kingsmill, Tucker Landesman, Hitomi Roppongi, Philip Schleifer, Joana Setzer, Amelia Sharman, C. Stolle Singleton, Jayaraj Sundaresan and Terry Townshend 2015. CLIMATE CHANGE LEGISLATION IN MOZAMBIQUE. Mozambique Government.

Mukwakwa, P. C. 2020. Mozambique: conflict insight.

Ndimurwimo, L. & Jahnig, M. 2022. The Impact of Climate Change on Statelessness in the Southern African Region. African Human Mobility Review, 8, 94-128.

Ngarega, B. K., Masocha, V. F. & Schneider, H. 2021. Forecasting the effects of bioclimatic characteristics and climate change on the potential distribution of Colophospermum mopane in southern Africa using Maximum Entropy (Maxent). Ecological Informatics, 65, 101419.

Organization, W. H. 2023. Promoting the health of refugees and migrants.

Palmujoki, E. & Virtanen, P. 2016. Global, national, or market? emerging REDD+ governance practices in Mozambique and Tanzania. Global Environmental Politics, 16, 59-78.

Sambo, M. F. 2022. The Politics and Political Economy of Violent Conflicts in Post-war Mozambique. Globalisation and Local Conflicts in Africa and Asia. Springer.

The World Bank. 2023. Population, total - mozambique [Online]. The World Bank. Available: https://data.worldbank.org/indicator/SP.POP.TOTL?locations=MZ [Accessed 18/04/2023 2023].

Thierfelder, C., Rusinamhodzi, L., Setimela, P., Walker, F. & Eash, N. S. 2016. Conservation agriculture and drought-tolerant germplasm: Reaping the benefits of climate-smart agriculture technologies in central Mozambique. Renewable Agriculture and Food Systems, 31, 414-428.

Uamusse, M. M., Tussupova, K. & Persson, K. M. 2020. Climate change effects on hydropower in Mozambique. Applied Sciences, 10, 4842.

Uncdf. 2023. Mozambique Expands Locally-Led Climate Resilience, with support from the European Union [Online]. Available: https://www.uncdf.org/article/8187/mozambique-expands-locally-led-climate-resilience-with-support-from-the-european-union#:~:text=The%20Government%20of%20Mozambique%20and,for%20Capital%20Development%20(UNCDF). [Accessed 21 April 2023].

Virtanen, P. & Palmujoki, E. 2020. Practices of development assistance and climate change mitigation in reshaping the Mozambican REDD+ strategy. The Journal of Modern African Studies, 58, 649-670.

Namibia

AMESHO, K. T., EDOUN, E. I., KADHILA, T. & NANGOMBE, L. R. 2022. An empirical analysis of the co-benefits of integrating climate change adaptation and mitigation in the Namibian energy sector. Journal of Energy in Southern Africa, 33, 86-102.

BLACKIE, R. & TARR, P. 2000. Government policies on sustainable development in Namibia. Population–Development–Environment in Namibia, 135.

CASSIDY, L. 2017. Review/Update of the National Biodiversity Strategy and Action Plan (NBSAP). Botswana documents.

CZAIKA, M. & REINPRECHT, C. 2022. Why do people stay put in environmentally stressful regions? Cognitive bias and heuristics in migration decision-making. Regional Environmental Change, 22, 84.

EGGE, K. 2014. The United Nations and Namibia since 1990. Namibia's Foreign Relations, 293-314.

IILONGA, S. 2015. Information and Knowledge Policy Framework to Enhance the Effectiveness of Namibia's Fourth National Development Plan (NDP4).

INTERNATIONAL ORGANIZATION FOR MIGRATION (IOM) 2023. Migration Governance Indicators Profile 2022-Republic of Namibia. International Organization for Migration.

JONES, P. G. & THORNTON, P. K. 2009. Croppers to livestock keepers: livelihood transitions to 2050 in Africa due to climate change. Environmental Science & Policy, 12, 427-437.

KALIMBO, M. 2019. A linguistic analysis of discursive strategies in the Harambee Prosperity Plan (HPP) policy document. University of Namibia.

KANYAMUNA, V. 2019. Analysis of Zambia's Whole-of-Government Monitoring and Evaluation System in the context of National Development Plans. Unpublished PhD thesis. Pretoria: University of Pretoria.

KHAN, M., MFITUMUKIZA, D. & HUQ, S. 2020. Capacity building for implementation of nationally determined contributions under the Paris Agreement. Climate Policy, 20, 499-510.

KHOZA, S., VAN NIEKERK, D. & NEMAKONDE, L. D. 2022. A Decade of Inaction in the SADC region?-disaster risk data gaps and inconsistencies on the Sendai Framework Monitor. Progress in Disaster Science, 16, 100250.

LOUIS, N., CALVIN, M. J., VINCENT, M. & KOKETSO, M. F. 2020. Analysis of Gender Responsiveness of Climate Change Response Strategies in the Southern African Development Community (SADC) Region. J. Soc. Sci. Humanit, 16, 1-12.

NANYENI, F. 2016. President Hage geingob's rhetoric on "Harambee Prosperity Plan" and the shaping of Namibia's future. African Yearbook of Rhetoric, 7, 45-55.

ORGANIZATION, W. H. 2023. Promoting the health of refugees and migrants.

PREVENTION WEB. 2011. Namibia: National disaster risk management plan [Online]. Available: https://www.preventionweb.net/publication/namibia-national-disaster-risk-management-plan [Accessed 30 April 2023 2023].

REID, H. 2007. The economic impact of climate change in Namibia: how climate change will affect the contribution of Namibia's natural resources to its economy, IIED.

REID, H., SAHLÉN, L., STAGE, J. & MACGREGOR, J. 2008. Climate change impacts on Namibia's natural resources and economy. Climate Policy, 8, 452-466.

REPUBLIC OF NAMIBIA 2004. Vision 2030. Windhoek, Namibia: National Planning Commission.

REPUBLIC OF NAMIBIA 2011. National Policy on Climate Change for Namibia 2011. In: TOURISM, M. O. E. A. (ed.). Windhoek, Namibia: GOVERNMENT OF THE REPUBLIC OF NAMIBIA.

REPUBLIC OF NAMIBIA 2021. First Adaptation Communication. In: FORESTRY, D. O. E. A. A. (ed.). Windhoek, Namibia Government of Namibia.

ROMOLA, A. 2012. State responsibility to prevent development-induced displacements–implementing article 10 of the Kampala Convention. University of Pretoria.

SIYAMBANGO, N., TOGAREPI, C., MUDAMBURI, B., MUPAMBWA, H. & AWALA, S. 2022. Climate-Smart Agriculture: Perspectives for Subsistence Crop Farming in Namibia. Food Security for African Smallholder Farmers. Springer.

SOLOMON, A. 2010. African Union Convention for the Protection and Assistance of Internally Displaced Persons in Africa. International Legal Materials, 49, 83-100.

THERON, A. K. & ROSSOUW, M. 2008. Analysis of potential coastal zone climate change impacts and possible response options in the southern African region.

THOBIAS, T. T. 2007. Impact evaluation of poverty alleviation programmes for the San community in Omaheke and Ohangwena region.

THORN, J. P., NANGOLO, P., BIANCARDI, R. A., SHACKLETON, S., MARCHANT, R. A., AJALA, O., DELGADO, G., MFUNE, J. K., CINDERBY, S. & HEJNOWICZ, A. P. 2023. Exploring the benefits and dis-benefits of climate migration as an adaptive strategy along the rural-peri-urban continuum in Namibia. Regional Environmental Change, 23, 10.

VAN SCHALKWYK, D. L., MCMILLIN, K. W., WITTHUHN, R. C. & HOFFMAN, L. C. 2010. The contribution of wildlife to sustainable natural resource utilization in Namibia: a review. Sustainability, 2, 3479-3499.

VENDITTO, B., KAMWANYAH, N. J. & NEKARE, C. H. 2022. Climate change, migration and urbanisation in contemporary Namibia.

WAKO, Y. M. 2022. Analysis of Livelihood Activities Among Pastoral Households in Urban and Peri-urban Areas of Isiolo Town, Northern Kenya. University of Nairobi.

WILHELM, M. 2013. Impact of climate change in Namibia: A case study of Omusati region.

WORLD BANK. 2023. The World Bank Group. Available: https://data.worldbank.org/indicator/SP.POP.TOTL?locations=NA [Accessed 29 April 2023.

"Country Profiles - Convention on Biological Diversity." https://www.cbd.int/countries/.

"NAMIBIA - World Bank." https://climateknowledgeportal.worldbank.org/sites/default/files/2021-08/15931-WB_Namibia%20Country%20Profile-WEB.pdf.

NAMIBIA - World Bank

https://ui.adsabs.harvard.edu/abs/2015EGUGA..1712110K/abstract

"SustainableForest Management -Thinknamibia." https://www.thinknamibia.org.na/projects/sustainable-forest-management.

Seychelles

Agricole, W., 2009 Second National Communications – Draft National Circumstances Report.

NCCC, Seychelles.

Allison EH, Perry AL, Badjeck MC, Adger WN, Brown K, Conway D, Halls AS, Pilling GM, Reynolds JD, Andrew NL, Dulvy NK., 2009 Vulnerability of national economies to the impacts of climate change. Fish and Fisheries.

Bindoff, N.L., J. Willebrand, V. Artale, A, Cazenave, J. Gregory, S. Gulev, K. Hanawa, C. Le Quéré, S. Levitus, Y. Nojiri, C.K. Shum, L.D. Talley and A. Unnikrishnan., 2007 Observations: Oceanic Climate Change and Sea Level. In: Climate Change 2007 The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Carolus, I. & Martin, M., 2009 Climate Change Education, Awareness and Training. Enabling activities for the preparation of the Seychelles second national communication to the United Nations Framework Convention on Climate Change. February 2009. National Climate Change Committee. Seychelles.

Cesar H, van Beukering, P., Payet R.A., Grandcourt, E., 2004 Evaluation of the socioeconomic impacts of marine ecosystem degradation in the Seychelles. Cesar Environmental Economics Consulting, Netherlands. 96 p.

Chang-Seng, D. & Guillande, R., 2008 Disaster risk profile of the Republic of Seychelles.

Chang-Seng, D., 2007 Climate Change Scenario Assessment for the Seychelles, Second National Communication (SNC) under the United Nations Framework Convention on Climate Change (UNFCCC), National Climate Change Committee, Seychelles.

Chang-Seng, D., 2007 Climate Variability and Climate Change Assessment for the Seychelles. Second National Communication (SNC) under the United Nations Framework Convention on Climate Change (UNFCCC), National Climate Change Committee, Seychelles.

Chretien J-P, Anyamba A, Bedno SA, Breiman RF, Sang R, Sergon K, Powers AM, Clayton CO, Small J, Tucker CJ, Linthicum KJ., 2007 Drought-associated Chikungunya emergence along coastal east Africa. Am J Trop Med Hyg 76: 405–407.

Church, J.A.,N.White and J.Hunter., 2006 Sea level rise at tropical Pacific and Indian Ocean islands. Global Planetary Change, 53, 155-168.

Coopoosamy T. & Jean-Louis, A., 2008 Enabling activities for the preparation of the Seychelles second national communication to the United Nations Framework Convention on Climate Change: national greenhouse gas inventories for the year 2000.
National Climate Change Committee. Seychelles.

Crowley, T. J. 2000 Causes of Climate Change Over the Past 1000 Years. Science 289(5477):

270-277.

Decomarmond, A., Payet, L. Sophola, F., Port-Louis, N., Zialor, V., Prosper, J. & Coeur-DeLion, F. 2008 Coastal Sector: Coastal Flooding and Erosion. Enabling activities for the preparation of the Seychelles second national communication to the United Nations Framework Convention on Climate Change. August 2008. National Climate Change Committee. Seychelles.

DRDM, 2008 Disaster Management Policy for Seychelles. Final draft. Department of Risk and Disaster Management, Seychelles.

DREF 2006 Seychelles: Chikungunya Epidemic, DREF Bulletin Report

Ebi, K.L., Lewis N.D., Corvalán, C.F. 2005 Climate variability and change and their health effects in small island states. World Health Organization, Geneva. Accessible at: http://www.who.int/entity/globalchange/publications/climvariab.pdf

FAO 2008 Pre-Feasibility Study - Seychelles National Agriculture and Fisheries Disaster Insurance Scheme (SNDIS). TCP/SEY/3202 Natural Disaster Insurance Scheme for Farmers and Fishermen.

Government of Seychelles, 1998 Forest fire damage in the Seychelles in 1998–1999. Unpublished report, Government of the Seychelles, Seychelles.

Government of Seychelles, 2005 Preliminary Study of the Drainage Problems in North Mahe - Drainage Task Force Committee. December 2005. Seychelles.

Government of Seychelles, 2000 Seychelles – Initial national communication Under the United Nations Framework Convention on Climate Change - Ministry of Environment and Transport - Republic of Seychelles.

Government of Seychelles, 2002 Report to the UNFCCC regarding Seychelles' participation in Global Climate Observing Systems (GCOS) and on systematic observation in Seychelles. December 2002. Seychelles

Government of Seychelles, 2008 Report of the Task Force on Energy Security. Prepared for the Ministry of National Development. December 2008. Seychelles.

Government of Seychelles, 2022 Seychelles' Third National Communication to the UNFCCC: Chapter 3— Climate Change Vulnerability and Adaptation; Ministry of Agriculture, Climate Change and Environment: Victoria, Republic of Seychelles

Government of Seychelles, 2020 *Seychelles' National Climate Change Policy*; Ministry of Environment, Energy and Climate, Seychelles: Victoria, Republic of Seychelles.

Government of Seychelles, 2015 *Intended Nationally Determined Contributions under the United Nations Framework Convention on Climate Change*; Ministry of Environment, Energy and Climate Change: Victoria, Republic of Seychelles.

Government of Seychelles, 2021 *Seychelles' Updated Nationally Determined Contribution*; Ministry of Agriculture, Climate Change and Environment: Victoria, Republic of Seychelles.

Graham NAJ, Wilson SK, Jennings S, Polunin NVC, Bijoux JP, Robinson, J (2006) Dynamic fragility of oceanic coral reef ecosystems. Proceedings of the National Academy of Sciences 103 (22): 8425-8429.

Henriette-Payet E. & Julienne, S. 2009 Impact of Climate Change on the Health Sector. Enabling activities for the preparation of the Seychelles second national communication to the United Nations Framework Convention on Climate Change. National Climate Change Committee. Seychelles.

HPA 2006. Chikungunya virus in the Indian Ocean. Commun. Dis. Rep. CDR Wkly 2006 [accessed 2 May 2006]. Available at: http://www.hpa.org.uk/cdr/archives/2006/cdr0606.pdf.

IMF, 2008 Staff Report for the 2008 Article IV Consultation and Request for a Stand-By Arrangement. IMF African Department. International Monetary Fund (IMF). Washington, USA. October 31 2008.

INC, 2000 Seychelles First National Communication to the United Nations Framework on Climate Change (UNFCCC). Government of Seychelles, Seychelles.

Intergovernmental Panel on Climate Change (IPCC). 2007. Working Group I, II and III Contribution to the Intergovernmental Panel on Climate Change Fourth Assessment Report. IPCC, Geneva, Switzerland.

Lajoie, F. R., 2004 Report on the WMO/CLIVAR ETCCDMI African Workshop on Extremes.

Seychelles.

Marguerite., T. M., 2001 Solar activity long term influence on Seychelles rainfall, Meteorological Services, Seychelles.

McClanahan TR, Cinner JE, Maina J, Graham NAJ, Daw TM, Stead SM, Wamukota A, Brown K, Ateweberhan M, Venus V, Polunin NVC (2008) Conservation action in a changing climate.
Conservation Letters (2008): 1- 7.

Ménard F, Marsac F, Bellier E, Cazelles B (2007) Climatic oscillations and tuna catch rates in the Indian Ocean: a wavelet approach to time series analysis. Fish Oceanogr 16(1): 95-104.

Metselaar D, Grainger CR, Oei KG, Reynolds DG, Pudney M, Leake CJ, Tukei PM, d'Offay RM, Simpson DIH. 1980 An outbreak of type 2 dengue fever in the Seychelles, probably transmitted by Aedes albopictus (Skuse). Bull. WHO 1980, 58: 937-943.

Mimura, N., L. Nurse, R.F. McLean, J. Agard, L. Briguglio, P. Lefale, R. Payet and G. Sem, 2007 Small islands. Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 687-716.

NCSA, 2005 National Capacity Self Assessment Report (NCSA): Capacity Assessment report.

UNDP/GEF Funded Project. April 2005, Seychelles.

NSB, 2007 Seychelles in Figures, 2007 Edition. National Statistics Bureau, Victoria, Seychelles. 37pp.

NSB, 2008 Statistical Abstract 2007. National Statistics Bureau. Government of Seychelles, Seychelles.

Payet R. 2008 Policy Brief on SIDS and Implementation of the Mauritius Strategy. 4th Global Conference on Oceans, Coasts and Oceans. Global Forum on Oceans, Coasts and Islands. University of Delaware, Delaware, USA.

http://www.globaloceans.org/globalconferences/2008/

Payet R.A. 2005 Climate policy implications of the recent ENSO events in a small island context. In: 'Climate and Africa; Edited by Pak Sum Low' Cambridge University Press. UK. p.
229-237.

Payet R.A. 2007 Climate change and the Tourism Dependent Economy of the Seychelles. In: Climate Change and Vulnerability; Edited by Neil Leary, Cecilia Conde, Jyoti Kulkarni, Anthony Nyong and Juan Pulhin Earthscan, (01 Nov 07), London, UK.

Payet, R.A. & Agricole W. 2006 Climate Change in the Seychelles – Implications for Water and Coral Reefs. AMBIO, 35 (4): 182-189.

Payet, R.A. 2004 Coral Reefs in Small island States: Status, Monitoring Capacity and Management Priorities. Int. J. of Island Affairs, Special Issue: Island Biodiversity-sustaining life in vulnerable ecosystems (February 2004). pp. 57-65.

Pinn G. Leptospirosis in the Seychelles. Aust Med J 1992; 156: 163-7.

PUC, 2004 Review of Water Supply Development Plan 2005 -2025. Government of

Seychelles, Seychelles.

Qautre, R. 2007 Anse Kerlan, A Case Study Report on Coastal Erosion. AIACC-GEF Project.

Unpublished Report. Seychelles.

Ragoonaden, S., 2006: Sea Level Activities and Changes on the Island of the Western Indian Ocean, Western Indian Ocean (WIOMSA),Mar. Sci. Vol.5, No.2, pp179-194.

Renwick, F. Rahimzadeh,M.M. Rusticucci, B.J. Soden and P.-M. Zhai, 2007: Observations: surface and atmospheric climate change. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change,

Robinson, J., Dorizo, J., Gerry, Guillotresau, P., Marsac, F., Jiménez-Toribio, R., Lantz, F. & Nadzon, L. 2008 Fisheries & Marine Environment Sector (Socio-economic Impacts of Climate Variability on Seychelles Tuna Industry). Enabling activities for the preparation of the Seychelles second national communication to the United Nations Framework Convention on Climate Change. November 2008. National Climate Change Committee.
Seychelles.

Robinson, J., Gerry, C. & Bijoux, J. 2009 Fisheries & Marine Environment Sector (Establishment of the Seychelles Ocean Temperature monitoring Network-SOTN). Enabling activities for the preparation of the Seychelles second national communication to the United Nations Framework Convention on Climate Change. February 2009. National Climate Change Committee. Seychelles.

Robinson J, Guillotreau P, Jiménez-Toribio R, Lantz F, Nadzon L, Dorizo J, Gerry C, Marsac F (2009) Impacts of climate variability on the tuna economy of Seychelles. Second National Communication (SNC) under the United Nations Framework Convention on Climate Change (UNFCCC). National Climate Change Committee, Seychelles.

Rolph Payet and Wills Agricole., 2006 "Climate Change in the Seychelles: Implications for Water and Coral Reefs," AMBIO: A Journal of the Human Environment 35(4), 182-189

Sheppard C., Dixon D, Gourlay, M., Sheppard, A., Payet R.A. 2005 Coral mortality increases wave energy reaching shores protected by reef flats: Examples from the Seychelles, Journal of Estuarine, Coastal and Shelf Science 64: 223-234.

Stenseth NC, Ottersen G, Hurrell JW, Belgrano A (2005) Marine Ecosystems and Climate Variation. Oxford University Press, Oxford, p. 252.

Stoddart, D. R., and Walsh, R.P.D., 1999 Long Term Climate Change in the Western Indian Ocean. Phil. Trans.R.Soc.Lond. B.286:11-23.

S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B.Averyt,M. Tignor and H.L.Miller, Eds., Cambridge University Press, Cambridge, 235-336.

The World Factbook. 2008 Washington, D.C.: Central Intelligence Agency, 2008. Retrieved on 29 November 2009 at https://www.cia.gov/library/publications/the-worldfactbook/fields/2060.html

Trenberth, K.E., P.D. Jones, P.G. Ambenje, R. Bojariu, D.R. Easterling, A.M.G. Klein Tank, D.E. Parker, J.A. Watson, R., H. Rodhe, et al., 1990 Greenhouse gases and aerosols. Climate change: the IPCC scientific assessment 1:40.

United Nations Climate Change, 2019 - https://unfccc.int/climate-action/momentum-for-change/lighthouseactivities/spurring-climate-change-adaptation-in-schools-through-rainwater-harvesting

Ximena, F.P, 1998 Contribution to the estimation of countries' inter-dependence in the area of plant genetic resources. Commission on Genetic Resources for Food and Agriculture, Background Study Paper No. 7, Rev. 1, FAO, Rome, 31 pp.

Yersin C. 1995 Human Leptospirosis in 1993 in Seychelles. Sey. Med. Dent. J. 1995; 3: 2-4.

Yersin C., Bovet P., Merien F., Wong T., Panowsky J., and P Perolat 1998 Human leptospirosis in the Seychelles (Indian Ocean): a population-based study. Am. J. Trop. Med.
Hyg., 59(6), pp. 933-940.

South Africa

"Chapter 9 Oceans and coasts - DFFE." https://www.dffe.gov.za/sites/default/files/reports/environmentoutlook_chapter9.pdf.

"Climate Smart Technologies." http://www.climatesmarttech.com/.

"Climate-Smart Agriculture - World Bank Group." 05 Apr. 2021, https://www.worldbank.org/en/topic/climate-smart-agriculture.

"Conventions | SADC - Southern African Development Community." https://www.sadc.int/pillars/conventions.

"Fisheries | South African Government." https://www.gov.za/about-SA/fisheries.

"Forestry | South African Government." https://www.gov.za/about-sa/forestry.

"Green Economy: Introduction | Department of Environmental Affairs - DFFE." https://www.dffe.gov.za/projectsprogrammes/greeneconomy/introduction.

"Overview of the South African Water Sector - DWS." https://www.dws.gov.za/IO/Docs/CMA/CMA%20GB%20Training%20Manuals/gbtrainingmanualchapter1.pdf.

"Presidential climate commission." https://www.climatecommission.org.za/.

"South Africa - Keep It Cool: climate change education | VVOB." https://www.vvob.org/en/programmes/south-africa-keep-it-cool-climate-change-education.

"South Africa - Main Details - Convention on Biological Diversity." 31 Jan. 1996, https://www.cbd.int/countries/profile/?country=za.

"South Africa - Vulnerability | Climate Change Knowledge Portal." https://climateknowledgeportal.worldbank.org/country/south-africa/vulnerability.

"SOUTH AFRICA - World Bank." https://climateknowledgeportal.worldbank.org/sites/default/files/country-profiles/15932-WB_South%20Africa%20Country%20Profile-WEB.pdf.

"South Africa Ocean Economy | Nairobi Convention Secretariat." https://www.nairobiconvention.org/south-africa-country-profile/south-africa-ocean-economy-2/.

"South Africa: Floods and landslides | IFRC." 23 Apr. 2022, https://www.ifrc.org/emergency/south-africa-floods-and-landslides.

"Southern African transboundary sustainable biodiversity and water ...." https://sdgs.un.org/partnerships/southern-african-transboundary-sustainable-biodiversity-and-water-resources-management.

Bryan, E., Q. Bernier, M. Espinal, and C. Ringler. 2016. Integrating Gender into Climate Change Adaptation Programs: A Research and Capacity Needs Assessment for Sub-Saharan Africa. CCAFS Working Paper no. 163. CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Copenhagen, Denmark. Available online at: www.ccafs.cgiar.org

Department of Forestry, Fisheries and Environment, "South Africa's Ocean Economy"(2015)

Department of Forestry, Fisheries and the Environment, "Climate Smart Agriculture Practices". 2020.

European Commission, Joint Research Centre, Ameztoy, I., McCormick, N., Carmona-Moreno, C.et al. (2018) 2018, drought and water crisis in Southern Africa – . Publications Office. https://data.europa.eu/doi/10.2760/81873

Garcia-Franco, N., Hobley, E., Hübner, R. & Wiesmeier, M. 2018. Climate-Smart Soil Management in Semiarid Regions. Soil Management and Climate Change. 349–368. DOI: https://doi.org/10.1016/B978-0-12-812128-3.00023-9

Linda M. Rosengren, Christopher M. Raymond, Mila Sell, Hilkka Vihinen. (2020) Identifying leverage points for strengthening adaptive capacity to climate change. Ecosystems and People 16:1, pages 427-444.

Maka, L., Ngotho, T., Walker, S., Ngcamphalala, S., & Maboa, L.. (2021). An assessment of climate-smart agriculture (CSA) practices skills amongst extension practitioners in South Africa. South African Journal of Agricultural Extension , 49(2), 70-83. https://dx.doi.org/10.17159/2413-3221/2021/v49n2a12802

Makindi, S.M., Mokua, M.A. and Bob, U., 2019. Integrating Gender and Conservation of Biodiversity as a Climate Change Adaptation Strategy.

Mawonde, A. and Togo, M., 2019. Implementation of SDGs at the university of South Africa. International Journal of Sustainability in Higher Education.

Roy, A., 2019. Blue economy in the Indian Ocean: Governance perspectives for sustainable development in the region. ORF Occasional Paper, 181.

Theron, A. K., De Lange, W., Nahman, A. and Hardwick, D. (2008). Sand Supply from Rivers within the eThekwini Jurisdiction, Implications for Coastal Sand Budgets and Resource Economics. CSIR Report CSIR/NRE/ECO/ER/2008/0096/C, Stellenbosch, South Africa.

Tanzania

"Climate-Smart Agriculture in Tanzania - World Bank." https://climateknowledgeportal.worldbank.org/sites/default/files/2019-06/CSA-in-Tanzania.pdf.

"East African Community." https://www.eac.int/.

"Global Climate Change | Climatelinks.org." https://www.climatelinks.org/.

"Tanzania: Mtwara Flood DREF Operation n° MDRTZ034 - ReliefWeb." 14 Apr. 2023, https://reliefweb.int/report/united-republic-tanzania/tanzania-mtwara-flood-dref-operation-ndeg-mdrtz034.

Ditlev-Simonsen, C.D. and Ditlev-Simonsen, C.D., 2022. Sustainability in Developing Countries: Case Sub-Saharan Africa. *A Guide to Sustainable Corporate Responsibility: From Theory to Action*, pp.215-234.

EcoAct - Tanzania. (n.d.). EcoAct - Tanzania. http://www.ecoact.co.tz/

en-1644923620-Mkakati wa Utekelezaji.pdf (vpo.go.tz)

https://cdn.who.int/media/docs/default-source/climate-change/tanzania-climate-change-health-wash.pdf?sfvrsn=bbac5ba4_3&download=true

https://international-partnerships.ec.europa.eu/news-and-events/stories/eco-villages-tanzania-fight-against-climate-change_en#:~:text=Eco%2DAct%20project%20(Ecovillage%20Adaptation,climate%20change%20and%20reducing%20poverty.

https://www.adaptation-undp.org/explore/eastern-africa/united-republic-tanzania

https://www.ecoact.co.tz/

https://www.eumetsat.int/features/fighting-wildfires-satellite-data-tanzania

https://www.nairobiconvention.org/tanzania-country-profile/tanzania-ocean-economy-2/

https://www.reuters.com/article/tanzaniahunger/survey-finds-most-tanzanians-go-hungry-despite-government-denialsidUSL5N1GJ5CP

https://www.worldbank.org/en/country/tanzania/publication/tanzania-economic-update-how-to-transform-tourism-into-a-more-sustainable

Karki, S., Burton, P. and Mackey, B., 2020. The experiences and perceptions of farmers about the impacts of climate change and variability on crop production: a review. *Climate and development*, *12*(1), pp.80-95.

Kilawe, C.J., Kaaya, O.E., Kolonel, C.P., Macrice, S.A., Mshama, C.P., Lyimo, P.J. and Emily, C.J., 2021. Wildfires in the Eastern Arc Mountains of Tanzania: Burned areas, underlying causes and management challenges. *African Journal of Ecology*, *59*(1), pp.204-215.

Kinyondo, A. and Magashi, J., 2017. Enhancing rural livelihoods in Tanzania: A small-holder farmers' perspective.

Komba C and Muchapondwa E 2018 Adaptation to climate change by smallholder farmers in Tanzania. Agricultural adaptation to climate change in Africa pp. 129-168, Routledge.

Kyara, V.C., Rahman, M.M. and Khanam, R., 2021. Tourism expansion and economic growth in Tanzania: A causality analysis. *Heliyon*, *7*(5), p.e06966.Kurgat, B.K., Lamanna, C., Kimaro, A., Namoi, N., Manda, L. and Rosenstock, T.S., 2020. Adoption of climate-smart agriculture technologies in Tanzania. *Frontiers in sustainable food systems*, *4*, p.55.

Leavens, M.K., Gugerty, M.K. and Anderson, C.L., 2019. Gender and agriculture in Tanzania. *Gates Open Res*, *3*(1348), p.1348.

Liwenga, E.T., Ndaki, P., Chengula, F. and Kalokola, R., 2019. Coastal communities' perceptions on climate change impacts and implications for adaptation strategies in Mtwara, Southern Tanzania. *Climate Change and Coastal Resources in Tanzania: Studies on Socio-Ecological Systems' Vulnerability, Resilience and Governance*, pp.155-168.

Makoye, K. (2015, April 2). Tanzania steps up efforts to manage surge in disasters. Reuters. https://www.reuters.com/article/us-tanzania-disasters/tanzania-steps-upefforts-to-manage-surge-in-disasters-idUSKBN0MT15420150402 Makoye, K. (2017, March 7). Survey finds most Tanzanians go hungry, despite government denials. Reuters.

Mapunda, R. and John, J.R., 2021. Effects of wildfire on vegetation and understory avian communities in montane rainforests, north-eastern Tanzania. *African Journal of Ecology*, *59*(2), pp.466-478.

Matoju, I., Le Masson, V., Montalescot, V., Ndawala, M.A. and Msuya, F.E., 2022. A resilience lens to explore seaweed farmers' responses to the impacts of climate change in Tanzania. *Applied Phycology*, pp.1-17.

Mhache, E.P., 2023. The Contribution of the Udzungwa Mountain National Park to the Livelihoods of Communities in the Morogoro Region of Tanzania. *Ghana Journal of Geography*, *15*(1), pp.62-83.

Mkonda, M.Y. and He, X., 2018. Vulnerability assessment of the livelihoods in Tanzania's semi-arid agro-ecological zone under climate change scenarios. *Climate*, *6*(2), p.27.

Msongaleli B, Rwehumbiza F, Tumbo SD and Kihupi NI 2014 Sorghum yield response to changing climatic conditions in semi-arid central Tanzania: evaluating crop simulation model applicability. Agric. Sci. 5: 822-833.

Mungai, C., Opondo, M., Outa, G., Nelson, V., Nyasimi, M., and Kimeli, P. (2017)"Uptake of climate-smart agriculture through a gendered intersectionality lens: experiences from Western Kenya," in Climate Change Adaptation in Africa. Climate Change Management, eds W. Leal Filho, S. Belay, J. Kalangu, W. Means, P. Munishi, and K. Musiviwa (Cham: Springer).

Näschen, K., Diekkrüger, B., Leemhuis, C., Seregina, L.S. and van der Linden, R., 2019. Impact of climate change on water resources in the Kilombero Catchment in Tanzania. *Water*, *11*(4), p.859.

Nationally Determined Contribution, Tanzania, 2021 | IFRC

NATIONALLY DETERMINED CONTRIBUTIONS (NDCs) (unfccc.int)

Newell, P., Taylor, O., Naess, L.O., Thompson, J., Mahmoud, H., Ndaki, P., Rurangwa, R. and Teshome, A., 2019. Climate smart agriculture? Governing the sustainable development goals in Sub-Saharan Africa. *Frontiers in Sustainable Food Systems*, *3*, p.55.

Nyasimi, M., Kimeli, P., Sayula, G., Radeny, M., Kinyangi, J., and Mungai, C. (2017). Adoption and dissemination pathways for climate-smart agriculture technologies and practices for climate-resilient livelihoods in lushoto, northeast tanzania. *Climate* 5, 2–22. doi: 10.3390/cli5030063

Ojija, F., Abihudi, S., Mwendwa, B., Leweri, C.M. and Chisanga, K., 2017. The Impact of Climate Change on Agriculture and Health Sectors in Tanzania: A review. *International Journal of Environment, Agriculture and Biotechnology*, *2*(4), p.238849.

Otieno, G., Sikinyi, E., Vernooy, R., Fadda, C. and Halewood, M., 2023. How policies influence smallholder farmers' access to and use of genetic resources in three East African countries

Rioux, J., Lava, E. and Karttunen, K., 2017. Climate-smart agriculture guideline for the United Republic of Tanzania: A country-driven response to climate change, food and nutrition insecurity. *FAO, Rome*.

Rubekie, A.P., Pauline, N.M. and Kaaya, L.T., 2022. Coastal communities' responses to climate change and variability impacts: a threat to coastal and marine resources?. *Climate and Development*, *14*(9), pp.842-856.

Rudari, R., Coijn, S., De Angeli, S., De Moel, H., Ferraris, L., Ghizzoni, T., & Trasforini, E. (2018). Disaster risk profile Tanzania (United Republic of): Building disaster resilience to natural hazards in Sub-Saharan African regions, countries and 58 communities. CIMA Research Foundation International Centre on Environmental Monitoring.

Strengthening Climate Change Adaptation and Resilience in Flood-Prone Dar es Salaam (worldbank.org)

Swai EY, Njau F and Farrely M 2020 Enhancing the capacity of vulnerable community to climate change: Role of quality declared seed production model in semi-arid areas of central Tanzania. In: Leal Filho W (Eds) Handbook of Climate Change Resilience. Springer, Cham.

Tesfaye, K., Kassie, M., Cairns, J., Michael, M., Stirling, C., Tsedeke Abate, M., et al. (2017). "Potential for scaling up climate smart agricultural practices: examples from sub-saharan africa," in *Climate Change Adaptation in Africa: Fostering Resilience and Capacity to Adapt*, eds W. Filho, B. Simane, J. Kalungu, M. Wuta, P. Munishi, and K. Musiyiwa (Cham, AG: Springer International Publishing, 185–203

Travel, W.T.T.C. and Impact, T.E., 2012. World Travel and Tourism Council. *Retrieved September*, *30*, p.2012.

United Nations World Food Programme. (2020). Global report on food crises. United Nations. https://docs.wfp.org/api/documents/WFP0000114546/download/?_ga=2.85090713.1249375840.1626298636 - 1164384223.162155935.

United Republic of Tanzania (2016). World Food Program (WFP) Strategic Review 2016: Framework for food and Nutrition Security in Tanzania. Available online https://docs.wfp.org/api/documents/WFP-0000019748/download/?_ga=2.47000800.610799115.1553932184-134515430.1553932184 (accessed 21/05/2023,).

United States Agency for International Development. (2018, June). Climate risk profile Tanzania. Reliefweb. https://reliefweb.int/sites/reliefweb.int/files/resources/20180629_USAIDATLAS_Climate-Risk-Profile-Tanzania.pd

United States Agency for International Development. (2021, January 4). Agriculture and food security: Tanzania. Retrieved May 16, 2021, from https://www.usaid.gov/tanzania/agriculture-and-food-security

Wamboye, E.F., Nyaronga, P.J. and Sergi, B.S., 2020. What are the determinants of international tourism in Tanzania?. *World Development Perspectives*, *17*, p.100175.

WIOMSA and UN-Habitat, 2021. Coastal Cities of the Western Indian Ocean Region and the Blue Economy: City Case Study - Dar es Salaam. WIOMSA and UN-Habitat, Zanzibar, Tanzania, xxx pp.

Wizara ya Fedha na Mipango National Five Year Development Plan, 2016/17-2020/21. Dar Es Salaam, Tanzania. Ministry of Finance and Planning (2016)

Zambia

"Zambia | International Organization for Migration." 29 May. 2023, https://www.iom.int/countries/zambia.

"Zambia Crisis Response Plan 2020 - Zambia | ReliefWeb." 06 Nov. 2020, https://reliefweb.int/report/zambia/zambia-crisis-response-plan-2020.

Adger WN, Arnell NW, Tompkins EL (2005) Successful adaptation to climate change across scales. Glob Environ Chang 15(2):77–86.

Ariom, T.O., Dimon, E., Nambeye, E., Diouf, N.S., Adelusi, O.O. and Boudalia, S., 2022. Climate-smart agriculture in African countries: A Review of strategies and impacts on smallholder farmers. *Sustainability*, *14*(18), p.11370.

Avadí, A., Cole, S.M., Kruijssen, F., Dabat, M.H. and Mungule, C.M., 2022. How to enhance the sustainability and inclusiveness of smallholder aquaculture production systems in Zambia?. Aquaculture, 547, p.737494.

Banda, B., Van Niekerk, D., Nemakonde, L. and Granvorka, C., 2020. Integrated development planning and related financing practice: A comparison case study of Zambia and South Africa. Journal of Public Administration, 55(1), pp.44-59.

Banda, Bowen & Niekerk, Dewald & Nemakonde, Livhuwani & Granvorka, Charley. (2021). Integrated development planning in Zambia: Ideological lens, theoretical underpinnings, current practices, views of the planners. Development Southern Africa. 39. 1-16. 10.1080/0376835X.2020.1868289

Central Statistical Office (CSO) 2017: Labour force survey report; Ministry of Labour and Social Security: Lusaka, Zambia, 2018.

Cumming, D.H.M. Large Scale Conservation Planning and Priorities for the Kavango-Zambezi Transfrontier Conservation Area; Conservation International: Arlington, V

F AO & UNDP. 2019. Gender mainstreaming and climate resilience in Zambia's cashew sector: Insights for adaptation planners. Rome, FAO, 18 pp.

FAO. Sustainable Charcoal Production for Food Security and Forest Landscape Restoration; FAO: Rome, Italy, 2020; pp. 1–6

Feliciano D, Recha J, Ambaw G, MacSween K, Solomon D, Wollenberg E (2022) Assessment of agricultural emissions, climate change mitigation and adaptation practices in Ethiopia. Clim Policy 1–18.

FOSA Country Report - Zambia (fao.org)

FP080: Zambia Renewable Energy Financing Framework | Green Climate Fund

GRZ (2016a). Government of the Republic of Zambia. National Policy on climate change. Ministry of National Development and Planning (MNDP), Lusaka, Zambia Return to ref 2016a in article

GRZ (2016b). Government of the Republic of Zambia. Second National Agricultural Policy. Ministry of Agriculture and Ministry of Livestock and Fisheries. Lusaka, Zambia
GRZ. 2013. Zambia National Agriculture Investment Plan (NAIP) 2014-2018. Lusaka, Zambia

GRZ. 2014. National Gender Policy. Ministry of Gender and Child Development. Lusaka, Zambia. (available at extwprlegs1. fao.org/docs/pdf/zam152916.pdf).

https://www.devere-zambia.co.zm/news/President-unveils-Zambia-WaterInvestment-Program[9] UNICEF-Zambia-Social-Sector-Budget-Brief-2022.PDF

International Federation of Red Cross. 2021. LEGAL PREPAREDNESS FOR INTERNATIONAL DISASTER ASSISTANCE IN ZAMBIA. Available at: https://disasterlaw.ifrc.org [2023, June 09].
IUCN GGO. 2017. Climate Change Gender Action Plan of the Republic of Zambia. Washington, D.C. (available at portals. iucn.org/union/sites/union/files/doc/ccgap-zambia-final-web.pdf)

Kakwasha K, Simmance FA, Cohen PJ, Muzungaire L, Phiri H, Mbewe M, Mutanuka E, Nankwenya B, Wesana J, Byrd K, Pincus L, de Bruyn J, Chan CY, Mills D, and Siamudaala V. 2020. Strengthening small-scale fisheries for food and nutrition security, human well-being and environmental health in Zambia. Penang, Malaysia: WorldFish. Program Brief: 2020-41.

Kaluma, K. and Umar, B.B., 2021. Outcomes of participatory fisheries management: An example from co-management in Zambia's Mweru-Luapula fishery. Heliyon, 7(2), p.e06083.

Kaminski, A.M., Little, D.C., Middleton, L., Syapwaya, M., Lundeba, M., Johnson, J., Huchzermeyer, C. and Thilsted, S.H., 2022. The role of aquaculture and capture fisheries in meeting food and nutrition security: testing a nutrition-sensitive pond polyculture intervention in rural Zambia. Foods, 11(9), p.1334.

Kunda, T., Impact of Climate Change on Small Scale Farmers in Samfya District of Luapula Province, Zambia.

Leal Filho W, Azeiteiro UM, Balogun AL, Setti AFF, Mucova SA, Ayal D, . . . Oguge NO (2021) The influence of ecosystems services depletion to climate change adaptation efforts in Africa. Sci Total Environ 146414

Linell, A.; Sjöstedt, M.; Sundström, A. Governing transboundary commons in Africa: The emergence and challenges of the Kavango–Zambezi Treaty. Int. Environ. Agreem. 2018, 19, 53–68. [CrossRef]

Mabeta, J., Mweemba, B. and Mwitwa, J., 2018. Key drivers of biodiversity loss in Zambia. *Policy*.

Ministry of Labour, 2017. Zambia Labour force survey, Lusaka: Minsitry of labour.

Ministry of Local Government. 2019. GUIDELINES FOR INTEGRATED DEVELOPMENT PLANNING: Zambia. Available at: http://www.kafuecouncil.gov.zm/?wpfb_dl=140 [2023, June 10].
MLNR. *National Climate Change Learning*; Ministry of Lands and Natural Resources (MLNR): Kalomo, Zambia, 2021.

Mofya-Mukuka R, Sambo J, Kuhlgatz CH. Exploring linkages between farm productive assets and household food security in Zambia. Working Paper 124, Indaba agricultural policy research institute, Lusaka, Zambia. 2017.

MoGEE and GGGI. (2022). Zambia National Green Growth Index 2022. Ministry of Green Economy and Environment (MoGEE) and Global Green Growth Institute. [Authors H. Tembo, E. Shitima, F. Mpampi, A. Sakala, L. Mwila, P. Tembo, C. Chishimba, M.M. Daka, L.M. Kapata, D.Z.P Mulenga, M. Mukuma, C. Langa, Y.N. Vibetti, F. Ngala, G.K. Sikantongwe, E.C. Lubumbashi, M.D. Lwando, K. Chalwe, O.C. Kawanga, D. Goma, P.H. Nyanga, S. Moya, M. Hazemba, M. Nyambe, M. Ng'ambi, P. Daka, M. Tembo, F. Mwenda, M. Nkoya, J. Kabandala, B. Nshindano, S. Kabwe, K. Chaleka, P. Chipenge, O. Zulu, J. Ntemba, E. Chilema, K. Kawesha, B. Mwileli, E. Mkumba, W. Mapulonga, M. Mkandawire, L. Acosta, A. Nantulya, K. Shula, I. Nzimenyera, R. Sabado, Jr., R.M. Mihigo, S.G. Quiñones, D.J. Valencia, and N.M. Puyo]
Moonga, M.S. and Chileshe, B., 2019. Zambia's transition to a green economy. Multidisciplinary Journal of Language and Social Sciences Education (2664-083X, Online ISSN: Print ISSN: 2616-4736), 2(1), pp.96-122.

Mulenga, C., Climate Change and Soil Governance in Zambia: Convergences or Divergences?. *Available at SSRN 4401847*.

Muyangana, S.M.S. and Phiri, C., RESPONDING TO CHALLENGES IN TOURISM IN THE ERA OF CLIMATE CHANGE IN ZAMBIA.

Mwange, A., 2022. An empirical investigation of the impact of monetary policy on economic growth in Zambia.

Mwitwa, J., Mwila, R. and Mweemba, B., 2018. Policy and Institutional Review for biodiversity conservation in Zambia. *Policy Brief*, *1*.

Nguru, W. and Mwongera, C., 2023. Predicting the future climate-related prevalence and distribution of crop pests and diseases affecting major food crops in Zambia. *PLOS Climate*, *2*(1), p.e0000064.

Odubote, I.K.; Ajayi, O.C. Scaling Up Climate-Smart Agricultural (CSA) Solutions for Smallholder Cereals and Livestock Farmers in Zambia. In Handbook of Climate Change Resilience; Leal Filho, W., Ed.; Springer International Publishing: Cham, Switzerland, 2020; pp. 1115–1136.

Phama, L.T., Kapembwab, J. and Gautamc, D.K., 2014. Implications of Green Economy for the South: A Case of Mining Sector in Zambia. *The Green Economy*, p.140.

Policy Monitoring and research Center Zambia, ND. Understanding the blue economy Opportunities for Zambia Available: https://www.pmrczambia.com/wp-content/uploads/2018/09/Understanding-the-Blue-Economy-Opportunities-for-Zambia-Infographic.pdf. [Date accessed: 26 May 2023]

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. https://doi.org/10.4060/cc2141en

Schachter, J.P., 2009. Data assessment of labour migration statistics in the SADC region: South Africa, Zambia, Zimbabwe. *International Organization for Migration*, *1*, pp.1-33. Siachoono, 2018 **Biodiversity in Zambia: Selected Countries in Africa** In book: Global Biodiversity (pp.387-404) DOI:10.1201/9780429469800-13

Wang, L., Mondela, C.L. and Kuuluvainen, J., 2022. Striking a Balance between Livelihood and Forest Conservation in a Forest Farm Facility in Choma, Zambia. *Forests*, *13*(10), p.1631.

World Bank. World Bank Open Data. 2021. Available online: **https://data.worldbank.org/** (accessed on 15 April 2023).

Zimbabwe

Dembedza, V.P., Chopera, P., Mapara, J., Mpofu-Hamadziripi, N., Kembo, G. and Macheka, L., 2023. The relationship between climate change induced natural disasters and selected nutrition outcomes: a case of cyclone Idai, Zimbabwe. BMC nutrition, 9(1), p.19.

Dodman, D., Sverdlik, A., Agarwal, S., Kadungure, A., Kothiwal, K., Machemedze, R. and Verma, S., 2023. Climate change and informal workers: Towards an agenda for research and practice. Urban Climate, 48, p.101401.

Jaison, C., Reid, M. and Simatele, M.D., 2023. Asset Portfolios in Climate Change Adaptation and Food Security: Lessons From Gokwe South District, Zimbabwe. Journal of Asian and African Studies, p.00219096231158340.

Mano, R. and Nhemachena, C., 2007. Assessment of the economic impacts of climate change on agriculture in Zimbabwe: A Ricardian approach. World Bank Policy Research Working Paper, (4292).

Mashizha, T.M. and Tirivangasi, H.M., Climate Change, Food Security and Poverty.

Mupepi, O. and Matsa, M.M., 2023. Decadal spatio-temporal dynamics of drought in semi-arid farming regions of Zimbabwe between 1990 and 2020: a case of Mberengwa and Zvishavane districts. Theoretical and Applied Climatology, pp.1-17.

Mupepi, O. and Matsa, M.M., 2023. Decadal spatio-temporal dynamics of drought in semi-arid farming regions of Zimbabwe between 1990 and 2020: a case of Mberengwa and Zvishavane districts. Theoretical and Applied Climatology, pp.1-17.

Mutari, B., Sibiya, J., Matova, P.M., Gasura, E. and Simango, K., 2023. Drought stress impact on agronomic, shoot, physiological, canning and nutritional quality traits of navy beans (Phaseolus vulgaris L.) under field conditions in Zimbabwe. Field Crops Research, 292, p.108826.

Trummer, U., Ali, T., Mosca, D., Mukuruva, B., Mwenyango, H. and Novak-Zezula, S., 2023. Climate Change Aggravating Migration and Health Issues in the African Context: The Views and Direct Experiences of a Community of Interest in the Field. Journal of Migration and Health, p.100151.

Yanou, M.P., Ros-Tonen, M., Reed, J. and Sunderland, T., 2023. Local knowledge and practices among Tonga people in Zambia and Zimbabwe: A review. Environmental Science & Policy, 142, pp.68-78.

Zvobgo, L., Johnston, P., Olagbegi, O.M., Simpson, N.P. and Trisos, C.H., 2023. Role of Indigenous and local knowledge in seasonal forecasts and climate adaptation: A case study of smallholder farmers in Chiredzi, Zimbabwe. Environmental Science & Policy, 145, pp.13-28.