EASTERN AND
SOUTHERN AFRICA

MALAWI

World Bank Group

COUNTRY CLIMATE AND DEVELOPMENT REPORT

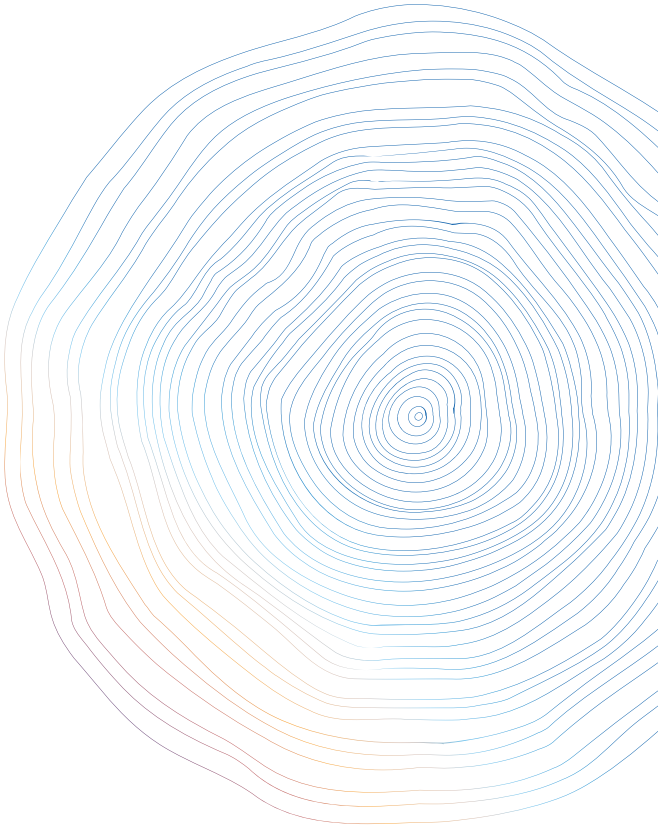
October, 2022

1818 H Street NW, Washington, DC 20433
Telephone: 202-473-1000; Internet: www.worldbank.org

Editing: Marion Davis

Photo Credit: Thoko Chikondi/World Bank
Editorial Credit: Dietmar/Shutterstock.com, Dereje/Shutterstock.com

Designed by: Roots Advertising Services



MALAWI

COUNTRY CLIMATE AND DEVELOPMENT REPORT

CONTENTS

Figures

Acknowledgments

The Malawi Country Climate and Development Report (CCDR) captures the interplay between development, climate change and climate policies. This report was developed by individuals across the World Bank Group (WBG), in coordination with the Government of Malawi (GoM), to promote sustainable and resilient development in the face of climate change.

The preparation of the report was co-led by Urvashi Narain (Lead Economist), William G. Battaile (Lead Country Economist), Nicholas Zmijewski (Environmental Engineer), and Dominick Revell de Waal (Senior Economist). Key contributions were made by Adrian Leigh Vogl (Land-Water Modeling Specialist), Andrew Burns (Lead Economist), April Nicole Frake (Senior Climate Change Specialist, Consultant), Atsushi Iimi (Senior Economist), Blessings Nyanjagha Botha (Senior Agricultural Economist), Brent Boehlert (Environmental Economist, Consultant), Charl Jooste (Senior Economist), Charles Nkoka (Consultant), Chiho Suzuki (Senior Health Specialist), Chipo Msowoya (Social Protection Specialist), Christopher De Serio (Senior Transport Specialist), Collins Owen Francisco Zamawe (Health Specialist), David Mason (Urban Specialist), Dhiraj Sharma (Senior Economist), Dhruva Sahai (Senior Financial Specialist), Diego Castillo (Land-Water Modeling Specialist), Elisson M. Wright (Senior Environmental Finance Specialist), Evariste Rutebuka (Land Modeling Specialist), Francis Samson Nkoka (Senior Disaster Risk Management Specialist), Grace Naa Merley Ashley (Transport Specialist, Consultant), Henry Harlod Chimbali (External Affairs Officer) Jakob Engel (Senior Economist), Javier Parada (Junior Data Scientist). Jenny Maria Hasselsten (Senior Energy Specialist), Jeongjin Oh (Junior Professional Officer), Jessica Charles Wade (Senior Risk Management Officer, MIGA), Jessica Leete Werner Flannery (Health Specialist, Consultant), Jingyi Wu (Clean Cooking / Energy Specialist), Jonathan Grabinsky Zabludovsky (Social Specialist, Consultant), Jorge Eduardo Leon Sarmiento (Land Modeling Specialist), Juan Pablo Baquero Vargas (Microsimulation expert, Consultant), Kagaba Paul Mukiibi (Senior Energy Specialist), Kenneth Strzepek (Land-Water Modeling Specialist, Consultant), Lina Marcela Cardona (Economist), M. Yaa Pokua Afriyie Oppong (Sustainable Development Sector Leader), Madalo Minofu (Resident Representative, IFC), Magidu Nyende (Senior Economist), Maria Claudia Pachon (Senior Digital Development Specialist), Massimo Sichinga (Social Protection Specialist, Consultant), Maud Alice Marie Melanie Frangi (Public Sector Specialist, Consultant), Michael Anthony Roscitt (Public Sector Specialist), Michael Chipalaule Gondwe (Senior Energy Specialist), Nataliya Mylenko (Lead Country Economist), Nicholas James Callender (Disaster Risk Specialist), Nicholas Meitaki Soikan (Senior Social Development Specialist), Nobuo Yoshida (Lead Economist), Nyandeng Verona John Gajang (Public Sector Specialist, Consultant), Onur Erdem (Senior Public Sector Specialist), Paulo De Sa (Mining Specialist, Consultant), Rochelle Glenene O'Hagan (Senior Data Scientist), Samantha Germaine Braid (Senior Environment Engineer), Sara Ballan (Senior Digital Development Specialist), Simon Croxton (Consultant), Sydney Noel Moss (Natural Capital Specialist, Consultant), Tesfaye Bekalu (Senior Water Resources Management Specialist), Thi Thanh Thanh Bui (Economist), Tim Kelly (Lead Digital Development Specialist), Vanessa Christine Satur (Tourism Specialist, Consultant), Viola Kirui (Land Modeling Specialist), Yabei Zhang (Senior Energy Specialist), and Yalenga Loraine Nyirenda (Economist, Consultant).

The team would like to thank colleagues of Government of Malawi who provided guidance and technical inputs to this work. In particular, the team would like to thank the focal points from Ministry of Natural Resources and Climate Change—Golivati Gomani (Environmental Inspector), Ministry of Finance and Economic Affairs—Chimvano Thawani (Economist) and Chinsinsi Phiri (Economist), and National Planning Commission—Joseph Nagoli (Director of Knowledge and Learning). Guidance from Tawonga Mbale-Luka (Director) and Benon Yassin (Deputy Director), Ministry of Natural Resources and Climate Change is also gratefully acknowledged.

Mara Warwick (former Country Director, Malawi), Jumoke Jagun-Dokunmu (Regional Director for Eastern Africa, IFC), Merli Margaret Baroudi (Director, MIGES), Ayat Soliman (Regional Director, Africa East and South), Catherine Signe Tovey (Acting Regional Director, Africa East and South), Iain Shuker (Practice Manager, ENB), Hugh Riddell (Country Manager, Malawi), and Amena Arif (Country Manager,

CAFE1) provided overall guidance. The team wishes to thank peer reviewers Richard Record (Lead Country Economist, EECDR), Diego Rodriguez (Lead Economist, SAEW2), Stephane Hallegatte (Senior Climate Change Adviser, GGSV), Karl Pauw (Lead Economist, IFPRI), and Paavo Eliste (Lead Agricultural Economist, SAEA3) for their constructive inputs. Valuable feedback was also provided by Vivek Pathak (Director, CBD), Zano Mataruka (Senior Investment Officer, IFC), Pablo Fajnzylber (Director, Strategy and Operations, Energy and Extractives Team), Abiyot Dagne Belay and Carter Brandon (World Resources Institute), Somik Lall (Lead Economist, EFI), and Mai Farid (Senior Economist, IMF).

The report benefitted from key studies on natural capital and climate finance where funding was provided by the Climate Support Facility (CSF) and the Climate Investment Fund (CIF), respectively. Support from PROGREEN-funded Biodiversity, Ecosystem-based Landscape Assessment (BELA) initiative is also appreciated.

Abbreviations and Acronyms

AFOLU	Agriculture, Forestry and Other Land Use
ASP	Aspirational Development
BAU	Business as usual
BAU+A	BAU with Adaptation
CCDR	Country Climate and Development Report
CBIT	Capacity Building Initiative for Transparency
CC-MFMod	Climate Change Macro-Fiscal Model
CO2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
CSA	Climate Smart Agriculture
CSO	Civil Society Organization
DCCMS	Department of Climate Change and Meteorological Services
DODMA	Department of Disaster Management Affairs
DPR	Disaster Preparedness and Relief
DRM	Disaster Risk Management
EAD	Environmental Affairs Department
EPWP	Enhanced Public Works Program
ESCOM	Electricity Supply Corporation of Malawi
ETF	Enhanced Transparency Framework
EWG	Expert Working Group
EWS	Early Warning System
FAO	Food and Agriculture Organisation
FRIM	Forestry Research Institute of Malawi
FOLU	Forestry and Other Land Use
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse gas
GoM	Government of Malawi
Ha	Hectare
ICT	Information Communications Technology
IFC	International Finance Corporation
IMF	International Monetary Fund
INDC	Intended Nationally Determined Contribution
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
IRP	Integrated Resource Plan
IWRM	Integrated water resources management
LDC	Least Developed Country
LUCF	Land use change and forestry
LULC	Land use and land cover
M&E	Monitoring and Evaluation
MCCCI	Malawi Confederation of Chambers of Commerce and Industry

MEGS	Malawi Economic Growth Strategy
MERA	Malawi Energy Regulatory Authority
MGDS III	Malawi Growth and Development Strategy 2017-2022
MIGA	Multilateral Investment Guarantee Agency
MNBR	Malawi National Building Regulations
MPRSP	Malawi Poverty Reduction Strategy Programme
MRV	Monitoring, Reporting and Verification
Mt	Million tonnes
MW	Megawatt
MK	Malawi Kwacha
NAMA	Nationally Appropriate Mitigation Action
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
NCCF	National Climate Change Fund
NCCMP	National Climate Change Management Policy
NCCRF	National Climate Change Response Framework
NCIC	National Construction Industry Council
NCRP	National Climate Resilience Program
NCST	National Commission for Science and Technology
NDC	Nationally Determined Contribution
NDC-P	NDC Partnership
ND-GAIN	Notre Dame Global Adaptation Initiative
NDRMP	National Disaster Risk Management Policy
NEP	National Energy Policy
NFLRS	National Forest Landscape Restoration Strategy
NRSWG	Natural Resources Sectoral Working Group
NSCCC	National Steering Committee on Climate Change
PES	Payments for Ecosystem Services
PIM	Public Investment Management
$PM_{2.5}$	Particulate matter of 2.5 micrometers
PSIP	Public Sector Investment Plan
PPP	Public Private Partnership
RBF	Results based finance
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RES	Resilient Development
SCTP	Social Cash Transfer Program
SDGs	(United Nations) Sustainable Development Goals
SSP	Shared Socioeconomic Pathway
TNC	Third National Communication to the UNFCCC
UBR	Unified Beneficiary Registry
UNFCCC	United Nations Framework Convention on Climate Change
UNDP	United Nations Development Program
US$	United States (US) dollar
WBG	World Bank Group

All dollar amounts are US dollars unless otherwise indicated

EXECUTIVE SUMMARY

Executive Summary

Malawi's economy has shown modest growth with persistently high poverty rates over the past decades and faces significant development challenges. Malawi's GDP per capita growth averaged less than 1.5 percent since independence in 1965; as a result, GDP per capita in 2021 was only US$394 compared with US$197 in 1965 (constant 2015 US$). The country is facing an economic and social crisis, with unsustainable debt, serious macro-fiscal imbalances, shortages of power and key import commodities, acute lack of foreign exchange, and high inflation. The crisis has been aggravated by exogenous shocks from the COVID-19 pandemic, the war in Ukraine, and climate disasters. In 2019, seven out of every ten Malawians were under the international poverty line of US$2.15 a day. Four in five Malawians experienced moderate to severe food insecurity in 2019–2021. Natural capital, the main asset underpinning economic activity, is being eroded by widespread land degradation and deforestation. A severe infrastructure deficit and economic policy distortions limit competitiveness and constrain economic diversification. And Malawi's human capital, though improving, remains low, held back by low educational attainment and gender disparities, among other factors. Weak institutions, corruption, lack of transparency, and significant policy uncertainty all undermine the business environment.

The government of Malawi has put forward ambitious plans to accelerate growth and reduce poverty. The "Malawi 2063" vision document (referred to hereafter as Malawi 2063) hopes to achieve an annual 6 percent GDP growth rate and make Malawi a lower-middle income country by 2030 and an upper-middle income country by 2063. The vision focuses on three pillars of inclusive economic growth: i) a productive, commercialized, and diversified agricultural sector, ii) a strong manufacturing sector driven by vibrant agriculture and mining sectors, and iii) the development of urban centers and tourism hubs across the country.

Climate change will however make it harder for Malawi to reach its ambitious development vision. Malawi faces significant development challenges, which are being compounded by climate change. Malawi is considered highly vulnerable to climate change, 163rd out of 182 countries ranked for 2020 on the ND-GAIN Index. Climate-related disasters are already increasing in frequency and severity, with devastating consequences. For vulnerable households, experiencing a disaster can significantly increase the likelihood of falling into poverty. Damage to infrastructure, especially from floods, also disrupts electricity service, travel, and business operations, and imposes large costs for repairs and rebuilding, diverting scarce resources from other development needs. Tropical Storm Ana, for instance, is estimated to have caused damages equivalent to 1.5–2.7 percent of Malawi's GDP—most notably, requiring extensive and costly rehabilitation of the Kapichira Dam.

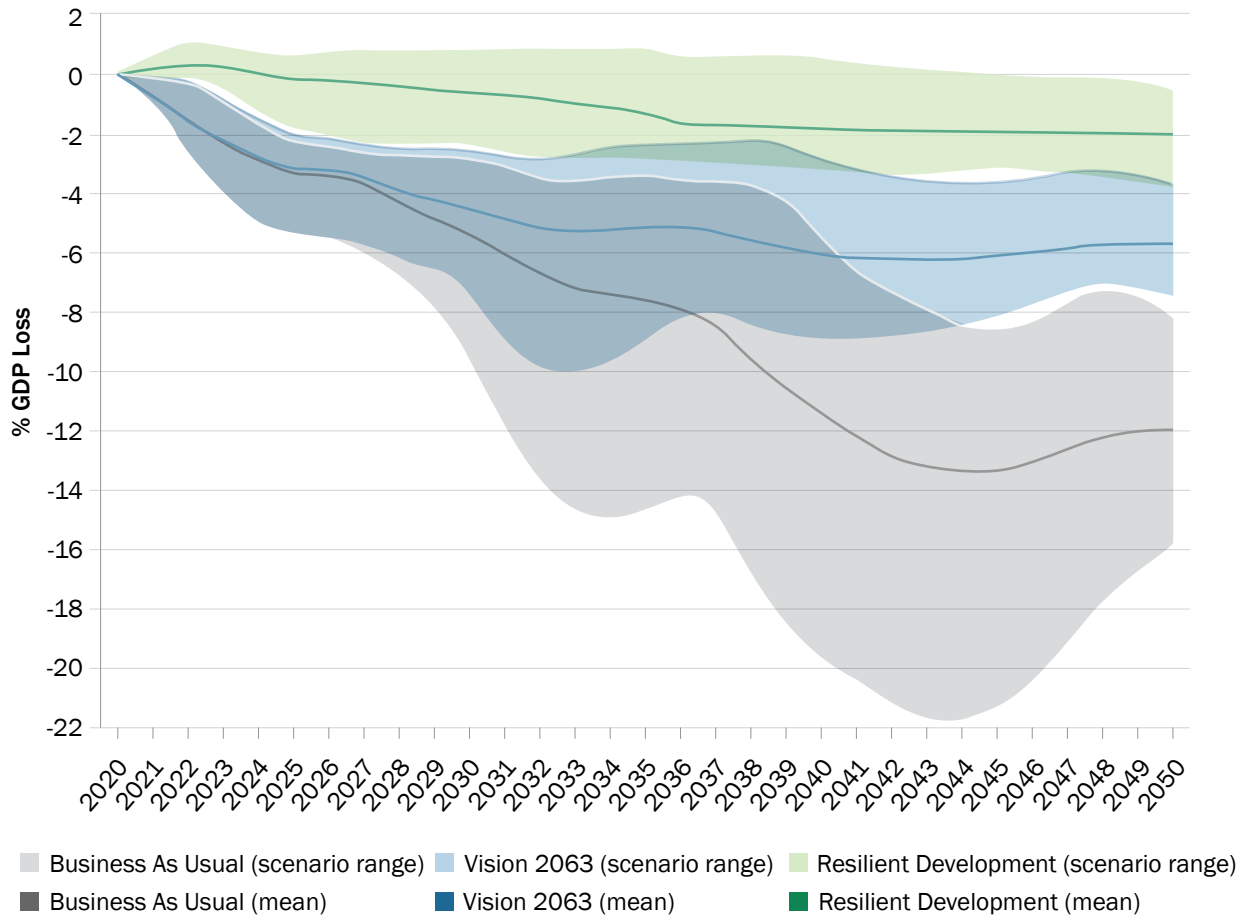
Malawi has one of the smallest greenhouse gas emissions (GHG) footprints in the world, and any efforts to reduce emissions will have to come as a co-benefit of development. In 2019, Malawi's total GHG emissions were only 19.34 million tonnes (metric tons) of carbon dioxide equivalent ($MtCO_2e$), including from land use change and forestry (LUCF), or 10.95 $MtCO_2e$ without LUCF—just 0.59 tCO2e per capita, the lowest in the world. The country's updated Nationally Determined Contribution (2021) lays out an ambitious agenda to reduce emissions spanning multiple sectors, but acknowledges that, due to its severe resource constraints, Malawi will need substantial international support to achieve its objectives.

This Country Climate and Development Report aims to support Malawi's efforts to achieve its development goals within a changing climate by quantifying the impacts of climate change on the economy and highlighting key policies and interventions that are needed to strengthen climate resilience. The analysis includes climate modeling across multiple scenarios to account for the inherent uncertainty in climate projections; and sector-by-sector analysis and assessment of economy-wide impacts to identify the biggest impacts. It examines Malawi's current policy landscape and identifies needed reforms; considers how Malawi can best protect its most vulnerable households; and considers how the country can finance its ambitious development and climate agenda, including the key role of the private sector.

The analysis shows that climate change will impose large costs on the economy and on already vulnerable households. If Malawi stays on its current low-growth development trajectory, climate change could reduce GDP by 3–9 percent in 2030, 6–20 percent in 2040, and 8–16 percent by 2050 (Figure E1 for Business As Usual (grey)). While this finding is not surprising, the magnitude and variability of potential climate impacts is alarming for one of the poorest countries in the world. The largest impacts from climate change are projected to come from damage to roads and bridges and reinforce what the country is currently experiencing in terms of large damage from current climate shocks to infrastructure assets. Heat impacts on labor productivity are also significant and point to compounding shocks on already poor and vulnerable households. The analysis finds that over the next 10 years, climate shocks on the economy could push another 2 million people into poverty (an increase in poverty rate by 8 percentage points), increasing to 4 million additional poor by 2040.

The analysis also clearly demonstrates that development, as set out in Malawi's Vision 2063, provides a strong basis for strengthening resilience to climate impacts. If Malawi were to accelerate implementation of policies and programs envisioned in the Vision 2063, the development trajectory would shift to a higher growth path and climate change impacts would be significantly reduced. Under this scenario, the magnitude and variability of the potential reduction in GDP from impacts of climate change are smaller: 3–7 percent in 2030, 3–9 percent in 2040, and 4–7 percent by 2050 (Figure E1 for Vision 2063 (blue)). By supporting higher-quality infrastructure and a more diversified economy, economic development is found to be one of the most powerful forms of adaptation. A push to achieve development objectives also protects the vulnerable from the impacts of climate change, in some cases reducing the households that would otherwise fall into poverty by as much as three-quarters.

Figure E1: Climate change will impose large economic costs; development will strengthen resilience but will require doing different things.



But the Vision 2063 development path will not be enough and building greater resilience to climate change will require doing different things and doing things differently. With additional adaptation measures, the analysis shows that not only is the impact of climate change on GDP much smaller, GDP is higher with climate change and adaptation when compared to the counterfactual with no climate impacts; losses range from -1 to 3 percent in 2030 and 2040, and 1 to 4 percent in 2050 (Figure E1 for Resilient Development (green)). Adaptation measures cut across sectors and are highlighted in the table below in contrast to development measures for select sectors. For roads and bridges, the sector with the largest projected damages from climate change, losses range from -0.2 to 0.8 percent in 2050 with development and additional adaptation investments, as compared to 5 to 12 precent under business as usual.

Sector	Development (Vision 2063) measures that build resilience	Going beyond Development (Vision 2063) to adapt to climate change
Agriculture	Promoting Crop Diversification Investing in Irrigation Development Promoting Mechanization and Digital Technologies Investing in Research, Innovation, and Dissemination Supporting Land Tenure Security	Investments to develop crop varieties and livestock breeds that are resilient to heat stress, droughts, and excessive rainfall Revising design standards of irrigation infrastructure to make it climate resilient Strengthening capacity to manage new pests and diseases
Land	Investment in land restoration to meet commitments under Bonn Challenge and the African Forest Landscape Restoration Initiative Promoting increased access to improved cooking technologies	Improved targeting of land restoration activities to ensure that restoration actions build resilience
Energy	Investing in large-scale hydropower generation projects and grid-connected solar power projects Promoting regional interconnections for power imports Investing in off-grid renewable energy	Diversification of location of hydropower generation plants within the country Increased regional trade within the Southern Power Pool
Transport	Improved road infrastructure in rural areas Increased the share of passenger transport for road, rail and waterways Expanded rail network	New infrastructure follows a 50-year design standard, instead of a 10-year standard (building wider paved shoulders to improve drainage; using asphalt binders that are more resilient to heat) Promoting output and performance-based road contracts to improve the effectiveness and efficiency of road development and maintenance practices for climate resilience
Digital	Increased connectivity in rural areas Adoption of a data policy that allows interoperability and cross-ministerial data flow, as well as data standards Implementation of cybersecurity and personal data protection measures	Acceleration of investment in climate-resilient digital infrastructure to support sector-specific climate services Adoption of cloud data storage, and a data backup practice Use of digital platforms to support early warning systems and disseminate information on climate-smart agriculture

While implementing Vision 2063 and additional adaptation measures will help Malawi achieve the most resilient growth path, the country cannot afford to finance these investments in-full at the present. Malawi's public debt is currently unsustainable, and Government financing of climate-related actions will remain constrained over the medium term. Fiscal imbalances have been a chronic challenge in Malawi and were exacerbated by the COVID-19 pandemic response and, most recently, by the rise in global commodity prices driven by the war in Ukraine. The latest WBG-IMF Debt Sustainability Analysis (December 2021) found that Malawi is at high risk of both external and public debt distress, and that the country's level of debt is unsustainable. Government has embarked on a course of fiscal consolidation in the 2022/23 budget that can put debt back on a sustainable path. Following this reform program, Government will have limited fiscal space over the medium term to finance adaptation investments, estimated at as much as US$2.9–5.2 billion between 2020 and 2050.

There is urgent need to identify financing sources to implement the Vision 2063 and additional adaptation measures that do not increase public debt. Grant and highly concessional financing from public sources and new inflows from private sources are urgently needed to meet the very large investment needs that are required to finance investments in the near term that in turn will deliver results over the medium and long terms. Development aid can be aligned to promote climate co-benefits and build on the opportunities created in recent changes to PPP legal framework. This will require optimizing the use of public sector resources, international public finance, and private investment, and finding synergies across sources to avoid the transaction costs of managing increasingly fragmented finance.

There are nonetheless things that Malawi can do now that are high reward in terms of addressing the biggest impacts of climate change, and are financially affordable. The report highlights that Malawi needs a wide array of investments, policy reforms, and other interventions to build resilience, but in identifying next steps, it is important to prioritize among these measures, recognizing the country's fiscal constraints and institutional capacity to implement. The analysis points to three priorities that are affordable and urgent in that they will cost more to implement later.

Priority 1: Build infrastructure so that it can withstand climate shocks and stressors

A key priority of the government is to build new infrastructure so that it can withstand climate shocks and stressors. This is the first key priority because closing the infrastructure deficit will be key to meeting Malawi 2063 aspirations and the largest impacts of climate change will be in the form of damage to infrastructure assets. In addition, investments to rehabilitate infrastructure assets from current climate shocks are presently taking up scarce financial resources, adding to the country's financial worries– a trend that will continue if not addressed now. These scarce financial resources could better be used to close the infrastructure deficit and build better, more resilient infrastructure. Studies have shown that building infrastructure to be climate-resilient does not add significantly to the upfront costs and brings substantial savings in maintenance and repair and reduced disruptions to the economy, over the lifetime of the infrastructure. Key actions include:

- Streamline climate-sensitive public investment management across all infrastructure investments.
- Adopt and implement a public asset management policy to support climate-resilient investment planning and management.
- Revise design, construction, and maintenance standards for infrastructure with a resiliency focus, and strengthen capacity to enforce these standards.

Malawi can finance the required incremental costs of climate-proofing investments even in the current tight fiscal environment by repurposing existing government resources and promoting

private sector investment in infrastructure. Malawi could, for example, earmark the resources that are collected from the existing carbon tax and fuel levies for screening, prioritizing, and designing public infrastructure projects that increase resilience to climate change and disaster risks. Currently these funds are collected and pooled in the Government's primary accounts but not used for climate change-related expenditures. Provision of discretionary funds to local governments for district-led climate and disaster-risk reduction investments, tied to performance and existing performance-based grant architecture at the district and local levels, could improving targeting and resource use efficiency. Building on the recently approved PPP Act to create enabling conditions for greater private sector participation and establishing a credible pipeline of investable opportunities that promote climate resilience, could help to bring private sector investment in infrastructure, though additional sector-level and macro-level reforms will also be needed. Development finance could also help de-risk the investment environment and promote private sector investments.

Priority 2: Halt and reverse widespread land degradation

Land restoration activities need to start now, as the benefits to development and adaptation accumulate over time, and some damages can be irreversible. Halting and reversing land degradation in the country will promote development outcomes, reduce the risk of damage to infrastructure and strengthen climate resilience. Conversely, the analysis shows that continued land degradation would increase the damage to infrastructure from inland flooding by as much as 25 percent by 2050. Implementing government plans to curb deforestation and restore degraded lands would more than halve current soil erosion rates, improve crop productivity, boost water storage while reducing flood damage to critical infrastructure. Restoring degraded lands includes promoting soil and water conservation and agroforestry at both farm and watershed levels; and investing in community forestry, forest management and protection; and riparian restoration. Halting degradation will also require increasing access to clean and efficient cookstoves and instituting forest management certification schemes to increase availability of sustainably sourced firewood and charcoal, which in turn will bring local health benefits from reduced indoor air pollution. At present, household air pollution from inefficient cookstoves has been linked to an estimated 12,400 premature deaths and 627,400 disability-adjusted life years lost each year in Malawi. But the benefits of land restoration to watershed health, agricultural productivity and protecting infrastructure take time to accumulate as land restoration involves natural processes of regeneration, and therefore should begin urgently.

Restoring degraded landscapes would also help to reduce GHG emissions, as a co-benefit of development, potentially generating resources to offset some of the costs of land restoration. Efforts to restore 4.5 million hectares under the Bonn Challenge and the African Forest Landscape Restoration Initiative, along with policies to reduce the dependence on biomass, could increase carbon stocks by 148 Mt by 2050, equivalent to about 24 percent on average of the total projected emissions for Malawi under current policies by 2050. The additional carbon sequestered could potentially raise finance linked to voluntary carbon markets in the order of US$24.8 million to US$74.3 million per year for the country depending on how the carbon markets evolve. While this is a modest sum, it could nonetheless provide critical resources to fund development investments. The use of market-based instruments can also generate financing for programs that reward different actors for contributing to land restoration. Healthy watersheds generate ecosystem services that benefit a range of economic sectors, such as hydropower and water supply utilities. Initiating payment for ecosystem services arrangements with these sectors and other beneficiaries can help raise resources for land restoration programs while ensuring that the land restoration activities are targeted to generate the required ecosystem services.

Additional key actions to promote land restoration include:

- Revising watershed management guidelines to better target land restoration activities to increase soil retention, water flow regulation, and carbon sequestration by embedding an ecosystem services-based approach in the guidance.

- Implementing institutional and policy reforms and enhancing government capacity to address property rights and land tenure.
- Strengthening and resourcing district-level administrations to decentralize natural resource management and put in place effective conflict resolution mechanisms for property rights disputes.
- Stronger legal and institutional frameworks to support climate financing, including establishing monitoring, reporting, and verification systems.

Priority 3: Address climate impacts on labor productivity and household livelihoods

The second-biggest impact of climate change on the economy is through shocks to labor productivity. Heat stress from climate change can reduce the performance of outdoor laborers, and many of these impacts are already being felt. The largest impacts are in agriculture, because activity in the sector involves mostly outdoor labor, followed by industry and then services. The analysis presented in Section 4 shows that impacts on labor productivity could reduce GDP by as much as 4.6 percent by 2050. The most vulnerable will be more affected; poorer households get most of their income from agriculture and informal labor while richer households rely more on businesses and wages. Even with adaptation measures, negative impacts on labor productivity will remain; one way to reduce them is through structural transformation of the economy, to shift labor away from agriculture and into sectors with fewer outdoor jobs. This, in turn, highlights the need to build human capital and to create new job opportunities. A well-educated population is also more resilient; for example, households are better able to shift jobs in response to shocks to cope with the impacts.

As structural transformation will take time, Malawi urgently needs to enhance support for vulnerable households through adaptive social protection programs. The scale-up of the Social Cash Transfer Program (SCTP) is a good start. The SCTP has recently incorporated a scalability mechanism to adjust transfers in response to extreme events, but as more data become available, transfers could be adjusted periodically in line with people's needs. Government can build on this capacity to expand the SCTP, particularly given additional investments in Unified Beneficiary Registry, enabling e-payments, and the grievance redress mechanism. Similarly, a redesigned enhanced public works program can provide social protection to vulnerable households while building natural capital and increasing resilience, advancing priority 2 to promote land restoration. Social protection programs will not only help households to cope with climate impacts; they will help households to accumulate human capital by protecting children from malnutrition.

The takeaway from this CCDR is clear: In Malawi, development and climate resilience are inextricably linked. The analysis shows that development aligned with the Malawi 2063, with additional adaptation investments yields the best outcomes for economic growth, poverty reduction, climate resilience, and Malawi's debt sustainability. Several measures that advance Malawi's development and climate goals can also slow GHG emissions growth, mainly by enhancing natural carbon sinks through investments in land restoration and forest protection. Malawi however faces serious fiscal and development challenges, that will limit the country's ability to implement adaptation measures. But the country can begin to address climate resilience now, starting with the lower cost and high impact priorities identified.

1 MALAWI'S DEVELOPMENT IN A CHANGING CLIMATE

1. Malawi's Development in a Changing Climate

1.1 Current Context and Key Challenges

Malawi is a low-income country, one of the poorest countries in the world,[1] and also one of the most densely populated. It is home to an estimated 20.4 million people (216 per square kilometer, four times the average in Sub-Saharan Africa).[2] As of 2019, almost three-quarters of the people lived on less than US$2.15 per day.[3] In rural Malawi, where 82 percent of Malawians live,[4] poverty is persistent and widespread, with poverty rates exceeding 65 percent in several districts; in urban areas, the average poverty rate is 19 percent, but it too has been rising slowly.[5]

Malawi has not grown its economy enough to significantly reduce poverty rates or make strong progress towards the Sustainable Development Goals (SDGs). From 2000 to 2020, Malawi grew its gross domestic product (GDP) by an average of almost 6.5 percent per year,[6] but population growth in that same period averaged almost 3.6 percent,[7] so the per capita GDP growth rate averaged a much more modest 1.5 percent per year.[8] Although by both measures, Malawi outperformed Sub-Saharan Africa as a whole, economic growth was not sufficient to reduce poverty. The share of the population living below the international poverty line dropped from 68.4 to 65.7 percent between 2010 and 2016 but increased to 70.1 percent in 2019.[9] Similarly, data on progress toward the SDGs show that Malawi faces "major challenges" in achieving 10 of the 15 goals and is only on track to achieve four—two of them because its energy use and consumption rates are very low.[10]

The country faces significant development challenges, including in governance. There are longstanding and systemic governance failures that have created inefficiencies and enabled corruption, a problem the government elected in 2020 has vowed to correct. Weak institutions, lack of transparency, and significant policy uncertainty all undermine the business environment.

Malawi lacks economic diversification, depending heavily on natural resources, especially low productivity rainfed agriculture. A World Bank analysis found that as of 2018, Malawi had just US$7,876 of wealth per capita, 52 percent of which was natural capital, while the averages for Sub-Saharan Africa were US$20,473 and 19 percent, respectively.[11] Agriculture, forestry, and fishing have

[1] With a gross domestic product (GDP) of just US$643 (in current US$) or US$1,658 (in purchasing power parity terms, using current international $) in 2021, Malawi ranked among the 12 poorest countries in the world—almost all of which are in Sub Saharan Africa. See World Development Indicators data from the World Bank: https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=MW (current US$) https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD?locations=MW (PPP, current international $).

[2] UN DESA. 2022. "World Population Prospects 2022." New York: United Nations Department of Economic and Social Affairs, Population Division. http://esa.un.org/unpd/wpp/.

[3] See World Bank data: https://data.worldbank.org/indicator/SI.POV.DDAY?locations=MW.

[4] Republic of Malawi. 2021. "Updated Nationally Determined Contributions." Lilongwe: Ministry of Forestry and Natural Resources. https://unfccc.int/sites/default/files/NDC/2022-06/Malawi%20Updated%20NDC%20July%202021%20submitted.pdf.

[5] Caruso, G. and L. Cardona Sosa. 2022. "Poverty Persistence in Malawi: Climate Shocks, Low Agricultural Productivity, and Slow Structural Transformation." Malawi Poverty Assessment. Washington, DC: World Bank Group. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099920006302215250/P174948072f3880690afb70c20973fe214d.

[6] Calculated as a compound annual growth rate (CAGR), in constant 2015 US$ with World Bank data from https://data.worldbank.org/indicator/NY.GDP.PCAP.KD?locations=MW.

[7] As with GDP, this is a CAGR value, using data from: UN DESA, 2022, "World Population Prospects 2022."

[8] Again, this is the CAGR value, using constant 2015 US$ with World Bank data; see https://data.worldbank.org/indicator/NY.GDP.PCAP.KD?locations=MW.

[9] See World Bank data for poverty headcount ratio at national poverty lines (% of population): https://data.worldbank.org/indicator/SI.POV.NAHC?locations=MW.

[10] See the Malawi country profile on the Sustainable Development Report dashboard: https://dashboards.sdgindex.org/profiles/malawi.

[11] Wealth as assessed in the Bank's "Changing Wealth of Nations" reports is defined as the sum of natural capital, physical capital, human capital, and net financial assets. Natural capital, in turn, comprises croplands, pasturelands, timber, forest-based ecosystem services, protected areas, mangroves, fisheries, fossil fuel energy, and minerals. Wealth per capita provides a measure of sustainability of economic growth, with an increase in wealth per capita reflecting sustainable economic growth. See World Bank. 2021. *The Changing Wealth of Nations 2021: Managing Assets for the Future*. Washington, DC: World Bank. http://hdl.handle.net/10986/36400;

accounted for 22–23 percent of GDP,[12] three-quarters of employment,[13] and up to three-quarters of export earnings in recent years.[14] Though some commercial crops, such as sugarcane, are often irrigated, and Malawi has about 90,000 ha of cropland suitable for irrigation, only about 30 percent of that land was actually irrigated as of 2018.[15] About 70 percent of cropland is used for a single crop: maize.[16]

Moreover, Malawi's natural capital is degrading, with implications for agricultural productivity and economic growth. With 97–98 percent of households relying on solid biomass—mainly firewood and charcoal— for cooking, typically on inefficient traditional stoves,[17] fuelwood harvesting has been identified as a major driver of deforestation and forest degradation in Malawi.[18] Unsustainable farming and grazing practices have also contributed significantly to land degradation, resulting in reduced vegetation cover and growing areas of bare land.[19] A 2017 study found 7.7 million hectares—more than 80 percent of Malawi's land area—could benefit from land restoration interventions.[20] An economic analysis found that, because topsoil loss harms crop productivity, just a 10 percent increase in topsoil loss could affect maize yields enough to reduce Malawi's GDP by 1 percent.[21] Watershed degradation has also affected the availability and quality of water resources.

Infrastructure deficits are large, constraining competitiveness and undermining economic diversification. World Bank analysis shows that Malawi's produced capital per capita, a measure of its infrastructure wealth, stood at only US$811, compared with US$4,619 across Sub-Saharan Africa.[22] Moreover, as a landlocked country, Malawi depends on its neighbors for access to global markets—and its own transport infrastructure is inadequate, ranked No. 38 (out of 54 countries) on the 2020 Africa Infrastructure Development Index.[23] As of 2020, only an estimated 14.9 percent of the population had access to electricity, mainly in urban areas.[24] A survey of businesses found more than 80 percent had to shut down at least some operations during electricity outages, and firms saw electricity to be the biggest obstacle to Malawi's economic growth. Malawi also needs to improve digital connectivity, which is closely linked to electricity access. Though the country has relatively good digital infrastructure, including a nationwide fiber network and good 3G and 4G coverage, actual broadband penetration—fixed and mobile—is very low.[25]

---

[12] See World Bank data for agriculture, forestry, and fishing, value added (% of GDP): https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS?locations=MW.

[13] See World Bank data for employment in agriculture (% of total employment), using modeled International Labour Organization estimates: https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS?locations=MW..

[14] See Malawi data on the Atlas of Economic Complexity: https://atlas.cid.harvard.edu/countries/152/export-complexity.

[15] Data from the UN Food and Agriculture Organization (FAO) Aquastat database: https://www.fao.org/aquastat/statistics/. The Third National Communication gives the same figure for land suited for irrigation, but estimates that about 40,000 ha are irrigated (p. 70).

[16] Fatch, P. et al. 2021. "Holistic Agricultural Diversity Index as a Measure of Agricultural Diversity: A Cross-Sectional Study of Smallholder Farmers in Lilongwe District of Malawi." *Agricultural Systems* 187 (February): 102991. doi:10.1016/j.agsy.2020.102991

[17] The Sustainable Development Report data dashboard estimates that 1.9 percent of the population has access to clean cooking fuels and stoves: https://dashboards.sdgindex.org/profiles/malawi/indicators.

[18] Republic of Malawi. 2021. "The Third National Communication of the Republic of Malawi." Lilongwe: Ministry of Forestry and Natural Resources. https://unfccc.int/documents/268340.

[19] Kirui, O.K., A. Mirzabaev, and J. von Braun. 2021. "Assessment of Land Degradation 'on the Ground' and from 'Above.'" *SN Applied Sciences* 3 (3): 318. doi:10.1007/s42452-021-04314-z.

[20] Republic of Malawi. 2017. "Forest Landscape Restoration Opportunities Assessment for Malawi." Study prepared with the International Union for Conservation of Nature and Natural Resources and the World Resources Institute. Lilongwe: Ministry of Natural Resources, Energy and Mining. https://portals.iucn.org/library/sites/library/files/documents/2017-029.pdf.

[21] Asfaw, Pallante, and Palma, 2020, "Distributional Impacts of Soil Erosion on Agricultural Productivity and Welfare in Malawi"; Asfaw, S. et al. 2018. "Soil and Nutrients Loss in Malawi: An Economic Assessment." Lilongwe: Food and Agriculture Organization of the United Nations, UNDP-UNEP Poverty-Environment Initiative, and Ministry of Agriculture, Irrigation and Water Development, Malawi. https://www.fao.org/family-farming/detail/en/c/1185502/.

[22] See World Bank, 2021, *The Changing Wealth of Nations 2021: Managing Assets for the Future*; Lange, Wodon, and Carey, 2018, *The Changing Wealth of Nations 2018: Building a Sustainable Future*.

[23] AfDB. 2020. "The Africa Infrastructure Development Index (AIDI) 2020." AfDB Statistics Department Economic Brief. African Development Bank. https://www.afdb.org/en/documents/economic-brief-africa-infrastructure-development-index-aidi-2020-july-2020.

[24] See World Bank data for access to electricity (% of population): https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=MW.

[25] See ITU's Digital Development Dashboard: https://www.itu.int/en/ITU-D/Statistics/Dashboards/Pages/Digital-Development.aspx.

Malawi has increased its human capital over the past decades, though challenges remain that are a drag on development. World Bank analysis shows that Malawi's human capital per capita increased from US$2,309 in 2000 to US$3,108 in 2018. Malawi's human capital per capita was nonetheless significantly lower when compared with the US$12,278 average for Sub-Saharan Africa.[26] Malawi's score on the Human Capital Index has improved, though only slightly, from 0.36 in 2010 to 0.41 in 2020, with minimal progress since 2017.[27] Malawi's workforce is undereducated, with a basic literacy rate of only about 70 percent among men and 55 percent among women.[28] About 17 percent of the population was undernourished in 2019, and 37 percent of children under 5 years old showed signs of stunting.[29]

Women and girls in Malawi face significant disadvantages that hinder their ability to accumulate human capital and rise out of poverty. The Bank's latest gender assessment pointed to a high fertility rate, high levels of teenage pregnancy and marriage, and inadequate access to reproductive healthcare and family planning as key factors.[30] Two in five women aged 15–24 are neither in school nor employed, and although more women than men aged 15 or older are literate (62 vs. 55 percent), more employed women live in poverty than employed men (70 vs. 63 percent), and are employed informally (74 vs. 67 percent).[31] Women farmers' plots are almost one-third less productive than men's, as women are less likely to grow cash crops and lack access to male labor and to agricultural technology and mechanization.[32]

The COVID-19 pandemic has negatively affected economic growth, creating new fiscal pressures, and exacerbating challenges to debt sustainability. Before the onset of the pandemic, Malawi's economy had been expected to grow by as much as 4.8 percent in 2020, but the actual growth rate was 0.8 percent.[33] GDP growth in 2021 is estimated at 2.8 percent, primarily driven by one-time increases in the agricultural sector. Public policy responses to the pandemic have increased government expenditure at a time when government revenues have fallen, resulting in a widening fiscal deficit. The latest debt sustainability analysis by the International Monetary Fund (IMF) and the World Bank, published in December 2021 found that Malawi was at high risk of external and overall debt distress.[34]

The Government has laid out its vision for the country's development to 2063,[35] and mapped out near-term steps in Malawi's Third Growth and Development Strategy, 2017–2022 (MGDS III).[36] A key element is a goal of 6 percent annual GDP growth to support transitioning Malawi to a lower-middle-income country by 2030, and to upper-middle-income status by 2063. It envisions actions around three key pillars: (i) a productive, commercialized, and diversified agriculture sector; (ii) a strengthened manufacturing sector, driven by productive and commercially vibrant agriculture and mining sectors; and (iii) the development of urban centers and tourism hubs across the country. The MGDS III is

[26] Background data for The Changing Wealth of Nations 2021 provided to the research team.

[27] See World Bank data for Human Capital Index (scale 0–1): https://data.worldbank.org/indicator/HD.HCI.OVRL?locations=MW.

[28] Data cited are for 2015, for people aged 15 and older. See UNESCO data: https://uis.unesco.org/en/country/mw?theme=education-and-literacy.

[29] See World Bank data (based on FAO statistics) for prevalence of undernourishment (% of population): https://data.worldbank.org/indicator/SN.ITK.DEFC.ZS?locations=MW and for wasting, weight for height (% of children under 5): https://data.worldbank.org/indicator/SH.STA.WAST.ZS?locations=MW.

[30] World Bank. 2022. "Malawi Gender Assessment." Washington, DC: World Bank. http://hdl.handle.net/10986/37537.

[31] All data from UN Women statistics. See https://data.unwomen.org/country/malawi.

[32] See World Bank, 2022, "Malawi Gender Assessment."

[33] World Bank. 2021. "Malawi Economic Monitor, December 2021: Addressing Macro and Gender Imbalances." Washington, DC: World Bank. http://hdl.handle.net/10986/36747.

[34] World Bank and IMF. 2021. "Malawi: Joint World Bank-IMF Debt Sustainability Analysis." Washington, DC: World Bank and International Monetary Fund. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/946631648217580282/Malawi-Joint-World-Bank-IMF-Debt-Sustainability-Analysis.

[35] Republic of Malawi. 2020. "Malawi 2063: An Inclusively Wealthy and Self-Reliant Nation." Lilongwe: National Planning Commission. https://npc.mw/wp-content/uploads/2021/01/MW2063-VISION-FINAL.pdf.

[36] Republic of Malawi, 2017, "The Malawi Growth and Development Strategy (MGDS) III: Building a Productive, Competitive and Resilient Nation."

aligned with those ambitions and identifies actions for the period 2017–2022, including a series of gender-related priorities.

1.2 Climate Shocks and Climate Change Projections

Climate shocks are exacerbating Malawi's development challenges. The number and severity of climate-related disasters in Malawi have increased in recent decades, with devastating consequences. Since 2010 alone, Malawi has experienced 16 major flooding events, a rainfall-related landslide, five storm-related disasters, and two severe droughts.[37] The first year of the devastating drought in 2015–2017, for instance, left 6.5 million people food-insecure, including 3.5 million children.[38] Hydropower production was also sharply reduced.[39] Tropical cyclones have also caused severe harm. Cyclone Idai devastated the country in 2019, and the 2022 cyclone season brought two storms: Tropical Storm Ana, in January 2022 (see Box 1), and Tropical Cyclone Gombe in March.

Box 1. The impacts of Tropical Storm Ana on people and infrastructure

Tropical Storm Ana hit southern Malawi on January 24, 2022, killing at least 46 people and injuring many more, destroying 71,700 hectares of crops, killing or injuring tens of thousands of livestock, displacing 190,400 people, and leaving nearly 1 million in need of humanitarian assistance.[40] Direct damages, excluding infrastructure, are estimated at US$126–192 million, equivalent to 1.5–2.7 percent of Malawi's 2020 GDP.[41] In addition, infrastructure damages are estimated at US$57–136 million, with the energy sector most severely impacted. This is due to damage to the Kapichira Hydroelectric Power Station, which accounts for 30 percent of the country's electricity generating capacity. Malawi is using an emergency World Bank operation to restore the hydropower infrastructure.[42]

Malawi has already documented some changes in its climate, including a rise in temperatures. The Malawi Department of Climate Change and Meteorological Services has reported a mean annual temperature increase of 0.2 °C since 1971. It is more difficult to determine whether there have been any significant changes in rainfall patterns, as large variations in rainfall occur naturally as well, and historical data are relatively sparse.[43]

Malawi is projected to become warmer in the coming decades, but there are considerable uncertainties in the projected changes. Climate models show average annual temperatures increasing in almost all scenarios, but the pace and scale of the increases varies significantly. Figure 1 shows the results across 125 climate models: historical data since 1995 and projections for the mean monthly

[37] See disaster data on EM-DAT: https://public.emdat.be (accessed August 15, 2022). For a graphic providing a longer-term view, see the World Bank Climate Change Knowledge Portal: https://climateknowledgeportal.worldbank.org/country/malawi/vulnerability.

[38] WBG, UN, and EU. 2016. "Malawi Drought 2015-2016: Post-Disaster Needs Assessment." Washington, DC: World Bank Group, United Nations, and European Union. http://hdl.handle.net/10986/25781..

[39] Sanje, K. 2015. "Malawi's Hydropower Dries up as River Runs Low, Menacing Forests." *Reuters*, October 29, sec. Forest & Wood Products. https://www.reuters.com/article/malawi-energy-hydropower-idUSL8N12S40920151029.

[40] OCHA. 2022. "Flash Appeal Malawi: Tropical Storm Ana, February 2022–May 2022." Lilongwe: United Nations Office for the Coordination of Humanitarian Affairs. https://malawi.un.org/en/173845-malawi-flash-appeal-tropical-storm-ana-february-may-2022; Government of Malawi. 2022. "Malawi: Tropical Storm ANA Situation Report (as of 15 February 2022)." Lilongwe: Department of Disaster Management Affairs. https://reliefweb.int/report/malawi/malawi-tropical-storm-ana-department-disaster-management-affairs-situation-report-2-15.

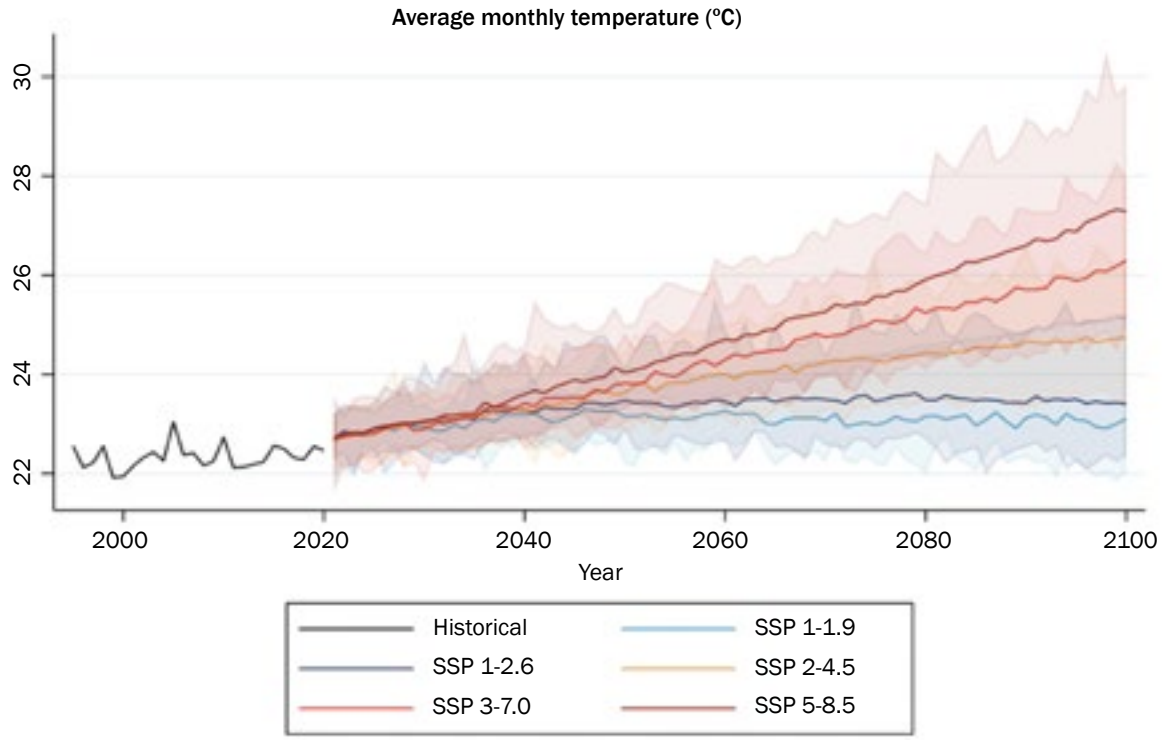
[41] Data are from an unpublished January 2022 Global Rapid Damage Estimation (GRADE) Report by the World Bank and the Global Facility for Disaster Reduction and Recovery.

[42] See https://projects.worldbank.org/en/projects-operations/project-detail/P178914.

[43] Vanya, C. et al. 2021. "Climate Change in Malawi: The Past, the Present and the Future." Blantyre: Malawi Department of Climate Change and Meteorological Services.

temperature to 2100.[44] The average projected increase across the model runs is 1.03°C by 2040 (from 22.34°C to 23.37°C), and 1.34°C by 2050 (to 23.68°C). The range of projected temperature changes is considerable reflecting the uncertainty in the how temperatures will change in the future.

Figure 1. Mean temperature trends and projections to 2100 across 125 climate models



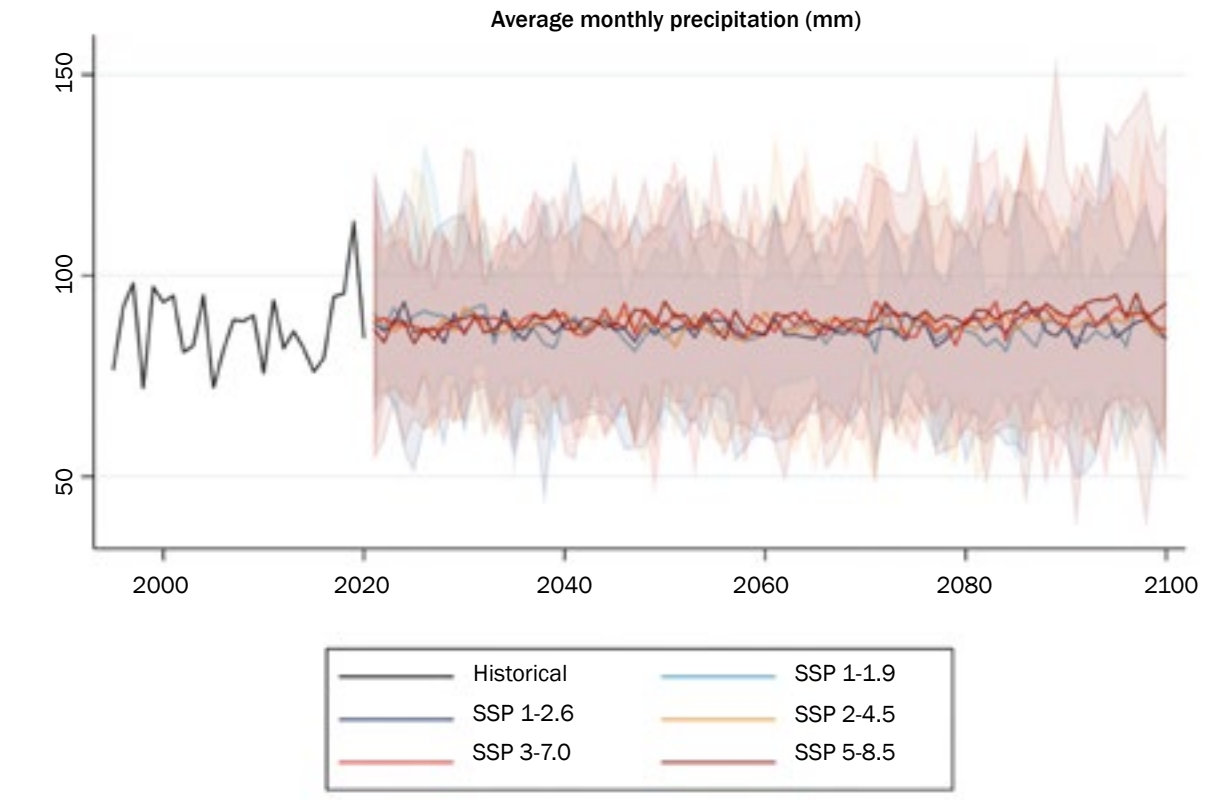
Source: World Bank. Note: The solid lines represent the average across climate models for each of the SSPs.

Projections of future precipitation are more uncertain, with large differences across model runs. Figure 2 shows historical data since 1995 and projections to 2100. Across the 125 model combinations, 57 (46 percent) predict wetter conditions, while 68 (54 percent) predict reductions in annual rainfall by the 2050s, pointing to deep uncertainty about future rainfall patterns. As highlighted by the latest IPCC assessment, globally and in southeastern Africa in particular, extreme precipitation events are also expected to intensify and become more frequent.[45] There is also high confidence that warming will intensify very wet and very dry weather, with implications for flooding and drought.

[44] Modeling for this CCDR used the CMIP6 suite of climate models, in line with the latest Intergovernmental Panel on Climate Change assessment, examining scenarios that combine Shared Socioeconomic Pathways (SSPs) with representative concentration pathways (RCPs): SSP1-1.9, SSP1-2.6, SSP2-4.5, SSP3-7.0, and SSP5-8.5. The SSPs are based on narratives describing broad socioeconomic trends: a shift toward sustainability and equality (SSP1); trends broadly along historical patterns (SSP2); resurgent nationalism (SSP3); growing inequality (SSP4); and rapid and unconstrained growth (SSP5). The SSPs are separate from the RCPs, which provide a range of global GHG emissions trajectories, but it is assumed that some pairings are likelier than others. The five SSP-RCP combinations chosen for this report, called SSPs for short, are run through general circulation models (GCMs) that project future climate conditions. In total, this analysis considers 125 GCM-SSP combinations. CMIP6 is the sixth phase of the Climate Model Intercomparison Project.

[45] IPCC. 2022. "Summary for Policymakers." In *Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*, edited by H.-O. Pörtner et al. Cambridge, UK, and New York: Cambridge University Press (in press). https://www.ipcc.ch/report/ar6/wg2/;

Figure 2. Mean precipitation trends and projections to 2100 across 125 climate models



Source: World Bank. Note: The lines represent the average across climate models for each of the SSPs.

1.3 How Climate Change Could Affect Malawi's Future Development

Climate change is expected to exacerbate Malawi's development challenges. Malawi is considered highly vulnerable to climate change, 163rd out of 182 countries ranked for 2020 on the ND-GAIN Index.[46] The expected impacts of climate change will put both urban and rural communities at risk, and particularly poor and vulnerable groups. Climate change will also put the country's asset base and drivers of growth at risk.

The agriculture sector is highly vulnerable to climate shocks—particularly for smallholders. Given that the vast majority of Malawi's crop production is rainfed, reliant on a single rainy season, changes in precipitation pose significant threats. Already, increased dry spells have reduced maize yields and production, resulting in recurrent food insecurity, as diversification is limited. Cyclone Idai, which hit Malawi in March 2019, caused devastating floods that affected an estimated 975,600 people and submerged or washed away mature crops, and destroyed irrigation infrastructure.[47] Climate change will also make it harder for the country to transition from low-productivity, subsistence agriculture to a more productive and commercially oriented sector, in line with the Malawi 2063 vision.

Climate change exacerbates threats to Malawi's natural capital, particularly its water and land resources. Malawi is already a water-scarce country and climate change will worsen many challenges,

[46] The Notre Dame Global Adaptation Initiative (ND-GAIN) Index is widely respected for taking into account a broad range of factors that, together, shape vulnerability, as well as economic, governance, and social factors that measure adaptation readiness. For 2020, Malawi is ranked 25th most vulnerable, and 160th in terms of readiness to respond to climate change. See https://gain.nd.edu/our-work/country-index/rankings/.

[47] Government of Malawi. 2019. "Malawi 2019 Floods Post Disaster Needs Assessment Report." Lilongwe. https://reliefweb.int/report/malawi/malawi-2019-floods-post-disaster-needs-assessment-report.

such as the erratic availability of water from shallow wells (the source of water for over 85 percent of the rural population);[48] increased demand for drinking water due to higher temperatures; and increased risks of water pollution and waterborne diseases due to flood events. Climate change is also expected to increase soil erosion and further degrade watersheds, leading to the loss of fertile soil with adverse impacts on agricultural productivity, and increased sedimentation in rivers, lakes, and reservoirs downstream, and reduce storage capacity needed for domestic uses, irrigation, energy generation, and flood control.

Climate change threatens Malawi's energy, transport, and communications infrastructure. Malawi's energy sector and its infrastructure are highly susceptible to climate variability. This impact is especially significant on its existing hydropower stations, most of which are on the Shire River. Transport infrastructure is already highly susceptible to climate-related shocks; repairing roads damaged by Tropical Storm Ana, for instance, is expected to cost US$6.1 million.[49] Extreme weather events can significantly reduce the performance of transport infrastructure, disrupt services, and isolate communities for extended periods. Severe droughts also affect water levels in Lake Malawi, with implications not only for fisheries, but also for port assets. Recurring floods, which increase the risks of subsidence, corrosion, and reduced stability of foundations and tower structures, also adversely affect digital infrastructure. For example, the southern tip of Lake Malawi is especially prone to riverine floods and is densely covered by 3G infrastructure.[50] This raises the risk of network infrastructure failure in the region, which would in turn affect other critical infrastructure and services, such as power grids, railways, banking, and retail. Such a failure would exacerbate the impacts of climate disasters.

Urban areas are likely to face increasing climate change impacts, including from more frequent torrential rains, and riverine floods, and because of unplanned growth and expansion in flood prone areas,[51] jeopardizing Malawi's urban growth center-focused growth strategy. More frequent and intense rainfall events and flooding will increase damage to public infrastructure and private property, increase the incidence of waterborne diseases, and disrupt economic and social activities. This is a particular concern for informal settlements, which is where the vast majority of urban residents in Malawi are now concentrated.[52]

Malawi's infrastructure deficit, often viewed as a constraint on development, now offers an opportunity to re-evaluate needs and priorities and build infrastructure differently. Climate change places new demands on the design and operation of most infrastructure, including in urban areas. For example, roads and buildings need to be able to withstand increasingly severe storms and floods. Retrofitting existing infrastructure to make it more climate-resilient is often costly, but new infrastructure investments can often be made resilient more cost-effectively.[53] The Government has estimated adaptation investment needs for transport infrastructure to be between US$437 million and US$1.75 billion with a cost-benefit ratio between 1.7 and 2.7.[54] International experience shows that innovative nature-based and flexible approaches to climate-resilient infrastructure may even reduce costs relative to conventional approaches.[55]

---

[48] Malawi Integrated Household Survey, 2019–2020.

[49] Government of Malawi, 2022, "Malawi: Tropical Storm ANA Situation Report (as of 15 February 2022)."

[50] Ballan, S. et al. 2022. "Malawi CCDR Digital Sector Background Note." Washington, DC: World Bank.

[51] "Jha, Abhas K.; Bloch, Robin; Lamond, Jessica. 2012. *Cities and Flooding: A Guide to Integrated Urban Flood Risk Management for the 21st Century*. World Bank. © World Bank. https://openknowledge.worldbank.org/handle/10986/2241 License: CC BY 3.0 IGO."

[52] About 80 percent of urban residents in Malawi live in informal housing, according to UN Habitat. See https://unhabitat.org/malawi.

[53] Hallegatte,S. et al. 2019. Lifelines - The Resilient Infrastructure Opportunity. Washington DC: World Bank Group. *© World Bank. https://openknowledge.worldbank.org/handle/10986/31805 License: CC BY 3.0 IGO.*

[54] Republic of Malawi, 2020, "Malawi National Transport Master Plan."

[55] OECD. 2018. "Climate-Resilient Infrastructure." OECD Environment Policy Paper No. 14. Paris: Organisation for Economic Co-operation and Development. doi:10.1787/4fdf9eaf-en. *Browder, G. et al. 2019. Integrating Green and Gray: Creating Next Generation Infrastructure. Washington, DC: World Bank and World Resources Institute. © World Bank and World Resources Institute. https://openknowledge.worldbank.org/handle/10986/31430 License: CC BY 4.0*

Climate change could imperil Malawi's ambitions to grow its tourism sector. The National Tourism Investment Master Plan 2022–2042,[56] launched in April 2022, identifies Malawi's lakes and nature and wildlife as its top tourist attractions. Climate change could undermine those assets and exacerbate biodiversity loss and land degradation. More frequent and more intense extreme events could also damage tourism infrastructure—and, as noted, both transport and communications infrastructure, which are important for tourism, are at risk as well.

Similarly, climate change poses risks to mining in Malawi, but global decarbonization efforts also create opportunities. The Malawi 2063 describes mining as a key component of industrialization and future economic growth. However, climate change impacts such as severe floods can damage infrastructure in the mining sector, a challenge that would be exacerbated by deforestation caused by mining activities. At the same time, Malawi's rich endowments of minerals needed to supply low-carbon technologies[57]—such as graphite, rare earths elements, niobium, graphite, and titanium mineral concentrates—provide a tremendous opportunity to support the country's development goals, while advancing global carbon mitigation efforts.

Climate change will affect the geographic range and burden of a variety of health risks throughout Malawi. Climate-related disasters not only cause injuries and deaths but can also lead to outbreaks of vector- and water-borne diseases. Cholera has been a recurring problem in Malawi, for instance, most recently in the aftermath of Tropical Storm Ana.[58] Climate change also poses risks due to extreme heat, and could affect many people's productivity and mental health. The most widely felt impacts of climate change are hunger and malnutrition, as food insecurity is a chronic problem in Malawi, in part driven by increasingly unreliable precipitation that affects agricultural productivity.

1.4 Climate Change Impacts on the Most Vulnerable Populations[59]

The poorest households, who are already particularly vulnerable to climate shocks, will be disproportionately affected by climate change, which will further reduce their incomes. Households in Malawi rely on income from four main sources: agriculture, informal labor markets, household business activities, and wage labor. Poor households get most of their income from agriculture and informal labor, while wealthier households rely more on businesses and wages. As noted, agriculture is very susceptible to damage from droughts and floods. Recent work by the World Bank estimates that agricultural returns in 2019 were 17 percent lower for households affected by floods at least once between 2016 and 2019.

Climate-related disasters can push affected people into poverty. For instance, while droughts increase the poverty rate among affected people by 14 percentage points, for those with only a primary education or less, who also tend to have lower incomes, the impact is 26 points. For floods, the corresponding increases are 14 and 30 percentage points, respectively. Individuals in the lowest two income quintiles are far more likely to have primary education or less, compared with the highest quintiles.

Women and girls in Malawi are particularly vulnerable to climate shocks. A 2018 study used harmonized longitudinal survey data and climate records in Malawi to capture the gendered effects of extreme weather events.[60] It found that temperature-related shocks affected overall household consumption, food consumption, non-food consumption, and caloric intake more in households

[56] Republic of Malawi, 2022, "Malawi National Tourism Investment Plan 2022-2024."

[57] World Bank. 2009. "Malawi – Mineral Sector Review: Source of Economic Growth and Development." Washington, DC: World Bank. http://hdl.handle.net/10986/3129.

[58] WHO, 2022, "Tropical Storms, Flooding and Cholera: Malawi Faces Cholera Emergency amidst Severe Climate Events."

[59] This section draws on Caruso and Cardona Sosa, 2022, "Poverty Persistence in Malawi: Climate Shocks, Low Agricultural Productivity, and Slow Structural Transformation."

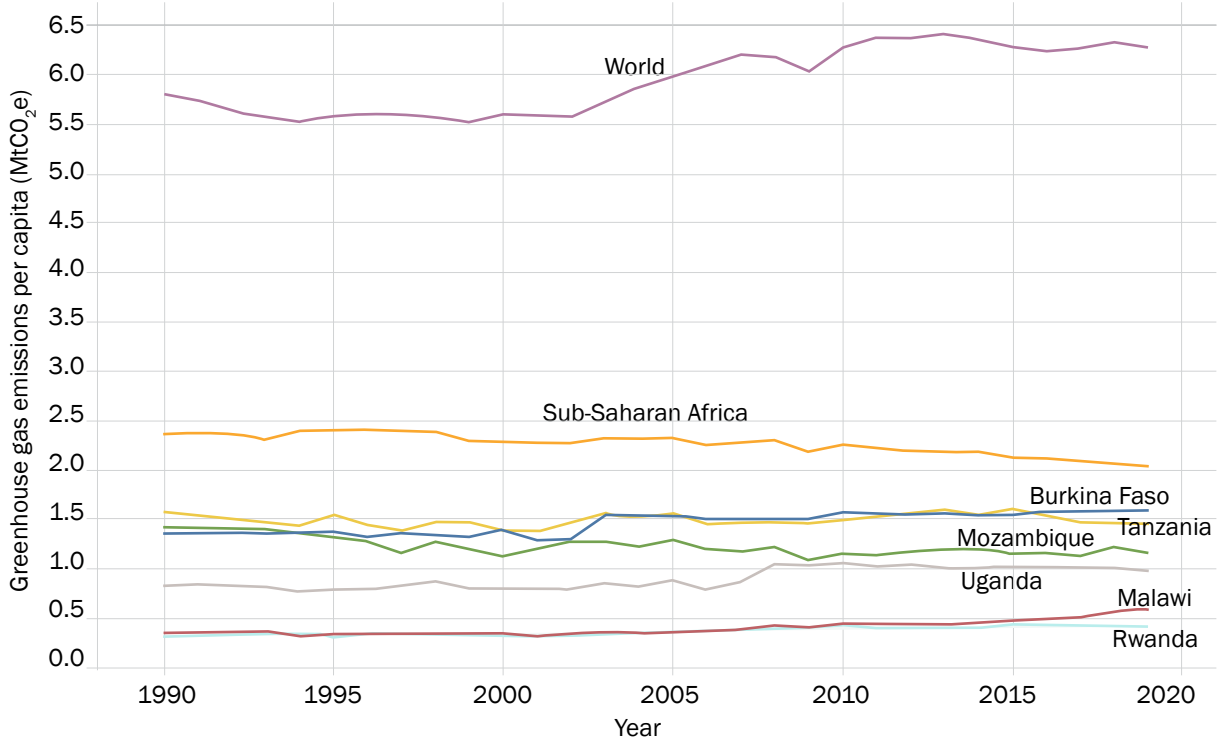
[60] Asfaw, S. and G. Maggio. 2018. "Gender, Weather Shocks and Welfare: Evidence from Malawi." *The Journal of Development Studies* 54 (2). Routledge: 271–91. doi:10.1080/00220388.2017.1283016.

in which the land was managed solely by women than in those households in which the land was managed by men or managed jointly. The authors attributed differences in vulnerability to climate shocks to women's lack of access to land-tenure security.

1.5 GHG Emissions and Decarbonization Opportunities

Malawi has a very small greenhouse gas (GHG) emissions footprint. In 2019, its total GHG emissions were only 19.34 million tonnes (metric tons) of carbon dioxide equivalent ($MtCO_2e$), including land use change and forestry (LUCF), or 10.95 $MtCO_2e$ without LUCF, about 0.02 percent of global emissions.[61] The latter translates to just 0.59 tCO2e—per capita—the lowest in the world. Including LUCF, Malawi's 2019 per capita emissions are just 1.04 tCO2e, 11th-lowest in the world and still one of the lowest in Sub-Saharan Africa. Figure 3 shows how Malawi's emissions footprint compares with its neighbors' and with the world average.

Figure 3. Per capita annual GHG emissions in Malawi, surrounding countries, and the world



Data source: Climate Watch, 2022.[62]

The top-emitting sectors in Malawi are agriculture and land use change and forestry. In 2019, the energy sector emitted an estimated 1.61 $MtCO_2e$, including 1.18 $MtCO_2e$ from transport; most of the rest was from biomass combustion for household energy. The agriculture sector emitted 7.86 Mt CO2e (not including land conversion), while industrial processes produced 1.02 Mt CO_2e, and the waste sector, 0.45 Mt CO_2e. As noted, LULC contributed 8.39 $MtCO_2e$.

Emissions are expected to increase over the coming decades, in line with population growth, but Malawi will still maintain a small carbon footprint. Recent projections suggest that, with current policies, Malawi's total GHG emissions (excluding LUCF) would at most roughly quadruple, to 42.34

[61] Climate Watch. 2022. "Global Historical Emissions." Washington, DC: World Resources Institute. https://www.climatewatchdata.org/ghg-emissions.

[62] Climate Watch, 2022.

$MtCO_2e$ by 2050.[63] The majority of the predicted increase is emissions from the energy and transport sector.

There is an opportunity to jointly achieve greater climate resilience, reduce Malawi's carbon footprint, and bring local health benefits from reduced indoor air pollution. Investing in land management to enhance terrestrial carbon storage, lowering the dependence on forests for fuelwood, and providing Malawians access to diversified and modern fuel and technologies for cooking will achieve increased resilience, sequester carbon, and reduce health impacts of indoor air pollution. For instance, household air pollution from use of solid biomass that produce both $PM_{2.5}$ and carbon monoxide emissions has been linked to an estimated 12,400 premature deaths and 627,400 disability-adjusted life years lost each year in Malawi.[64]

[63] Projections range from 24.2 Mt CO_2e to 42.34 Mt CO_2e by 2050, as modeled using GCAM5.3 and REMIND-MAgPIE 2.1-4.2, respectively. The updated NDC projects that total emissions will increase to 34.61 Mt CO_2e by 2040.

[64] Health Effects Institute. 2020. State of Global Air 2020. Special Report. Boston MA: Health Effects Institute.

2 MALAWI'S CLIMATE POLICIES AND GOVERNANCE CAPACITY

2. Malawi's Climate Policies and Governance Capacity

The Government of Malawi has indicated its strong commitment to tackling climate change by reducing emissions and building resilience through adaptation measures. Malawi prepared a National Adaptation Program of Action (NAPA) in 2006 and updated it in 2015,[65] when it also published its Nationally Appropriate Mitigation Actions (NAMA).[66] Malawi is also a signatory to the Paris Agreement and first submitted its intended nationally determined contribution (INDC) in 2015,[67] which was revised in 2021 as Malawi's updated nationally determined contribution (NDC).[68]

Malawi's updated NDC makes an unconditional economy-wide GHG emission reduction commitment, as well as a much more ambitious pledge conditional on the provision of external support. The unconditional commitment, to be achieved using domestic resources, is to reduce GHG emissions by 6 percent by 2030 relative to a business-as-usual (BAU) pathway, and to keep emissions at 6 percent below BAU up to 2040. The conditional pledge is to reduce GHG emissions by another 45 percent by 2040. Both targets exclude emissions from land use change and forestry (LUCF).

Malawi's updated NDC also provides details on implementing actions to reduce emissions and address climate risks. The Implementation Plan of the NDC identifies more than 30 mitigation actions and more than 70 adaptation actions across a range of sectors. The proposed mitigation actions cover energy, industrial processes and product use, waste management, and agriculture. The adaptation actions, which, like the mitigation pledge, include activities to be funded with domestic resources as well as a much more ambitious agenda with international support, include climate services, strengthening governance for effective NDC implementation, and measures to build resilience in the water sector; biodiversity and ecosystems; agriculture, livestock and fisheries; infrastructure; and human well-being. Notably, although the NDC provides extensive details of all the proposed actions, it does not prioritize or set specific targets for the individual actions.

2.1 Policies and Institutions for Climate Change Management[69]

Government of Malawi's key vision and planning documents are starting to address aspects of climate change and disaster risk management (DRM). The principles laid out in Malawi's Constitution have underpinned key vision and planning documents, such as Malawi 2063 and its predecessor, a vision to 2020; the Malawi 2063 Implementation Plan (MIP I) (2021–2030); and three Malawi Growth and Development Strategies (MGDS I, II, and III). Malawi 2063 emphasizes the need for effective climate responses and DRM. The MIP-I explicitly calls for (i) ecosystem conservation and environmental management; (ii) waste management and a green economy; (iii) climate change management; (iv) environmental and climate finance; and (v) disaster preparedness.

Malawi has several laws, policies, and plans that focus on climate change, and disaster risks.[70] The National Climate Change Management Policy (NCCMP 2016) is the main strategy guiding the Government's actions on climate change adaptation, mitigation, research, technology development

[65] Republic of Malawi. 2015. "Malawi National Adaptation Programmes of Action, Second Edition." Lilongwe: Ministry of Natural Resources, Energy and Mining, Environmental Affairs Department. https://www.ead.gov.mw/storage/app/media/Resources/Miscellaneous/National%20Adaptation%20Programmes%20of%20Actions.pdf.

[66] Republic of Malawi. 2015. "Nationally Appropriate Mitigation Actions for Malawi." Lilongwe: Ministry of Natural Resources, Energy and Mining, Environmental Affairs Department. https://www.ead.gov.mw/storage/app/media/Resources/Miscellaneous/Nationally%20Appropriate%20Mitigation%20Actions.pdf.

[67] Republic of Malawi. 2017. "Intended Nationally Determined Contribution." Lilongwe: Ministry of Forestry and Natural Resources. https://unfccc.int/sites/default/files/NDC/2022-06/MALAWI%20INDC%20SUBMITTED%20TO%20UNFCCC%20REV.pdf.

[68] Republic of Malawi, 2021, "Updated Nationally Determined Contributions."

[69] This section draws on the Malawi Climate Change Institutional Assessment that is a background paper for the Malawi CCDR.

[70] Malawi's climate and environmental policies are not all easily accessible on Government websites, but a large number, including some not discussed here, are available at http://www.ead.gov.mw/resources/document-library.

and transfer, and capacity building.[71] The National Disaster Risk Management Policy (NDRMP 2015) does the same for DRM.[72] However, a DRM bill introduced in 2018 that would update the Disaster Preparedness and Relief (DPR) Act of 1991,[73] has yet to be voted on by Parliament. The National Resilience Strategy 2018–2030 (NRS), meanwhile aims to promote more coherent, coordinated, and efficient approaches to food security, climate change and disaster response, and humanitarian interventions to "break the cycle of food and nutrition insecurity" in Malawi.[74] The strategy covers priorities such as climate-resilient infrastructure, enhancing adaptive capacity, and improved access to climate information and early warning systems.

Several dedicated funds have been established to support climate action and DRM at both the national and local levels. Under the Forest Act, a Development Trust Fund was established to finance investments in forest landscape restoration across the country. The DPR Act has the DPR Fund to support activities towards disaster risk reduction, preparation, prevention, mitigation, and early warnings. The Environmental Affairs Department (EAD) is in the process of setting up a National Climate Change Fund ("Climate Fund") to support adaptation, mitigation, research, and capacity development activities. Consultations with stakeholders on the Climate Fund began in 2019.

Several institutions share responsibilities for climate action, and DRM at the national and local levels. The EAD, the Department of Climate Change and Metrological Services (DCCMS), and Department of Disaster Affairs Management (DoDMA) are the entities overseeing climate change and disaster-related policies. The National Technical Committee on Climate Change and Disaster Risk Management (NTCCC-DRM) provides technical guidance to the Climate Change National Steering Committee (CCNSC), which is chaired by the Secretary to the Office of the President and Cabinet and includes ministries, departments, and agencies. At the district level, activities are implemented through the District Executive Committee, which has subcommittees on the environment and civil protection. At the community level, actions are executed through area and village development committees, which also have subcommittees on the environment and natural resources.

2.1.1 Key areas for improvement in Malawi's governance frameworks

Malawi has a relatively strong climate policy framework but there are overlaps and undefined functional mandates for leadership and implementation. The EAD coordinates the implementation of most climate change initiatives within the Ministry of Natural Resources and Climate Change, and the DCCMS has been mandated with providing information on weather and climate. However, DCCMS does not have financial resources or relevant capacities such as in communications to fulfill its responsibilities. EAD and DoDMA lack the legal mandate to follow climate change management actions implemented through sectors such as agriculture, energy, forest, water resources, land resources conservation, and others. Planning of interventions is still highly fragmented, so DoDMA and EAD tend to program activities without engaging with the other institutions, resulting in duplication of activities among agencies.

There is no legal instrument, enacted through Parliament, for regulating climate and DRM investments at both the national and local levels. This gap in the legal framework also disempowers responsible institutions from taking full responsibility for climate and DRM programming, implementation, and evaluation. Malawi is now developing a position paper on the need for a new

[71] Government of Malawi. 2016. "National Climate Change Management Policy." Lilongwe: Ministry of Natural Resources, Energy and Mining, Environmental Affairs Department. https://reliefweb.int/report/malawi/national-climate-change-management-policy.

[72] Government of Malawi. 2015. "National Disaster Risk Management Policy, 2015." Lilongwe: Secretary and Commissioner for Disaster Management Affairs. https://www.preventionweb.net/publication/malawi-national-disaster-risk-management-policy-2015.

[73] Government of Malawi. 1991. "Disaster Preparedness and Relief Act, 1991 (revised in 2014)." https://www.malawilii.org/akn/mw/act/1991/27/eng@2014-12-31

[74] Government of Malawi. 2018. "National Resilience Strategy (2018–2030): Breaking the Cycle of Food Insecurity in Malawi." Lilongwe: Department of Disaster Management Affairs. https://www.preventionweb.net/publication/malawi-national-resilience-strategy-nrs-breaking-cycle-food-insecurity.

legal instrument to guide climate action but is has yet to translate it into a climate change bill. Moreover, as noted above, DRM legislation drafted in 2018 has yet to go before Parliament. The delay in developing and approving these two bills makes the functional mandates for EPA, DCCMS, EAD, and DoDMA difficult and unclear. Current investments are therefore overseen and implemented by various stakeholders, making it difficult for the leading institutions (for example, Ministry of Finance and the Planning Commission) to coordinate and monitor resource allocation and execution.

Financing for climate and DRM-related actions at both the national and local levels is inadequate or nonexistent. Despite high-level planning, most activities in the National Climate Change Management Investment Plan 2013–2018[75] have yet to be implemented, due to the lack of financial resources. Discussions with the Ministry of Finance indicated that there are resources that the Treasury collects through instruments that are meant to be channeled to climate change mitigation activities, including the carbon tax and fuel levies. The majority of these earmarked funds have not been transferred for climate change actions due to a lack of an operationalized Climate Fund and an associated set of bankable project proposals. Of the MK 4.1 billion collected through the carbon tax and fuel levy, only one-eighth was ultimately appropriated for climate investments. Funds are rarely allocated for prevention or reduction interventions and instead, following disasters, the Government appropriates resources from the Vote of Unforeseen Expenditure to DRP Fund to be used in response.[76]

There are no explicit development transfers to local authorities dedicated to climate change projects, although transfers for DRM activities have increased. Development transfers have increased in volume and as a percentage of the transfer pool in recent years, driven by the introduction of the Performance Based Grant (PBG) in FY21/22 as a complement to the District Development Fund. These are purely discretionary and are meant to fund priority development projects identified in District Development Plans. Some projects could specifically target climate-related objectives, but those actions are not coordinated, and environmental considerations are not systematically incorporated in local project identification and development. Other recurring transactions for environmental purposes are transferred to local authorities, but have declined on a real, per capita basis by almost 50 percent since FY09/10. The notable exception is recurring funding for DRM introduced in FY20/21—which is now the largest such transfer to a sector after health, education, and agriculture.[77]

The majority of funds that flow to finance actions on climate and DRM are therefore fragmented and off-budget. Most are now financed by development partners and implemented off-budget— meaning the funds are spent directly through parallel projects as opposed to through government systems and budgets. While off-budget programming is a historical response to low confidence in weak government financial systems, it is unsustainable and diminishes government accountability over the longer term. Also, this has led to a proliferation of parallel mechanisms of monitoring, evaluating, verifying, and reporting which do not go through government systems. At the subnational level, the vast majority of these resources are not transferred to local authorities but are instead retained by the central government to be spent on their behalf. There is no legal backing for district- or community-led response planning or monitoring of interventions. Most investments are identified centrally, which goes against the tenets of decentralization. As these funds are often allocated in an emergency environment, public procurement processes are relaxed with the justification of expediency of delivery at the expense of transparency, and accountability of resource use.

There is minimal recognition of climate change and DRM considerations in Malawi's public investment management (PIM) processes. The NCCMP 2016 for example does not mention the

[75] Government of Malawi. 2013. "National Climate Change Investment Plan 2013–2018." Lilongwe: Ministry of Environment and Climate Change Management, Environmental Affairs Department. http://extwprlegs1.fao.org/docs/pdf/mlw190674.pdf.

[76] Republic of Malawi. 2022. "Public Finance Management Act, 2022." Lilongwe. https://gazettes.africa/archive/mw/2022/mw-government-gazette-dated-2022-03-31-no-2C.pdf.

[77] In FY20/21, local authorities were budgeted MW 1.079 billion in other recurring transactions for DRM, while the environment was budgeted MW 154 million. Other key sector recurring transfers were for education (MW 4.147 billion), health (MW 7.788 billion), and agriculture (MW 1.405 billion).

role of the Ministry of Finance in implementing the climate agenda or in assessing macroeconomic risks related to climate change. Hence, the current Public Sector Investment Plan (PSIP) prioritization tools utilized to implement PIM frameworks do not include a climate/DRM lens. While most public investments screening processes do include some environmental and social impact assessments, this consideration is not done systematically, and the framework does not integrate specific climate vulnerability screening. Moreover, as Malawi does not have any framework in place to implement regular maintenance of public assets, existing and newly built infrastructure alike is vulnerable to climate change impacts, and disruptions to service delivery. Moreover, the National Public Procurement and Asset Disposal Act (2017) did not mainstream the concept of green public-private partnerships, which also hampers the development of climate resilient infrastructure.

There is no framework for monitoring, evaluation, and reporting of climate and DRM projects. The monitoring and evaluation system managed by the Department of Economic Planning is evolving into an online harmonized platform—but the system does not have a national target for climate change adaptation and mitigation efforts that could be used to measure progress against. Moreover, the system does not capture data and progress on climate or DRM interventions, making it difficult for the country to account for gains and update the NDC. The data that are captured are not easy to isolate for analysis or to share across agencies and with stakeholders. Based on the Decentralization Policy of 1998, local authorities are supposed to be assigned functions and services in various climate change-related sectors (including monitoring and evaluation), but this is a largely unfunded mandate. Finally, there is no clear policy on stakeholder engagement, including at the community level. Discussions with civil society organizations (CSOs) indicated that they are seldom consulted by the Government or by donors when designing strategies and programs.[78]

2.1.2 Recommendations for Strengthening Policy Frameworks and Institutions

Malawi needs to fully integrate and mainstream climate action and DRM across government institutions and improve overall governance. Key actions include:

Develop and adopt new, coordinated legal frameworks on climate change and disaster risk management: As noted above, a new climate change bill is in the works, and a DRM bill drafted in 2018 has yet to be brought before Parliament. Both should be fast-tracked for completion, in a coordinated manner, and submitted for approval. The climate bill should integrate the NDC process, calling for the submission of annual progress reports on NDC targets. It should also strengthen the leadership of the mandated government agencies, namely EAD, DCCMS, and DoDMA, with required human and financial resources, and it should clarify the mandates of various stakeholders at the national and local level and enhance the coordination process. It is also important to develop a consistent monitoring and evaluation framework for climate action and DRM, to be used by relevant sectors with the support of DCCMS, EAD, and DoDMA.

Clarify eligibility for use of dedicated climate and DRM funding: As provided in the NDC, develop a resource mobilization strategy to support the implementation of the NDC, clarifying which expenditures are eligible for climate and DRM funds. Considering the inadequacy of resources now allocated to these activities and their implementing agencies, it may be helpful to focus domestic resources on screening, prioritizing, and designing public infrastructure projects that increase resilience to climate change and disaster risks. In other words, the goal should be to make all financed infrastructure projects more resilient. Resources for these investments could also mirror an element of a matching fund with donor partners—establishing the foundation for bringing pooled climate dedicated funds on budget and increasing confidence in Government systems. Equally, the DRM fund could have a

[78] During the consultation process for the Malawi Climate Change Institutional Assessment (CCIA), the World Bank met with a collection of Civil Society Organizations (CSOs) to explore the existence and/or functionality of stakeholder engagement mechanisms and the extent to which stakeholder inputs are taken into account during government programming and policy making in the climate change and DRM sectors.

determined proportion to be allocated to climate-related disasters, with specific objectives on disaster risk reduction, prevention and preparedness, with some resources earmarked for disaster response and humanitarian assistance.

Streamline climate-sensitive PIM across all Government infrastructure investments: The Government should integrate climate risk screening in the public sector investment program and make this process mandatory for all projects through regulations under the Public Financial Management Act. In addition, environmental and social impact assessments should be part of the funding qualification of public infrastructure investments. This can eventually become an incentive for mainstreaming green PPPs.

Empower local governments by increasing the decentralization of climate and DRM funds to support district-led action plans: First, the Ministry of Finance and Economic Affairs should provide discretionary funds to local governments to empower district-led climate and DRM investments, tied to performance and existing performance-based grant architecture at the district and local levels. Second, the Department of Economic Planning should develop a monitoring, evaluation, and reporting system that allows the exchange of climate and DRM information between districts and the national government. The monitoring system should allow tracking of annual progress reports on these investments. Climate and DRM-related objectives and actions, including those contained in the NDC and the NRS, should be included in district development plans.

Empower communities and civil society organizations to shape climate actions and DRM and to monitor and evaluate results: Participatory mechanisms are crucial to effective climate action and DRM, as these challenges are multisectoral and entail several layers of governance and engagement. Achieving this will require a combination of (i) community engagement in environmental, climate, and DRM action plans, (ii) upstream civil society engagement in climate policy design and implementation processes, and (iii) experimenting further and scaling up best practices piloted in other countries or within the region. Existing mechanisms that can be used to strengthen collaboration with CSOs include expert working groups and the National Youth Council of Malawi.

Prioritize targeted capacity building within and between levels of government: The ministries and departments with the greatest expertise in climate action and DRM have key roles to play in building the capacities of their counterparts in other agencies, including to help them understand the NDC and NRS objectives and priority areas. DCCMS, EAD, and DoDMA should also help build the capacities of district-level authorities to support the implementation of climate and DRM actions. The latter will also need comprehensive hazard maps to inform district development planning, including land use planning and investments.

2.2 Social Protection as a Pillar of Climate Resilience

The social protection system is central to Malawi's governance framework to protect the most vulnerable populations and build their resilience. However, Malawi's social protection system is now donor-dependent and thus highly fragmented, though reforms are underway to improve efficiency and reduce the administrative burden on Government. This involves updating the National Social Support Policy (2012), which guides the design, implementation, coordination, monitoring and evaluation of social protection programs.

Malawi has four main mechanisms, for channeling resources to and building the resilience of the most vulnerable communities and households but these are mainly donor funded. The Social Cash Transfer Program (SCTP) is the country's flagship program, but only covers 7 percent of the population—a fraction of those living in extreme poverty. The SCTP provides unconditional cash transfers to very poor and labor constrained households in all 28 districts, paying an average monthly transfer of MK 9,500 (US$12) per beneficiary household. In 2020, the SCTP reached 1.3 million people in 290,000 households, at a total cost of around MK 40 billion (US$50 million), 90 percent of which was donor-funded. In 2018, the PWP, which is being reformed, provided cash or in-kind support

in exchange for labor to 451,000 ultra-poor and poor households. The Schools Meals Program (SMP), meanwhile, provided meals to nearly 3 million primary school students in 2018. The Village Savings and Loans Program (VSLP) supports the establishment and operation of community-based savings and credit groups that now reach just over 1 million people (80 percent women). The SMP and the VSLP are also donor-funded mechanisms and off-budget.[79] Moving towards donor harmonization through pooled financing instruments, such as multi-donor trust funds, could provide a basis for donor harmonization. In a quest for sustainable financing, increasing Government contribution to social protection programs is critical in the medium to long term.

There is robust evidence that cash transfers are an effective investment in Malawi, providing a strong rationale for continued investments in the SCTP. In a review of 55 impact evaluations for 27 social safety net programs in 14 African countries, Malawi's SCTP had some of the strongest outcomes in measures related to equity, resilience, and long-term opportunities.[80] Beyond supporting human capital development through increased primary school attendance and a 23 percent increase in food consumption and health treatment-seeking behavior among beneficiaries, the SCTP helped households build up resilience to economic shocks through increased investments in productive assets, specifically livestock holdings, durable assets, and fertilizers.

Though not part of Malawi's social protection system, the Affordable Input Program (AIP) plays a similar role by helping smallholders to access farm inputs. The AIP, managed by the Ministry of Agriculture, guarantees subsidized fertilizer prices to around 3.7 million small farmers per year, at a cost of US$170 million in 2020/21, or 7 percent of the national budget. In its latest budget statement the Government committed to reforming the AIP, which has become fiscally unsustainable in its current form—even more so in 2022, when fertilizer costs are 80 percent higher than in the previous year. Fiscal savings from AIP reduction are an important aspect of the Government's aim to reduce borrowing needs and return to debt sustainability. Moreover, AIP's effectiveness in achieving food security and poverty reduction objectives has been called into question.[81] Better-off farmers would benefit more from agricultural commercialization interventions, while the poorest AIP beneficiaries would be better served by scaling up existing social safety net interventions that also build rural resilience.

Research evidence from Malawi points to the importance of aligning social protection programs and delivery systems with disaster risk management and emergency food aid programs.[82] Linking the different social protection programs more closely to disaster relief efforts could substantially improve welfare outcomes during and after a disaster. Key to achieving this shock-responsiveness is further strengthening adaptability of social protection delivery systems, especially the Unified Beneficiary Registry (UBR), e-payments, and Grievance Redressal Mechanisms. The UBR data collection of all households is ongoing; by Bank estimates, as of February 2022, it has covered a total of nearly 2 million households in 20 districts (close to half of the total household population in Malawi). Using existing UBR data, the Government is also collecting complementary data needed to identify beneficiaries who could be part of scale-ups related to climate shocks.

A redesigned Enhanced Public Works Program (EPWP) could also help to address climate vulnerability. The proposed temporary scale-up of EPWP to across all 28 districts nationwide has an estimated cost of US$108 million. The EPWP differs from prior public works programs in that it

[79] UNICEF. 2021. "Protecting and Transforming Social Protection Spending during and beyond COVID-19." Malawi Social Protection Budget Brief 2020/21. Lilongwe: United Nations Children's Fund. https://www.unicef.org/esa/media/9016/file/UNICEF-Malawi-2020-2021-Social-Protection-Budget-Brief.pdf.

[80] Ralston, L., C. Andrews, and A. Hsiao. 2017. "The Impacts of Safety Nets in Africa: What Are We Learning?" Policy Research Working Paper No. 8255. Washington, DC: World Bank. http://hdl.handle.net/10986/28916.

[81] Unpublished, publicly disclosed World Bank note, Malawi AIP reform: Towards greater impact on agricultural productivity and food security. January, 2022.

[82] McCarthy, N. et al. 2017. "Shelter from the Storm?: Household-Level Impacts of, and Responses to, the 2015 Floods in Malawi." Policy Research Working Paper No. 8189. Washington, DC: World Bank. http://hdl.handle.net/10986/28366.

includes stronger provisions for community participation, technical assistance to communities, and design and enforcement of clear climate-smart guidelines for the subprojects. It will also be focused particularly on climate-responsive public works in rural areas—soil and water conservation (for example, contour ridging, swales, terracing, etc.), forestry, and other rural infrastructure—responding to evidence from elsewhere in the region that these types of local investments can have substantial impacts on climate resilience.

In the medium term, the Government and its development partners should ensure that core country systems are developed to harmonize the financing and delivery of SCTP. The aim should be that SCTP is a scalable and shock-sensitive social protection mechanism that is Government-led and uses e-payment systems to increase the efficiency and responsiveness of the system to climate events. Another medium-term goal should be to move households out of the social protection system by building human capital and creating new job opportunities.

3 SECTORAL IMPLICATIONS OF CLIMATE CHANGE IN MALAWI

3. Sectoral Implications of Climate Change in Malawi

In order to understand the potential impacts of climate change across Malawi's economy, detailed modeling was conducted, with climate scenarios chosen to reflect the large uncertainties. As noted in Section 1, while there is consensus that mean annual temperatures will rise in Malawi, projections of future precipitation vary significantly. A subset of five climate scenarios was thus chosen for further analysis, reflecting a wide range of possible temperature and precipitation patterns: Dry SSP 1-1.9, Wet SSP 1-1.9, Dry SSP 3-7.0, Wet SSP 3-7.0, and Hot SSP 3-7.0.[83]

Development plays a key role in building resilience, and policy scenarios were selected to model the interaction of development and climate change. For instance, development can reduce dependence on agriculture, which is one of the most climate-sensitive economic sectors. It also makes more resources available for abating risks, and some investments (such as improved health care services) help countries develop and adapt. Development is therefore critical for adaptation. However, development can also exacerbate vulnerability—for example, by driving environmental degradation, displacing people, or deepening inequality—and new investments need to be climate-resilient. Development as usual will not suffice. Additional policies and investments will be needed to increase the likelihood that Malawi reaches its development goals. Adaptation therefore requires doing more development, doing things differently, and doing different things. Four policy scenarios were selected to understand the interplay of climate change and development: (i) Business-As-Usual (BAU) Development, which defines what the economy would look like leading up to 2050 if Malawi continues on a growth trajectory similar to recent decades; (ii) BAU with Adaptation (BAU+A), which is BAU with adaptation measures, (iii) Aspirational Development (ASP), which incorporates the investments, programs and policies envisioned to reach Malawi 2063 vision goals, and (iv) Resilient Development (RES) which is ASP with adaptation.

The sections that follow describe the actions that can be taken to build resilience to climate change in each of seven sectors (agriculture, land management, water supply, energy, transport, digital, and urban). The models are used to estimate the impacts of climate change and the effectiveness of adaptation measures. Measures to adapt to health and labor productivity impacts are discussed in Section 4. While it was not feasible to model the impacts of climate change on mining or tourism, or to examine adaptation options for those sectors, the analysis considers impacts on them indirectly through the impact on factors of production: labor, land, and infrastructure.

3.1 Making Agriculture More Productive and Climate-Resilient

Agriculture is Malawi's largest economic sector, but its productivity has stagnated over the past 10–15 years. As noted in Section 1, agriculture, forestry, and fishing are dominant sectors in the country. The sector is predominantly rainfed and underproductive, with productivity growth averaging only 0.5 to 1 percent per year.[84] Maize is by far the dominant crop, with limited diversification into other subsistence or cash crops.

The Government has formulated the National Agriculture Investment Plan to transform the sector by 2030, in line with the Malawi 2063 vision. Key actions include, but are not limited to:[85]

- **Diversification:** A strong diversification program backed by effective extension services aims to promote the production of higher-value crops, livestock, and fisheries, with niche products largely destined for the export market (such as oil cakes, soybean oil, and macadamia nuts).

[83] For more details on model results in this chapter, see Boehlert, B. et al. 2022. "Sectoral Impacts of Climate Change in Malawi: Deep Dive on Land, Water, Agriculture, Energy, Infrastructure, and Health." Background Note for the Malawi CCDR. Washington, DC: World Bank.

[84] Republic of Malawi, 2020, "Malawi 2063: An Inclusively Wealthy and Self-Reliant Nation."

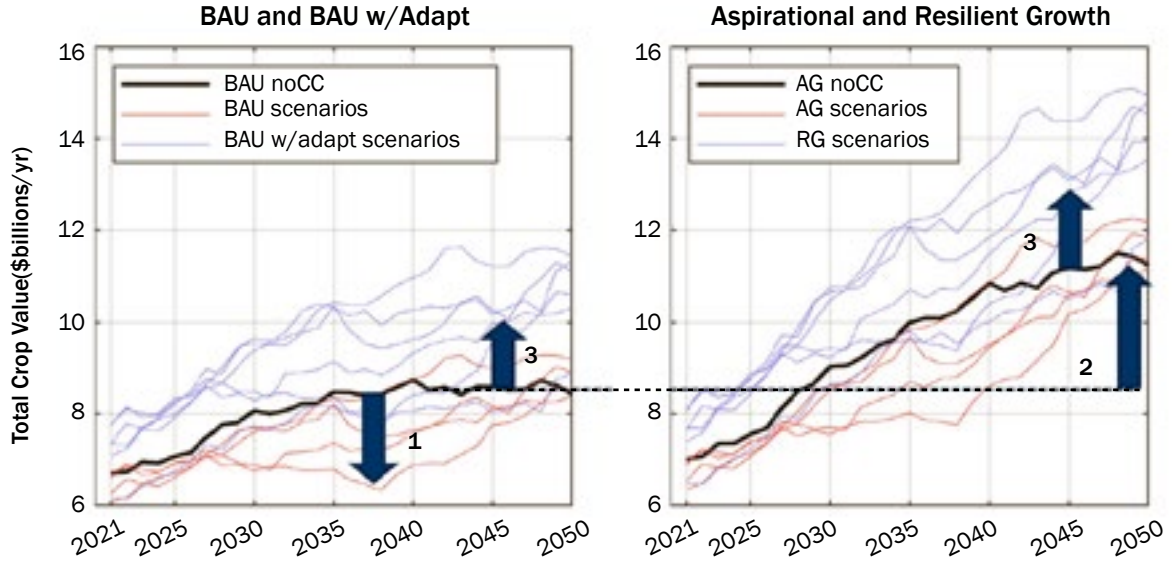
[85] Republic of Malawi. 2018. "National Agricultural Investment Plan." Prioritised and Coordinated Agricultural Transformation Plan for Malawi: FY 2017/18-2022/2. Lilongwe: Ministry of Agriculture, Irrigation and Water Development. https://www.scotland-malawipartnership.org/assets/resources/National_Agicultural_Investment_Plan_2018_Final_Signed.pdf.

- **Irrigation development:** Investments in sustainable irrigation systems to increase irrigation area by 43,700 ha to optimally harness productivity and drive commercialization while averting adverse climatic variability, guided by the National Irrigation Masterplan.
- **Inputs, mechanization, and digital technologies:** A sustainable high-quality input supply system that is accessible to farmers and increased mechanization and use of modern technologies (including digital) is seen as a way to boost productivity.
- **Structured markets:** Ensuring well-functioning structured agricultural markets that can generate high farmer incomes and release agricultural labor.
- **Research, innovation, and dissemination:** Investing in genetic improvement programs to create high-yielding crop varieties and fast-growing animal and fish breeds.
- **Land tenure security to promote sustainable land management:** Land tenure security (customary land registration), at pilot stage reaching few thousands, needs to be taken to scale to reach millions.

The modeling shows that climate change will significantly reduce agricultural productivity. Changes in the availability of water are the main factor; the effects of increased heat and soil erosion were also considered. Climate change is not expected to impact production of commonly irrigated crops, such as fruits, stimulants (coffee and tea), and sugarcane, as the availability of irrigation water is not affected even if rainfall declines or becomes less predictable. For all rainfed crops, the impact on yields varies with the climate scenario, but the prospects for some are clearly more negative than for others.

The modeling shows that both development and adaptation measures will be needed to achieve the crop productivity gains that Malawi needs. Figure 4 shows projections to 2050 of total annual crop values in the different climate scenarios. The left panel shows a counterfactual BAU with no climate change (the thick dark line), the projected values with no adaptation (BAU red lines), and the effect of adaptation measures (BAU+A, in purple). By the mid-2030s, without adaptation, climate change reduces crop values in all but one scenario, by as much as 25 percent. The right panel shows projections for the Aspirational Growth scenario—again with a counterfactual with no climate change, plus projections in the five climate scenarios (red lines)—and the Resilient Growth scenario (purple lines). It shows that improved agricultural practices and expanded irrigation boost crop values relative to BAU (by 35 percent by 2050 when comparing the counterfactuals). This is true even with

Figure 4. Projected total annual crop values across policy and climate scenarios



Source: World Bank.

climate change, but there are significant differences across climate scenarios. By far the greatest crop values are achieved in the Resilient Growth scenario, which combines development and adaptation measures. These adaptation measures are effective under both BAU and ASP, making them no-regrets measures. While variability in crop values remains, the total value of crops is notably higher with the adaptation measures than without.

With regards to the livestock sector, the modeling results show that impacts on the sector are expected to be relatively small before 2050. The two main factors considered in the analysis were the impact of heat stress, and projected changes in the availability of pasture and feed. Results show that the negative impacts on livestock yields would increase substantially after 2050, as rising temperatures surpass the maximum heat tolerance for both livestock and pasture grasslands. The more limited impacts before 2050 suggest that livestock can continue to provide a safety net to households that face increased vulnerability in agricultural incomes from climate change. By then, Malawi should have been able to diversify its economy enough that reduced livestock yields would have less of an impact on overall GDP.

Malawi's updated NDC identifies several additional adaptation measures beyond those modeled. They include: 1) advanced crop and livestock breeding to develop varieties and breeds that are resilient to heat stress, droughts, and excessive rainfall; 2) improved design and maintenance of existing and new irrigation schemes to be far more robust to extreme weather conditions than existing designs; and 3) improved capacity to manage pests and diseases, especially those whose incidence and prevalence are affected by weather patterns. Some of the key policy and institutional reforms needed to promote resilience adaptation measures include: (i) developing seed regulations, guided by the recently enacted Seed Bill to promote improved resilient crop varieties, and (ii) develop new livestock laws to promote resilient livestock breeds, feeds and veterinary services. The National Agricultural Policy, which is under review, needs to guide the sector towards deepening adaptation, while also recognizing the mitigation benefits.

3.2 Improving Landscape Management and Reversing Degradation

Restoring degraded landscapes is crucial to preserving Malawi's natural capital, boosting crop productivity, and building climate resilience—and it would also reduce GHG emissions. As noted in Section 1.1, Malawi has lost large shares of its forests to clearing for cropland and to fuelwood harvesting, and unsustainable farming and grazing practices have further degraded the land. Land degradation is reducing land fertility and vital ecosystem services, such as water regulation, flood mitigation, erosion control, pollination, biodiversity, and carbon storage.

Planned policies, regulations and investments in integrated land management that are part of the Government's development plans will substantially improve land conditions. Efforts to address land degradation have been anchored in the 2016 Malawi National Forest Landscape Restoration Strategy. The Bank-financed Malawi Watershed Services Improvement Project, launched in 2020, is already supporting the promotion of sustainable landscape management practices in targeted watersheds.[86] Malawi's pledge to restore 4.5 million hectares under the Bonn Challenge and the African Forest Landscape Restoration Initiative will further increase areas under improved management.[87] The energy sector interventions described in Section 2.2 are also expected to significantly reduce pressure on forests.

Improved land management will generate substantial climate co-benefits while ensuring that human needs are met. The modeling results show that landscape restoration and improved land management practices in the ASP scenario (including promoting soil and water conservation and agroforestry at

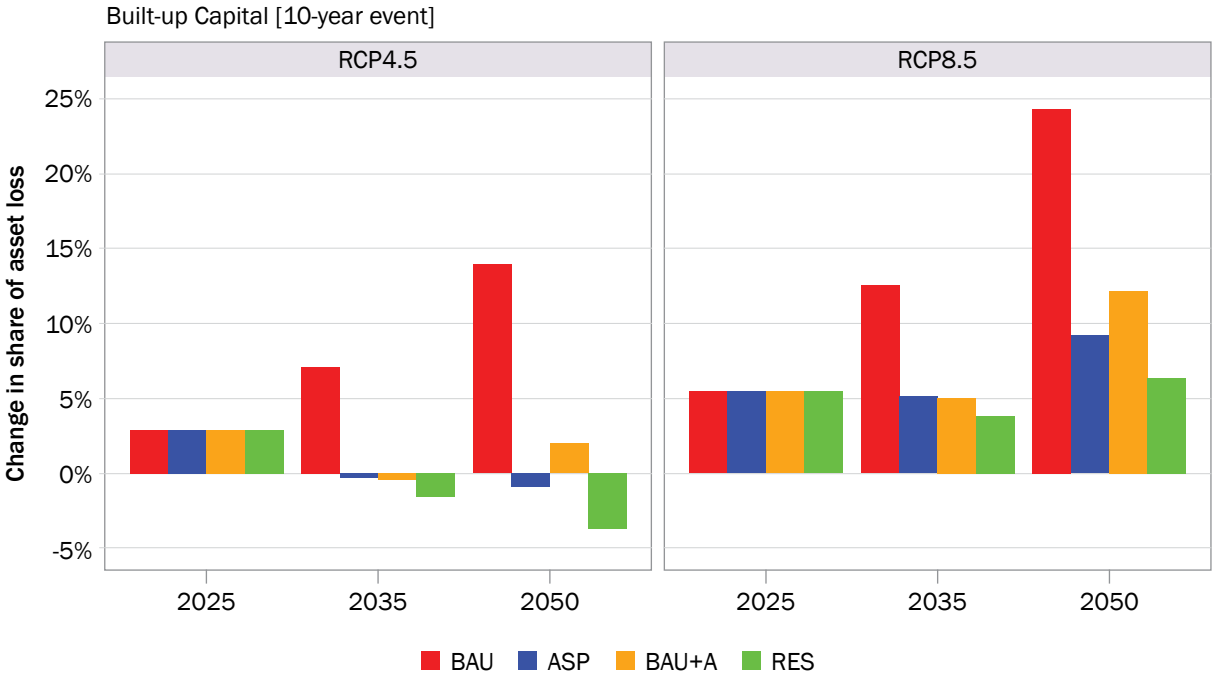
[86] See https://projects.worldbank.org/en/projects-operations/project-detail/P167860.

[87] See https://www.bonnchallenge.org/pledges/malawi, as well as this 2020 spotlight video: https://www.bonnchallenge.org/resources/spotlight-malawi, and https://afr100.org/content/malawi.

both farm and watershed levels; promoting conservation agriculture at the farm level; and investing in community forestry, forest management and protection; and riparian restoration) would increase carbon storage in Malawi's landscapes by 139 $MtCO_2e$ between 2020 and 2050, relative to BAU. They would also improve agricultural productivity by reducing soil erosion in croplands by an average of 14 tonnes per hectare per year from BAU levels. Additional measures to adapt to climate impacts (achieving universal access to improved cooking technologies, reducing demand for fuelwood from the landscape by 45 percent, and better targeting land restoration activities) bring additional benefits, though marginally. These resilience measures would increase the soil erosion reduction benefits, to 18 tonnes per hectare relative to BAU; increase land-based carbon storage by 177 $MtCO_2e$ by 2050 relative to BAU. Stemming soil erosion would also reduce siltation in downstream dams.

Another key benefit of improved land management is a reduction in flood risks. When torrential rains come, healthy forests and other natural landscapes can significantly mitigate flood risks, as they can hold large amounts of water. The vegetation cover also protects the soil from being carried away. Figure 5 shows the projected loss of capital from a once-in-10-years flood in two climate scenarios relative to current conditions, reflecting the benefits of both development measures (the improved land management practices included in the ASP scenario), and of complementary adaptation measures. In the high-emissions scenario (RCP8.5), in 2050, increased land degradation and climate change impacts combined increase losses by almost 25 percent. Improved land conditions in the ASP and RES scenarios significantly reduce flood-related losses.

Figure 5. Projected change in asset losses from inland flooding in different policy scenarios



Source: World Bank modeling results.

Both the public and the private sector need to be engaged in the implementation of land management programs. The public sector typically takes the lead in implementing integrated land management. Given Malawi's fiscal constraints, however, it is crucial to engage the private sector and identify other sources of finance to support this work. There is a need to expand, and better target, programs that provide payments for ecosystem services (PES) for watershed management. In order to strengthen the institutional context that will enable private sector investments in PES, crucial actions required in the immediate term include (i) strengthening of the water authority and the environmental protection authority; (ii) initiation of a PES scheme; (iii) strengthened forest management and

enforcement; (iv) strengthened land tenure (including the implementation of the land reform law); (v) support for the development of ecotourism; and (vi) improved land use planning and enforcement through strengthened measurement, reporting, and verification.

3.3 Expanding Water and Sanitation Access

Malawi is not on track to achieve Sustainable Development Goal 6–universal access to clean water and sanitation–by 2030, and it is particularly far behind on sanitation.[88] This makes the country particularly vulnerable to the expected rise in waterborne diseases as climate change brings warmer temperatures and worse floods and droughts.

The Malawi 2063 calls for universal access to improved water supply by 2050, and 95 percent of households with access to safely managed sanitation. This will require investments in diversifying water sources, increasing dam storage, and expanding distribution systems, as well as in sewerage and wastewater treatment capacity—especially in urban areas, which are expected to grow rapidly. These measures would make Malawi more resilient to future water scarcity due to climate change, and they would also have immediate development benefits, making them no-regrets investments. The NDC also includes measures to expand water supply, storage, and harvesting in drought-prone areas and to construct multipurpose dams for water storage. Flood management measures focus on extending telemetry and early warning systems in flood-prone areas. The NDC does not give a specific target for the number of rural households to be provided access to piped water and is also silent on the need to increase the capacity of urban sewage and wastewater treatment systems, which will have to cope with more intense rainfall events.

3.4 Climate Change Implications for Malawi's Electricity Supply[89]

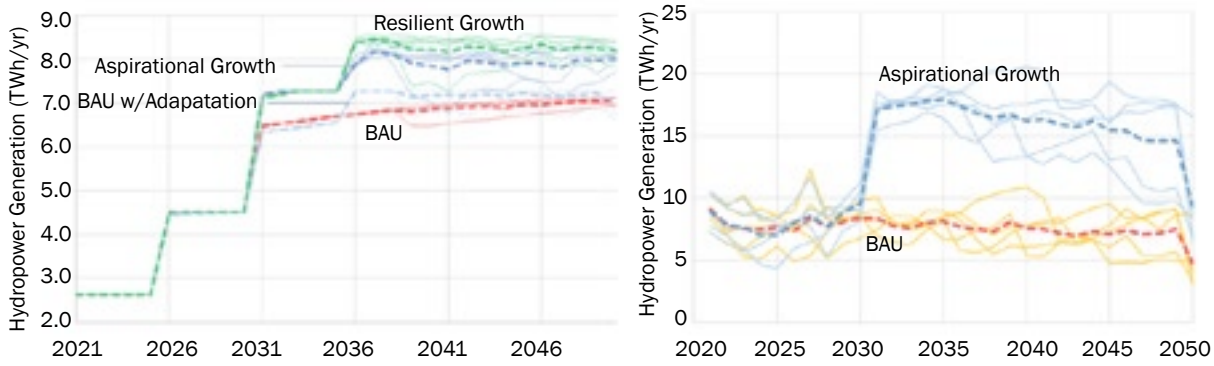
Malawi is working rapidly to close large gaps in electricity access, with plans to achieve 50 percent access by 2030 through a combination of on-grid and off-grid options. The Government has set a goal of increasing access to on-grid electricity to 30 percent by 2030, and to reach another 20 percent of the population with off-grid solutions. In order to expand grid-connected service, Malawi is investing in large-scale power generation projects, such as the 350 MW Mpatamanga Hydropower Project; grid-connected solar power projects (to date there are signed power purchase agreements with independent producers for 216 MW of solar capacity) and regional interconnections for power imports. In addition, Malawi aims to increase off-grid power generation by scaling up existing initiatives, establishing quality standards, providing fiscal incentives for solar devices, and supporting the local manufacture of renewable off-grid devices.

Climate change could affect future hydropower generation in Malawi, but the presence of Lake Malawi will moderate the effects, in contrast to neighboring Mozambique. Figure 6 shows how projected changes in hydropower generation in 2030 and 2040 relative to the BAU and the ASP averages for Malawi (left panel) and Mozambique (right panel). For Malawi, hydropower generation increases in all but the SSP1-1.9 and SSP3-7.0 dry climate scenarios (in which it declines by about 4 and 10 percent, respectively), in both the BAU and ASP scenarios. In contrast, drying in the Zambezi Basin is expected to reduce hydropower generation in Mozambique by as much as 35 percent in the SSP3-7.0 dry climate scenario by 2040. That said, Malawi can benefit from measures to increase the climate resilience of its electricity infrastructure. Key options include diversifying the locations of hydropower plants (such as replacing Songwe with the more resilient Lower Fufu facility), reducing transmission losses, and increasing regional trade within the Southern Power Pool—which would bring about twice the benefits in terms of additional hydropower generation compared to shifting hydropower

[88] See SDG 6 indicators on the Sustainable Development Report data hub: https://dashboards.sdgindex.org/profiles/malawi/indicators.

[89] This section summarizes the in-depth analysis in Gondwe, M.C. et al. 2022. "Malawi CCDR Energy Sector Background Note." Washington, DC: World Bank.

Figure 6. Impact of climate change on hydropower production in Malawi (left) and Mozambique (right)



Source: World Bank modeling results.

plant locations. Hydropower generation will also likely be affected by changes in flood frequency and intensity. Examination of these impacts was beyond the scope of this report.

Implementation of these adaptation measures requires enabling policy and institutional environment. An overhaul of energy sector building standards for both existing and future energy development is needed, to ensure that infrastructure can better withstand climate change impacts. Successful implementation will also require addressing current barriers limiting private sector investment in the energy sector, such as strategically engage in public-private partnerships to demonstrate project bankability; acquire the financial expertise to structure finance and de-risk investments, and put in place mechanisms to assure investors that the national electric utility is a financially viable off-taker.

3.5 Improving Transport Infrastructure[90]

The Malawi 2063 set ambitious goals for the transport sector, aiming to connect rural areas to markets, support tourism and urban development, and use railways to support industrialization. Key actions include:

- **Improving road infrastructure in rural areas,** so that 50 percent of Malawians live within two kilometers of an all-season road—up from 23 percent in 2016. The goal is to build new and upgraded sealed roads and rehabilitate the road along the shore of Lake Malawi.
- Malawi 2063 sets targets that aim to **increase the share of passenger transport for road, rail and waterways** from around 10 percent to around 30 percent by 2040.
- **Completing the rail network** by reconnecting the Sena line from Limbe, Malawi, to the Port of Beira, Mozambique. Key sections of this line were washed away during the floods of 1997 and 2015 and have yet to be repaired.

The National Transport Master Plan (2017–2037) includes a Strategic Climate Change Adaptation Plan to mainstream climate risks into transport planning, asset management, and operations.[91] Developing a geospatial database of transport asset conditions and identifying vulnerable

[90] This section summarizes the in-depth analysis in De Serio, C., A. Iimi, and C. Nsusa. 2022. "Malawi CCDR Transport Sector Background Note: Road Transport Criticality and Resilience." Washington, DC: World Bank.

[91] Republic of Malawi, 2020, "Malawi National Transport Master Plan."

infrastructure is paramount to improving resilience. Priorities include: 1) adapting technical and design codes to increase infrastructure resilience and improve enforcement of those codes; 2) undertaking a comprehensive assessment of existing bridge infrastructure to form the basis of a prioritized bridge replacement and maintenance plan, together with a vulnerability assessment of critical road links on the national roads network; and 3) prioritizing and ensuring adequate financing for road maintenance. Similarly, expanding community-based road maintenance, particularly in locations at high risk of water damage, can provide a sustainable way to keep the roads in good condition and thereby ensure rural communities' continued access to key services and to markets.

Modeling results show that climate change impacts could increase the cost of building, operating, and maintaining Malawi's roads and bridges by as much as US$100 million per year during 2036-2050 relative to historical levels. These costs are high for several reasons. First, Malawi has a larger share of paved roads (27 percent) than many other countries in Sub-Saharan Africa, and most roads are categorized as either primary or secondary (86 percent). These road types are more expensive to repair than gravel/dirt or tertiary roads. For comparison, only 13 percent of Mozambique's roads are paved, and 58 percent are primary or secondary. Second, all climate models for Malawi show a large increase in the frequency of floods, which pose particularly large threats to roads and bridges. However, the additional costs per kilometer are lower in the ASP scenario even with climate change, as roads and bridges do not need to be repaired or rebuilt as often as in the BAU scenario. Building infrastructure to be resilient to climate risks increases costs in the near term but reduces costs in the long run.

Achieving the level of resilience envisioned in the RES scenario will require engaging the private sector, but the large sums owed by the Government is a barrier. The total arrears owed to the private sector for roads contracts is estimated at US$100 million; resolving this payment issue in a viable and transparent way will be crucial to crowd in private investment. Malawi is exploring mechanisms to complement the road funds from fuel levies with transportation bonds and road tolls. As with the energy sector, the transport sector needs to strategically expand PPP ventures to establish project bankability. Malawi also needs the road industry to utilize performance-based contracts to increase private sector participation. Output and performance-based road contracts (OPRCs) can improve the effectiveness and efficiency of road development and maintenance practices by securing sufficient long-term financing and incentivizing private contractors to achieve value for money, with a strong focus on asset quality and level of service metrics. There is also potential to incorporate climate risk insurance to back contracts through specific revenue streams. This would provide some security to the contracting industry, with access to emergency contingency funding in times of crisis.

3.6 Resilient Digital Networks for Economic Diversification[92]

Malawi has recognized the importance of information and communications technology (ICT) for economic growth for years and has good digital infrastructure. Key efforts have included the National ICT Master Plan launched in 2014 and the national broadband and cybersecurity strategy adopted in 2019. In 2021, in the aftermath of the COVID-19 pandemic, the government rolled out a five-year Digital Economy Strategy 2021–2026,[93] which aims to create a strong digital ecosystem and enhance sectors from finance, to industry, to agriculture and health. The foundations of digital infrastructure are relatively well developed: almost a third of Malawians live within 10 kilometers of a fiber network, and nearly all live within 50 kilometers.[94]

However, despite a fairly good national backbone network infrastructure, usage and penetration are limited due to intermittent or low access to electricity, among other things. Only 28 percent of urban

[92] Ballan et al., 2022, "Malawi CCDR Digital Sector Background Note."

[93] Republic of Malawi. 2021. "Malawi Digital Economy Strategy: Supporting Inclusive Wealth Creation." Presented at the Lilongwe, February 26. https://www.slideshare.net/RonaldTemboBBusScMSc/malawi-digital-economy-strategy.

[94] World Bank. 2021. "Malawi Economic Monitor, June 2021: Investing in Digital Transformation." Lilongwe: World Bank. http://hdl.handle.net/10986/35880.

households and 7 percent of rural households (10 percent overall) had internet access at home as of 2018.[95] In the entire country, there were just over 12,000 fixed broadband subscriptions in 2020. And although many Malawians have mobile phones, there are only 36 active mobile broadband subscriptions per 100 people. The Bank has estimated that an additional 10 percent in mobile broadband penetration in Malawi could increase GDP by US$189 million per year.[96]

Digital technologies can also help Malawi build climate resilience. Although Malawi has relatively low digital adoption, simple technologies such as WhatsApp-based early warning solutions are already playing an important role informing inhabitants about adverse weather and disaster risks. Malawi's NDC and implementation strategy envision digital technologies as key enablers—for early warning systems, improving infrastructure resilience, and more. The NDC also calls for expanding ICT infrastructure and human capacity to support sector-specific climate services.

As Malawi expands digital infrastructure, access and services, the digital ecosystem should be built to be resilient, which aligns with actions identified under the NDC. Key measures include: 1) accelerating investment in climate-resilient digital infrastructure; 2) adopting a data policy that allows interoperability and cross-ministerial data flow, as well as data standards; 3) adopting cloud data storage, and a data backup practice; and 4) using digital platforms to support early warning systems and disseminate information on climate-smart agriculture.

3.7 Protecting Urban Communities

Malawi is still overwhelmingly rural, but its urban population is growing rapidly, and urbanization is a key part of the country's economic diversification and development strategy. More than 70 percent of urbanization in Malawi involves informal settlements and unplanned traditional housing areas. In Lilongwe, about 76 percent of the population lives in informal settlements, which are expanding into flood-prone areas. Urban areas face other climate risks too, as discussed in Section 1.

The NDC outlines a number of actions that Malawian cities can take to protect themselves from floods and extreme heat, with substantial benefits. Actions to build resilience include: 1) increasing urban vegetation and tree-planting for shade, and further reducing heat exposure through evaporative and passive cooling systems, as well as the use of more reflective materials on buildings; 2) risk-informed building codes or design guides; and 3) delineating flood-prone areas with flood zoning maps and developing appropriate adaptation strategies and measures. Modeling results show that changing design standards so that 50 percent of urban infrastructure can withstand a flood depth of 0.5m would bring substantial benefits—a 49 percent reduction in structural or content damage for Lilongwe. Similarly, in Blantyre, flood damage could be reduced by 40 percent.

The Government of Malawi is making advanced efforts to develop building regulations, a building policy and Buildings Act to regulate and enhance the resilience of the built environment. The current draft regulations, Malawi National Building Regulations (MNBR), have high level hazard information that can be detailed out to assist building designers to design resilient and sustainable buildings. Urban local governments need to actively plan and coordinate climate investments and policies across sectors and with national-level actions to facilitate implementation.

3.8 Sectoral Mitigation Opportunities

Although Malawi's GHG emissions are very modest (see Section 1.5), there are opportunities for the country to slow its future emissions growth as a co-benefit of development. The NDC forecasts that the GHG emissions will roughly triple over the period 2017–2040 unless strong mitigation measures

[95] See ITU's Digital Development Dashboard: https://www.itu.int/en/ITU-D/Statistics/Dashboards/Pages/Digital-Development.aspx.

[96] World Bank, 2021, "Malawi Economic Monitor, June 2021: Investing in Digital Transformation."

are implemented.[97] The share of emissions from energy and transport is projected to grow from 25 percent in 2017 to 57 percent in 2040, but accessible mitigation measures can moderate that growth. There are also opportunities to reduce emissions through waste management and better-managed urban development. Moreover, as noted in Section 3.2, stemming and reversing land degradation and forest loss would yield both substantial development benefits, and enhanced carbon sequestration.

Malawi's electricity production is based on renewables, with hydropower providing the major share (75 percent), and there are plans to further increase the share of renewables. The Government intends to replace high-cost diesel generation (70 MW) with solar power from independent power producers (IPPs), reducing the fiscal burden of meeting growing electricity demand. The Malawi Renewable Energy Strategy (2017) envisions a multifaceted approach, including grid-scale electricity generation, sustainable bioenergy, clean mini-grids, off-grid power, clean cookstoves, solid biofuels, biogas, and biofuel use in transport.[98] It also notes that improving access to clean electricity for households and industry will reduce the use of carbon-intensive fuels such as charcoal and fossil fuels.

There are opportunities to green Malawi's transport sector, through: (i) promoting modal shift in passenger and freight transport to rail; (ii) increasing the use of biofuels (though not at the expense of food security); and (iii) investing in non-motorized transport. These measures will improve road safety and access while reducing GHG emissions and therefore have been identified in Malawi's NDC. A greener transport sector will require public policy and investment interventions, such as those aimed at increasing private sector participation and establishing a regulatory regime for passenger transport.

Similarly, there are opportunities to reduce GHG emissions as a co-benefit of development in urban areas. Malawi's urban areas contribute to 13 percent of the country's total GHG emissions, but their share is growing. By shifting to a more compact urban growth model, Malawi would reduce air pollution, travel costs for individuals, as well as traffic congestion and its associated cost to the economy. More compact growth would preserve land, reduce also the embodied GHG emissions associated with materials, and improve building energy efficiency. Denser growth can also reduce the energy required per capita for heating and cooling buildings. Immediate action is needed to prevent lock-in for generations.

Potential investments in waste management, such as landfill gas utilization and waste-to-energy plants, can also yield GHG emission reductions, as a co-benefit of economic development. Total emissions from waste in 2020 in Malawi are estimated at 1.1 $MtCO_2e$, and in a business-as-usual scenario, they are projected to increase by 11 percent annually, to reach 3.1 MtCO2 by 2035.[99] Reducing open dumping by 15 percentage points in 10 years, compared to 2020 is estimated to lead to 16.5 percent reduction of CO2e emissions (360,190 tCO2e), as a co-benefit of development.

Finally, integrated land management presents another opportunity to reduce GHG emissions while supporting development goals. As noted earlier, the most significant drivers of deforestation and forest degradation in Malawi are unsustainable fuelwood extraction and expansion of agriculture and settlements. Modeling for this CCDR shows that under BAU it is projected the continued deforestation and land degradation will result in a loss of 96 Mt and an additional 116 Mt of land-based CO2e storage by 2030 and 2050, respectively. The successful implementation of the ASP or the RES Development scenario will slow the near-term loss of carbon stocks by 2030, and significantly increase them by 2050. In the RES scenario, carbon stocks increase by 148 Mt by 2050, equivalent to about 19–37 percent (average of 24 percent) of the total projected emissions for Malawi under current policies.

---

[97] Republic of Malawi, 2021, "Updated Nationally Determined Contributions." The updated NDC projects that total emissions will increase to 34.61 Mt CO_2e by 2040. As noted in Section 1.5, other recent projections range from 24.2 Mt CO_2e to 42.34 Mt CO_2e by 2050, as modeled using GCAM5.3 and REMIND-MAgPIE 2.1-4.2, respectively.

[98] Republic of Malawi. 2017. "Malawi Renewable Energy Strategy." Lilongwe. https://mera.mw/download/malawi-renewable-energy-strategy/.

[99] Kaza, S. et al. 2018. *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050*. Washington, DC: World Bank. http://hdl.handle.net/10986/30317.

4 MACROECONOMIC, POVERTY, AND FISCAL IMPLICATIONS

4. Macroeconomic, Poverty, and Fiscal Implications

Climate change clearly has major implications for Malawi's economy and future development and strengthening resilience will require substantial investments. This section builds on the sectoral analysis in Section 3, using an economic model to demonstrate the importance of climate change to the whole economy and Malawi's development, and to help better integrate related policy considerations into Malawi's development agenda. The emphasis is on the medium to long term economy-wide effects of climate change, as well as distributional welfare impacts. The section also examines how Malawi's fiscal sustainability challenges could affect its ability to make crucial investments to build resilience; the key roles the private sector could play; and the risks and opportunities for Malawi's financial sector.

4.1 Climate Change and Malawi's Future Growth

A country-specific Climate Change Macro-Fiscal Model (CC-MFMod) was used to quantify the macroeconomic effects of different climate and policy scenarios. CC-MFMod is well suited for assessing not only the direct impact of damages suffered by key sectors and on Malawi's capital stock and labor supply, but also indirect effects on investment, productivity, total output, government finances, debt sustainability, external balances, household employment, consumption and welfare, as the economy adjusts over time.[100] Using the climate and policy scenarios described in section 3, the goal was to assess the economic and poverty impacts of climate-related shocks and the country's fiscal and financial capacity to adapt. Climate change impacts on the economy are assessed through six specific damage channels— i) irrigated and rainfed crop shocks, (ii) livestock revenue shock, iii) labor productivity shock from heat stress, iv) labor productivity shock from health effects, v) capital damages to roads and bridges, and vi) capital damages to hydropower plants—as well as the combined effects of these six shocks. These damage channels represent some of the main ways in which climate-related shocks are already impacting Malawi and are likely to affect its future development. The analysis does not cover all possible damage pathways, however, and some could not be modeled due to time and resource constraints—for example, damage to hydropower infrastructure from increased frequency of floods. *The simulated damages (GDP loss) from climate change are thus only a first approximation.*[101]

4.1.1 Macroeconomic impacts of climate change without adaptation

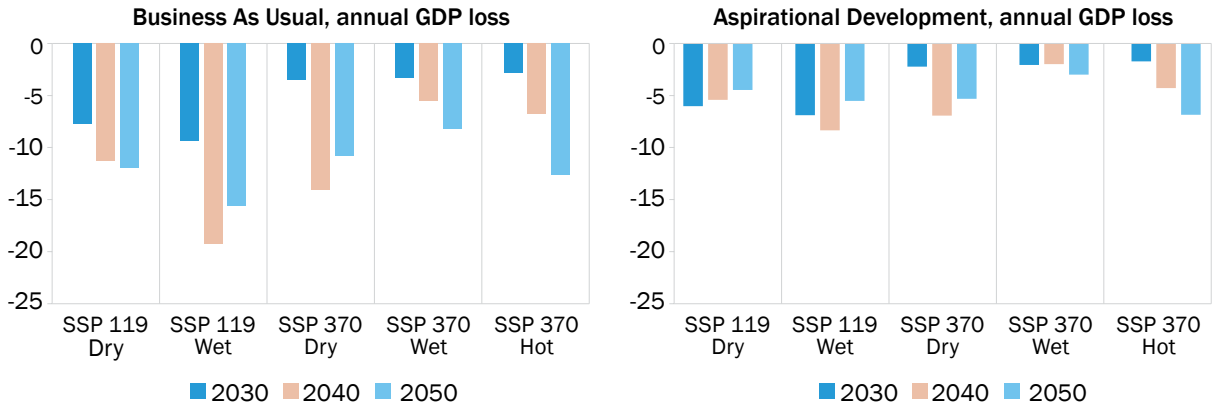
The model results show that climate change impacts could result in very large annual GDP losses—as high as 20 percent under BAU and 11 percent under ASP. The impacts are calculated as the difference in projected GDP for 2030, 2040, and 2050 in a future without climate change (beyond climate shocks that Malawi is already experiencing), and GDP in a future under each of the five climate scenarios. Figure 7 shows the combined impact of the six damage channels in the BAU and ASP policy scenarios, assuming no adaptation policies or investments. The model shows the largest annual losses in the SSP1-1.9 Wet climate scenario, with GDP losses peaking around 2040, at 19.5 percent below the baseline in the BAU scenario, narrowing to 15.8 percent in 2050. This is due to large precipitation changes and associated damage from heavy rainfall. This has historically been the major channel of climate change damage for Malawi. Damages are higher under SSP1-1.9 rather than SSP3-7.0 scenarios because the single run of the SSP1-1.9 model suite that was chosen has very high precipitation variability. The precipitation variability causes large transport flooding impacts that make

[100] The model uses 2010-based, public national income account data for both the expenditure and production side. The more recent 2017-based expenditure data are not yet available. In turn, using the 2010-based data maintains fiscal and external account data in levels. Fiscal and external account indicators are accordingly expressed as shares of GDP and may differ from figures in the Spring Meeting 2022 Macro-Poverty Outlook.

[101] More details on choosing/defining the damage channels are available in Boehlert, B. et al. 2022. "Sectoral Impacts of Climate Change in Malawi: Deep Dive on Land, Water, Agriculture, Energy, Infrastructure, and Health." Background Note for the Malawi CCDR. Washington, DC: World Bank.

up the majority of the impacts under SSP1-1.9. Without the “roads and bridges” channel, the SSP3-7.0 Dry and SSP3-7.0 Hot scenarios are the most damaging.

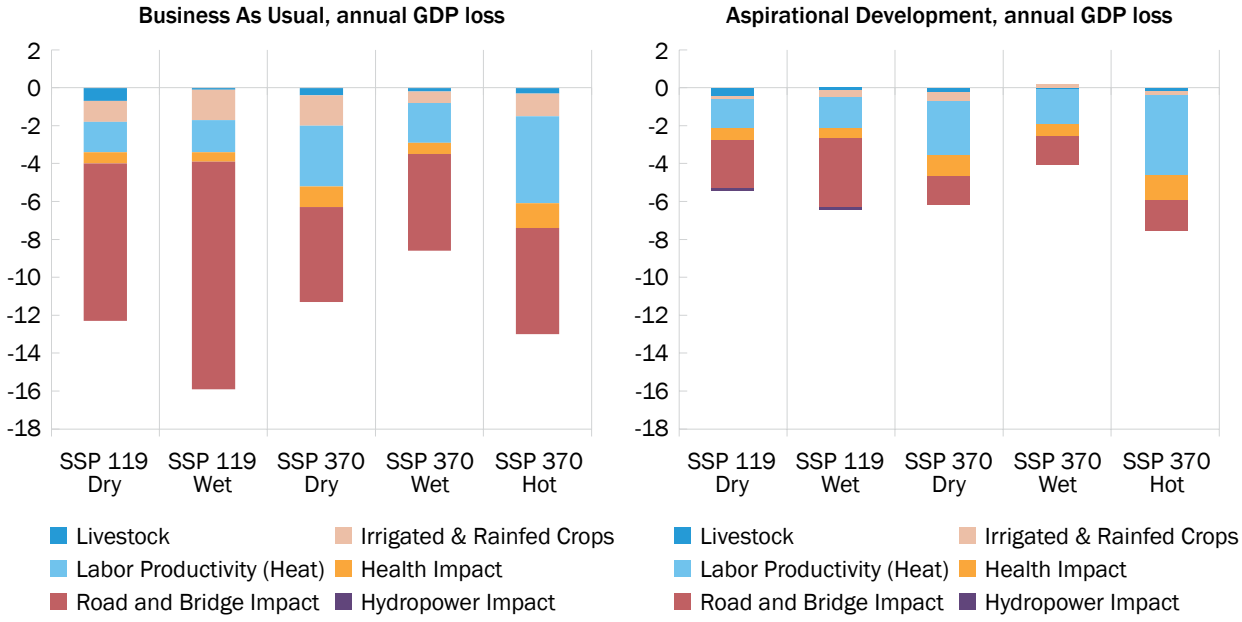
Figure 7. Annual GDP loss from climate change damage with NO adaptation (% deviation from the baseline)



Source: World Bank modeling results.

The model results for the ASP scenario show how much damages would be reduced by the policies and investments envisioned in Malawi 2063, as the economy shifts away from the vulnerable agriculture sector, and infrastructure is built to higher standards. Losses peak at 8.8 percent below the baseline in 2040 and narrow to 6.2 percent by 2050 in the SSP1-1.9 Wet climate scenario. Annual losses are also high and significant under BAU for the SSP1-1.9 Dry, and the SSP3-7.0 Dry and SSP3-7.0 Hot climate scenarios. As shown in Figure 8, roads and bridges is the damage channel with the largest impacts in most climate and policy scenario pairs; heat impacts on labor productivity are also significant in some scenarios.

Figure 8. Climate change impacts by damage channel, 2050



Source: World Bank modeling results.

The impacts broken down by channel are as follows:

Roads and bridges: Annual GDP losses from this channel are highest in the SSP1-1.9 wet scenario. Most roads and bridges are vulnerable to floods associated with heavy rainfall, as evidenced most recently by Tropical Cyclones Ana and Gombe. Loses are generally lower under ASP as infrastructure that is damaged is rebuilt to a higher standard, and all new infrastructure is designed to 50-year instead of a 10-year standard, so it is more resilient.

Labor productivity shock from heat stress: Heat stress can reduce the performance of outdoor laborers. As shown in Figure 8, the impact from this damage channel on GDP is most significant in SSP3-7.0 Hot, decreasing GDP by 4.6 percent in BAU and 4.1 percent in ASP by 2050. The impact is least pronounced in SSP1-1.9 Dry, just 1.6 percent in BAU and 1.5 in ASP by 2050.

Labor productivity shock from health impacts of climate change: The model examined the impact on labor productivity of increases in vector-borne diseases (malaria, dengue), diarrhea, and respiratory heat-related diseases due to climate change. Other effects, such as the risk of injuries from disasters, were not considered. The health impacts are particularly severe in the SSP3-7.0 Hot scenario, reducing GDP by 1.3 percent in 2050 in both BAU and ASP, and least severe in the SSP1-1.9 Wet scenario, where the annual GDP loss in 2050 is about 0.5 percent. Overall, however, the losses are smaller from this channel than from heat stress, as a smaller share of laborers would be affected.

Irrigated and rainfed crops: This channel captures productivity losses for crops from changes in temperature and precipitation. The impact from this channel is severe in the SSP3-7.0 Dry scenario, reducing GDP by 1.6 percent in BAU and 0.5 percent in ASP in 2050. Dry spells and associated droughts have historically had a pronounced downward impact on crop production in Malawi. With better investments and the economy shifting away from agriculture in line with the Malawi 2063, the impact of climate change under ASP is lower than under BAU. The lowest impacts occur in the wet scenarios, with a GDP loss of 0.6 percent in 2050 for BAU and a gain of 0.2 percent in ASP.

Livestock revenue shock: The livestock revenue shock channel captures the impacts on livestock productivity from changes in temperature and precipitation. Damage from this channel is more pronounced in the dry scenarios, with an estimated annual GDP loss of 0.7 percent and 0.4 percent by 2050 for BAU and ASP, respectively, in SSP1-1.9 dry. However, the impact in this scenario is minor relative to other shocks and also depends significantly on the climate scenario used. The impact is smallest in the wet scenarios, with an estimated annual GDP loss of 0.1 percent from the baseline for both BAU and ASP by 2050.

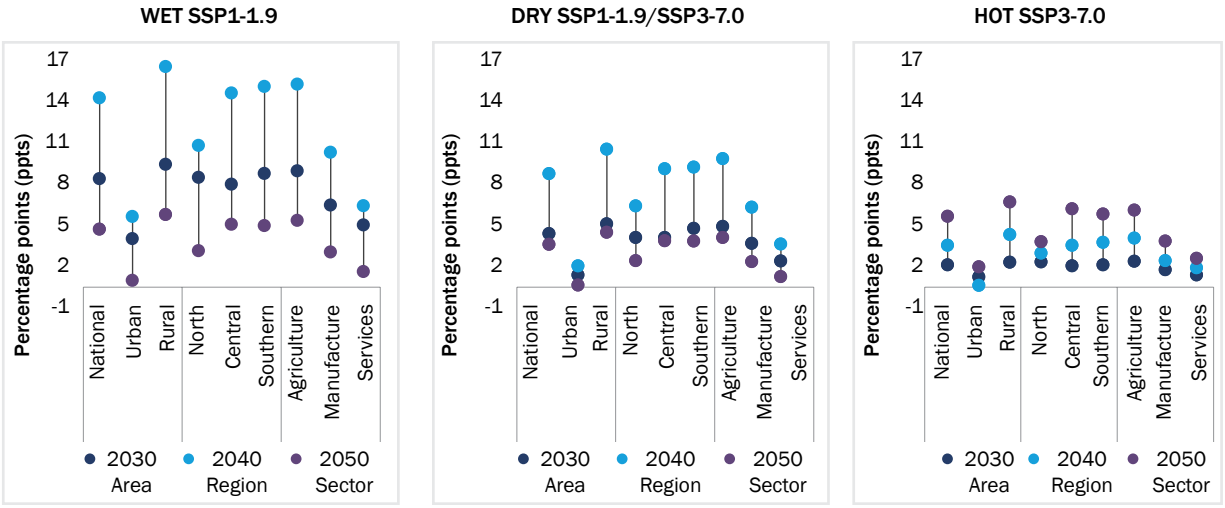
Hydropower: As discussed in Section 3.4, climate change can disrupt power generation through changes in the water flow which disrupts power generation. The damages from this channel are negligible in both BAU and ASP: 0.1 percent of GDP in 2050 for ASP in the SSP1-1.9 Wet scenario and very negligible under BAU. The planned facilities are mostly below Lake Malawi, which greatly reduces upstream hydrological variability by storing water and releasing it relatively steadily. In addition, the maximum impact due to climate change is a 10 percent reduction in generation under ASP in the 2040s. Finally, as previously noted, the analysis does not account for damage from floods, which, if included, would likely increase the extent of the impact.

4.1.2 Poverty and distributional impacts of climate change

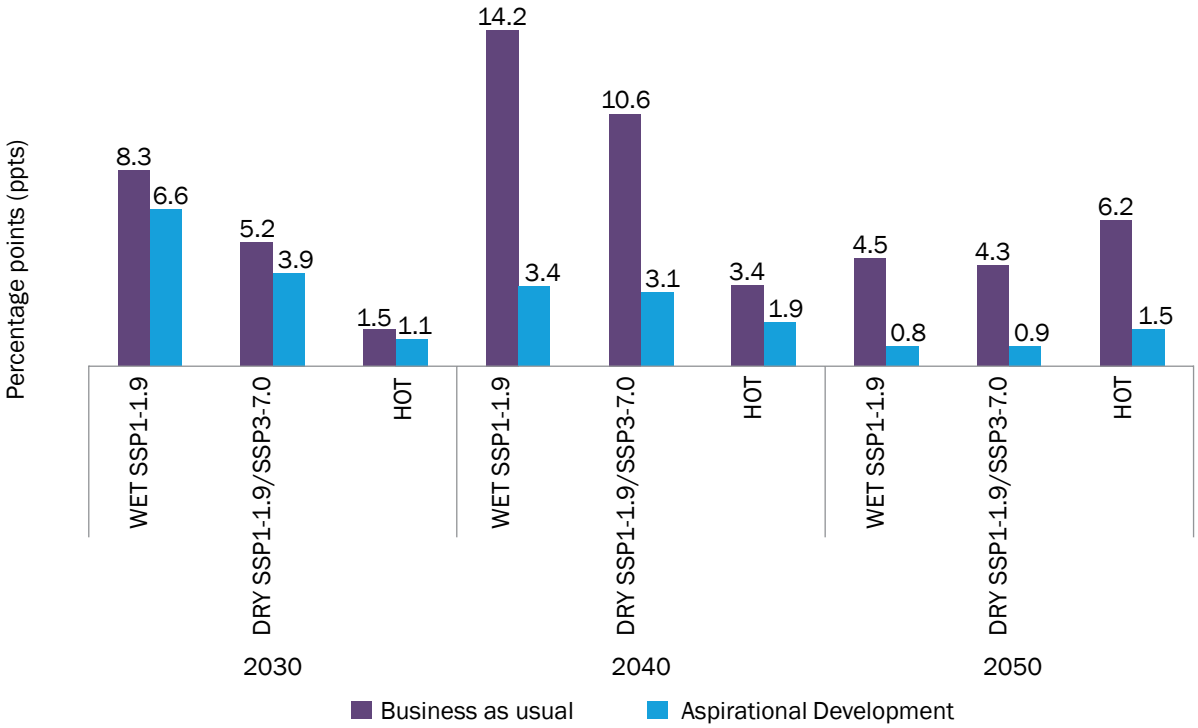
Analysis shows that climate change impacts on the economy will drive up poverty rates. Results from a microsimulation exercise using different climate scenarios shows that the largest cumulative climate change effects will be felt in the SSP1-1.9 Wet scenario. As shown in Figure 9, over the next 10 years in the BAU policy scenario, climate shocks on the economy will push another 2 million people into poverty, increasing the poverty rate by 8 percentage points. This estimate increases to 4 million additional poor Malawians by 2040, mostly in the Southern and Central regions. In the dry SSP1-1.9 and SSP3-7.0 scenarios, an additional 1.2 million people would fall into poverty in the next decade, mostly in rural areas. By 2040, the number would rise to 2.3 million, mainly in rural areas and particularly in the Southern and Central regions.

Figure 9. Increase in the poverty headcount due to the economic impacts of climate change

a. BAU with no adaptation, by area, region, and sector



b. Increase in poverty, BAU vs. ASP



Source: World Bank microsimulations using inputs from MFMOD in the household survey (IHS5). The wet scenarios correspond to SSP1-1.9 in all years, while the dry scenarios correspond to SSP3-7.0 in 2040 but to SSP1-1.9 in 2030 and 2050. The hot scenarios correspond to SSP3-7.0.

Development—a shift to the ASP scenario—can reduce the impact of climate change on poverty rates. In the ASP scenario, fewer people are pushed into poverty due to the impacts of climate change, significantly so by 2040: Instead of 2 million people, 800,000 are impacted in the dry climate scenarios, and 1 million are pushed into poverty, instead of 4 million, in the SSP1-1.9 Wet scenario.

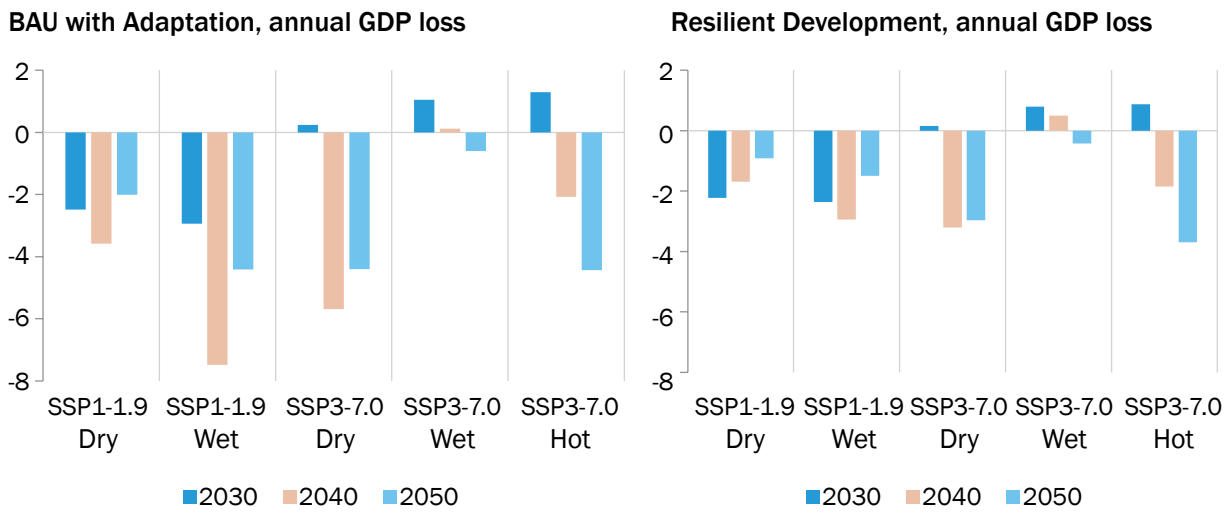
This is in part because of significant changes in the structure of the economy from agriculture, as well as more investment in modern infrastructure. Moreover, higher levels of GDP growth are accompanied by increased business formation, more paid jobs and formal employment, which will improve the income of households.

4.1.3 How selected adaptation measures can reduce economic damages

The analysis confirms that adaptation investments can significantly reduce the damages from climate-related shocks. The assessment considers adaptation measures and costs for agriculture and livestock productivity, land management, roads and bridges, and hydropower. A more comprehensive coverage of all adaptation measures was not possible due to data, time, and resource constraints. That said, it is important to recognize that there are limits to adaptation. There are no easy adaptation options to avoid some kinds of climate change impacts on Malawi's economy—for instance, the impact on heat on labor productivity.

Annual GDP losses decline with investments to enhance resilience in the different sectors. Figure 10 presents annual GDP losses from climate change in the BAU+A and RES scenarios, which reflect adaptation investments. In RES, Malawi benefits both from high economic growth and adaptation, and annual GDP losses are significantly reduced. The benefits from adaptation are highest in the SSP1-1.9 Wet scenario, where annual GDP losses in 2050 are 4.4 percent in BAU+A, compared with 15.7 percent in BAU—and 1.5 percent in RES, compared with 6.2 percent in ASP. The smallest benefits of adaptation investments are estimated in the SSP3-7.0 Wet scenario. This analysis highlights the value of adaptation measures in addition to economic development. Notably, in both BAU+A and RES, adaptation is projected to lead to GDP gains in the 2030s in the SSP3-7.0 scenarios, as the benefits from adaptation investments more than offset the impacts of climate change.

Figure 10. Annual GDP loss (% deviation from the baseline) with adaptation



Adaptation is most effective at reducing climate damages transmitted through three channels: roads and bridges, irrigated and rainfed crops, and livestock.

Roads and bridges: This channel shows the largest benefits from adaptation. Annual GDP losses in 2050 decline significantly, to 4.1 percent in SSP1-1.9 Wet and 0.7 percent in SSP3-7.0 Hot in the BAU+A scenario. Similarly, adaptation in the RES scenario leads to an annual GDP gain of 0.2 percent in 2050, instead of an annual GDP loss of 0.8 percent in ASP, in the SSP3-7.0 Hot climate scenario. Adaptation for roads and bridges includes climate-resilient repair and maintenance as well as construction. New road infrastructure is constructed to resist high temperatures and heavy downpours, as well as a future 50-year flooding event.

Irrigated and rainfed crops: Adaptation investments to reduce impact of climate change on the agriculture sector, such as reducing irrigation losses, switching to cassava from maize, and reducing soil erosion through improved land management translate into significant economic gains. In all climate scenarios, and for both BAU and ASP, it is estimated that these adaptation measures result in annual GDP gains, ranging from 1.9 to 3.6 percent from the baseline for BAU+A by 2050, and ranging from 1.0 to 1.9 percent from the baseline for RES.

Livestock revenue: While the impact of climate change from this damage channel is the smallest, the benefits from adaptation are significant. In SSP1-1.9 Dry, adaptation limits the reduction in GDP in 2050 due to climate change impacts on livestock to just 0.2 percent in BAU+A, and in both SSP1-1.9 Wet and SSP3-7.0 Wet, a GDP gain of 0.1 percent is projected. In the RES scenario, the GDP loss in 2050 in SSP1-1.9 Dry is limited to 0.1 percent, and a GDP gain of 0.1 percent is projected in the SSP1-1.9 Wet scenario. The lower impact under this damage channel, even with adaptation, is due to the fact that the economy transitions away from dependence on agriculture as it develops.

4.2 Fiscal Considerations in Managing Climate Change Impacts

4.2.1 Malawi is already deeply indebted and resource-constrained

Fiscal imbalances have been a chronic challenge in Malawi. The country has a long history of budget deficits, which have been financed through aid. Since development partners largely halted their budget support following the 2013 "cashgate" scandal, higher fiscal deficits have led to a sharp rise in domestic debt. Fiscal pressures have been exacerbated by the cost of the COVID-19 pandemic response and, most recently, by the rise in global commodity prices driven by the war in Ukraine. The latter has exerted additional pressure on external balances and resulted in a deterioration of Malawi's terms of trade, which drove up inflation. The December 2021 Debt Sustainability Analysis found that Malawi is at high risk of both external and public debt distress, and that the country's level of debt is unsustainable.[102] The stock of public and public-guaranteed debt increased to 59 percent of GDP in 2021, from 55 percent in 2020. This was driven by increased uptake of both domestic and external debt. The government has embarked on a course of fiscal consolidation in the FY2022/23 budget that is expected to reduce the deficit and public debt, and gradually create the space for greater public investments.

Fiscal pressures are expected to remain large in both the BAU and ASP policy scenarios, even before accounting for climate change impacts. Government will continue to face significant fiscal pressure, be it from continuation of weak policy decisions that have led to the country's current debt sustainability challenges (BAU) or the front-loading of development-enhancing investments (ASP). Importantly, the deficit under the ASP policy scenario would moderate and stabilize before 2050 as improved growth would drive higher revenues over the long term. Financing of these deficits would increase public debt, which, as noted, is already at unsustainable levels. There is therefore a need to promote greater private sector engagement to support the achievement of the Malawi 2063 vision, as a way to help manage fiscal deficits and public debt levels.

Adaptation will reduce the impact of climate change on the economy but come at significant cost above needed development investments, which Government cannot finance alone. The adaptation investments needed from 2020 to 2050 are estimated at US$3.2–4.8 billion in the BAU+A scenario and US$2.9–5.2 billion in the RES scenario. As a share of GDP, annual average investment needs in BAU+A range from 0.7 percent of GDP in SSP3-7.0 Hot, to 1 percent of GDP in SSP 1-1.9 Wet; in RES, they range from 0.4 percent of GDP in SSP3-7.0 Hot, to 0.7 percent of GDP in SSP1-1.9 Wet. Most of these are costs associated with investments in roads and bridges.

[102] World Bank and IMF, 2021, "Malawi: Joint World Bank-IMF Debt Sustainability Analysis."

Malawi needs to aggressively seek non-public debt creating financing sources for climate-related actions, given investment needs go way beyond what Government can afford as it works to return debt to sustainable levels. Grant and highly concessional financing from public sources are urgently needed to meet the very large investment needs that are required in the coming few years to deliver results over the medium and long terms. Current and future development aid should crowd-in climate finance (public and voluntary) and should leverage private sector investment for bankable opportunities – as expanded on in the next section.

4.2.2 Tapping into international climate finance, green finance, and private investments

As mentioned in Section 2, the Government is establishing the Climate Fund to operate as a single institutional framework for coordinating climate action finances. Along with the Climate Fund, monitoring, reporting, and verification and financial management systems are being developed to track inflows of resources towards climate change related interventions by different stakeholders, including international NGOs; bilateral and multilateral institutions; development banks; United Nations programs; academic institutions; the private sector, and various non-state actors. A prototype of the system is being tested. As of August 2022, two Global Climate Facility projects had been approved, both with co-financing from other agencies: one supporting the modernization of early warning systems, and one to develop renewable energy projects in regions with power deficits. There are also projects with the Adaptation Fund, and the Global Environment Facility.

Despite this progress, Malawi faces a range of challenges with accessing climate finance. These include: i) accreditation of national entities under various financing mechanisms, as none are accredited yet; ii) inadequate institutional and technical capacity to develop bankable project proposals; iii) challenges to crowd in private sector to finance climate action; iv) lack of financial data on investments by the private sector and some NGOs; v) inadequate evidence to support the rationale for climate finance in climate; and vi) the need to establish robust MRV systems for climate-related outcomes—for example, soil carbon sequestration.

Malawi is just starting to leverage market-based instruments, but, with catalytic technical assistance, this has potential to accelerate climate action. The growing market for investments that meet environmental, social, and governance (ESG) standards provides an opportunity to engage with new investors through emerging bond types, such as green/sustainability bonds. These bonds may designate the use of proceeds or, in the case of sustainability-linked bonds, have no restrictions on the use of proceeds, but instead rely on key performance indicators to measure performance with regard to sustainability and climate action. Accessing these sources of finance requires knowledge of ESG and carbon markets, local knowledge to identify opportunities, and reliable MRV systems. Malawi would benefit from catalytic technical assistance on all three.

The market for carbon credits is already generating opportunities—albeit modest ones. Malawi has developed activities under the Reducing Emissions from Deforestation and forest Degradation (REDD+) program. The country is seeking to maximize potential emission reductions by implementing targeted measures and activities that will lower net emissions by: i) lowering rates of deforestation; ii) lowering rates of forest degradation from unsustainable fuel wood harvesting, and iii) enhancing carbon stocks through afforestation and reforestation. The Kulera Landscape REDD+ Program[103] has been able to generate Verified Emission Reductions which, when sold, provide resources for conservation efforts and livelihood improvements in the targeted areas. Accelerating the establishment of a functional and independent MRV system for wide-scale generation of carbon

[103] The Kulera Landscape REDD+ Program for co-managed protected areas aims to reduce deforestation in selected protected areas (Nyika National Park, Vwaza Marsh Wildlife Reserve, and Nkhotakota Wildlife Reserve). The project proponents include the Department of National Parks and Wildlife (DNPW), the Nyika-Vwaza Association (NVA), the Nkhotakota Wildlife Reserve Association (NAWIRA), and Terra partnered with a Malawi-based NGO, Total Land Care. Over the 30-year period that the program is active, over 162,632 hectares of forest will be conserved, which would have been lost in the absence of the project, resulting in more than 7.2 million tons of carbon emission reductions.

credits in Malawi will help grow this market. Based on the land restoration modeling results in the RES scenario, the potential value of additional carbon sequestration that could be linked to voluntary carbon markets could potentially range from US$24.8 million to US$74.3 million per year.

Malawi needs to pursue reforms to open up opportunities in climate-smart investing in sectors including renewable energy, transport, green buildings, urban wastewater, climate-smart agriculture, and municipal solid waste management. For Malawi to attract more private participation in infrastructure development—for example, in renewables—the Government will need to continue to reform tariffs to reflect cost more accurately, to allow for its national utility to become a financially viable off-taker, and to address foreign exchange controls and transferability.

In addition, lack of institutional capacity to manage and monitor long-term concession contracts of the existing PPPs has resulted in mixed outcomes. Contract enforcement has been a challenge for most investors in Malawi. It takes almost two years to resolve commercial disputes due to inefficient, slow judicial processes often obstructed by arbitrary injunctions. Once resolved, purely local disputes need to be enforced by the local courts, suffering from the same slow processes. A significant drawback to investment in the road sector, for example, is the high amount of arrears owed to the private sector, currently estimated at US$100 million—almost equal to the road sector's annual budget. Moreover, although Malawi has adopted strong anti-corruption laws and institutions, and initiatives by the private sector complement governmental efforts, experts state that there is still a significant gap between law and practice.[104] At the beginning of 2021 the Government ratified the New York Convention on Enforcement of Foreign Arbitral Awards. Creating a sound policy, regulatory, and institutional environment that encourages foreign investment is fundamental to creating a broader investment-friendly climate.

Projects highlighted by the Government as investment opportunities have failed to attract private sector interest. Some projects failed to make a strong business case, or they were too small to attract foreign direct investment, or too large for domestic firms to deliver. Others are not viable in Malawi's small market, where affordability for the target consumer must be carefully considered. Turning proposals into detailed investment plans and bankable projects remains a major challenge for the Government. Malawi needs a credible pipeline of investable opportunities and viable PPPs to increase private sector participation in key sectors. Since the national PPP program was launched in 2011, the government has mobilized more than US$1.1 billion in private capital, but nearly all came from one rail deal with the mining firm Vale. Private sector participation, especially in growth-oriented sectors such as agriculture, mining, industry, fisheries, and tourism, has been limited. Across the board, underlying issues need to be addressed, including better data collection, better identification of blended finance opportunities and de-risking solutions, and more transparent and competitive public investment management processes.

The new PPP Act passed by Parliament in April 2022 has introduced streamlined procedures and financing mechanisms for PPPs. Previously, there was no systematic approval process for PPP arrangements, and the process did not involve the ministry responsible for Public Sector Investment Program (PSIP). The new Act now stipulates that Government agencies will have to submit proposed PPP projects to the Ministry of Finance and Economic Affairs, which will include the PPPs in a compendium after approval of the PSIP by the Cabinet. The new PPP Act has also introduced provisions that will make implementation of PPP arrangements financially sustainable by establishing a PPP Financing Fund and a levy to be paid by private investors after being offered the opportunity to implement a PPP project.

[104] Malawi was ranked 110th out of 180 countries on the latest Corruption Perceptions Index, with a score of 35 out of 100 (the average score for Sub-Saharan Africa was 33, while the top-ranked countries, Denmark, Finland, and New Zealand, earned 88 points). See Transparency International. 2022. "2021 Corruption Perceptions Index." Berlin. https://www.transparency.org/en/cpi/2021; 2022. "CPI 2021 for Sub-Saharan Africa: Amid Democratic Turbulence, Deep-Seated Corruption Exacerbates Threats to Freedoms." January 25. https://www.transparency.org/en/news/cpi-2021-sub-saharan-africa-amid-democratic-turbulence-deep-seated-corruption.

Malawi also needs to improve the fundamentals to attract private sector finance for climate action. They include but are not limited to: (i) cost of finance, (ii) forex convertibility, (iii) streamlined administration process, (iv) fair and transparent tax treatments, (v) regulations and procurement systems, (vi) creditworthiness of counterparts, and (vii) access to reliable and affordable electricity and telecommunication.[105] Improving these fundamentals will not only help Malawi advance its climate agenda, but also encourage private investment across the economy. Other factors limit private sector participation, such as unstable macroeconomic and political conditions, the small market size. The dominant role of the state remains a challenge. The Government still plays a dominant role in various markets through the state-owned enterprises, which reduces effective competition.

Building on the recently approved PPP Act—and drawing on successful examples of PPP arrangements in solar energy, tourism, and forestry—offers further opportunities. Progress has been made in the past few years, as government and development partners have acted to reduce risks through a range of guarantee mechanisms. This includes protection from currency risk through linked power purchase agreements and credit guarantees on off-taker payments. Improving the regulatory environment and incentive structure for banks may support scaling up green financing by domestic financial intermediaries. Establishing green finance targets and promoting regular disclosures and/or GHG emission reporting will incentivize lending to climate-smart investments.

The private sector, including insurance companies, processors, manufacturers, and other national stakeholders, offers important opportunities for climate funding. Some private sector organizations, including Agora and Ex-Agris Africa, have dedicated funds to directly or indirectly support climate-smart agriculture. To develop the energy sector pipeline, Malawi should start with public sources of green climate finance to blend, de-risk, and attract private investment. Several green climate facilities can provide funding to de-risk more commercial sources of financing, such as the Access to Energy Fund, the InfraCo Africa, the Interact Climate Change Facility, the IFC Canada Climate Change Program, the Climate Investment Funds' Clean Technology Fund, the Energy and Environment Partnership in Southern and East Africa (EEP), and the Green Bonds Program.

Real and perceived risks remain that make it more difficult and expensive to access capital for infrastructure projects in Malawi. Action is needed to remove administrative bottlenecks, to update and reconcile laws and policies affecting private sector operations, and to maintain fiscal stability. Focusing on the whole financial system is fundamental to stimulating long-term investments in climate and sustainability projects in Malawi. The roadmap for securing finance from global markets needs to be strategically developed based on the applicability/feasibility and capacity to manage different instruments.

4.2.3 How climate change could affect Malawi's financial system

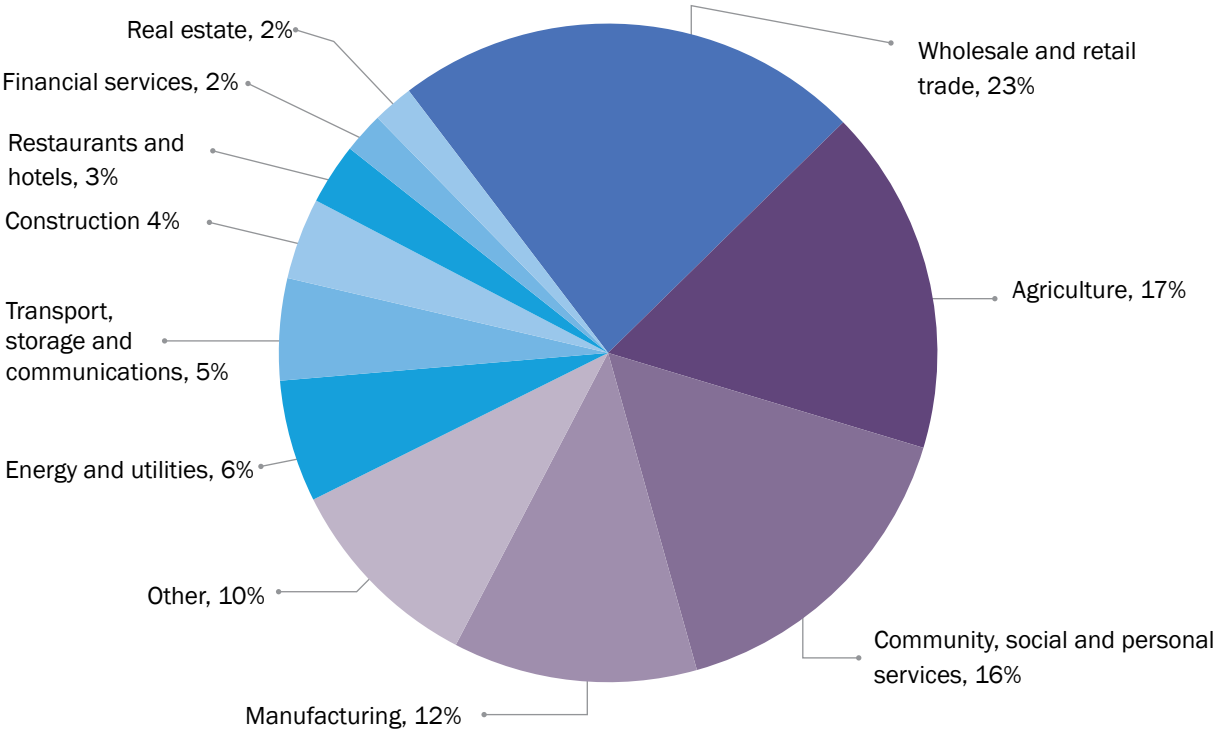
Malawi's financial system is small even by SSA standards. At the end of 2020, total financial sector assets stood at 47 percent of GDP. Banks account for the largest share of the system, with assets equivalent to 25.5 percent of GDP; the pension system accounts for 12.4 percent, and insurance, for 10 percent. The reach of the formal financial system is limited. Only 23 percent of adults had an account with a formal financial institution in Malawi in 2018, compared with 32.8 percent, on average, in Sub-Saharan Africa.

Climate change poses risks for Malawi banking system, due to exposure to climate-related shocks and impacts on agriculture. The agricultural loans portfolio accounts for 17 percent of total lending (Figure 11), which is substantial compared with many other countries in the region. Agricultural credit is dominated by lending to large producers, while overall access to agricultural finance for small holder farmers remains very limited. The financial sector's substantial exposure to risk affecting the

[105] Malawi Ministry of Natural Resources, Energy and Mining 2019, MCCCI 2018b, African Trade Insurance Agency (ATI), World Bank Group 2021.

agricultural sector could potentially pose systemic risks as climate-related shocks become more severe. Two important elements of making Malawi's financial system more climate-resilient are to grow and diversify the credit portfolio, and to improve insurance and other risk management instruments. It is important to start building the capacity of Reserve Bank of Malawi and of banks in supervision and management of climate related risks in the banking sector and applying climate related stress testing scenarios.

Figure 11. Sectoral structure of Malawi bank credit, percent



Malawi's insurance sector is in the early stages of development, with limited exposure in property and agriculture. Malawi has a small but dynamic insurance market, composed of eight non-life companies and five life companies. At the end of 2020, the total assets of life insurance companies stood at 9.3 percent of GDP, while non-life sector had total assets of less than 1 percent of GDP. Malawi has gained a wealth of experience on agricultural insurance in the past 14 years, but so far failed to scale up. The agricultural production that is currently insured is equivalent to less than 1 percent of the agricultural GDP. All eight general insurers are actively engaged in the agricultural market, and six insurance schemes aimed at small-scale farmers are currently being operated, covering different crops (maize, tobacco, soya, and oilseeds). The key challenge in Malawi is to design agricultural insurance schemes that can reach a majority of the farming population.

Deploying agricultural insurance at scale is an important element of building resilience of the agricultural sector. A possible solution is a PPP with the insurance sector to kick-start the establishment of large-scale agricultural insurance schemes for farmers in Malawi. Such a partnership would help address the two key challenges hindering the development of the sector: (1) low affordability of and weak demand for agricultural insurance, and (2) the high cost of reaching out to small-scale farmers. To address affordability, the government could subsidize premiums to create incentives for farmers to buy insurance. Paired with insurance literacy campaigns, premium subsidies could help address the key demand-side challenges. The key supply-side challenges of high distribution and administration costs can best be addressed by linking agricultural insurance to existing structures, services and retail networks in the agricultural sector, such as contract farming, and agricultural credit.

While climate change poses some risks to Malawi financial system, the main challenge is in ensuring that the financial system continues to develop in line with a vision of a sustainable economy. The Malawi 2063 and the updated NDC identify a broad range of investments needed to meet the objectives of green and inclusive development.[106] As discussed above, the resulting funding needs are substantial and would be difficult to meet with Malawi's current financial market and institutions. It is essential to continue the overall development and deepening of the financial sector and strengthening of regulation and supervision. The development of capital markets is particularly important, given the substantial needs for infrastructure financing, and emerging opportunities in mobilizing new modalities of climate finance.

Mobilizing finance for green growth and climate change adaptation will require actions by financial regulators and supervisors to foster the development of a green finance market and to implement ESG standards in financial institutions. While there are no international standards for prudential supervision in relation to climate risks, a number of regulators, Network for Greening the Financial System, the Sustainable Banking Network, and several of the international standard-setting bodies have developed recommendations on integrating climate-related risks in supervisory review and evaluation process and setting requirements for disclosure. Action by Malawian regulators to introduce appropriate standards would be needed to also support the development of a green finance market and tap into new international capital sources that are expected to open up as economies globally work toward a net zero future.

Further progress on the implementation of the government's National Disaster Risk Finance (DRF) Strategy, 2019-2024, will support greater financial resilience against disaster and climate shocks for government, firms and households. As of June 2022, the government had implemented two financial instruments, a sovereign drought insurance policy through the African Risk Capacity, and a scalable social cash transfer program using contingent financing supported by the World Bank to respond to climate shocks. Further instruments should be explored, including sovereign polices for flood and tropical cyclones, the creation of the DRM fund and a public asset insurance program.

[106] Republic of Malawi, 2020, "Malawi 2063: An Inclusively Wealthy and Self-Reliant Nation"; 2021, "Updated Nationally Determined Contributions."

5 CONCLUSIONS AND PRIORITIES FOR ACTION

5. Conclusions and Priorities for Action

The analysis presented in this report shows that climate change has serious implications for many sectors of Malawi's economy—and development with adaptation investments are crucial. Pursuing the vision laid out in Malawi 2063 will not only accelerate growth and reduce poverty, but also make the country more resilient to the impacts of climate change. It is important though to integrate climate objectives into Malawi's development plans and policies and ensure that all investments are climate-resilient, which may require doing things differently, and doing different things.

Malawi needs a wide array of investments, policy reforms, and other interventions to build resilience, but in identifying next steps, it is important to prioritize among these measures, recognizing the country's fiscal constraints. Sections 2–4 identify a range of interventions that will be required for Malawi to meet its development goals with a changing climate. Many of these measures are also included in the country's updated NDC. While all the interventions described are important, it is critical to identify priority interventions, particularly given the country's fiscal constraints. This section prioritizes measures that will help to address the biggest impacts of climate change on the economy, those that will set back development goals the most, and also those that are most affordable in the current environment. This list of priority interventions can also inform how to prioritize among the more than 70 adaptation actions listed in the updated NDC.

Three priority areas are identified:

- Build infrastructure to withstand climate shocks and stressors
- Halt and reverse widespread land degradation
- Address climate impacts on labor productivity and household livelihoods.

5.1 Build Infrastructure to Withstand Climate Shocks and Stressors

As noted in Section 4, the largest impacts of climate change on the economy are through shocks to infrastructure. Malawi's public infrastructure is already suffering costly damage from climate shocks, particularly from flooding. As noted, Tropical Storm Ana is estimated to have cost damages on the order of 1.5–2.7 percent of Malawi's GDP, including damage to the Kapichira Dam. The analysis of impact channels in Section 4 shows that the biggest impact of climate change on GDP is through roads and bridges, a reasonable proxy for infrastructure.

Investments to rehabilitate infrastructure assets from climate shocks are currently taking up scarce financial resources. The high cost of repairing the damage caused by disasters—such as the emergency operation to restore Kapichira Dam—diverts already-scarce resources from longer-term development priorities. Of course, it is crucial to restore the services provided by the damaged infrastructure assets to previously achieved levels. However, every dollar that goes to repairs is a dollar that cannot be invested in building new infrastructure, to close Malawi's large deficits, provide much-needed services to the people, and support economic growth. The deficit remains as there are fewer resources to build new infrastructure beyond what is rehabilitated.

At the same time, Malawi's efforts to repair damaged assets and to close its infrastructure deficit offer prime opportunities to build better, more resilient infrastructure. Substantial new investments in infrastructure are needed to achieve Malawi 2063 goals and more. It can be less costly to build new infrastructure to be resilient than to retrofit infrastructure to address the changing demands of climate change on design and operation of infrastructure. The top priority for adaptation for Malawi is therefore to build infrastructure to withstand climate shocks and stressors. Key actions include:

Streamline climate-sensitive PIM across all infrastructure investments. The Government should integrate climate risk screening across all public sector investment planning and make such screenings binding and mandatory for all projects through public investment management regulations or integration in the Public Finance Management Act (2022). Climate risk should be considered by respective line ministries as part of project concept and as part of the feasibility study during project appraisal phase. In the urban sector this will help avoid construction in high-risk areas, for example. Revenues from existing carbon tax and fuel levies could potentially be used to screen, prioritize, and design public infrastructure projects that increase the resilience to climate change.

Adopt and implement a public asset management policy to support climate resilient investment planning and management. This is a prerequisite for introducing climate change considerations into investment planning; it can be developed once the Government's draft public asset management policy is adopted. The asset register should include information on the vulnerabilities and criticality of both existing and new infrastructure assets. Data and analysis of aging and risk-exposed bridge structures can form the basis of a prioritized bridge replacement and maintenance plan, for example. A crisis response mechanism can also be included as part of the functional asset management system, to provide immediate emergency recovery support following an eligible crisis or emergency. One example is an IT disaster recovery plan addressing risks to hardware and software and encouraging cloud or off-site backup routines.

Revise design, construction, and maintenance standards for infrastructure with a resiliency focus. The National Transport Master Plan already calls for this for transport sector assets. The task now is to institutionalize the recently updated construction standards and specifications for civil and building works; place greater emphasis and expectations on quality assurance systems, reliable material selection and testing; and ensure that specifications for bitumen and asphalt designs are appropriately adjusted to site specific dynamics. There are opportunities to green existing industries (for example, housing sector, urban wastewater, and municipal solid waste management) by encouraging the adoption of renewable energy through revisions to design, construction, and maintenance standards.

Empower local governments by increasing the decentralization of climate funds to support district-led action plans: First, the Ministry of Finance and Economic Affairs should provide discretionary funds to local governments for district-led climate and DRM investments, tied to performance and existing performance-based grant architecture at the district and local levels. Second, the Department of Economic Planning should develop a monitoring, evaluation, and reporting system that allows the exchange of climate and DRM information between districts and the national government. The monitoring system should allow tracking of annual progress reports on these investments.

Build on the recently approved PPP Act to create enabling conditions for greater private sector participation and establish a credible pipeline of investable opportunities and viable PPPs that promote climate resilience. Such efforts can build on and learn from existing, successful PPP arrangements in solar energy, tourism, and forestry in the country. In the transport sector there are opportunities to introduce performance-based/availability-based contracts, such as on unpaved secondary and tertiary roads, that can promote climate-resilient infrastructure development.

Adopt macroeconomic and sector-level reforms to unleash private sector investment in infrastructure. The needed macroeconomic reforms include improving currency convertibility, reducing administrative bottlenecks, strengthening contract enforcement, shifting from unsolicited to solicited bids, putting in place a project preparation fund, and routine screening and management of contingent liabilities based on a fiscal commitments and contingent liabilities framework. Sector-level reforms such as greater transparency and regular financial reporting by state-owned enterprises in the energy sector are a first step to restoring cost-reflective tariffs and building creditworthy off-takers. The partial unbundling of the electricity sector has yet to lead to a credible off-taker for independent power producers.

5.2 Halt and Reverse Widespread Land Degradation

Malawi urgently needs to stem and reverse land degradation and forest loss, to build climate resilience and enhance productivity. Investing in improved land management will reduce risks to existing and new infrastructure—both public and private—during heavy precipitation that leads to flooding. Healthy forests and other natural landscapes can absorb and store large amounts of water, reducing flood and landslide risks and soil erosion. As highlighted in Section 3.2, investing now in integrated approaches to restore forests and riparian areas and promote agroforestry and conservation agriculture could lead to significantly higher crop production by the mid-2030s. Land restoration activities need to start now, as the benefits accumulate over time.

Malawi also needs to reduce the enormous pressure on Malawi's forests from the collection of firewood and the production of charcoal. This requires accelerating the transition to clean and efficient cookstoves and instituting a forest management certification scheme to increase sustainably sourced firewood and charcoal. A rapid transition to cleaner cookstoves and fuels is not only essential for forest protection, but to reduce indoor air pollution. This will bring important health benefits, particularly to women, girls, and children, and address one of the leading causes of premature death.

Land restoration investments will create opportunities for carbon credits but will require targeting investments in the watershed to optimize carbon capture. Analysis done for this CCDR has shown that the potential value of additional carbon sequestered that could be linked to the voluntary carbon markets ranges from US$24.8 million to US$74.3 million per year. Apart from stronger legal and institutional frameworks to support climate financing, including establishing monitoring, reporting, and verification (MRV) systems for climate and carbon finance, as described in Section 2.2.2, Malawi will need to revise watershed management guidelines to better target land restoration activities under the Bonn Challenge to increase carbon capture. The sites chosen for land restoration investments will determine the extent and flow of ecosystem services such as water regulation, soil retention, and carbon sequestration. An ecosystem services-based approach would also need to be embedded in the watershed management guidelines.

The use of market-based instruments can also generate financing for programs that reward different actors for contributing to land restoration. Healthy watersheds generate ecosystem services that benefit a range of economic sectors, such as hydropower and water supply utilities. Initiating payment for ecosystem services arrangements with these sectors and other beneficiaries can help raise resources for land restoration programs while ensuring that the land restoration activities are targeted to generate the required ecosystem services.

However, undertaking wide-scale land restoration will also require a number of institutional and policy reforms and enhancing government capacities. Actions are needed to address property rights and land tenure. Supporting land registration and titling (backed with digital land title records) will create incentives for improved land management at the household and community level. Digitized mapping of forest boundaries can help strengthen forest management by the public sector. In addition, Malawi will need to strengthen and resource district-level administrations to decentralize the management of natural resources, put in place effective conflict resolution mechanisms for property rights disputes, and promote coordination among government actors (across scales and between rural and urban communities).

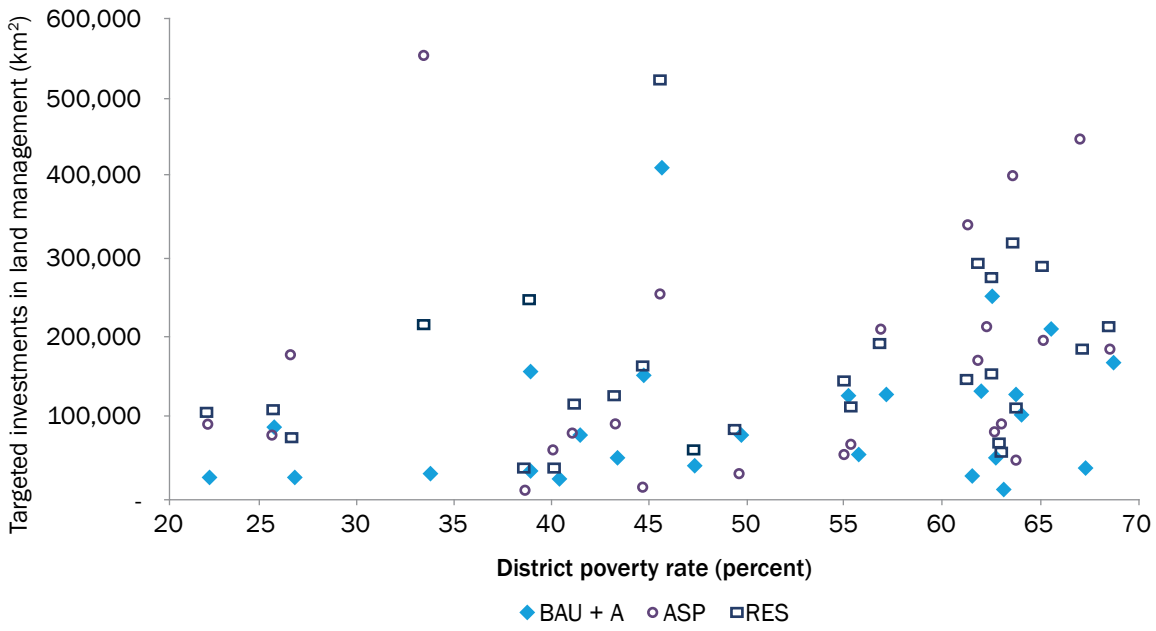
5.3 Address Climate Impacts on Labor Productivity and Livelihoods

Climate change will affect labor productivity, particularly through heat stress, and it will negatively impact agriculture. The impact channels analysis in Section 4 shows the second-biggest impact of climate change on the economy is through shocks to labor productivity. This, in turn, affects Malawians' livelihoods, food security—which is often already tenuous at best—and ability to recover from shocks. The worst-affected are likely to be poorer households in rural areas, precisely those

that are already most vulnerable to all types of shocks, including from extreme weather. Even with adaptation measures, negative impacts on labor productivity will remain; the only way to reduce them is through structural transformation of the economy, to shift labor away from agriculture and into sectors with fewer outdoor jobs. This, in turn highlights the need to build human capital and to create new job opportunities.

Since structural transformation will take time, Malawi urgently needs to enhance support for vulnerable households coping with climate change impacts. The scale-up of the Social Cash Transfer Program (SCTP) is a good start. The SCTP has recently incorporated a scalability mechanism to adjust transfers in response to extreme events, but as more data become available, transfers could be adjusted periodically in line with people's needs. The Government has shown a strong capacity to implement the SCTP and it can build on this capacity to expand the SCTP, particularly given additional investments in Unified Beneficiary Registry, enabling e-payments, and the grievance redress mechanism. Similarly, a redesigned enhanced public works program can provide social protection to vulnerable households while building natural capital and increasing resilience. In this context, it is important to recognize a limitation in this approach as a poverty reduction measure: as shown in Figure 12, there is some overlap between where Malawi's poorest households live, and where land restoration efforts are most needed, but the overlap is not perfect.

Figure 12. District-level rate of poverty vs. area targeted for landscape investments (km²)



Source: World Bank model results.

Unlike in land restoration or infrastructure investments, there is no direct role for private financing, though some PPPs and carbon market mechanisms could complement safety net deliveries. Instead, the government will need to consider alternative modalities to release funds in response to emergencies and harmonize actions with development partners involved in emergency relief.

5.4 Closing Reflections and Looking Ahead

Additional policy and institutional reforms will be needed to integrate and mainstream climate action across government institutions and support implementation. Key measures include: (i) develop

and adopt new, coordinated legal frameworks on climate change and disaster risk management; (ii) establish the National Climate Change Fund and clarify which expenditures are eligible for climate and DRM funds; and (iii) empower communities and civil society organizations to shape climate actions and to monitor and evaluate results.

Malawi would benefit from additional research to delve into questions this CCDR could not fully explore. While the analysis includes the major sectors of the economy, it was inherently limited in scope. More work is warranted on fisheries, for example, as well as on tourism and mining. Similarly, although the modeling sought to capture the main pathways in which climate stressors could affect Malawi's economy, not all pathways could be analyzed. Finally, the assessment considers adaptation measures and costs for agriculture and livestock productivity, land management, roads and bridges, and hydropower. A more comprehensive coverage of all adaptation measures was not possible due to lack of data, and time and resource constraints. While these constraints do not take away from the main findings, they point to the need for further research. Looking ahead, it is important to support a vibrant research community in the country to fill these knowledge gaps.

Still, the takeaway from this CCDR is clear: In Malawi, development and climate resilience are inextricably linked. Across multiple climate scenarios, the analysis shows that development aligned with the Malawi 2063, with additional adaptation investments—the Resilient Growth (RES) scenario—yields the best outcomes for economic growth, poverty reduction, climate resilience, and Malawi's debt sustainability. Several measures that advance Malawi's development and climate goals can also slow GHG emissions growth, mainly by enhancing natural carbon sinks through investments in land restoration and forest protection. Malawi faces serious fiscal and development challenges that will limit the country's ability to implement adaptation measures. But as the analysis makes clear, the country can begin to address climate resilience now, starting with the lower cost and high impact priorities identified.

REFERENCES

References

AfDB. 2020. “The Africa Infrastructure Development Index (AIDI) 2020.” AfDB Statistics Department Economic Brief. African Development Bank. https://www.afdb.org/en/documents/economic-brief-africa-infrastructure-development-index-aidi-2020-july-2020.

Asfaw, S. and G. Maggio. 2018. “Gender, Weather Shocks and Welfare: Evidence from Malawi.” The Journal of Development Studies 54 (2): 271–91. doi:10.1080/00220388.2017.1283016.

Asfaw, S., C. Orecchia, G. Pallante, and A. Palma. 2018. “Soil and Nutrients Loss in Malawi: An Economic Assessment.” Lilongwe: Food and Agriculture Organization of the United Nations, UNDP-UNEP Poverty-Environment Initiative, and Ministry of Agriculture, Irrigation and Water Development, Malawi. https://www.fao.org/family-farming/detail/en/c/1185502/.

Asfaw, S., G. Pallante, and A. Palma. 2020. “Distributional Impacts of Soil Erosion on Agricultural Productivity and Welfare in Malawi.” Ecological Economics 177 (November): 106764. doi:10.1016/j.ecolecon.2020.106764.

Ballan, S., J. Oh, N. Rogerson, and E.J. Oughton. 2022. “Malawi CCDR Digital Sector Background Note.” Washington, DC: World Bank.

Boehlert, B., A. Vogl, D. Castillo, J. Leon, R. Payet-Burin, J. Helman, Y. Gebretsadik, V.C. Kirui, E. Rutebuka, and K. Strzepek. 2022. “Sectoral Impacts of Climate Change in Malawi: Deep Dive on Land, Water, Agriculture, Energy, Infrastructure, and Health.” Background Note for the Malawi CCDR. Washington, DC: World Bank.

Browder, G. et al. 2019. Integrating Green and Gray: Creating Next Generation Infrastructure. Washington, DC: World Bank and World Resources Institute. © World Bank and World Resources Institute. https://openknowledge.worldbank.org/handle/10986/31430 License: CC BY 4.0

Caruso, G. and L. Cardona Sosa. 2022. “Poverty Persistence in Malawi: Climate Shocks, Low Agricultural Productivity, and Slow Structural Transformation.” Malawi Poverty Assessment. Washington, DC: World Bank Group. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099920006302215250/P174948072f3880690afb70c20973fe214d.

Climate Watch. 2022. “Global Historical Emissions.” Washington, DC: World Resources Institute. https://www.climatewatchdata.org/ghg-emissions.

De Serio, C., A. Iimi, and C. Nsusa. 2022. “Malawi CCDR Transport Sector Background Note: Road Transport Criticality and Resilience.” Washington, DC: World Bank.

Fatch, P., C. Masangano, T. Hilger, I. Jordan, I. Mambo, J.F.M. Kamoto, A. Kalimbira, and E.-A. Nuppenau. 2021. “Holistic Agricultural Diversity Index as a Measure of Agricultural Diversity: A Cross-Sectional Study of Smallholder Farmers in Lilongwe District of Malawi.” Agricultural Systems 187 (February): 102991. doi:10.1016/j.agsy.2020.102991.

Gondwe, M.C., K.P. Mukiibi, J.M. Hasselsten, and Z. Meng. 2022. “Malawi CCDR Energy Sector Background Note.” Washington, DC: World Bank.

Government of Malawi. 2013. “National Climate Change Investment Plan 2013–2018.” Lilongwe: Ministry of Environment and Climate Change Management, Environmental Affairs Department. http://extwprlegs1.fao.org/docs/pdf/mlw190674.pdf.

Government of Malawi. 2015. “National Disaster Risk Management Policy, 2015.” Lilongwe: Secretary and Commissioner for Disaster Management Affairs. https://www.preventionweb.net/publication/malawi-national-disaster-risk-management-policy-2015.

Government of Malawi. 2016. “National Climate Change Management Policy.” Lilongwe: Ministry of Natural Resources, Energy and Mining, Environmental Affairs Department. https://reliefweb.int/report/malawi/national-climate-change-management-policy.

Government of Malawi. 2018. “National Resilience Strategy (2018–2030): Breaking the Cycle of Food Insecurity in Malawi.” Lilongwe: Department of Disaster Management Affairs. https://www.preventionweb.net/publication/malawi-national-resilience-strategy-nrs-breaking-cycle-food-insecurity.

Government of Malawi. 2019. “Malawi 2019 Floods Post Disaster Needs Assessment Report.” Lilongwe. https://reliefweb.int/report/malawi/malawi-2019-floods-post-disaster-needs-assessment-report.

Government of Malawi. 2022. “Malawi: Tropical Storm ANA Situation Report (as of 15 February 2022).” Lilongwe: Department of Disaster Management Affairs. https://reliefweb.int/report/malawi/malawi-tropical-storm-ana-department-disaster-management-affairs-situation-report-2-15.

Hallegatte,S. et al. 2019. Lifelines - The Resilient Infrastructure Opportunity. Washington DC: World Bank Group. © World Bank. https://openknowledge.worldbank.org/handle/10986/31805 License: CC BY 3.0 IGO.

IPCC. 2022. “Summary for Policymakers.” In Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, edited by H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, et al. Cambridge, UK, and New York: Cambridge University Press (in press). https://www.ipcc.ch/report/ar6/wg2/.

Kaza, S., L.C. Yao, P. Bhada-Tata, and F. Van Woerden. 2018. What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050. Washington, DC: World Bank. http://hdl.handle.net/10986/30317.

Kirui, O.K., A. Mirzabaev, and J. von Braun. 2021. “Assessment of Land Degradation ‘on the Ground’ and from ‘Above.’” SN Applied Sciences 3 (3): 318. doi:10.1007/s42452-021-04314-z.

Lange, G.-M., Q. Wodon, and K. Carey, eds. 2018. The Changing Wealth of Nations 2018: Building a Sustainable Future. Washington, DC: World Bank. http://hdl.handle.net/10986/29001.

McCarthy, N., T. Kilic, A. de la Fuente, and J. Brubaker. 2017. “Shelter from the Storm?: Household-Level Impacts of, and Responses to, the 2015 Floods in Malawi.” Policy Research Working Paper No. 8189. Washington, DC: World Bank. http://hdl.handle.net/10986/28366.

OCHA. 2022. “Flash Appeal Malawi: Tropical Storm Ana, February 2022–May 2022.” Lilongwe: United Nations Office for the Coordination of Humanitarian Affairs. https://malawi.un.org/en/173845-malawi-flash-appeal-tropical-storm-ana-february-may-2022.

OECD. 2018. “Climate-Resilient Infrastructure.” OECD Environment Policy Paper No. 14. Paris: Organisation for Economic Co-operation and Development. doi:10.1787/4fdf9eaf-en.

Ralston, L., C. Andrews, and A. Hsiao. 2017. “The Impacts of Safety Nets in Africa: What Are We Learning?” Policy Research Working Paper No. 8255. Washington, DC: World Bank. http://hdl.handle.net/10986/28916.

Republic of Malawi. 2015. “Malawi National Adaptation Programmes of Action, Second Edition.” Lilongwe: Ministry of Natural Resources, Energy and Mining, Environmental Affairs Department. https://www.ead.gov.mw/storage/app/media/Resources/Miscellaneous/National%20Adaptation%20Programmes%20of%20Actions.pdf.

Republic of Malawi. 2015. “Nationally Appropriate Mitigation Actions for Malawi.” Lilongwe: Ministry of Natural Resources, Energy and Mining, Environmental Affairs Department. https://www.ead.gov.mw/storage/app/media/Resources/Miscellaneous/Nationally%20Appropriate%20Mitigation%20Actions.pdf.

Republic of Malawi. 2017. “Malawi Renewable Energy Strategy.” Lilongwe. https://mera.mw/download/malawi-renewable-energy-strategy/.

Republic of Malawi. 2017. “Forest Landscape Restoration Opportunities Assessment for Malawi.” Study prepared with the International Union for Conservation of Nature and Natural Resources and the World Resources Institute. Lilongwe: Ministry of Natural Resources, Energy and Mining. https://portals.iucn.org/library/sites/library/files/documents/2017-029.pdf.

Republic of Malawi. 2017. “Intended Nationally Determined Contribution.” Lilongwe: Ministry of Forestry and Natural Resources. https://unfccc.int/sites/default/files/NDC/2022-06/MALAWI%20INDC%20SUBMITTED%20TO%20UNFCCC%20REV.pdf.

Republic of Malawi. 2017. “The Malawi Growth and Development Strategy (MGDS) III: Building a Productive, Competitive and Resilient Nation.” Lilongwe: National Planning Commission. https://npc.mw/wp-content/uploads/2020/07/MGDS_III.pdf.

Republic of Malawi. 2018. “National Agricultural Investment Plan.” Prioritised and Coordinated Agricultural Transformation Plan for Malawi: FY 2017/18-2022/2. Lilongwe: Ministry of Agriculture, Irrigation and Water Development. https://www.scotland-malawipartnership.org/assets/resources/National_Agicultural_Investment_Plan_2018_Final_Signed.pdf.

Republic of Malawi. 2020. “Malawi 2063: An Inclusively Wealthy and Self-Reliant Nation.” Lilongwe: National Planning Commission. https://npc.mw/wp-content/uploads/2021/01/MW2063-VISION-FINAL.pdf.

Republic of Malawi. 2020. “Malawi National Transport Master Plan.” Lilongwe: Ministry of Transport and Public Works. https://npc.mw/wp-content/uploads/2020/07/National-Transport-Master-Plan1.pdf.

Republic of Malawi. 2021. “The Third National Communication of the Republic of Malawi.” Lilongwe: Ministry of Forestry and Natural Resources. https://unfccc.int/documents/268340.

Republic of Malawi. 2021. “Malawi Digital Economy Strategy: Supporting Inclusive Wealth Creation.” Presented at the Lilongwe, February 26. https://www.slideshare.net/RonaldTemboBBusScMSc/malawi-digital-economy-strategy.

Republic of Malawi. 2021. “Updated Nationally Determined Contributions.” Lilongwe: Ministry of Forestry and Natural Resources. https://unfccc.int/sites/default/files/NDC/2022-06/Malawi%20Updated%20NDC%20July%202021%20submitted.pdf.

Republic of Malawi. 2022. “Public Finance Management Act, 2022.” Lilongwe. https://gazettes.africa/archive/mw/2022/mw-government-gazette-dated-2022-03-31-no-2C.pdf.

Roscitt M.A., M. Frangi, N. V. Gajang, and I. Pangapanga-Phiri. 2022. “Malawi Climate Change Institutional Assessment.” Washington, DC: World Bank.

Sanje, K. 2015. “Malawi’s Hydropower Dries up as River Runs Low, Menacing Forests.” Reuters, October 29, sec. Forest & Wood Products. https://www.reuters.com/article/malawi-energy-hydropower-idUSL8N12S40920151029.

Santpoort, R. 2020. “The Drivers of Maize Area Expansion in Sub-Saharan Africa: How Policies to Boost Maize Production Overlook the Interests of Smallholder Farmers.” Land 9 (3): 68. doi:10.3390/land9030068.

Sichinga, M., C. Msowoya, and I. Drabek. 2022. “Malawi CCDR Social Protection Sector Background Note.” Washington, DC: World Bank.

Transparency International. 2022. “2021 Corruption Perceptions Index.” Berlin. https://www.transparency.org/en/cpi/2021.

Transparency International. 2022. “CPI 2021 for Sub-Saharan Africa: Amid Democratic Turbulence, Deep-Seated Corruption Exacerbates Threats to Freedoms.” January 25. https://www.transparency.org/en/news/cpi-2021-sub-saharan-africa-amid-democratic-turbulence-deep-seated-corruption.

Trisos, C.H., I.O. Adelekan, E. Totin, A. Ayanlade, J. Efitre, A. Gemeda, K. Kalaba, et al. 2022. “Africa.” In Climate Change 2022: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, edited by H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, et al., 1285□1455. Cambridge, UK, and New York: Cambridge University Press. https://www.ipcc.ch/report/ar6/wg2/.

UN DESA. 2022. “World Population Prospects 2022.” New York: United Nations Department of Economic and Social Affairs, Population Division. http://esa.un.org/unpd/wpp/.

UNICEF. 2021. “Protecting and Transforming Social Protection Spending during and beyond COVID-19.” Malawi Social Protection Budget Brief 2020/21. Lilongwe: United Nations Children’s Fund. https://www.unicef.org/esa/media/9016/file/UNICEF-Malawi-2020-2021-Social-Protection-Budget-Brief.pdf.

Vanya, C., L. Mtilatila, C. Boyce, A. Mtonya, H. Milanzi, J. Pagona, T. Kanyenda, K. Mang’anda, B. Mdzagada, and J. Nkhokwe. 2021. “Climate Change in Malawi: The Past, the Present and the Future.” Blantyre: Malawi Department of Climate Change and Meteorological Services.

WBG, UN, and EU. 2016. “Malawi Drought 2015-2016: Post-Disaster Needs Assessment.” Washington, DC: World Bank Group, United Nations, and European Union. http://hdl.handle.net/10986/25781.

WHO. 2022. “Tropical Storms, Flooding and Cholera: Malawi Faces Cholera Emergency amidst Severe Climate Events.” World Health Organization – Africa. Tropical Storms, Flooding and Cholera: Malawi Faces Cholera Emergency amidst Severe Climate Events, March 23. https://www.afro.who.int/photo-story/tropical-storms-flooding-and-cholera-malawi-faces-cholera-emergency-amidst-severe.

World Bank. 2009. “Malawi – Mineral Sector Review: Source of Economic Growth and Development.” Washington, DC: World Bank. http://hdl.handle.net/10986/3129.

World Bank. 2021. “Malawi Economic Monitor, June 2021: Investing in Digital Transformation.” Lilongwe: World Bank. http://hdl.handle.net/10986/35880.

World Bank. 2021. The Changing Wealth of Nations 2021: Managing Assets for the Future. Washington, DC: World Bank. http://hdl.handle.net/10986/36400.

World Bank. 2021. “Malawi Economic Monitor, December 2021: Addressing Macro and Gender Imbalances.” Washington, DC: World Bank. http://hdl.handle.net/10986/36747.

World Bank. 2022. “Malawi Gender Assessment.” Washington, DC: World Bank. http://hdl.handle.net/10986/37537.

World Bank and IMF. 2021. “Malawi: Joint World Bank-IMF Debt Sustainability Analysis.” Washington, DC: World Bank and International Monetary Fund. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/946631648217580282/Malawi-Joint-World-Bank-IMF-Debt-Sustainability-Analysis.

Wu J. and Y. Zhang. 2022. “Malawi CCDR Clean Cooking Sector Background Note.” Washington, DC: World Bank.


WORLD BANK GROUP