



REPUBLIC OF MALAWI

UPDATED
**NATIONALLY DETERMINED
CONTRIBUTIONS**

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Foreword

Climate Change is recognized as one of the biggest challenges humanity is facing today. It has implications for economic development, food security and poverty eradication for developing countries especially for Least Developed Countries (LDCs) like Malawi. Evidence shows that all of Malawi's socioeconomic sectors have been, and will continue to be, affected by climate change, with implications for the livelihoods of its population and social-economic development. It is evident that climate change is making Malawi's pathway to prosperity more difficult, more complex and costlier than before. Vulnerability to climate change impacts in Malawi is caused by factors such as deep-rooted poverty, high dependence on subsistence rain-fed agriculture, rapid human population growth that results in pollution and overexploitation of natural resources.



Malawi's Nationally Determined Contributions (NDC) demonstrates the commitment of the Malawi Government to meeting its obligations towards addressing the challenges of climate change. The NDC articulates areas of priority for climate change management through both mitigation and adaptation measures needed to address challenges of climate change. It represents a decisive and reference document for implementation of Malawi's adaptation and mitigations commitments.

The NDC has been developed through a consultative process and designed within the context of national development priorities. It is guided by principles set out by the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. Implementation of the NDC should not be considered as the responsibility of the Government alone, but its successful implementation will require concerted efforts with the involvement and participation of all stakeholders including NGOs, Civil Society, the Private Sector, Academia and the general public.

While the Ministry of Forestry and Natural Resources through the Environmental Affairs Department, in its capacity as the UNFCCC Focal Point for Malawi, will coordinate the implementation of the NDC all stakeholders will be expected to implement various aspects of the NDC and report on the same, in order to allow for tracking of implementation progress. It is the Government's expectation to have a successful implementation that will materialize into the intended results.

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A handwritten signature in black ink, appearing to read 'Nancy G. Tembo', written over a light blue background.

Preface

The Government of Malawi recognizes the adverse impacts caused by climate change and its implications for the country. In 2015 and 2016 Malawi experienced unprecedented floods and droughts on account of climate change with negative consequent effects on socio-economic sectors and on the economy. Even though Malawi's contribution to greenhouse gas emissions is very low on a global scale, it is scientifically accepted that human activities such as deforestation and land use change, consumption of fossil fuels such as coal, diesel and petrol, pollution from manufacturing industries, and improper waste management, release greenhouse gases into the atmosphere, which cause global warming.

Following the adoption of the Paris Climate Agreement in 2015, Malawi in 2015 submitted and communicated the United Nations Framework Convention on Climate Change (UNFCCC) its commitment to reduce greenhouse gas emissions and scale-up adaptation actions through the Intended Nationally Determined Contribution (INDC). As part of its commitment to the Paris Agreement, the Government of Malawi has revised its Nationally Determined Contributions (NDCs). The NDCs embody efforts by countries that are Party to the Paris Agreement to put in place measures to reduce national emissions and adapt to the impacts of climate change.

The NDC has outlined Malawi's climate change priorities for the period from 2020 - 2040 and has provided concrete strategies for addressing the causes of climate change and responding to the adverse effects and impacts in line with provisions established under the Paris Agreement. In order to ably track progress of its implementation and funding, the NDC has been prepared together with accompanying documents that will facilitate its implementation, mainstreaming, monitoring and reporting. These are: an Implementation Plan; Mainstreaming Guidelines; a Monitoring, Reporting and Verification Framework; and a Resource Mobilization Strategy.

The NDC affirms government's commitment to fully addressing climate change issues in order to reduce the vulnerability of its people and ecosystems, at the same time contributing to socio-economic development. It is the government's vision that implementation of the NDC will build Malawi's resilience to overcome challenges of climate change and embrace the opportunities that are available to enable the country lay a solid foundation for a sustainable and prosperous Malawi in line with the Malawi Vision 2063.



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The Government of Malawi through the Ministry of Forestry and Natural Resources would like to express its profound gratitude to the NDC-Partnership and all the Implementing Partners for their commendable technical support and to UNDP for both technical and financial support. The Government also extends its gratitude to the District Councils, key focal points in the relevant sectors, Civil Society, Academia, NGOs, Development Partners and the Private Sector, all of whom contributed to development of the Implementation Plan, the Mainstreaming Guidelines, Monitoring, Reporting and Verification (MRV) Framework and compilation of the NDC submission document in coordination with the Implementation Partners.

The Government of Malawi also acknowledges the coordination team in the Environmental Affairs Department for leading the work, and also to all the national experts who partnered with the international experts in undertaking the revision of Malawi's NDC.



Tawonga Mbale-Luka (Ms)

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Acronyms and abbreviations

AFOLU	Agriculture, Forestry and Other Land Use
BAU	Business as usual
BUR	Biennial Update Report
CAEP	Climate Action Enhancement Package
CBA	Cost-benefit analysis
CBIT	Capacity Building Initiative for Transparency
CCA	Climate Change Adaptation
CCS	Carbon capture and storage
CCU	Carbon capture and utilisation
CDM	Clean Development Mechanism
CH ₄	Methane
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
COP	Conference of the Parties
CSA	Climate Smart Agriculture
DADO	District Agriculture Development Office
DCCMS	Department of Climate Change and Meteorological Services
DODMA	Department of Disaster Management Affairs
DOF	Department of Forestry
DRTSS	Department of Road Traffic and Safety Services
EAD	Environmental Affairs Department
EC	European Commission
EGES	Enabler Coordination Group on Environmental Sustainability
EGENCO	Electricity Generation Company of Malawi
EPD	Department of Economic Planning and Development
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
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GoM	Government of Malawi

Ha	Hectare
ICTU	Information necessary for clarity, transparency and understanding
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
LUANAR	Lilongwe University of Agriculture and Natural Resources
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	Malawi Growth and Development Strategy
MOA	Ministry of Agriculture
MOFNR	Ministry of Forestry and Natural Resources
MOEPD&PSR	Ministry of Economic Planning, Development and Public Sector Reforms
MOI	Ministry of Industry
MOTPW	Ministry of Transport and Public Works
MOLG	Ministry of Local Government
MOE	Ministry of Energy
MPRSP	Malawi Poverty Reduction Strategy Programme
MRV	Monitoring, Reporting and Verification
Mt	Million tonnes
N ₂ O	Nitrous oxide
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
NEP	National Energy Policy
NFLRS	National Forest Landscape Restoration Strategy
NGO	Non-Governmental Organisation
NSO	National Statistics Office

NRSWG	Natural Resources Sectoral Working Group
NSCCC	National Steering Committee on Climate Change
PCG	Pillar Coordination Group
RBF	Results based finance
REDD+	Reducing Emissions from Deforestation and Forest Degradation
SDGs	(United Nations) Sustainable Development Goals
t	Tonne
TCCC&DRM	Technical Committee on Climate Change and Disaster Risk Management
TNA	Technology Needs Assessment
TNC	Third National Communication to the UNFCCC
UNFCCC	United Nations Framework Convention on Climate Change
UNDP	United Nations Development Program
USD	United States (US) dollar

Executive Summary

Introduction

This document presents the Government of Malawi's update of its first Nationally Determined Contribution (NDC) for mitigation and adaptation for the period 2015 to 2040. The contributions described in this submission build upon Malawi's existing NDC, new policies and national plans, and reflect subsequent work in developing quantifiable mitigation and adaptation targets. The updated NDC represents a more detailed and robust assessment of mitigation and adaptation measures in Malawi, including emissions reductions and estimated funding requirements, informed by in-depth analysis, improved information and data, and an extensive national stakeholder-driven consultation process.

Malawi's climate change response

Malawi has experienced an increase in the frequency, intensity and magnitude over the last two decades of extreme weather events. Malawi is particularly vulnerable to floods, droughts and strong winds associated with tropical cyclones. The country has experienced more than 19 major flooding events and seven droughts over the past five decades and in 2015 was affected by the worst floods in 50 years; the floods affected over 1 million people, displaced 230,000 people and killed 106 people, with another 172 people reported missing. The agriculture sector suffers the greatest losses as a result of climate change impacts. Most smallholder farmers in Malawi are resource poor with very limited capacity to contain shocks arising from climate change. Economic modelling has estimated the direct overall costs due to climate change impacts equivalent to losing at least 5% of the country's gross domestic product (GDP) each year.

Malawi's land and natural resources are heavily utilized and prone to environmental degradation, and therefore also highly vulnerability to climate change. Malawi's land resource base is particularly under threat from increasing human and livestock population pressures, and the expanding agricultural production to marginal areas. Overdependence on traditional biomass (wood, charcoal) and other fossil fuels to meet the country's growing energy needs are threatening Malawi's climate as forest resources are being depleted as carbon sinks. In common with many other developing countries, the country's ongoing economic growth is highly threatened by climate change.

The Government of Malawi (GoM) is committed to taking urgent action to mitigate and adapt to the effects of climate change. As a Party to the UNFCCC, the country seeks to contribute to the ambitious goal of limiting temperature rise to 2°C with efforts to reach 1.5°C agreed under the Paris Agreement. Given the challenges posed to its ongoing social and economic development, Malawi has taken significant strides towards addressing climate change, including through the development of Nationally Appropriate Mitigation Actions (NAMAs), a

National Climate Change Response Framework (NCCRF) and National Adaptation Plans (NAPs). Malawi has also put in place a series of legislative sectoral frameworks and strategies to integrate environment and climate change management in socio-economic development activities, including within the Malawi Growth and Development Strategy (MGDS III) and Malawi 2063. In 2016, Malawi adopted the National Climate Change Management Policy (NCCMP) which provides strategic direction for the country's priorities for climate change interventions covering both adaptation and mitigation.

Despite its status as a least developed country (LDC) with one of the lowest per capita emissions rates worldwide, Malawi believes in playing its part towards achieving the goals of the UNFCCC and the Paris Agreement. The updated NDC, which draws upon the NCCMP and other national strategies and policies, therefore proposes an ambitious and wide-ranging set of measures which can significantly reduce Malawi's GHG emissions compared to a business-as-usual (BAU) scenario of economic development and emissions growth over the next two decades. The mitigation and adaptation contributions set out in this document are therefore considered to be both fair and ambitious in the context of Malawi's national circumstances.

Mitigation

Malawi's mitigation contribution takes the form of a reduction in GHG emissions relative to a business-as-usual (BAU) emissions scenario over the period to 2040.

Latest national inventory data estimate total greenhouse (GHG) emissions excluding forestry and other land use (FOLU) at 9.33 million tonnes of carbon dioxide equivalent (tCO₂e) for 2017. Agriculture accounted for by far the largest share of the total (5.07 million tCO₂e, 54% of total), followed by Energy (2.34 million tCO₂e, 25% of total) and waste (1.67 million tCO₂e, 18% of total). Emissions from industrial processes represented just 0.24 million tCO₂e, equivalent to around 3% of total emissions in 2017 (mainly associated with calcination CO₂ emissions from minerals production). Emissions from livestock represented the largest emissions source category, followed by emissions from managed soils in crop production. Following these agriculture sources, major sources included CO₂ emissions from fossil fuel use in transport, which accounted for 11% of the total, and methane emissions from unmanaged waste disposal site (dumps), which accounted for 13% of the total.

Under a BAU emissions scenario, total emissions excluding FOLU are forecast to increase by more than three times by 2040, rising from 9.3 million tCO₂e in 2017 to 34.6 million tCO₂e in 2040. This outlook reflects assumptions around the growing contribution from fossil fuels to national emissions, arising from increasing demand for thermal power generation and transport services. At the same time, despite potential for increased productivity, agricultural output is expected to be more limited, growing broadly in line with trends over the past decade.

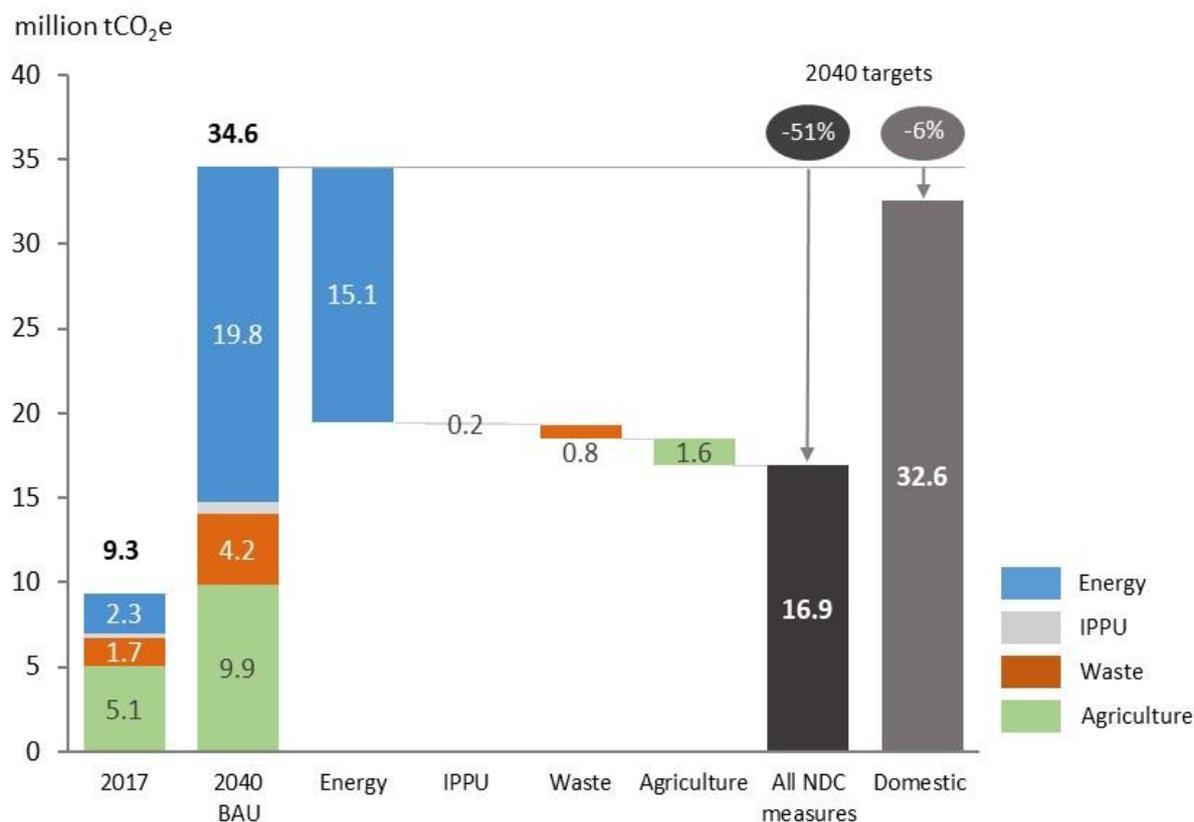
A detailed assessment of identified GHG mitigation options for Malawi estimates a total emissions reduction potential of around 17.7 million tCO₂e in 2040 against the BAU scenario emissions in the same year of 34.6 million tCO₂e, equivalent to a reduction of 51 per cent. Based on the analysis, mitigation measures have been grouped according to two different contributions:

- **Unconditional contribution:** A reduction of 6 per cent relative to BAU in the year 2040; equivalent to an estimated mitigation level of 2.1 million tonnes of carbon dioxide equivalent (tCO₂e) in that year. This is an unconditional target, based on domestically supported and implemented mitigation measures and policies.
- **Conditional contribution:** An additional reduction of 45 per cent relative to BAU in the year 2040; equivalent to an estimated mitigation level of 15.6 million tCO₂e in that year. This represents an additional targeted contribution, based on the provision of international support and funding.

The combined unconditional and conditional contribution is therefore a 51 per cent reduction in GHG emissions compared to BAU in 2040, expressed as a single year target. The coverage of the contribution includes the three main greenhouse gases carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O).

The sectoral scope of this contribution covers all emissions sources described in the IPCC 2006 Reporting Guidelines, including emissions from the categories of energy; industrial processes and product use (IPPU); waste; and agriculture, forestry and other land use (AFOLU) but excluding sources from forestry and other land use (FOLU). These latter sources may be included within future contributions, subject to improved data availability and ongoing development in the accuracy of their quantification within the national GHG inventory. For this updated NDC, an indicative emissions reduction contribution has instead been made. This has been estimated at 59.8 million tCO₂e of reductions through a range of FOLU interventions covering an area of up to 2 million hectares (Ha), of which 22 per cent is unconditional and 78 per cent conditional on international support.

Figure ES-1 NDC emission reduction scenarios (excl. FOLU)



Adaptation

Malawi’s adaptation contribution prioritises adaptation interventions and develops sector-level performance indicators and targets. As shown in the table below, ten strategic adaptation options have been identified relating to the three pillars, namely: (i) institutional framework, (ii) knowledge, technology and financing and (iii) resilience of the most vulnerable, which support three main objectives: (i) promote an enabling environment to facilitate Climate Change Adaptation (CCA) mainstreaming, (ii) improve capacity for data and information management and sharing, and access to technology and financing for adaptation, and (iii) plan and implement adaptation actions toward an increased resilience of the most vulnerable Malawians.

Table ES-1 Strategic adaptation actions

Objective	Pillar	Strategic Adaptation Actions	Adaptation actions
Promote enabling environment to facilitate CCA mainstreaming	Institutional framework	1. Establishment of the institutional arrangements for the multi-sector coordination of climate change actions, including the definition of its composition and mandate	NAP’s mandate

Objective	Pillar	Strategic Adaptation Actions	Adaptation actions
		2. Testing and institutionalization of mechanisms to integrate CCA into the next “National Development Plan” or equivalent and sectoral planning instruments, including the annual sectoral budgets and guidelines	NAP’s implementation Definition of guidelines to integrate CCA into sectoral planning and budgeting
Improve the capacity for data and information management and sharing, and access to technology and financing for adaptation	Knowledge, technology and financing	3. Development and implementation of a research programme on climate change impacts and CCA actions	Research programme on climate resilient technologies, including industry and drought tolerant and fast-growing vegetal species
		4. Implementation of a capacity-building plan and integration of CCA into curricula	CB at national and district levels to use the guidelines CB on EWS and data downscaling CB on Wash interventions CB on wildlife and tourism management CB on aquaculture and cage farming CB on diagnose, prevention and control of climate-sensitive diseases and malnutrition Integration of forestry, livelihoods and environmental management in curricula
		5. Implementation of the communication plan	Public campaigns on water conservation measures Campaigns on hygiene and sanitation
		6. Operationalization of an overarching M&E framework covering the NDC and potentially the NAP, SDGs and Sendai Framework	Elaboration of recommendations for climate M&E in the scope of the NDC
		7. Elaboration and implementation of a resource mobilization plan	Preliminary estimates of costing of the actions and measures included in the NDC
Plan and implement adaptation actions toward an increased resilience of the most vulnerable Malawians	Resilience of the most vulnerable	8. Elaboration of NAPs for priority sectors	Elaboration of NAPs for agriculture, biodiversity and ecosystems, fisheries, health, infrastructures and housing, tourism and water resources

Objective	Pillar	Strategic Adaptation Actions	Adaptation actions
		9. Development of CCA planning tools tested in particularly vulnerable communities, demonstrating an integrating CCA approach in various sector	Development of simplified methodologies as a basis to assess risks and identify community-based adaptation options and measures to include in local CCA plans and budgets Design of local EWS
		10. Elaboration of a portfolio of CCA priority actions for the key sectors aligned with sectoral planning and budgeting, using nature-based solutions and ecosystems-based adaptation	Effective and efficient EWS Accessible and harmless water Blooming biodiversity and ecosystems and eco-tourism Smart agriculture, livestock and fisheries Climate-proofed infrastructures, buildings, and energy systems Healthy and protected people

The updated NDC describes a sectoral framework of measures to enhance Malawi’s climate adaptation and resilience, along with a set of indicators to monitor and evaluate their progress, aiming at increasing the resilience of its people, ecosystems and economy. This is fully aligned with the UN Sustainable Development Goals (SDGs) and subsequently with Agenda 2030 and the sectoral planning process, along with the framework for the National Adaptation Plan.

Monitoring, reporting and verification (MRV) framework

The Paris Agreement contains several additional MRV requirements which, when taken together with the existing UNFCCC arrangements, provide an enhanced basis for Malawi’s international reporting requirements relating to its updated NDC. The enhanced transparency framework (ETF) established by the Paris Agreement requires an MRV system to transparently report progress made towards the targets defined in Malawi’s NDC and to track the implementation of mitigation and adaptation actions, as well as the use and results of means of including climate finance. The system should also capture broader non-GHG impacts resulting from implementation of measures for the purposes of evaluating their contribution to achieving broader development goals.

A framework has therefore been developed which provides a basis for Malawi to monitor and report on its NDC in a way which is consistent these requirements whilst also being well-aligned with existing procedures and arrangements. The framework describes the institutional arrangements for tracking the progress of the NDC and reporting on its implementation at both an international and domestic level. Alongside Malawi’s NDC Implementation Plan, the framework indicates the institutions, fora, roles and responsibilities proposed to guide and support implementation of MRV of the NDC at the national level

including policy and strategic decision levels. Supporting this process, a comprehensive framework of sectoral indicators has been developed according to which Malawi can monitor and evaluate its progress in meeting its NDC targets through 2040.

Means of implementation

To fully implement the mitigation and adaptation contributions described in this document, Malawi will require support in the form of finance, capacity building, and technology transfer. The total estimated cost for Malawi's identified NDC mitigation measures through 2040 is estimated at around 41.8 billion USD for mitigation measures, and around 4.5 billion USD for adaptation measures, representing a combined funding requirement of 46.3 billion USD. Of this total, around one third is estimated to be required over the next decade (2020-2030), and two thirds in the subsequent decade (2030-2040). For both mitigation and adaptation combined, unconditional measures account for around 24% of the total estimated funding requirements, and conditional measures around 76%.

Table ES-2 Estimated NDC funding requirements (mitigation and adaptation)

USD million	2020-2025	2025-2030	2030-2040	Total
Mitigation measures				
Unconditional contribution	1,664	1,949	5,362	8,974
Conditional contribution	2,550	5,393	24,866	32,808
Total	4,213	7,341	30,228	41,782
Adaptation measures				
Unconditional contribution	573	738	817	2,128
Conditional contribution	656	818	945	2,419
Total	1,230	1,556	1,762	4,547
Combined total	5,443	8,897	31,990	46,329

Challenges for climate finance in Malawi include insufficient funds, a limited domestic budget for the implementation of climate actions, and the limited involvement of private sector investment in environment and climate change activities. In response to these factors, Malawi is currently preparing a resource mobilization strategy which will identify sources of finance and strategies to fund and support the prioritised measures identified in this document.

The Government of Malawi will continue to commit significant resources to climate change relevant strategies, both in relation to mitigation and adaptation. However, there is clearly also a need for increased levels of bilateral and multilateral financial support. Malawi intends to meet its conditional contribution through the use of climate finance and international

market mechanisms where appropriate, building upon its experience of the Clean Development Mechanism (CDM) and other existing market mechanisms. These include the potential involvement in international cooperative approaches under Article 6 of the Paris Agreement. As outlined in this updated NDC, technology transfer and capacity building will also be required to fully implement Malawi's mitigation and adaptation contributions.

Contents

FOREWORD	i
PREFACE	ii
ACKNOWLEDGEMENTS	iii
ACRONYMS AND ABBREVIATIONS	iv
EXECUTIVE SUMMARY	vii
1 INTRODUCTION	1
1.1 Background	1
1.2 Outline of this document	2
2 NATIONAL CIRCUMSTANCES	3
3 MALAWI'S CLIMATE CHANGE RESPONSE	7
4 NDC REVISION PROCESS.....	9
4.1 Mitigation.....	9
4.2 Adaptation	12
5 MITIGATION CONTRIBUTION	13
5.1 Overview	13
5.2 GHG emissions inventory	14
5.3 Mitigation potential	18
5.4 Implementation plan.....	32
5.5 Funding requirements	45
6 ADAPTATION CONTRIBUTION.....	47
6.1 Overview	47
6.2 Vulnerability and resilience	47
6.3 Methodological approach	52

6.4	Resilience and assessment of adaptation responses.....	53
6.5	Targets and indicators for resilience	61
6.6	Implementation plan.....	61
6.7	Funding requirements	84
7	MONITORING, REPORTING AND VERIFICATION FRAMEWORK	86
7.1	Tracking the NDC target	86
7.2	Institutional arrangements	87
7.3	Data provision	94
8	MEANS OF IMPLEMENTATION	98
8.1	Finance needs	98
8.2	Capacity building and technology transfer	100
	REFERENCES	104

1 Introduction

1.1 Background

At the 21st Conference of the Parties (COP21) in Paris, on 12 December 2015, Parties to the United Nations Framework on Climate Change (UNFCCC) reached an agreement to combat climate change and accelerate the actions and investments needed to achieve a sustainable low carbon future. The Paris Agreement entered into force in November 2016 following the universal adoption of the Agreement by Parties. Under the Agreement, developed and developing countries made individual commitments to transition toward a climate-resilient and low-emissions future. Importantly, the Agreement also acknowledges that achieving the ambitions of the United Nations Sustainable Development Goals (SDGs) will require a collective and concerted action on climate change.

Parties are required to undertake and communicate efforts to contribute to the achievement of these goals in the form of Nationally Determined Contributions (NDCs) communicated to the UNFCCC (Article 3). These include efforts to reduce greenhouse gas (GHG) emissions (mitigation) as well as adapting to the effects of climate change (adaptation). Parties shall submit revised NDCs every five years, each representing a progression beyond the Party's current NDC and reflect its highest possible ambition, "as well as its common but differentiated responsibilities and respective capabilities, in the light of different national circumstances". The Paris Agreement also requires that in communicating their NDCs, all Parties shall provide the information necessary for clarity, transparency and understanding (ICTU) of their NDCs and established an Enhanced Transparency Framework (ETF) which specifies how Parties must report on progress in implementing mitigation and adaptation measures, and on support provided or received.

Parties have been requested to submit their updated and revised NDCs to the UNFCCC Secretariat ahead of the 26th Conference of the Parties (COP26) to be held in Glasgow in 2021. In this context, the Republic of Malawi is submitting this updated NDC. The contributions described in this submission build upon Malawi's existing first NDC, and reflect subsequent work supported by the NDC Partnership in developing quantifiable mitigation and adaptation targets, an NDC implementation plan and a monitoring, reporting and verification (MRV) framework for tracking the NDC. This updated NDC represents a more detailed assessment of mitigation and adaptation measures in Malawi informed by in-depth analysis, improved information and data, and an extensive stakeholder-driven consultation process.

1.2 Outline of this document

This document describes Malawi's updated first Nationally Determined Contribution (NDC) for mitigation and adaptation for the period 2015 to 2040. It is structured as follows:

- Section 2 describes Malawi's national circumstances.
- Section 3 presents Malawi's approach to climate change and a brief summary of its policy response through national, regional and global efforts to tackling climate change
- Section 4 summarises the NDC revision process covering both the mitigation and adaptation contributions.
- Section 5 presents Malawi's contribution to mitigation, including a description of GHG emissions mitigation options across key sectors and their reduction potential and funding requirements against a business-as-usual baseline to 2040, according to unconditional and conditional measures.
- Section 6 summarises Malawi's vulnerability to climate change and sets out a framework of proposed measures relating to adaptation and resilience.
- Section 7 described a measuring, reporting and verification (MRV) framework for implementing and tracking the mitigation and adaptation measures contained in this NDC, consistent with best practice and Malawi's reporting requirements under UNFCCC and the Paris Agreement.
- Section 8 outlines the means of implementation for the mitigation and adaptation measures contained in the NDC.

2 National circumstances

This section provides a brief overview of Malawi's national circumstances, including the country's vulnerability to climate change, its natural resources, and its key socio-economic characteristics.¹

2.1.1 Vulnerability to climate change

In Malawi, natural resources and the environment play a very significant role in influencing social and economic development at both household and national levels (GoM, 2016a). Approximately 80 percent of Malawians depend on renewable natural resources for their livelihoods, and the foundation of the national economy is primarily rain-fed agriculture. The success of many important sectors of the economy such as agriculture, water supply and sanitation, transport, tourism, industry, health and education relies on environment and natural resources to enhance their productivity. However, environmental degradation and climate change have emerged as major development issues that have adversely impacted on food security, water quality and energy security, thereby frustrating government efforts to improve the general livelihoods of both urban and rural communities.

Scientific evidence in Malawi shows an increase in the frequency, intensity and magnitude over the last two decades of extreme weather events (GoM, 2016a). Malawi is particularly vulnerable to floods, droughts and strong winds associated with tropical cyclones. Most of the drought episodes that Malawi experiences are caused by the El Nino and the Southern Oscillation (ENSO) phenomena, with serious impacts on crop and livestock production. Additionally, the country experiences long dry spells that occasionally disrupt the rainfall season and cause crop failure. The pattern of rainfall results in the seasonality of crop production, and forces farmers to stay idle during the dry season. Livestock productivity is highly constrained by lack of adequate feed and drinking water in the dry season (GoM, 2020). Over the past five decades, Malawi has experienced more than 19 major flooding events and seven droughts. In 2015, Malawi was affected by the worst floods in 50 years; the floods affected over 1 million people, displaced 230,000 people and killed 106 people, with another 172 people reported missing (GoM, 2020).

The agriculture sector suffers the greatest losses as a result of climate change impacts (GoM, 2016a). Most smallholder farmers in Malawi are resource poor with very limited capacity to contain shocks arising from climate change. Food security remains a concern in many of the affected districts and agriculture production of crops and livestock continues to see only a limited increase in productivity over years because of vulnerability to climate change (GoM, 2020). Food shortages cause domestic grain prices to rise, resulting in

¹ A more detailed description of Malawi's national circumstances is provided in the Third National Communication (TNC) to the UNFCCC.

increased grain imports which erode the foreign exchange reserves with depreciating effects on the exchange rate, and divert resource reallocation from other productive sectors. As a result, prices of other food stuffs also increase, fuelling inflation with knock-on effects on interest rates and the macroeconomic outlook (GoM, 2016a). Economic modelling has estimated the direct overall costs due to climate change impacts equivalent to losing at least 5% of the country's gross domestic product (GDP) each year (GoM, 2016a).

2.1.2 Natural resources

Malawi is endowed with abundant and diverse natural resources, which is a basis for sustainable economic growth and development (GoM, 2020). At the same time, the country's high dependency on these resources, many of which face challenges from degradation and overuse, increase the vulnerability of communities and ecosystems to the adverse impacts of climate change. The majority people in Malawi live below the poverty line. Under abject poverty, people are forced to heavily depend on natural resources for energy (fuel wood), food, construction material, medicine, and fodder. Poverty forces people to trade-off long term sustainable resources for short term consumption because they depend entirely on the existing natural resources.

Of Malawi's total land area of 9.4 million hectares (ha) only around 31% is suitable for rain-fed agriculture at traditional level of management due to variations in topography, slope, rainfall, temperature, soil type and soil depth (GoM, 2020). This limited land resource base is heavily utilized and prone to environmental degradation, and therefore also highly vulnerability to climate change. Malawi's land resource base is particularly under threat from increasing human and livestock population pressures, and the expanding agricultural production to marginal areas. Other factors that contribute to land degradation include: (i) insecure and unforeseeable property rights leading to open access exploitation for agricultural production, (ii) limited information on the costs of land degradation and the benefits of conservation, (iii) lack of access to credit for soil conservation and management practices, and (iv) poor agricultural production practices (GoM, 2020).

Unsustainable use of natural resources impacts a range of important sectors. For example, the fisheries sector is one of the most economically important in Malawi, providing employment and contributing to food security for millions of rural poor Malawians. It provides about 70% of the animal protein and 40% of total protein intake for the majority of Malawians (GoM, 2020). Increasing population growth has however brought about great demand for fish for domestic consumption leading to an increase in the number of fishermen, localized fishing, and reduced fish catches. In recent years, fish landings have fallen dramatically due to overfishing and environmental degradation. Similarly, the overdependence on traditional biomass (wood, charcoal) and other fossil fuels to meet the country's growing energy needs are threatening Malawi's climate as forest resources are being depleted as carbon sinks (GoM, 2020). These important concerns are reflected in the choice of mitigation measures outlined in this nationally determined contribution.

Malawi is blessed with abundant biodiversity and has diverse habitats and ecosystems including woodlands, montane grasslands, wetlands and fresh water bodies that harbour a rich variety of flora and fauna, including more than 5,000 plants and over 8,500 invertebrate species. Malawi's terrestrial ecosystems comprise forests, mountains and grasslands (GoM, 2020). The country has 87 forest reserves, five national parks, four wildlife reserves and three nature sanctuaries that were established to protect important wildlife populations, major water catchment areas, and landscapes of high aesthetic value and to preserve them for scientific and recreational uses (GoM, 2020).

The greatest threat to biodiversity in Malawi is the unprecedented loss of habitats, fragmentation of species habitats and isolation of remaining communities due to unsustainable land use practices. Agriculture, urbanization, infrastructure development and human settlements are the major drivers of habitat loss and fragmentation in Malawi. The agriculture sector has been embroiled in the continuous cultivation of land in wetlands and riverbanks, encroachment into protected areas and cultivation on mountain slopes. Developmental activities have contributed to habitat loss through conversion of arable land, wetlands and forests for road construction, urbanization and human settlements. Damming of rivers for irrigation and water supply has also led to changes in ecosystems downstream (GoM, 2020). These challenges serve to further threaten Malawi's capacity to adapt to climate change impacts and provide an important context for the country's development and environmental policy priorities.

2.1.3 Socio-economic characteristics

Malawi's population was 18.1 million in 2018 and has been growing at an average rate of around 2.8% per year since 2000 (UN DESA, 2019). According to the national Population and Housing Census 2018, around 18% of the population are located in urban areas and 82% in rural areas (NSO, 2019). The population density is 168 persons per km², making Malawi one of the most densely populated countries in the world. The overall average life expectancy is about 48.5 years, which is below the average life expectancy for Africa which is estimated at 53 years (GoM, 2020).

Malawi's economy is largely based on agriculture, with the sector supporting about 80% of rural people's livelihoods and contributing about 30% to gross domestic product (GDP) and 80% of export revenues (GoM, 2020). The performance of the other sectors is dependent on agriculture which is largely rainfed and hence highly vulnerable to climate change and climate variability. Malawi's GDP was estimated at 6,917 USD million in 2018 (World Bank, 2020), representing an average GDP per capita of 381 USD, one of the lowest in the world and also in Africa.

As well as being highly vulnerable to the increasing impacts of climate change, Malawi has been severely affected by the global COVID-19 pandemic. Analysis by the International Monetary Fund (IMF) indicates that spill-overs from the sharp global slowdown as well as the economic disruption in the region have weighed on international trade, tourism, remittances,

investment, and consumption. The national lockdown introduced to contain the pandemic has also impacted the near-term economic outlook, which has deteriorated significantly, with large uncertainties surrounding the duration and spread of the pandemic (IMF, 2020).

Before COVID-19, economic growth was forecast at around 5% in 2020, with strong agricultural production, post-cyclone reconstruction, investments to build resilience to climate change, and improved electricity generation. Over the medium-term, greater access to finance, additional resilience investments, enhanced electricity generation and irrigation (e.g., the Shire Valley project), crop diversification, and better telecommunications were anticipated to boost growth to just over 6% (IMF, 2020). Growth has since been expected to fall to 1% percent for 2020 and to 2.5% in 2021, assuming it will take time for businesses to re-open after the lockdown ends and for trade flows to normalize. A gradual recovery is expected thereafter, with growth averaging 6.4% during 2022-25 (IMF, 2020).

3 Malawi's climate change response

The Government of Malawi (GoM) is committed to taking urgent action to mitigate and adapt to the effects of climate change. As a Party to the UNFCCC, the country seeks to contribute to the ambitious goal of limiting temperature rise to 2°C with efforts to reach 1.5°C agreed under the Paris Agreement. Malawi ratified the United Nation Framework Convention on Climate Change (UNFCCC) in 1994, and in line with the Paris Agreement submitted its Intended Nationally Determined Contribution (INDC) in 2016 which became its first NDC in 2016.

Given the challenges posed to its ongoing social and economic development, Malawi has taken significant strides towards addressing climate change. Through the National Adaptation Programmes of Action (NAPA) (GoM, 2006), submitted to the UNFCCC in 2006, Malawi has identified sectors that are most affected by climate change including agriculture, human health, energy, fisheries, wildlife, water, forestry and gender. The Government has also developed a number of initiatives and processes to assist vulnerable communities and ecosystems to adapt and mitigate to both current and projected climate change impacts through increased adaptive capacity and resilience, enhanced carbon sinks, reduced GHG emissions, improved food security and sustainable economic development. These include the development of Nationally Appropriate Mitigation Actions (NAMAs), a National Climate Change Response Framework (NCCRF) and National Adaptation Plans (NAPs).

Furthermore, Malawi has put in place a series of legislative sectoral frameworks and strategies to integrate environment and climate change management in socio-economic development activities, including through the Malawi Vision 2020, which was the country's previous overarching long term strategy to achieve middle-income status (GoM, 1998). Malawi has subsequently prioritised climate change, environment and natural resources management within the Malawi Growth and Development Strategy (MGDS III) (GoM, 2018) and has integrated climate considerations within a wide range of sectoral policies and strategies. Most recently, climate change is embedded within Malawi 2063, which sets out the country's vision to become an inclusively wealthy and self-reliant industrialised upper-middle-income country by 2063 (GoM, 2021).

In 2016, Malawi adopted the National Climate Change Management Policy (NCCMP) which provides strategic direction for the country's priorities for climate change interventions through six priority areas (GoM, 2016a):

- Climate change adaptation;
- Climate change mitigation;
- Capacity building, education, training and awareness;
- Research, technology development and transfer and systematic observation;

- Climate financing; and
- Cross-cutting issues (including gender considerations, population dynamics and HIV and AIDS)

The NCCMP acts to guide implementation of critical climate change issues and strategies, including capacity building, education, training and public awareness, the Clean Development Mechanism (CDM), Reducing Emissions from Deforestation and Forest Degradation (REDD+), and adaptation and mitigation within agriculture, energy, industrial processes, waste management, forestry, water resources, and wildlife sectors. The Policy serves as the country's overarching reference document for policy makers in Government, the private sector, civil society, and donors concerning climate change as a priority development issue (GoM, 2016a).

The updated NDC builds upon the NCCMP in its commitment to tackling climate change through the development of both mitigation and adaptation responses, as well as other key national guiding documents including Malawi 2063, the Malawi Economic Growth Strategy (MEGS), and the Malawi Growth and Development Strategies (MGDS) III. The NDC also aligns with Malawi's National Adaptation Plan (NAP) Framework, which the country developed in 2020 to guide efforts to develop its National Adaptation Plan with an effort to address climate change. The NAP Framework has built on the NAP Roadmap, validating and updating the vision, objectives and mandates for adaptation structures in the country. It reaffirmed the structure and approach for the NAP process, linking it to existing or planned policies, plans, strategies and legislation that will enable Malawi to address its medium- and long-term adaptation needs. The NAP stocktaking report prepared in 2016 served as a key foundation for the NAP Framework by reaffirming Malawi's readiness to proceed with the NAP process.

Despite its status as a least developed country (LDC) with one of the lowest per capita emissions rates worldwide, Malawi believes in playing its part towards achieving the goals of the UNFCCC and the Paris Agreement. The updated NDC therefore proposes an ambitious and wide-ranging set of measures which can significantly reduce Malawi's GHG emissions compared to a business-as-usual (BAU) scenario of economic development and emissions growth. The mitigation and adaptation contributions set out in this document are therefore considered to be both fair and ambitious in the context of Malawi's national circumstances.

4 NDC revision process

Malawi submitted its Intended Nationally Determined Contribution (INDC) to the United Nations Framework Convention on Climate Change (UNFCCC) in October 2015 setting out its adaptation and mitigation goals to 2040. With the entry into force of the Paris Agreement in November 2016, the INDC formally became Malawi's first NDC.

This updated NDC updates and strengthens the first NDC for both the mitigation and adaptation contributions, informed by improved data collection, in-depth technical analysis and extensive stakeholder engagement. In the case of mitigation, detailed sector- and project-based modelling has been undertaken to estimate the national mitigation potential and develop quantified conditional and unconditional contributions through 2040. This section provides a brief description of the revision process of Malawi's NDC for both the mitigation and adaptation components.

4.1 Mitigation

4.1.1 Business-as-usual (BAU) emissions forecasting

The mitigation contribution contained in this updated NDC takes the form of a 'baseline target'. This is a deviation below a reference baseline (BAU) scenario in the absence of NDC measures, expressed as a *relative reduction* (%) between the mitigation scenario and the BAU scenario in 2040. This type of target requires estimating counterfactual projections of emissions based on a number of assumptions around what constitutes BAU (e.g. economic growth, population, planned policies and strategies).

As described further in the next section, the development of the BAU scenario used in the updated Malawi's NDC has now been undertaken at a detailed sectoral level, drawing from extensive consultation with national sector experts and stakeholders. The modelling undertaken includes economy-wide drivers of activity (e.g. fuel use, waste generation) and emissions, such as economic and population growth, as well as sector-specific factors (e.g. power expansion plans, transport strategy plans, agricultural output levels). The projections also make use of regression analysis based on latest available data to better understand and inform relationships between certain forecast model parameters. The projections make use of the most recent information and data including recently available information sources such as e.g. national population projections, official power demand and generation projections, transport and vehicle survey data, official statistics, policy planning documents etc.

4.1.2 Identifying and assessing mitigation measures

Malawi's first NDC identified a wide range of mitigation measures within each of the country's key emitting sectors. However, these were not assessed for their GHG mitigation potential. The analysis used to develop this updated NDC has involved identifying a range of mitigation options from within each of the NDC sectors for further consideration and quantitative analysis by several teams of consultants.

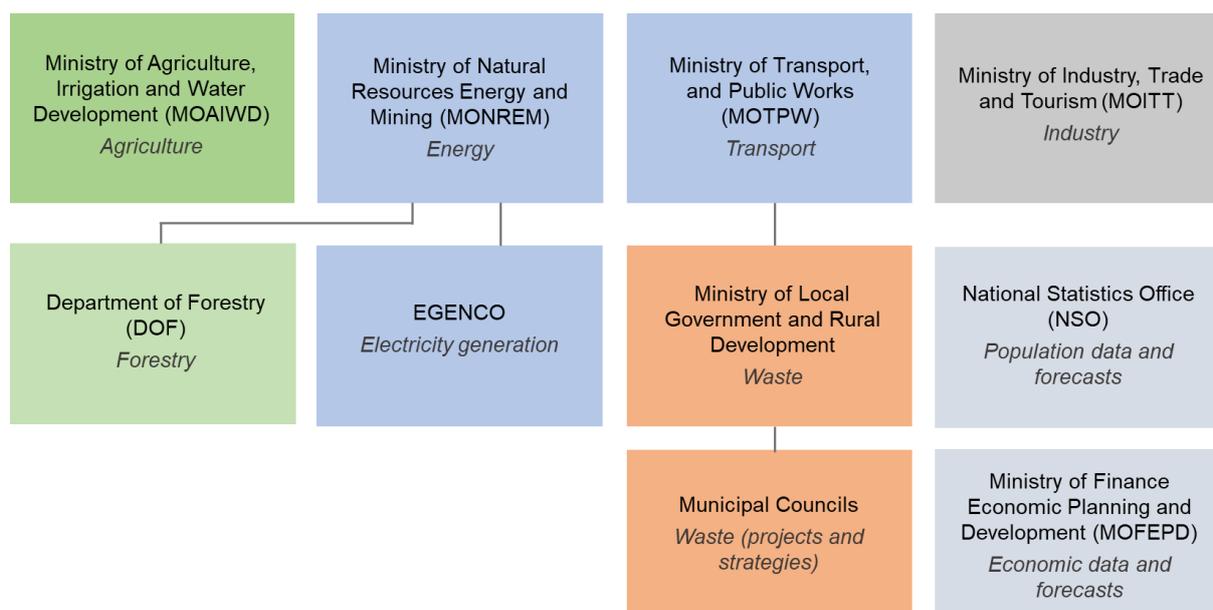
A bottom-up 'long-list' was developed through close consultation with various stakeholders and experts. A modified 'long list' was further refined, based on subsequent meetings held between the consulting teams, government officials and sector experts though late 2019 - early 2021. The projects identified in the NDC were re-assessed, as well as additional projects and programmes. In some cases, the details, and context, regarding many of the projects were found to have changed since the time of INDC submission. The 'long list' of options identified thereby reflected a set of real projects and programmes under consideration, or having been studied, from within government departments and agencies. The identified measures provided the basis for the GHG emissions modelling described in the following section.

This updated NDC reflects the use of in-depth technical and economic analysis of NDC measures. As is described further below, the measures were assessed by applying mitigation modelling and cost-benefit analysis (CBA) over the period to 2040 in order to determine their emissions reduction potential against the BAU scenario, along with their socio-economic costs and benefits, including investment requirements. Alongside other criteria and following discussions with relevant national officials, these results were used to inform the choice of which measures (or shares of measures) represent unconditional measures to be funded domestically and which are conditional on the provision of international support.

4.1.3 Consultation and coordination

As noted above, the development of the analysis involved close consultation with government officials, experts and stakeholders. This was mainly undertaken on a sectoral basis through a list of agreed key government and expert focal points, in relation to collection of data and information as well as discussion and validation of projects, measures and modelling assumptions. The key focal points are shown below in Figure 4-1, along with their sectoral coverage, responsibility or area.

Figure 4-1 Key focal points informing NDC mitigation analysis



Because the measures identified for analysis were based upon existing studies, sources and official documents which have applied multi-criteria evaluation and extensive in-country stakeholder consultation to arrive at prioritised measures (i.e. INDC, TNC, NAMAs and various sectoral policy documents), a revised bottom-up evaluation of all potential mitigation options was not undertaken. Instead, NDC measures were identified from existing sources within Malawi and subsequently classified as conditional and unconditional by each of the consultant teams drawing upon the technical analysis, existing information and discussions with focal points. These were provided for review and validation by government departments and other stakeholders.

Following completion of the technical analysis, covering the BAU development and mitigation analysis, a validation workshop was held with national experts and government representatives alongside a series of regional and local dissemination and stakeholder events. The following key items were highlighted for review, discussion and validation:

- Choice of mitigation measures for inclusion in the NDC
- Review and validation of the technical assumptions used to develop the GHG reduction and cost estimates across each key sector (by sector departments and experts)
- Review and validation of the estimated allocation of unconditional and conditional contributions to the identified measures (by sector departments and experts)
- Discussion of choices and approaches to target-setting (types, scope, periods etc)

4.2 Adaptation

The adaptation component of this NDC is an upgrade from that of the 2015 INDC. While the initial selection of adaptation measures was based on priority sectors for the country as identified in the previous INDC and confirmed in national policies, programmes and plans, this NDC took a further step to refine the measures by reflecting on desired outcomes – an approach advanced by the National Resilience Strategy (2018-2030) that allows for cross-sector collaboration in planning and delivery. A special outcome on strengthened governance has been proposed to support coordinated implementation of the measures, which was found to be a major challenge in the delivery of the previous INDC.

The NDC comes with an improved Monitoring and Evaluation framework with an elaborated structure for reporting progress nationally and internationally. The framework is aligned with the UN SDGs through linkage to SDG indicators, and to the national vision (Malawi 2063) through linkage with the vision's pillar and enabler provisions and indicators. The framework also includes engendered measure-specific indicators capable of tracking the extent of gender and vulnerability integration across sectors.

The adaptation component of the analysis was developed in close coordination with the Adaptation Expert Working Group (EWG). The prioritised adaptation measures and actions identified from the work were coupled with a proposed set of indicators to measure and evaluate their progress towards targeted outcomes, along with cost estimates. The Adaptation EWG and other national stakeholders were requested to review and validate the set of measures, its proposed M&E framework and the cost estimates, and as far as possible to provide inputs. As a result of this process, changes to choice of indicators were made and taken forward into the subsequent stage of work (NDC Implementation Plan and M&E Framework).

5 Mitigation contribution

5.1 Overview

Malawi's mitigation contribution takes the form of a reduction in GHG emissions relative to a business-as-usual (BAU) emissions baseline over the period to 2040. The contribution comprises of two components:

- **Unconditional contribution:** A reduction of 6 per cent relative to BAU in the year 2040; equivalent to an estimated mitigation level of 2.1 million tonnes of carbon dioxide equivalent (tCO₂e) in that year. This is an unconditional target, based on domestically supported and implemented mitigation measures and policies.
- **Conditional contribution:** An additional reduction of 45 per cent relative to BAU in the year 2040; equivalent to an estimated mitigation level of 15.6 million tCO₂e in that year. This represents an additional targeted contribution, based on the provision of international support and funding.

The combined unconditional and conditional contribution is therefore a 51 per cent reduction in GHG emissions compared to BAU in 2040, expressed as a single year target; this is equivalent to an estimated mitigation level of up to 17.7 million tCO₂e in 2040. The coverage of the contribution includes the three main greenhouse gases carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O).

The sectoral scope of this contribution covers all emissions sources described in the IPCC 2006 Reporting Guidelines, including emissions from the categories of energy; industrial processes and product use (IPPU); waste; and agriculture, forestry and other land use (AFOLU) but excluding sources from forestry and other land use. These sources may be included within future contributions, subject to improved data availability and ongoing development in the accuracy of their quantification within the national GHG inventory. For this updated NDC, an indicative emissions reduction contribution has instead been made. This has been estimated at 59.8 million tCO₂e of reductions through a range of forestry and land use interventions covering an area of up to 2 million hectares (Ha), of which 22 per cent is unconditional and 78 per cent conditional on international support.

This section describes Malawi's nationally determined contribution to mitigation. It describes the emissions sources covered by the contribution according to the latest national GHG inventory year, the development of BAU emissions projections by sector to 2040, the expected contribution from mitigation measures according to each sector, and the associated funding requirements expected for both the unconditional and conditional components. The section includes information necessary for clarity, transparency and understanding (ICTU) in relation to the development and scope of the target(s), comprising

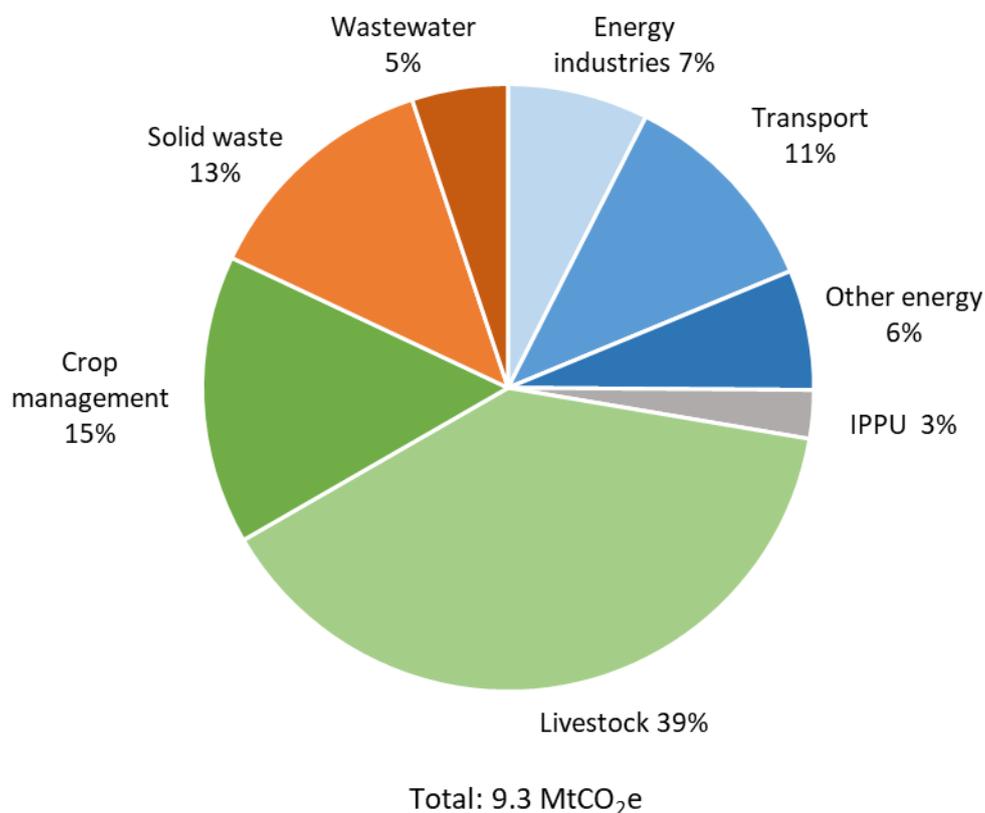
both the BAU scenario and emissions reductions associated with implementation of the mitigation measures.

5.2 GHG emissions inventory

Malawi's Third National Communication (TNC) (GoM, 2020) provides a detailed breakdown of the national GHG emissions inventory for the year 2010. However, the TNC also provides emissions estimates up to 2017 based on data developed by the national GHG inventory team in accordance with the IPCC 2006 Guidelines (IPCC, 2016). This year was therefore adopted as the most recent data year for the revised BAU modelling across all emitting sectors. GHG inventory data in the year 2017 is summarised in Figure 5-1, and shown in greater detail in Table 5-1 according to IPCC reporting categories for all GHG emissions sources.

Total emissions excluding FOLU are estimated at 9.33 million tCO₂e for 2017. Agriculture accounted for by far the largest share of the total (5.07 million tCO₂e, 54% of total), followed by Energy (2.34 million tCO₂e, 25% of total) and waste (1.67 million tCO₂e, 18% of total). Emissions from IPPU represented just 0.24 million tCO₂e, equivalent to around 3% of total emissions in 2017 (mainly associated with calcination CO₂ emissions from minerals production). Emissions from livestock, predominantly methane from enteric fermentation in cattle, represented the largest emissions source category, followed by N₂O emissions from managed soils in crop production. Following these agriculture sources, major sources included CO₂ emissions from fossil fuel use in transport, which accounted for 11% of the total, and methane emissions from unmanaged waste disposal site (dumps), which accounted for 13% of the total.

Figure 5-1 GHG emissions by source excl. FOLU in 2017, million tCO₂e



Sources: Malawi GHG Inventory data; TNC (GoM, 2020); EC (2021); UNDP (2021)

Note: due to decimal rounding within Energy, values do not sum to 100%

Table 5-1 GHG emissions by source in 2017

IPCC Categories			GgCO ₂ e	MtCO ₂ e
1. Energy	1.A. Fuel Combustion Activities	1.A.1. Energy industries	694	0.69
		1.A.2. Manufacturing Industries	194	0.19
		1.A.3. Transport	1052	1.05
		1.A.4. Other Sectors	392	0.39
	1.B. Fugitive Emissions	1.B.1. Solid Fuels	10	0.01
2. IPPU	2.A. Mineral Industry	2.A.1. Cement production	145	0.14
		2.A.2. Lime production	96	0.10
		2.A.4.a. Ceramics production	0	0.00
3. AFOLU	3.A. Livestock	3.A.1. Enteric Fermentation	2137	2.14
		3.A.2. Manure Management	1496	1.50
	3.B. Land	3.B.1. Forest land	-9033	-9.03
		3.B.2. Cropland	1589	1.59
		3.B.3. Grassland	262	0.26
	3.B.5. Settlements	25	0.02	

		3.B.6. Other land	188	0.19
	3.C. Aggregate Sources and Non-CO ₂ Emissions Sources on Land	3.C.1. Biomass burning	12	0.01
		3.C.3. Urea application	95	0.09
		3.C.4. Direct N ₂ O Emissions from soils	1123	1.12
		3.C.5. Indirect N ₂ O Emissions from soils	0	0.00
		3.C.6. Indirect N ₂ O Emissions from manure management	72	0.07
		3.C.7. Rice cultivation	134	0.13
3.D Other	3.D.1 Harvested Wood Products	-130	-0.13	
4. Waste	4.A. Solid Waste Disposal	4.A.2. Unmanaged Disposal Sites	1073	1.07
	4.C. Incineration and Open Burning	4.C.2. Open Burning	128	0.13
	4.D. Wastewater Treatment Discharge	4.D.1. Domestic	474	0.47
Total emissions: Energy			2342	2.34
Total emissions: IPPU			240	0.24
Total emissions: Agriculture (3A + 3C)			5069	5.07
Total emissions: Waste			1675	1.67
Total emissions excluding FOLU			9326	9.33
Total emissions: FOLU (3B + 3D)			-7098	-7.10
Total net emissions including FOLU (emissions minus removals)			2228	2.23

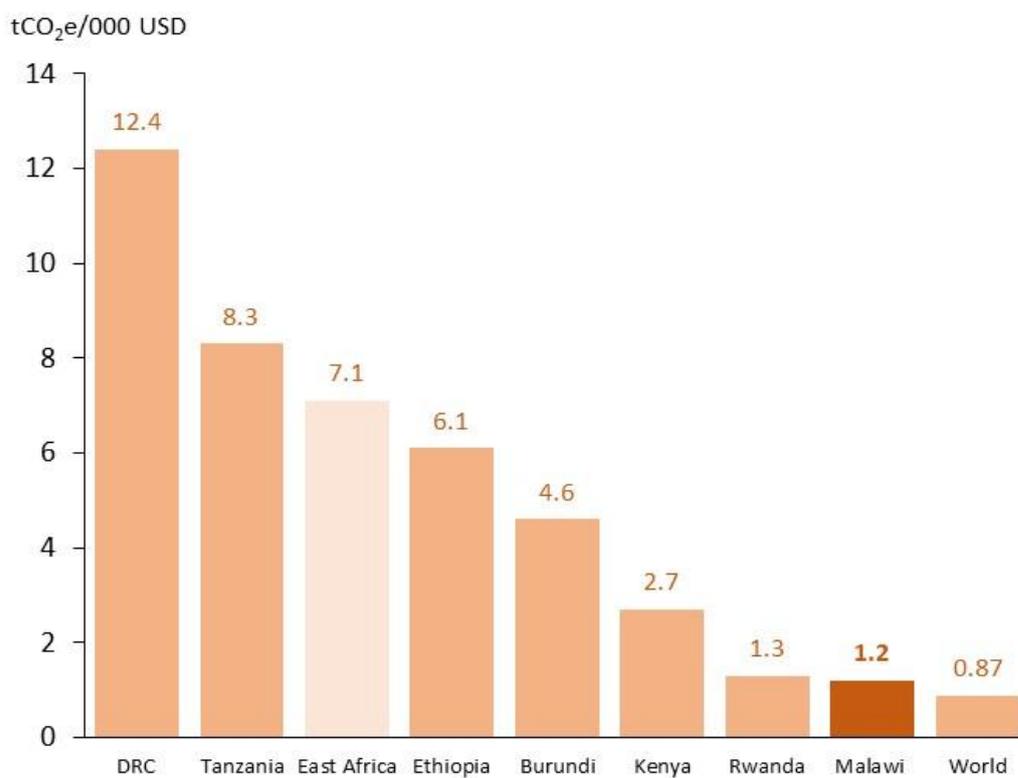
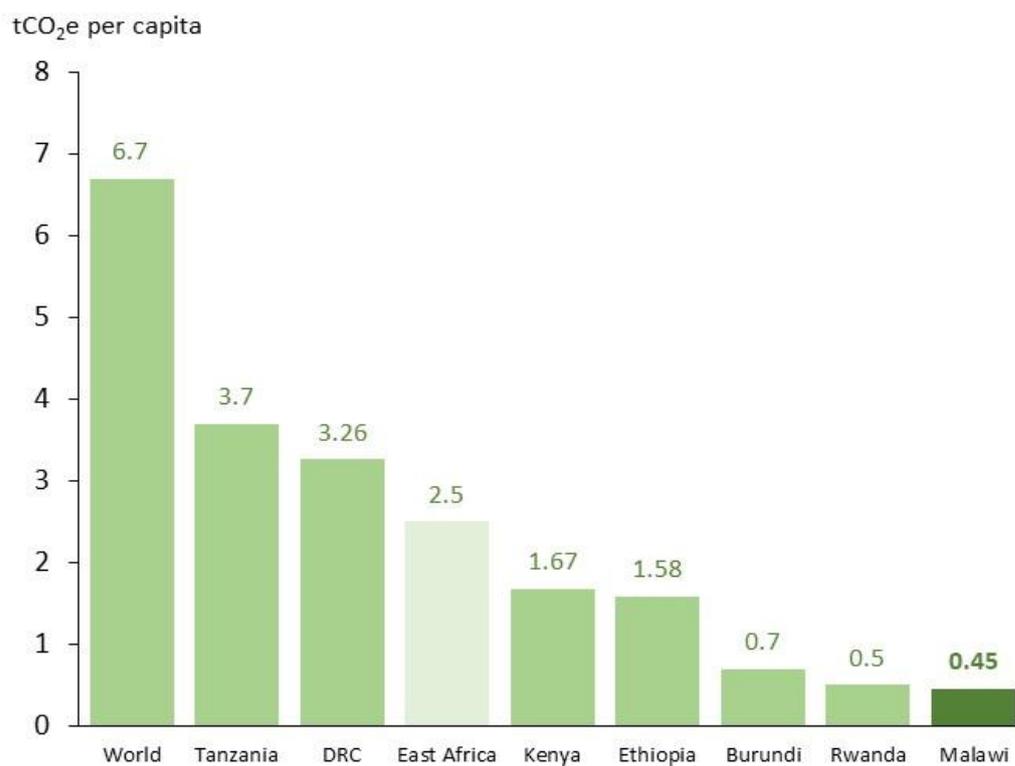
Sources: Malawi GHG Inventory data; TNC (GoM, 2020); EC (2021); UNDP (2021)

Figure 5-2 compares Malawi's total GHG emissions against other East African countries on a per capita basis, and also emissions intensity of economic output i.e. emissions per unit of gross domestic product (GDP).

The data show that Malawi has very low per capita emissions - around 0.5 tCO₂e - compared to other countries within the region. This figure is around one fifth of the regional average and just thirteenth of the world average, reflecting Malawi's predominantly agricultural economy based on subsistence farming with relatively low fossil fuel consumption. The data also show that Malawi has a relatively low emissions intensity – around 1.5 tCO₂e per '000 (thousand) USD GDP – which is also around one fifth of the regional average. Although per capita GDP is relatively low in Malawi at around 360 USD², the low intensity value mainly reflects the importance of the relatively non-energy intensive and low emitting agriculture sector to the national economy.

² Based on population data provided by UN DESA (2019) and real GDP data provided by World Bank (2020).

Figure 5-2 Regional comparison of Malawi per capita and per GDP emissions



Source data: USAID, 2015

Note: Emissions exclude FOLU

5.3 Mitigation potential

5.3.1 Methodological approach

Malawi's NDC mitigation targets are based on an in-depth assessment of the country's mitigation potential against a BAU baseline scenario through 2040. This has been undertaken through a process that integrates an analysis of Malawi's existing sectoral and climate policy framework, the generation of qualitative information through consultation with government officials, experts and stakeholders, quantitative modelling of mitigation options and scenarios, and multi-criteria assessment to determine conditional and unconditional contributions.

In so doing, the analysis builds on the work undertaken in support of Malawi's INDC submission in 2015 and other more recent studies including e.g. GHG mitigation estimates made in the context of NAMAs and the Third National Communication (TNC) to the UNFCCC (GoM, 2020), and a variety of other official data and information sources. The mitigation analysis was undertaken according to these key steps:

- **Step 1: Develop BAU emissions forecasts:** Based on the national GHG inventory emissions in key sector categories (Energy, Industrial Processes and Product Use, IPPU, Waste, Agriculture, and Forestry and Other Land Use; AFOLU)³ develop a revised BAU baseline scenario through 2040.
- **Step 2: Undertake GHG mitigation and economic assessment:** Identify and collect information on mitigation options across sectors based on the INDC measures and discussions with in-country officials and experts, and quantify their emissions reduction potential through 2040 compared to the BAU scenario. Quantify economic costs and benefits (including estimated investment requirements) to enable cost-benefits analysis (CBA) and calculation of GHG abatement costs and investment.
- **Step 3: Model GHG reduction pathways:** Model alternative GHG pathways based on the assessed mitigation options against the BAU baseline through 2040 to quantify the emissions reduction potential across NDC sectors and associated costs and investment needs.

These steps are described further below.

5.3.2 Business-as-usual (BAU) scenario

This section summarises the choice and development of a BAU emissions baseline for Malawi. The projection provides the reference case against which the emissions reduction

³ According to Intergovernmental Panel on Climate Change (IPCC) GHG reporting guidelines (IPCC, 2006); for the purposes of the NDC analysis, AFOLU is separated into Agriculture and FOLU; FOLU was excluded from the projection modelling.

potential from specific mitigation actions has been estimated under alternative GHG reduction pathways (described further below).

The BAU modelling approach is based on detailed bottom-up activity and GHG projections developed for each emitting sector through 2040. These reflect a number of assumptions determining changes in *inter alia* energy supply and demand, agricultural output, waste generation, and technology uptake. In so doing, existing government projections and plans were assessed, and experts consulted within relevant ministries, agencies and organisations. The BAU projections were undertaken by separate consulting teams and separate technical reports have been prepared for these providing details on the projections made.

Given the very large degree of uncertainty when accounting for emissions and removals from forestry and other land use (FOLU)⁴, as well as challenges in data collection and management, this category has been excluded from the BAU analysis. As part of Malawi's REDD+ activities, a national forestry reference level (FRL) has been prepared but at present this is provisional only and subject to revision. For similar reasons, Malawi's mitigation contribution relating to FOLU is treated separately from other emitting sources which can be more robustly quantified, reflecting international guidance and current practice.

It is recognised that the development of a counterfactual baseline projection to 2040 involves an inherently large degree of uncertainty. It is therefore proposed that a *dynamic baseline* be adopted allowing the BAU emissions to be updated by Malawi over the NDC implementation period, to be communicated within each BTR. The basis upon the dynamic baseline will be updated during the NDC commitment period will include key technical factors such as the availability of revised official national projections for GDP growth and population, any errors being rectified; and updates to reflect continuous improvement in emissions inventories (e.g. apply the latest IPCC guidelines), emissions factors and data sources. It is proposed that fundamental and/or methodological changes are not made within the period to the main target (covering all sources excluding FOLU) and that the FOLU contribution in future NDC periods be refined/adjusted based on additional technical assessments and the finalised national forestry reference level (FRL).⁵

The bottom-up sectoral projections are aggregated below to produce an economy-wide forecast of BAU emissions through 2040 (Figure 5-3 and Table 5-2). This represents the BAU baseline projection of all emitting sectors, excluding FOLU, against which the contribution from NDC mitigation measures can be quantified. At an aggregate level, total emissions are forecast to increase by more than three times over the 2017-2040 period, rising from 9.3 million tCO₂e in 2017 to 34.6 million tCO₂e in 2040. The graph shows that this represents a slightly increased rate of growth compared to that seen during the period 2010-

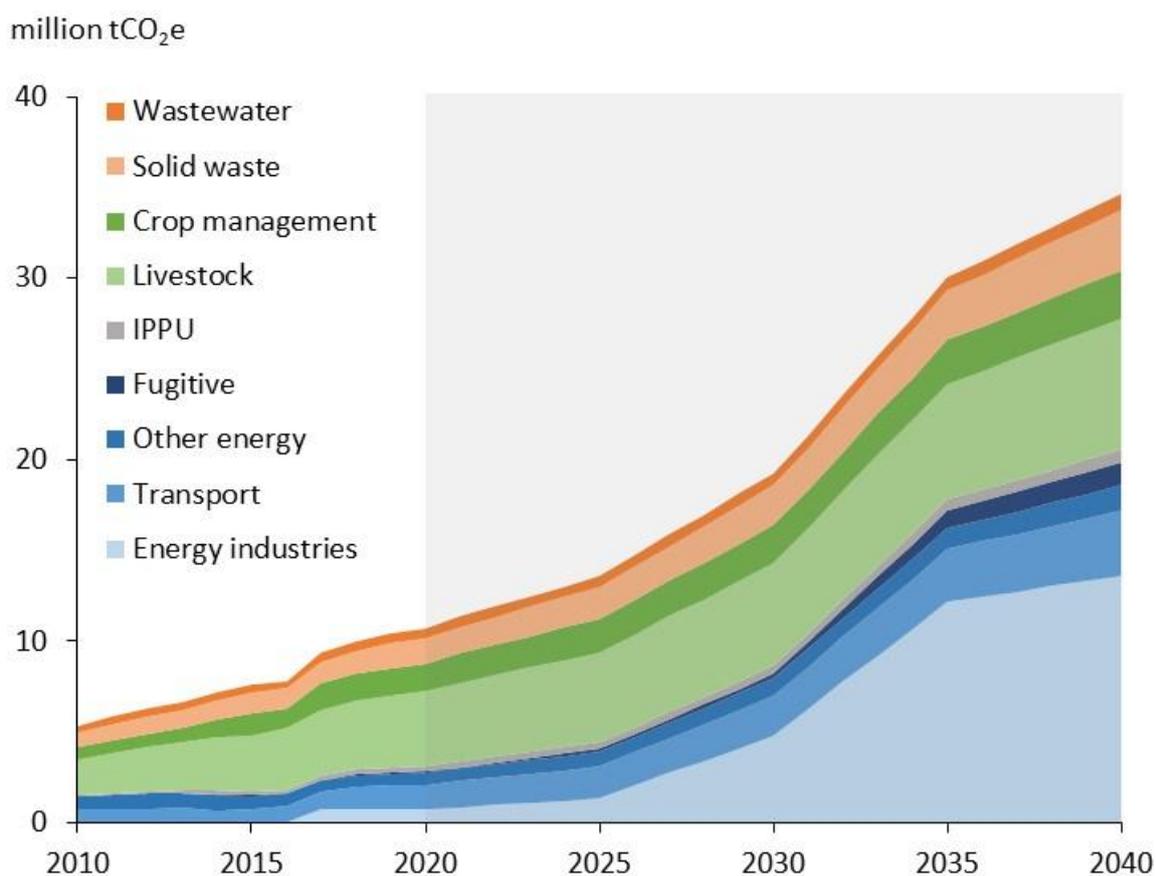
⁴ FOLU is interpreted as including emissions and removals under categories 3B (Land) and 3D (Other) within the IPCC category AFOLU (Agriculture, Forestry and Other Land Use).

⁵ GoM (2019b)

2017, closely reflecting the assumptions around economic and population growth, as well as future expansion of grid-based fossil power generation.

The most rapid growth is forecast within energy use (energy industries, transport, other energy use and fugitive emission), which expands its share of total emissions from 25% in 2017 to around 42% in 2030 and 57% by 2040. The share of emissions from waste generation (wastewater and solid waste) falls slightly from around 18% in 2017 to 12% in 2040, whilst the share of emissions from agricultural sources (crop management and livestock) declines from 54% to 29% over the same period. Emissions from IPPU remain at around 2% of the total. These trends clearly indicate the growing contribution from fossil fuels to national emissions, arising from increasing demand for thermal power generation and transport services. At the same time, despite potential for increased productivity, agricultural output is expected to be limited, growing broadly in line with trends over the past decade.

Figure 5-3 BAU GHG emissions projection to 2040, all sectors excl. FOLU



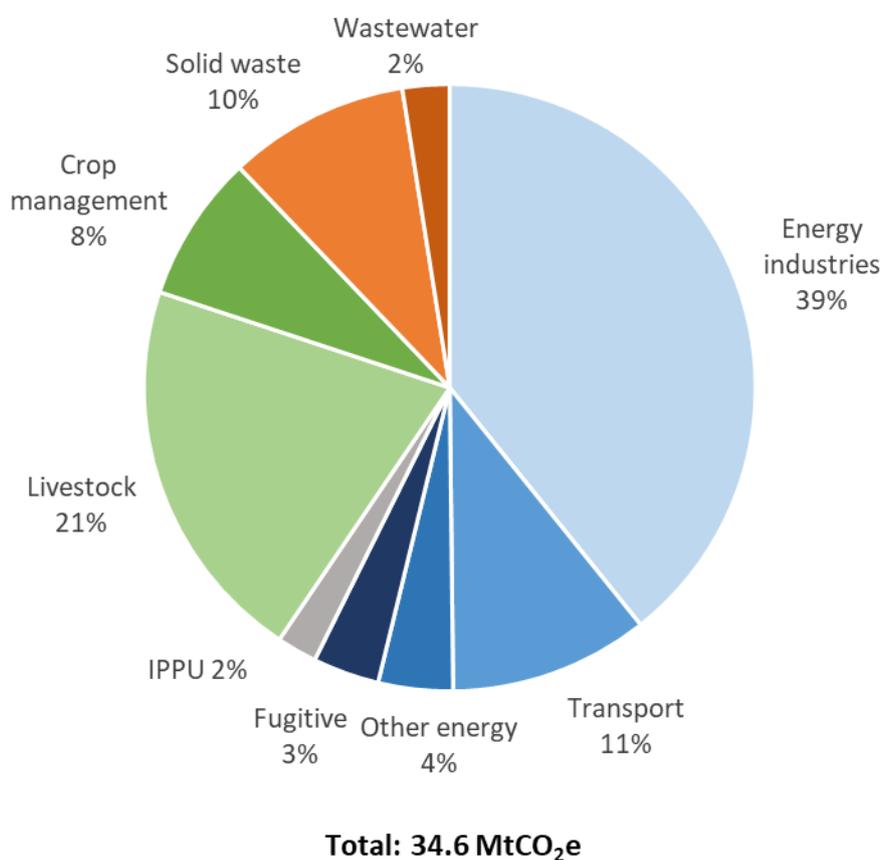
Source: Carbon Counts (2021), EC (2021) and UNDP (2021)

Table 5-2 BAU emissions projection to 2040, all sectors excl. FOLU

GHG emissions (MtCO ₂ e)	2017	2020	2030	2040
Energy	2.35	2.82	8.18	19.83
IPPU	0.24	0.28	0.45	0.74
Agriculture	5.07	5.67	7.74	9.87
Waste	1.67	1.94	2.88	4.18
Total	9.33	10.71	19.25	34.61

Source: Carbon Counts (2021), EC (2021) and UNDP (2021)

Figure 5-4 BAU GHG emissions in 2040, all sectors excl. FOLU



Source: Carbon Counts (2021), EC (2021) and UNDP (2021)

5.3.3 Mitigation assessment

A detailed assessment of GHG mitigation measures for Malawi was next undertaken to quantify the contribution within the updated NDC and the associated investment needs. The analysis was undertaken according to a four-step process:

- **Step 1: Identifying mitigation options:** A comprehensive list of potential emission reduction projects and measures was first developed through a thorough review of national documents and discussions and consultation with government officials, sector experts and other stakeholders.
- **Step 2: Assessing the potential:** The identified options were then assessed in terms of their mitigation potential through 2040 compared to the BAU reference scenario, and their socio-economic costs and benefits by undertaking cost-benefit analysis (CBA).
- **Step 3: Evaluating the measures:** The quantitative analysis was complimented by a broader assessment in order to determine and validate which measures can be implemented through domestic efforts ('unconditional' measures) and which will instead require international support and finance ('conditional' measures), including through international market-based approaches e.g. under Article 6 of the Paris Agreement.
- **Step 4: Alternative GHG emissions pathways:** Based on the analysis undertaken, the economy-wide mitigation potential through the period to 2040 was modelled against the BAU baseline. Two basic NDC mitigation scenarios were modelled, covering implementation of (a) all NDC measures; and (b) domestic measures only.

Each of these steps is described further below.

Identifying mitigation options

The first step of the assessment involved identifying a range of mitigation options from within the each of the NDC sectors for further consideration and quantitative analysis. A bottom-up long-list was developed through close consultation with various stakeholders and experts, based on the following key sources:

- Malawi's INDC (GoM, 2015a)
- Nationally Appropriate Mitigation Actions (NAMAs) for Malawi (GoM, 2015b)
- Sectoral Technical Needs Assessments (TNA) for Climate Change Mitigation
- Malawi's Third National Communication (TNC) to the UNFCCC (GoM, 2020)

Additional mitigation measures were also reviewed, including those identified from the latest sectoral plans, programmes and projects (e.g. national forestry strategies, electricity generation system planning, transport planning, municipal waste drainage and sanitation master plans). Information was collected primarily through discussions with the agreed focal points within the relevant ministries, departments and other organisations.

The resulting long-list was refined on these discussions and follow-up meetings with government officials and sector experts through August 2020 to February 2021. As part of this process, the measures identified in the INDC were re-assessed along with additional projects and programmes. In some cases, the details, and context, regarding some of the

projects were found to have changed since the time of INDC submission in 2015. The long-list thereby reflects a set of real projects and programmes under consideration, or which have been studied by government officials, sector experts and donor partners. As such, it draws upon a rich source of national information gathering, and in-country and international expertise. A total of 33 separate measures were identified for quantitative mitigation assessment.

Assessing the potential

Figure 5-5 summarises the estimated annual emissions reduction potential in 2040 for the mitigation measures modelled. The pie charts indicate the relative contribution made from projects within the key sectors of Energy (covering electricity and heat generation, manufacturing, transport, other energy use and fugitive emissions), Waste, IPPU and Agriculture against the base case BAU projected emissions described above. The estimated potential from the forestry sector (FOLU) is presented separately from these emitting source sectors further below. Descriptions of each of the measures are given in the summary Implementation Plan presented further below.

The total mitigation potential is estimated at around 17.7 million tCO₂e in 2040 compared to base case BAU emissions in the same year of 34.6 million tCO₂e. According to the analysis, mitigation measures identified within the energy sector accounts for by far the largest share of total potential at 85%, followed by agriculture (9% of total), waste (5%), and IPPU (1%).

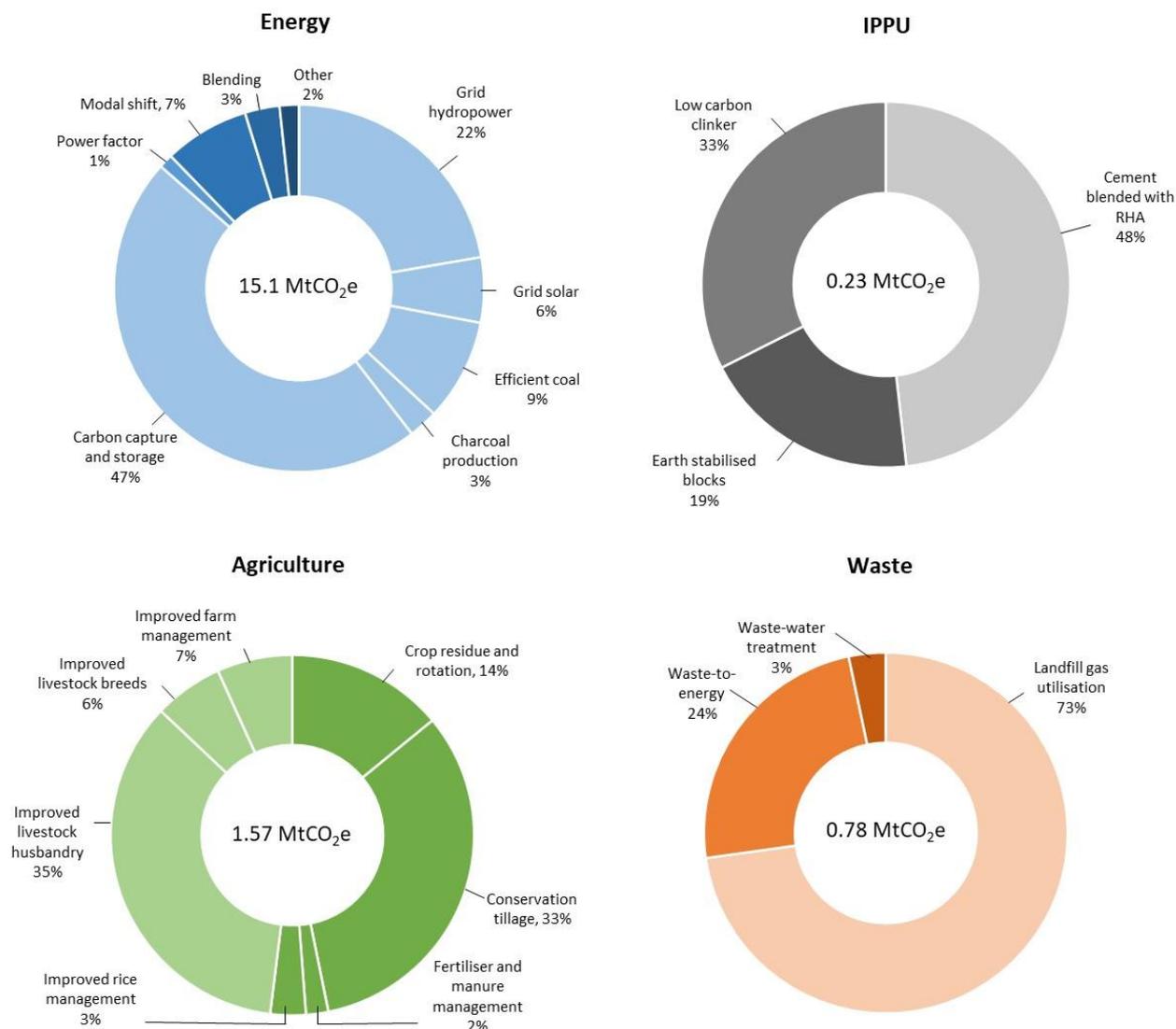
Within **energy** use, increased use of renewables and clean coal technology to meet increasing energy demand combined dominate the mitigation potential. Significant emissions reduction potential exists across each of the key sub-sectors. The application of carbon capture and storage (CCS) to future grid-based thermal power plants from 2030 onwards represents the largest share of the identified GHG reduction potential, with almost half of all sectoral mitigation by 2040. This is followed by large-scale grid hydropower with over a quarter of the total potential. Other measures within electricity and heat generation including the use of high efficiency ultra-super critical coal-fired, large-scale grid based solar PV and efficient charcoal production contribute around 18% of the total. Emissions reductions arising from modal shift and low carbon fuels in the transport sector are also considered to be potentially significant, together contributing around 10% of the estimated energy sector mitigation potential by 2040.

Within **agriculture**, soil conservation measures – which include conservation or zero tillage and crop residue and rotation practices – account for almost half of the sector’s feasible mitigation potential. The bulk of the remaining mitigation potential includes measures to reduce enteric fermentation emissions from livestock, including improved livestock husbandry and the potential introduction of new species to replace local herds.

Within **waste**, the most significant potential is identified within energy utilisation measures such as landfill gas recovery and to a lesser extent direct waste-to-energy (WtE) plants. Mitigation potential from **IPPU** sources is by comparison relatively limited, with the majority

of emissions reductions arising from increased use of rice husk ash (RHA) blending and earth stabilised blocks (ESB) to reduce clinker and cement demand; over the longer term, the use of emerging low carbon clinker processes may also be feasible.

Figure 5-5 Estimated GHG mitigation potential in 2040 from all measures excl. FOLU



Source: Carbon Counts (2021), EC (2021) and UNDP (2021)

Within **forestry and other land use (FOLU)**, the most significant drivers of deforestation and forest degradation in Malawi are the expansion of agriculture and settlements, and unsustainable fuelwood extraction. Under its REDD+ program, Malawi is seeking to maximize potential emission reductions by implementing targeted measures and activities that will lower net emissions by lowering rates of deforestation, lowering rates of forest degradation from unsustainable fuelwood harvesting, and enhancing carbon stocks through afforestation and reforestation. Four key areas of intervention were identified for quantitative assessment and inclusion within the NDC:

1. Afforestation (protective forests, woodlots and urban forests)
2. Agroforestry (wood, fruit and fodder)
3. Sustainable forest management (including REDD+)
4. Riparian restoration

These measures are closely aligned with a number of national policies including the National Forest Policy, Malawi's REDD+ (Reducing Emissions from Deforestation and Forest Degradation) Strategy, the National Forest Landscape Restoration Strategy (NFLRS), and the National Charcoal Strategy and National Climate Change Investment Plan.

In total, the identified measures represent a very significant implementation of additional forestry activities on over one half of a million hectares (534,478 ha) of national land over the coming decade. If scaled up with international support, it is estimated that this could be increased to just under 2 million ha, in line with estimated scaled-up potential to 2030 as outlined in the NFLRS.⁶ The associated net emissions removals calculated from the FOLU sector through 2040 are shown below. The net emissions reduction potential from afforestation and sustainable forestry management, which includes REDD+, can be seen to be particularly significant; taken together the measures are estimated to offer around 40 million tCO₂e of net removals through the NDC period, or two thirds of the total estimated potential of 59.8 million tCO₂e.

⁶ Note that although National Forest Landscape Restoration Strategy identifies a total of 7.5 million Ha of land (80% of Malawi land area) for restoration potential, this is considered a total technical potential; furthermore around half of this relates to agricultural practices (assessed under the Agriculture sector) while some practices have highly uncertain mitigation outcomes which have not been quantified.

Figure 5-6 Proposed land areas for FOLU mitigation measures (hectares, ha)

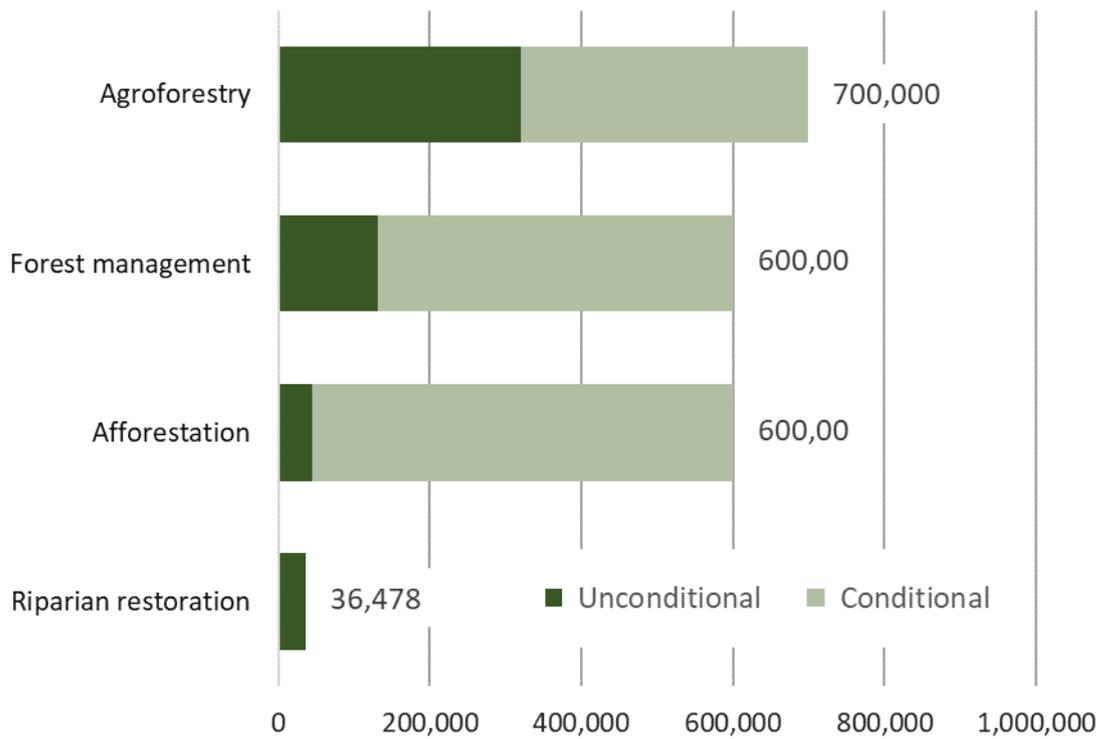
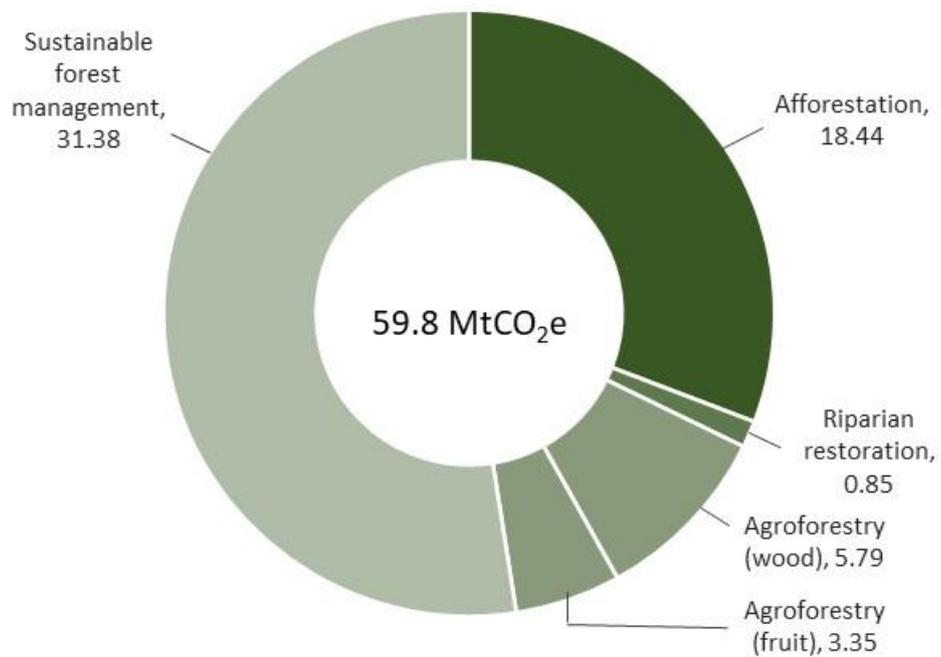


Figure 5-7 Estimated net reductions from FOLU mitigation measures through 2040



Evaluating the measures

Economic analysis indicates that many of the identified projects will require significant financial support. Developing country Parties to the UNFCCC are asked to identify the ‘means of implementation’ relating to their NDC mitigation measures, including the scale of international support required. In this context, Malawi has developed its NDC contribution according to two different components:

- **Unconditional contribution:** Those mitigation measures and policies which will be implemented ‘unconditionally’ through domestic efforts alone (e.g. funded within committed national policy plans and actions); and
- **Conditional contribution:** Additional mitigation measures which could be implemented, but only conditional upon the availability of international support (including funding and other types of support from donors, climate finance and potentially carbon markets).

This approach requires classifying each of the mitigation measures (or a share of its full implementation potential) as either an ‘unconditional’ or ‘conditional’ action. Multi-criteria evaluation provided a basis for grouping the mitigation measures accordingly. In so doing, the following broad considerations were also used to help guide the choices:

1. **Costs and investment levels:** Higher cost projects and those requiring significant up-front investment levels are typically considered more suitable to international support given national budget and resource constraints.
2. **Inclusion within existing national policies and sector plans:** Several projects and measures are already included within Malawi’s domestic climate policy response and budgeted for within sector plans: these are therefore be viewed as domestically committed.
3. **Suitability to international support:** Measures are more or less suited to existing and emerging forms of support (e.g. under Article 6 of the Paris Agreement), both in terms of project types and their likelihood to demonstrate real and measurable, and additional, mitigation outcomes.

Based on consultations with experts and staff within government departments, an estimated partition of conditional and unconditional support was developed for each of the identified NDC measures (Table 5-3 **Error! Reference source not found.**).

Table 5-3 Unconditional and conditional NDC mitigation measures

	Mitigation measure	Conditional	Unconditional
ENERGY	Grid hydropower	100%	-
	Grid solar	100%	-
	Small scale solar PV/SHS	100%	-
	Grid wind power	100%	-
	High efficiency coal plant	100%	-

	Efficient charcoal production	-	100%
	Carbon capture and storage	100%	-
	Power factor correction	100%	-
	Modal shift: passenger	70%	30%
	Modal shift: freight	50%	50%
	Ethanol blending	50%	50%
	Biodiesel blending	90%	10%
	Efficient charcoal stoves	-	100%
	Efficient wood stoves	-	100%
	Efficient tobacco curing	-	100%
	Conservation tillage	-	100%
IPPU	Cement blended with RHA	100%	-
	Earth stabilised blocks	100%	-
	Low carbon clinker	100%	-
AGRICULTURE	Fertiliser and manure management	40%	60%
	Crop residue and rotation	50%	50%
	Improved rice management	70%	30%
	Improved livestock husbandry	40%	60%
	Improved farm management	10%	90%
	Conservation tillage	50%	50%
	Improved livestock and breed management	70%	30%
FOLU	Forestry measures (average)	57%	43%
WASTE	Landfill gas utilisation	100%	-
	Waste-to-energy (WtE) plants	100%	-
	Waste-water treatment and re-use	100%	-

Alternative GHG emissions pathways

Figure 5-8 illustrates the emission projections for the BAU baseline and two alternative NDC mitigation scenarios covering implementation of (a) all NDC measures; and (b) domestic measures only. The associated values are shown in Table 5-4.

The graph shows emissions excluding FOLU forecast to grow significantly under the BAU projection from 9.3 MtCO₂e in 2017 to 34.6 MtCO₂e in 2040. According to the alternative GHG pathway which implements the domestically supported **unconditional** mitigation contribution, it is estimated that by 2040 emissions would instead rise to around 32.6 MtCO₂e, representing a reduction against BAU of around 6%. The second mitigation scenario, showing the total mitigation potential from both domestic and **conditional** mitigation, sees emissions increasing by a much reduced rate over the period, to around 16.9 MtCO₂e, equal to a reduction of around 51% by 2040 against the same baseline.

Figure 5-8 NDC emission reduction scenarios against BAU (excl. FOLU)

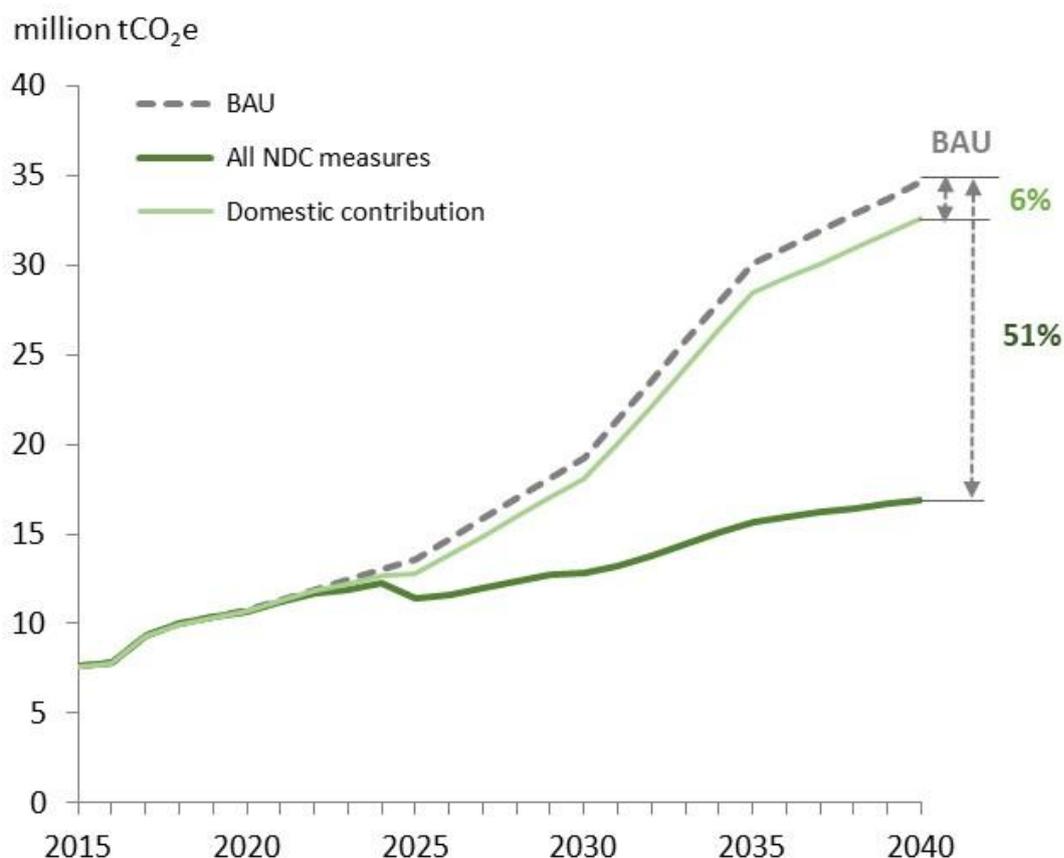
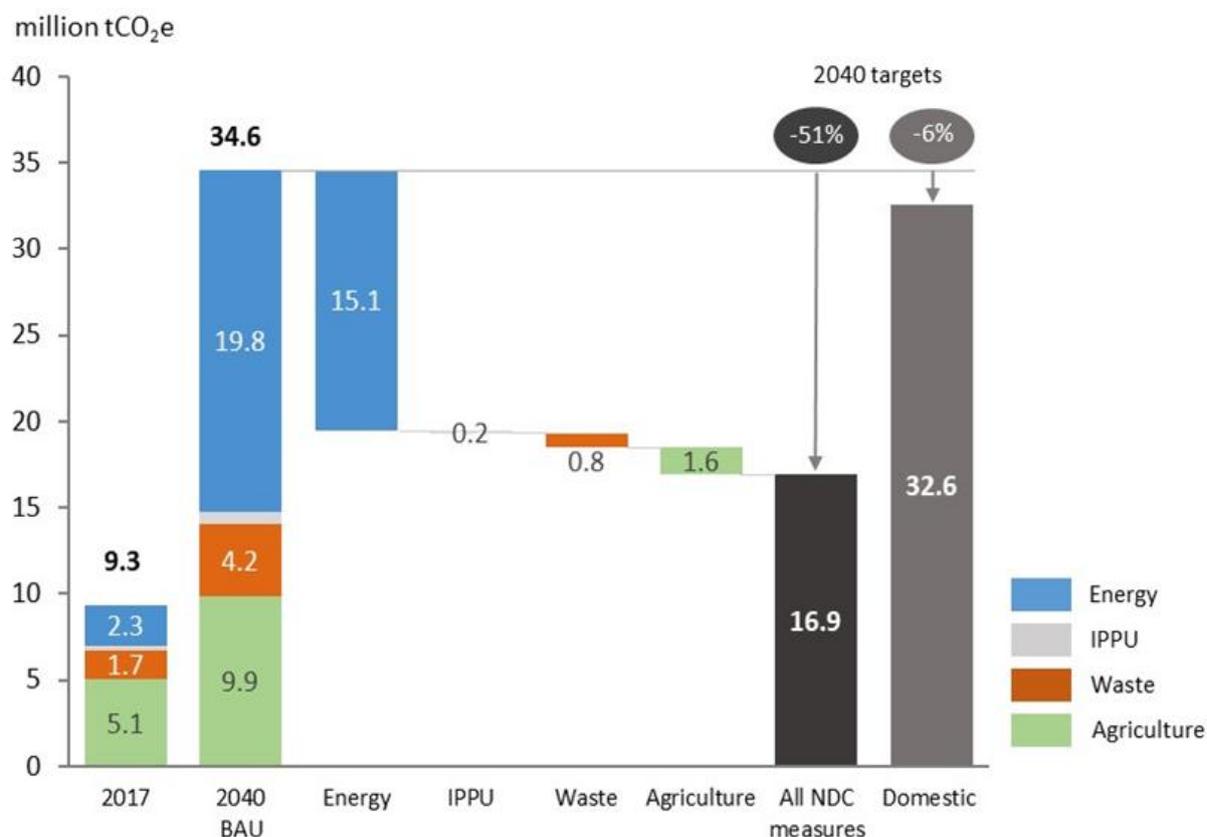


Table 5-4 NDC emission reduction scenarios against BAU (excl. FOLU)

Scenario	2017	2020	2030	2040
Total emissions (MtCO₂e)				
BAU	9.33	10.71	19.25	34.61
Domestic contribution	9.33	10.70	18.07	32.56
All NDC measures	9.33	10.68	12.78	16.92
GHG reduction relative to BAU				
<i>Domestic NDC measures</i>	-	<1%	6%	6%
<i>All NDC measures</i>	-	<1%	34%	51%

The BAU and NDC mitigation scenarios are summarised in Figure 5-9 below, which also shows the contribution of each emitting sector to the total estimated potential based on the technical assessments of all mitigation measures.

Figure 5-9 NDC emission reduction scenarios (excl. FOLU)



A particular feature of the forestry and land use (FOLU) sector is data uncertainty and the large variability for carbon (C) stocks and C stock changes when certain carbon pools are measured. Average uncertainty ranges that are associated with estimates of the level of emissions and removals from the sector are relatively high (32 per cent) compared to other sources such as fossil fuel combustion (1 per cent).⁷ Furthermore, net emissions and removals from FOLU can show very significant variations over a given period. For these reasons, a separate target for Malawi's FOLU sector has been proposed within the NDC. For this updated NDC, this is presented as a provisional contribution subject to further analysis and finalisation of the national FRL.⁸

Reflecting key sector policies such as the National Forest Landscape Restoration Strategy (NFLRS), National Forest Policy and REDD+ (Reducing Emissions from Deforestation and Forest Degradation) Strategy, the indicative FOLU contribution is defined in terms of land use (hectares, Ha) for each identified measure but with estimated net GHG emissions reductions also provided for additional clarity and transparency. Given uncertainty levels and annual variations associated with carbon stocks and removals, the estimated GHG

⁷ Figures from study of EU-15 countries (see Iverson et al, 2014 in Herold and Böttcher, 2018).

⁸ It is expected that the finalised FRL will be presented in the next NDC for use as the baseline reference against which Malawi's FOLU target(s) can be assessed.

reductions are presented as a GHG volume (tCO₂e) through the NDC period rather than for a single end target year. These are shown as conditional and unconditional target values as summarised below in Figure 5-10. At present, Malawi's FRL is provisional only and so the estimated net emissions reductions measures arising from additional FOLU interventions through 2040 are not quantified in relation to the FRL.

Figure 5-10 NDC emission reductions for FOLU to 2040

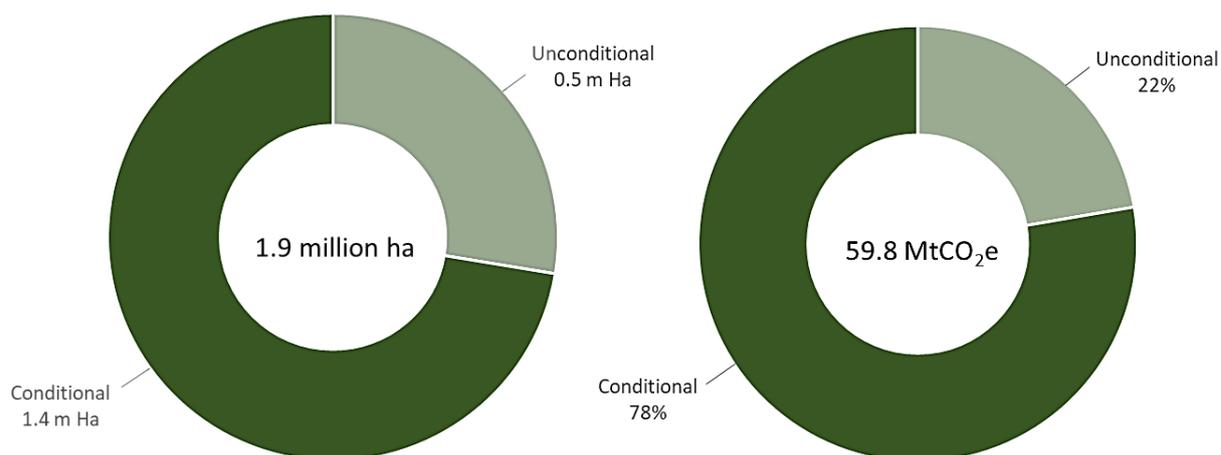


Table 5-5 NDC emission reduction scenarios for FOLU to 2040

Scenario	2015-2040	Share of total
Total area (million ha)		
Unconditional contribution	0.5	28%
Conditional contribution	1.4	72%
Total	1.9	100%
Estimated net emissions reductions (MtCO₂e)		
Unconditional contribution	13.3	22%
Conditional contribution	46.5	78%
Total	59.8	100%

5.4 Implementation plan

The following tables present a summary of Malawi’s NDC Implementation Plan for each of the mitigation measures. The measures are grouped by sector and summarised according to key aspects of implementation planning, including the responsible government ministries and implementing entities⁹, the planned timeline, and the estimated funding requirements through 2040¹⁰. Adaptation and resilience co-benefits are also shown, as well as key linkages with achieving the UN Sustainable Development Goals.

⁹ Note that due to space restrictions, acronyms are used throughout; please therefore refer to the list of acronyms and abbreviations included at the front of this report as required.

¹⁰ Where relevant, estimated unconditional and conditional components are denoted in the tables by “uc” and “c”.

NDC MEASURE	LINE MINISTRY (FOCAL POINT)	OTHER KEY IMPLEMENTING ENTITIES	TOTAL ESTIMATED FUNDING	ADAPTATION AND RESILIENCE CO-BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
						2020- 2025	2025- 2030	2030- 2040
ENERGY								
ELECTRICITY GENERATION								
Grid-connected hydropower generation Displacement of GHG emissions from fossil fuel power generation, including coal-fired, diesel and HFO generation.	MOE (Department of Energy Affairs)	MERA, EGENCO, ESCOM	US\$ 8.3 billion 100% conditional	Improved water management through flood and drought control. Increase in agricultural production due to improved water management and reduced exposure to extreme climate events.		✓	✓	✓
Off-grid small scale solar PV systems Installation of PV systems for domestic solar heating and lanterns, resulting in avoided GHG emissions from kerosene and unsustainable charcoal use.	MOE (Department of Energy Affairs)	MOLG, District Councils, CSOs, NGOs	US\$ 4 million 100% conditional	Reduced dependence on traditional biomass fuels, which is vulnerable to climate variability. Reduced pressure on forests and forest biodiversity. Increased off-farm business for rural community having access to energy also increases adaptive capacity.		✓	✓	✓
Grid connected large scale solar PV Displacement of GHG emissions from fossil fuel power generation, including coal-fired, diesel and HFO generation.	MOE (Department of Energy Affairs)	MERA, EGENCO, ESCOM, Department of Lands, IPPs	US\$ 1.1 billion 100% conditional	Reduced dependence on fossil fuels including imported liquid fuels, the supply and distribution of which are vulnerable to climate impacts both globally and regionally.		✓	✓	✓

NDC MEASURE	LINE MINISTRY (FOCAL POINT)	OTHER KEY IMPLEMENTING	TOTAL ESTIMATED	ADAPTATION AND RESILIENCE CO-BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Grid connected wind power Displacement of GHG emissions from fossil fuel power generation, including coal-fired, diesel and HFO generation.	MOE (Department of Energy Affairs)	MERA, EGENCO, ESCOM	US\$ 479 million 100% conditional	Reduced dependence on fossil fuels including imported high cost liquid fuels, the supply and distribution of which are vulnerable to climate impacts both globally and regionally.		✓	✓	✓
Efficient charcoal production Production of charcoal to meet energy demand using less wood feedstock through use of efficient kilns, resulting in reduced CH ₄ and N ₂ O emissions.	MOE, Ministry of Forestry and Natural Resources (DOF)	MOLG, District Forestry Offices	US\$ 1.2 million 100% unconditional	Reduced dependence on availability of traditional biomass fuels, which is vulnerable to climate variability. Reduced pressure on forests resources, with reduced impacts from extreme rainfall events.		✓	✓	✓
Clean Coal technology - high efficiency coal-fired power plant Installation of highly efficient super ultracritical coal plant, resulting in reduced GHG emissions from coal use in electricity generation.	MOE (Department of Energy Affairs)	MERA, EGENCO, ESCOM, IPPs, Department of Mines, private sector (mining companies)	US\$ 7.5 billion 100% conditional	Reduced reliance on coal production and use - when compared to the baseline reference case - thereby increasing resilience of grid power and supply and reducing fossil fuel dependence.		✓	✓	✓
Clean Coal technology - Carbon Capture and Storage (CCS) Deployment of carbon capture to sub-critical coal power stations in the north of Malawi with permanent geological storage within in-situ coal seams.	MOE (Department of Energy Affairs)	MERA, EGENCO, ESCOM, IPPs, Department of Mines, donors	US\$ 4.8 billion 100% conditional	Not applicable		✓	✓	✓
TRANSPORT								

NDC MEASURE	LINE MINISTRY (FOCAL POINT)	OTHER KEY IMPLEMENTING	TOTAL ESTIMATED	ADAPTATION AND RESILIENCE CO-BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Modal shift: private to passenger transport Increasing the share of passenger transport from around 10% at present to around 30% in 2040, reducing GHG emissions from gasoline and diesel use.	MOTPW, MOLG (Department of Road Traffic and Safety Services)	Passenger Associations, Bus Operators Associations, City Councils, private transport cos	US\$ 138 million uc: US\$ 41m c: US\$ 97m	Increased resilience of transport infrastructure. Improved health and reduction of harmful local air pollutants, enhancing resilience of population to disease and adverse climate impacts.	   	✓	✓	✓
Modal shift: road to rail freight Increased use of rail under the National Transport Master Plan, resulting in reduced diesel consumptions and GHG emissions from road freight transport.	MOTPW (Department of Rail and Public Transport)	Road Transporters Association, Railway Operator, District and City Councils	US\$ 12.9 billion uc: US\$ 6.45m c: US\$ 6.45m	Increased resilience of transport infrastructure. Improved health and reduction of harmful local air pollutants, enhancing resilience of population to disease and adverse climate impacts.	   	✓	✓	✓
Increasing ethanol blending with gasoline as a transportation fuel Achieving an average national blend rate of 20% ethanol, resulting in reduced GHG emissions from gasoline consumption in road transport.	MOTPW, MOE (Department of Energy Affairs)	MERA, private sector	US\$ 506 million uc: US\$ 253m c: US\$ 253m	Decreased dependence on imported fossil fuel energy products. Improved health and reduction of harmful local air pollutants, enhancing resilience of population to disease and adverse climate impacts.	   	✓	✓	✓
Blending biodiesel with diesel as a transportation fuel Commercial production of biodiesel fuel reaching 55 million litres and resulting in reduced GHG emissions from diesel consumption in road transport.	MOTPW, MOE (Department of Energy Affairs)	MERA, MOA, DADOs, private sector	US\$ 157 million uc: US\$ 141m c: US\$ 16m	Decreased dependence on imported fossil fuel energy products. Improved health and reduction of harmful local air pollutants, enhancing resilience of population to disease and adverse climate impacts.	   	✓	✓	✓

BUILDINGS

NDC MEASURE	LINE MINISTRY (FOCAL POINT)	OTHER KEY IMPLEMENTING	TOTAL ESTIMATED	ADAPTATION AND RESILIENCE CO-BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Improved charcoal cookstoves - rural households (a) Deployment of efficient charcoal cookstoves to urban households; increasing from 20% to 30% efficiency thereby reducing demand for charcoal and CH ₄ and N ₂ O emissions.	MOE (Department of Energy Affairs), Ministry of Forestry and Natural Resources (DOF)	District Energy Offices, District Forestry Offices, District Councils, NGOs, Area and Village Development Committees	US\$ 8 million 100% unconditional	Reduced demand for traditional biomass, which helps to reduce pressure on forestry resources with associated reduced impacts from extreme rainfall events.		✓	✓	✓
Improved firewood cookstoves - rural households (b) Introduction of 2 million improved high efficiency stoves, resulting in carbon sink preservation through reduction in use of unsustainable biomass fuel.	MOE (Department of Energy Affairs)	District Councils, NGOs, Area and Village Development Committees	US\$ 18 million 100% unconditional	Reduced dependence on traditional biomass fuels, which is vulnerable to climate variability. Reduced pressure on forests resources, with reduced impacts from extreme rainfall events.		✓	✓	✓
INDUSTRY AND MANUFACTURING								
Power Factor Correction Reduced generation of reactive power at power plants resulting in avoided GHG emissions from reduced fossil fuel combustion to generate reactive power.	MOI (Department of Factory Inspectorate)	MERA, ESCOM	US\$ 1.5 million 100% unconditional	Increased resilience and efficiency of industrial and manufacturing consumers - because the use of PFC allows electricity users to reduce their electricity bills by maintaining the level of reactive power consumption.		✓	✓	✓
AGRICULTURE								

NDC MEASURE	LINE MINISTRY (FOCAL POINT)	OTHER KEY IMPLEMENTING	TOTAL ESTIMATED	ADAPTATION AND RESILIENCE CO-BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
						2020-2025	2025-2030	2030-2040
Use of efficient barns for tobacco curing Reduced demand for fuelwood required in tobacco curing from 2025-2040 by use of efficient barns, resulting in avoided CH ₄ and N ₂ O emissions from fuelwood combustion.	MOA	DOF, Department of Energy Affairs, District Agriculture Development Offices, tobacco associations	US\$ 60 million 100% unconditional	Reduced dependence of farmers on traditional biomass fuels, which is vulnerable to climate variability. Reduced pressure on forests resources, with reduced impacts from extreme rainfall events.	   	✓	✓	✓
Conservation tillage within for commercial crop farming Use of conservation or zero tillage farming, resulting in avoided GHG emissions from diesel use in tractors used in ploughing and tilling before crop planting.	MOA	District Agriculture Development Offices, NGOs	US\$ 1 million 100% unconditional	Reduced dependence on imported fossil fuel energy and increased food security.	   	✓	✓	✓

NDC MEASURE	LINE MINISTRY (FOCAL POINT)	OTHER KEY IMPLEMENTING ENTITIES	TOTAL ESTIMATED FUNDING	ADAPTATION AND RESILIENCE CO-BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
						2020-2025	2025-2030	2030-2040
IPPU								
MINERALS INDUSTRY								

NDC MEASURE	LINE MINISTRY (FOCAL POINT)	OTHER KEY IMPLEMENTING	TOTAL ESTIMATED	ADAPTATION AND RESILIENCE CO-BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
<p>Increased use of rice husk ash (RHA) in blended cement</p> <p>Reduction in demand for cement in construction industry through ;increased blending in cement production resulting in reduced calcination emissions from domestic clinker production.</p>	MOI (Department of Factory Inspectorate)	EAD, Department of Housing, cement companies	US\$ 3 million 100% conditional	Reduced dependence on imported fossil fuels for use in clinker production and promotion of indigenous resources. Increased resilience of the sector through a potential reduction of cement production costs and exposure to energy price volatility.	  	✓	✓	✓
<p>Earth stabilised blocks (ESBs) as building materials Wider promotion of ESBs as materials within institutional and domestic building projects to replace cement stabilised blocks within construction, reducing emissions from cement production.</p>	MOI (Department of Factory Inspectorate)	Department of Housing, Malawi Bureau of Standards, ESB providers, NCIC, NGOs	< US\$ 1 million 100% conditional	Increased resilience through use of sustainable domestic materials and development of local building construction market. Reduced dependence on global and regional cement market dynamics.	  	✓	✓	✓
<p>Alternative low carbon cement processes Potential use of emerging lower-carbon cement production processes such as belite ye'elimate-ferrite (BYF) clinker with reduced GHG emissions compared to conventional process.</p>	MOI (Department of Factory Inspectorate)	Malawi Bureau of Standards, cement companies	<US\$ 1 million 100% conditional	Not applicable.	  	✓	✓	✓
CROSS-CUTTING								

NDC MEASURE	LINE MINISTRY (FOCAL POINT)	OTHER KEY IMPLEMENTING	TOTAL ESTIMATED	ADAPTATION AND RESILIENCE CO-BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Support industries involved in carbon capture utilisation and storage (CCUS) Support for companies assessing, developing or implementing CCUS from suitable facilities, resulting in stored or avoided CO ₂ emissions.	MOI (Department of Factory Inspectorate)	Department of Energy Affairs, private sector, donors	< US\$ 1 million 100% conditional	Utilisation of domestically produced CO ₂ within industries can help reduce dependence on products and inputs whilst enhancing resource reuse and recycling. Depending on the process and product(s), environmental impacts can also be lessened.	  	✓	✓	✓

NDC MEASURE	LINE MINISTRY (FOCAL POINT)	OTHER KEY IMPLEMENTING ENTITIES	TOTAL ESTIMATED FUNDING	ADAPTATION AND RESILIENCE CO-BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
						2020-2025	2025-2030	2030-2040
WASTE								
SOLID WASTE								
Landfill gas (LFG) utilisation Generation of up to 95 GWh of electrical power from landfill gas extraction, collection and utilization applied to sanitary landfills, resulting in reduced CH ₄ from landfill sites and avoided CO ₂ from displacement of fossil-based electricity use.	MOFNR, MOLG	City and District Councils, Department of Energy Affairs, MERA	US\$ 102 million 100% conditional	Improved quality of water, soil and local atmosphere, increasing human and environmental resilience. Increased access to electricity and reduced dependency on traditional biomass energy. Creation of revenue generation opportunities for urban population in the waste management process chain.	     	✓	✓	✓

NDC MEASURE	LINE MINISTRY (FOCAL POINT)	OTHER KEY IMPLEMENTING	TOTAL ESTIMATED	ADAPTATION AND RESILIENCE CO-BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Waste Reduction Practices Solid and water waste reduction practices at household, institutional and industry level to reduce waste generation, resulting in reduced CH ₄ and CO ₂ emissions.	MOFNR, MOLG	City and District Councils, EAD	Not quantified	Reduced local pollution and unsustainable waste management practices and generation, resulting in increased resilience of ecosystems and public health.	     	✓	✓	✓
Waste to Energy (WtE) Installation of waste to energy incinerators to generate up to 250 GWh of electricity per year in Lilongwe and Blantyre, achieving reduced CH ₄ emissions from landfill sites and avoided CO ₂ from displacement of grid power.	MOFNR, MOLG	City and District Councils, Department of Energy affairs, MERA	US\$ 169 million 100% conditional	Increased access to electricity and reduced dependency on traditional biomass energy. Creation of revenue generation opportunities for urban population in the waste management process chain.	     	✓	✓	✓
WASTE WATER								
Waste-water treatment and reuse Rehabilitation and construction of sewerage network and wastewater treatment plants in Lilongwe, Blantyre, Mzuzu and Zomba, achieving a reduction in CH ₄ , and N ₂ O emissions from waste-water and sewage.	MOFNR, MOLG	City and District Councils, Department of Water Resources	US\$ 67 million 100% conditional	Reduced water contamination resulting in increased human and environmental resilience. Increased agriculture production and groundwater recharge. Increased food production and nutrition security.	     	✓	✓	✓

NDC MEASURE	LINE MINISTRY (FOCAL POINT)	OTHER KEY IMPLEMENTING ENTITIES	TOTAL ESTIMATED FUNDING	ADAPTATION AND RESILIENCE CO-BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
						2020- 2025	2025- 2030	2030- 2040
AGRICULTURE								
CROP MANAGEMENT								
Conservation agriculture: crop residue and rotation Support and implementation of the planned expansion targets for crop residue and crop rotation to improve soil conservation, resulting in increase of soil carbon stock and improved crop yields.	MOA (Department of Crop Development)	MOFNR, LUANAR, NGOs, donors	US\$ 472 million uc: US\$ 236m c: US\$ 236m	Increased food security and agricultural resilience through enhanced soil fertility, increased crop stability and reduced soil erosion. Cleaner water provision, through reduced nutrient and soil runoff.		✓	✓	✓
Conservation agriculture: conservation tillage Support and implementation of the planned expansion targets for conservation tillage to improve soil conservation, resulting in increase of soil carbon stock and improved crop yields.	MOA (Department of Crop Development)	Department of Land Resources and Conservation, MOFNR, LUANAR, NGOs, donors	< US\$ 1 million	Increased food security and agricultural resilience through enhanced soil fertility, increased crop stability and reduced soil erosion. Cleaner water provision, through reduced nutrient and soil runoff.		✓	✓	✓

NDC MEASURE	LINE MINISTRY (FOCAL POINT)	OTHER KEY IMPLEMENTING	TOTAL ESTIMATED	ADAPTATION AND RESILIENCE CO-BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
<p>Promotion of efficient fertiliser use and manure management Improved fertiliser management through increased use of organic waste in soil fertilizers and compost manure, increasing carbon stock retention in soils, and reduced N₂O emissions from mineral N-fertilizer use.</p>	MOA (Department of Crop Development)	Department of Land Resources and Conservation, MOFNR, LUANAR, NGOs, donors	<p>US\$ 369 million</p> <p>uc: US\$ 148m</p> <p>c: US\$ 221m</p>	Enhanced effectiveness of fertilizer application supports resilience and agricultural efficiency of vulnerable farmers. Reduced compostable waste related health risks such as dengue fever. Enhanced soil fertility and reduced soil erosion.		✓	✓	✓
<p>Improved rice management practices Deep organic fertiliser application and improved biomass and fertilizer management in rice and nitrification inhibitors application, resulting in reduced N₂O emissions from mineral N-fertilizer use.</p>	MOA (Department of Crop Development)	MOFNR, LUANAR, NGOs, donors	<p>US\$ 333 million</p> <p>uc: US\$ 233m</p> <p>c: US\$ 100m</p>	Enhanced effectiveness of fertilizer application supports resilience and agricultural efficiency of vulnerable farmers. Reduced compostable waste related health risks such as dengue fever. Enhanced soil fertility and reduced soil erosion.		✓	✓	✓
LIVESTOCK								
<p>Improved livestock husbandry Improved livestock husbandry through expansion of new fodder area under <i>Brachiaria</i> and <i>Napier</i>, reducing CH₄ emissions from enteric fermentation and increasing biomass carbon stock.</p>	MOA (Department of Animal Health and Livestock Development)	MOFNR, LUANAR, NGOs, donors	<p>US\$ 120 million</p> <p>uc: US\$ 48m</p> <p>c: US\$ 72m</p>	Increased food security and resilience of livestock farmers and rural communities through enhanced yields.		✓	✓	✓

NDC MEASURE	LINE MINISTRY (FOCAL POINT)	OTHER KEY IMPLEMENTING	TOTAL ESTIMATED	ADAPTATION AND RESILIENCE CO-BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Improved livestock and breed management Improved breeding management to increase meat and milk yields, including through species replacements, encouragement of semi-intensive feeding system and diversification, resulting in reduced CH ₄ emissions from enteric fermentation.	MOA (Department of Animal Health and Livestock Development)	MOFNR, LUANAR, NGOs, donors	US\$ 2.3 billion uc: US\$ 1.6bn c: US\$ 0.7bn	Increased food security and resilience of livestock farmers and rural communities through introduction of more drought resistant livestock species and enhanced yields.		✓	✓	✓
Improved farm management Establishing biogas digesters, promotion of collective farms, improved manure management and promotion of slurry systems, resulting in reduced or avoided N ₂ O and CH ₄ emissions.	MOA (Department of Animal Health and Livestock Development)	Department of Land Resources and Conservation, MOFNR, LUANAR, NGOs, donors	US\$ 43 million uc: US\$ 4m c: US\$ 39m	Increased food security and resilience of livestock farmers and rural communities through enhanced yields. Increased access to clean and sustainable energy sources.		✓	✓	✓
FORESTRY AND LAND USE								
Afforestation (protective forests, woodlots and urban forests) Production and planting of native Eucalyptus and Pinus trees in 45,000 Ha of areas, with potential to be scaled-up to 600,000 Ha with international support, based on NFLRS targets.	MOFNR (Department of Forestry)	FRIM, DFOs, NGOs, local communities, village associations, and traditional authorities.	US\$ 515 million including riparian restoration uc: US\$ 35m c: US\$ 480m	Adaptation related benefits include reduced soil erosion from loss of forest cover, run-off in steep areas and water purification. Co-benefits include ecosystem related sources of income and improved livelihood, landscape restoration and biodiversity gains.		✓	✓	✓

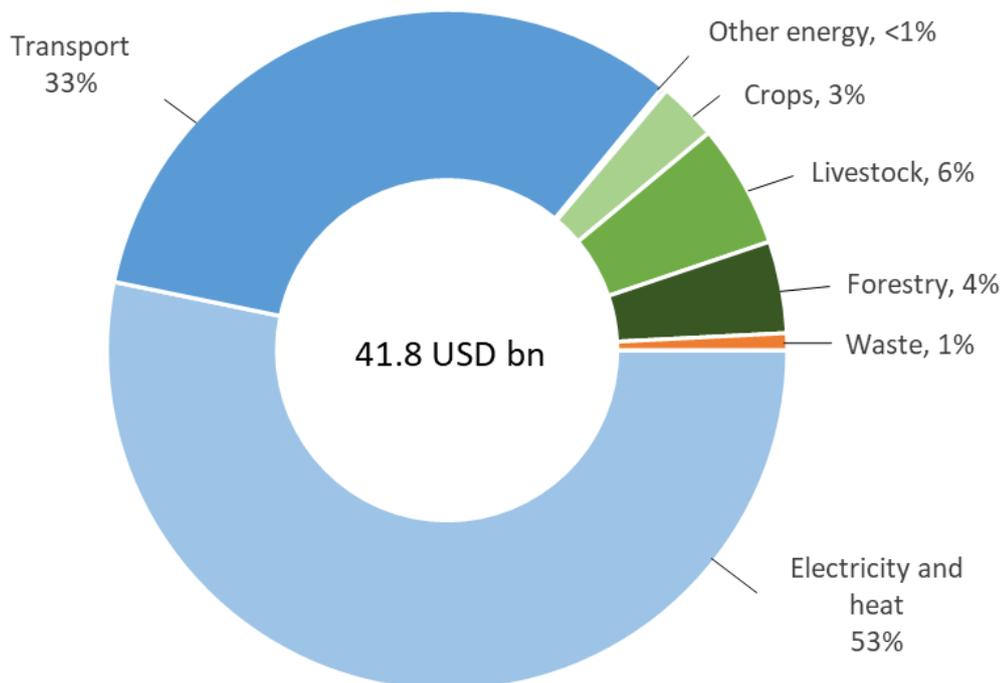
NDC MEASURE	LINE MINISTRY (FOCAL POINT)	OTHER KEY IMPLEMENTING	TOTAL ESTIMATED	ADAPTATION AND RESILIENCE CO-BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
<p>Riparian restoration Around 36,000 Ha of native species and bamboo to be planted within riparian zones and wetland borders to enable higher ecological productivity and sustainable harvesting.</p>	MOFNR (Department of Forestry)	FRIM, DFOs, NGOs, local communities, village associations, and traditional authorities.	See above	Increased ecological resilience to climate change, reduced risk of flooding, linking of aquatic and terrestrial ecosystems, and thermal refugia for aquatic species. Co-benefits include ecosystem related sources of income and improved livelihood, water resource protection and biodiversity gains.		✓	✓	✓
<p>Agroforestry Targeted planting of an additional 25 trees/ha on 155,000 Ha of crop fields, equivalent to 20% of total arable land, 31,784 Ha of village forest areas; and expansion of new fruit area on 27,000 Ha to achieve at least a 10% tree cover. Scaled-up potential for all agroforestry types estimated at 700,000 Ha.</p>	MOFNR (Department of Forestry)	FRIM, LUANAR, DFOs, NGOs, local communities, village associations, and traditional authorities.	<p>US\$ 666 million</p> <p>uc: US\$660m</p> <p>c: US\$ 6m</p>	Agroforestry increases plot and farm resilience while reducing vulnerability to climate change in both agricultural and forestry lands. Co-benefits include ecosystem related sources of income such as sustainable wood (for fuel and timber), fruit, and fodder, and improved livelihood, landscape restoration and biodiversity gains.		✓	✓	✓
<p>Sustainable forest and landscape management Production and planting of native trees in conservation areas, and protection of areas with tree-site matching species for a total of up to 132,000 ha, with potential to be scaled up to around 600,000 Ha with international support, based on NFLRS targets.</p>	MOFNR (Department of Forestry)	FRIM, DFOs, NGOs, local communities, village associations, and traditional authorities, private sector	<p>US\$ 643 million</p> <p>uc: US\$94m,</p> <p>c: US\$ 549m</p>	Adaptation related benefits include reduced soil erosion from loss of forest cover, run-off in steep areas and water purification. Co-benefits include ecosystem related sources of income and improved livelihood, landscape restoration and biodiversity gains.		✓	✓	✓

5.5 Funding requirements

The figure below show the estimated funding requirements associated with all identified mitigation options, estimated at 41.8 billion USD through 2040.

These represent the investment costs required for new plant, installations, equipment and goods, as well as additional implementation and ongoing costs. The funding levels for each sector broadly correspond to the estimated mitigation shares across each emitting sector, with energy projects accounting for the majority (around 86%), followed by agriculture (9%). In order to achieve the projected mitigation outcomes, the estimates indicate how resource requirements increase significantly over each subsequent five-year period. This reflects increasingly deep cuts in emissions through 2040, but also the timing of large capital-intensive energy and infrastructure projects developed from around 2030 onwards.

Figure 5-11 Funding requirements for all identified measures through 2040



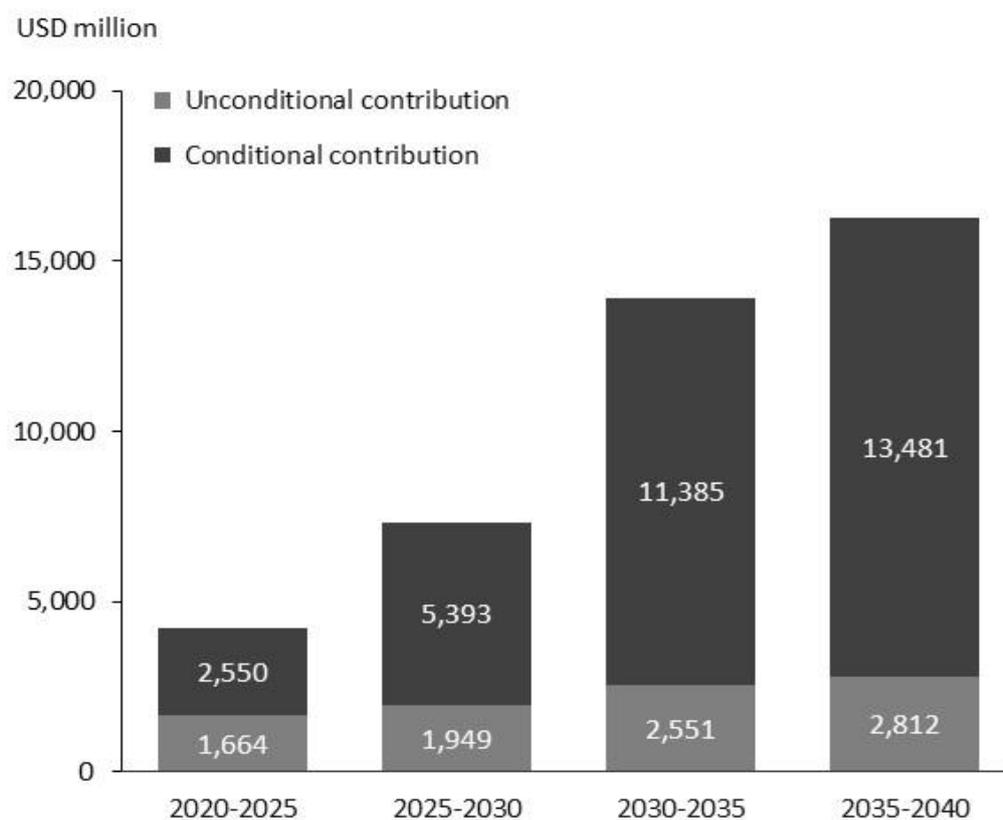
Source: Carbon Counts (2021), EC (2021) and UNDP (2021)

Table 5-6 Funding requirements for all mitigation measures (USD million)

Sector	2020-2025	2025-2030	2030-2035	2035-2040	Total
Electricity and heat	421	2,980	8,465	10,374	22,240
Transport	2,145	2,473	4,200	4849	13667
Other energy	19	22	23	24	88
Energy total	2,584	5475	12,688	15,247	35,994
IPPU	3.0	0.0	0.0	0.0	3.0
Crop management	131	284	368	392	1175
Livestock	505	652	646	646	2449
Agriculture total	635	936	1014	1,039	3,624
Forestry	743	854	226	0	1,824
Solid waste	214	42	7	7	271
Waste-water	33	33	0	0	67
Waste total	248	76	7	7	337
TOTAL	4,213	7,341	13,935	16,292	41,782

Figure 5-12 shows the estimated funding requirements according to the grouping of “unconditional” (domestically supported) and “conditional” measures for each five-year period through 2040.

Figure 5-12 Estimated funding requirements for NDC measures



6 Adaptation contribution

6.1 Overview

This section describes the adaptation component of Malawi's nationally determined contribution. After a description of vulnerability and resilience to climate change impacts, a description is made of the methodology used to prioritise adaptation priorities and develop relevant indicators. Adaptation actions are then described, followed by a summary of the national Implementation Plan for prioritised measures and their estimated funding requirements.

6.2 Vulnerability and resilience

As noted earlier, most of the vulnerabilities of the key socio-economic sectors and the supporting ecosystems and natural resources are related to climate extreme events, as heavy rains and droughts and strong winds related to cyclones. Recently, Malawi has been having its heavy share of all, but those effects have been increasingly observed in the last decades.

The vulnerability assessment was taken from the Third National Communication (TNC) (GoM, 2020). The following conclusions may be drawn from climate change scenario analysis results about future expected temperature and rainfall regimes in Malawi based on the two scenarios used: (a) there is a positive trend in temperature rise, i.e., there will be an increase in temperature in Malawi with climate change; (b) minimum temperatures exhibit a faster rise in temperature with climate change than maximum temperatures; (c) generally, there is an insignificant decrease in rainfall during the October-December period, and an increase during January-March; (d) future temperatures will rise by 1.3 °C to 2.6 °C; and (e) El Niño conditions will likely increase climate extremes, resulting in the increased severity, or magnitude/intensity, and frequency of floods, droughts, and strong winds.

What is clear from the description of climate change scenarios for Malawi in its TNC is that floods, droughts and strong winds will continue to wreak havoc in the country. The country's vulnerability to the vagaries of severe floods, droughts, and strong winds should therefore be taken as a serious cause for worry by the Government of Malawi and the citizenry, and hence the urgent need by the country to implement robust climate change adaptation strategies in order to avert impending disasters associated with these three hazards.

It was proposed that the adaptation actions take on the four building blocks of the NAP process, namely: (i) national development strategies, (ii) capacity development, (iii) knowledge and information management, and (iv) sustainable partnerships. The socio-economic sectors are based on the NAP and the TNC and include:

- Agriculture, fisheries and livestock;
- Ecosystems (including forestry), biodiversity, tourism, culture and wildlife;
- Energy;
- Human health;
- Infrastructures, buildings and energy; and
- Social protection and gender

The sectoral vulnerability assessment is largely based on the TNC. The language used in that from the IPCC AR5 Climate Change 2014: Impacts, Adaptation, and Vulnerability Part B: Regional Aspects. 3: Africa (see Figure 6-1). This refers to climatic drivers, key risks and adaptation issues and prospects or adaptation actions disaggregated in measures, for the specific Malawian case. Key risks are identified based on detailed assessment of the literature including an evaluation based on the assessment of impacts, adaptation, and vulnerability in the Working Group II contribution to the IPCC's Fifth Assessment Report (WGII AR5).

Figure 6-1 Key risks from climate change and the potential for risk reduction through mitigation and adaptation in Africa.

Climate-related drivers of impacts								Level of risk & potential for adaptation	
Key risk	Adaptation issues & prospects			Climatic drivers	Timeframe	Risk & potential for adaptation			
Shifts in biome distribution, and severe impacts on wildlife due to diseases and species extinction (<i>high confidence</i>) [22.3.2.1, 22.3.2.3]	Very few adaptation options; migration corridors; protected areas; better management of natural resources				Present Near term (2030–2040) Long term 2°C (2080–2100) 4°C	Very low Medium Very high			
Compounded stress on water resources facing significant strain from overexploitation and degradation at present and increased demand in the future, with drought stress exacerbated in drought-prone regions of Africa (<i>high confidence</i>) [22.3-4]	<ul style="list-style-type: none"> Reducing non-climate stressors on water resources Strengthening institutional capacities for demand management, groundwater assessment, integrated water-wastewater planning, and integrated land and water governance Sustainable urban development 				Present Near term (2030–2040) Long term 2°C (2080–2100) 4°C	Very low Medium Very high			
Degradation of coral reefs results in loss of protective ecosystems and fishery stocks (<i>medium confidence</i>). [22.3.2.3]	Few adaptation options; marine protected areas; conservation and protection; better management of natural resources				Present Near term (2030–2040) Long term 2°C (2080–2100) 4°C	Very low Medium Very high			
Reduced crop productivity associated with heat and drought stress, with strong adverse effects on regional, national, and household livelihood and food security, also given increased pest and disease damage and flood impacts on food system infrastructure (<i>high confidence</i>) [22.3-4]	<ul style="list-style-type: none"> Technological adaptation responses (e.g., stress-tolerant crop varieties, irrigation, enhanced observation systems) Enhancing smallholder access to credit and other critical production resources; Diversifying livelihoods Strengthening institutions at local, national, and regional levels to support agriculture (including early warning systems) and gender-oriented policy Agronomic adaptation responses (e.g., agroforestry, conservation agriculture) 				Present Near term (2030–2040) Long term 2°C (2080–2100) 4°C	Very low Medium Very high			
Adverse effects on livestock linked to temperature rise and precipitation changes that lead to increased heat and water stress, and shifts in the range of pests and diseases, with adverse impacts on pastoral livelihoods and rural poverty (<i>medium confidence</i>) [22.3.4.2, 22.4.5.2, 22.4.5.6, 22.4.5.8]	Addressing non-climate stressors facing pastoralists, including policy and governance features that perpetuate their marginalization, is critical for reducing vulnerability. Natural resource-based strategies such as reducing drought risk to pastoral livelihoods through use of forest goods and services hold potential, provided sufficient attention is paid to forest conservation and sustainable management.				Present Near term (2030–2040) Long term 2°C (2080–2100) 4°C	Very low Medium Very high			
Changes in the incidence and geographic range of vector- and water-borne diseases due to changes in the mean and variability of temperature and precipitation, particularly along the edges of their distribution (<i>medium confidence</i>) [22.3]	<ul style="list-style-type: none"> Achieving development goals, particularly improved access to safe water and improved sanitation, and enhancement of public health functions such as surveillance Vulnerability mapping and early warning systems Coordination across sectors Sustainable urban development 				Present Near term (2030–2040) Long term 2°C (2080–2100) 4°C	Very low Medium Very high			
Undernutrition, with its potential for life-long impacts on health and development and its associated increase in vulnerability to malaria and diarrheal diseases, can result from changing crop yields, migration due to weather and climate extremes, and other factors (<i>medium confidence</i>). [22.3.5.2]	Early warning systems and vulnerability mapping (for targeted interventions); diet diversification; coordination with food and Agriculture sectors; improved public health functions to address underlying diseases				Present Near term (2030–2040) Long term 2°C (2080–2100) 4°C	Very low Medium Very high			
Increased migration leading to human suffering, human rights violations, political instability and conflict (<i>medium confidence</i>) [22.3.6, 22.4.5, 22.5.1.3]	Adaptation deficit to current flood and drought risk; effective adaptation includes sustainable land management and modification of land use, drought relief, flood control and effective regional and national policy and legislative environment that allows for flexible adaptation responses.				Present Near term (2030–2040) Long term 2°C (2080–2100) 4°C	Very low Medium Very high			
Sea level rise and extreme weather events disrupt transport systems, production systems, infrastructure, public services (water, education, health, sanitation), especially in informal areas (flooding) (<i>medium confidence</i>) [22.3.7, 22.4.4.4, 22.4.4.6, 22.4.5.6, 22.4.5.7]	Limited options for migration away from flood prone localities. Enhanced urban management and land use control would reduce both vulnerability and exposure to risks; would require policy review, significant capacity development and enforcement. Low-cost soft protective coastal infrastructure options could reduce risk significantly in some areas; while hard infrastructural options are expensive, need technical knowledge and not always environmentally sustainable.				Present Near term (2030–2040) Long term 2°C (2080–2100) 4°C	Very low Medium Very high			

Each key risk is characterized as very low, low, medium, high, or very high. Risk levels are presented for the near-term era of committed climate change (here, for 2030–2040), in which projected levels of global mean temperature increase do not diverge substantially across emissions scenarios. Risk levels are also presented for the longer-term era of climate options (here, for 2080–2100), for global mean temperature increase of 2°C and 4°C above pre-industrial levels. For each time frame, risk levels are estimated for the current state of adaptation and for a hypothetical highly adapted state. As the assessment considers potential impacts on different physical, biological, and human systems, risk levels should not necessarily be used to evaluate relative risk across key risks. Relevant climate variables are indicated by symbols.

The following table summarizes the climate drivers and key risks per sector for Malawi, based on the TNC and the framework presented by the IPCC.

Table 6-1 Climate drivers and key risks per sector in Malawi

Sector	Climate drivers	Key risks	Causes of vulnerability
Ecosystems and biodiversity	Temperature increase Precipitation Lake surface temperature increase	Shifts in biome distribution, and severe impacts on wildlife due to diseases and species extinction	<ul style="list-style-type: none"> – Soil erosion – Declining soil fertility – Loss of vegetation cover – Low technology uptake – Weak coordination among various sectors as forestry, environment, agriculture and water resources' management
Water resources	Temperature increase/ Extreme temperature Precipitation/ Extreme precipitation Lake surface temperature increase	Compounded stress on water resources facing significant strain from overexploitation and degradation at present and increased demand in the future, with drought stress exacerbated in drought-prone regions	<ul style="list-style-type: none"> – The quantity of surface water resources in Malawi, especially in rivers, is highly dependent on the availability of rainfall which sustains runoff – Many river basins in the country are under severe pressures due to deforestation, unsustainable agriculture, settlements, mining, industry, commerce, tourism and climate change – Manually operated system for flood forecasting and flood warning in the country; and it is only the Lower Shire Valley that has such a system in place – The main shortfall with the EWS for droughts is that it mainly focuses on food security rather than being a multisectoral tool where the impact of droughts on water resources, health, energy, DRM, and tourism are considered

Sector	Climate drivers	Key risks	Causes of vulnerability
Agriculture, fisheries and livestock	Temperature increase/ Extreme temperature Precipitation/ Extreme precipitation	Reduced crop productivity associated with heat and drought stress, with strong adverse effects on regional, national, and household livelihood and food security, also given increased pest and disease damage and flood impacts on food system infrastructure Adverse effects on livestock linked to temperature rise and precipitation changes that lead to increased heat and water stress, and shifts in the range of pests and diseases, with adverse impacts on pastoral livelihoods and rural poverty	<ul style="list-style-type: none"> – Exposure to climate extremes – Most smallholder farmers are resource poor; as such, they have very limited capacity to contain shocks arising from climate change, particularly floods, strong winds, and droughts – Limited agro-processing facilities – Over-dependency on rain-fed agriculture and biomass energy – Lack of insurance schemes to compensate farmers and fishers – Inadequate hazard maps – Poor crop diversification – Overfishing – Weed infestation and eutrophication
Infrastructure, buildings and energy	Cyclones and winds	Extreme weather events disrupt transport systems, production systems, infrastructure, public services (water, education, health, sanitation), especially in informal areas (flooding)	<ul style="list-style-type: none"> – Exposure to extreme events and lake level raise with damages and disruptions in the supply chains – Environmental degradation, insufficient capacity, liquidity problems and vandalism, water level fluctuations, silting
Human health and wellbeing	Temperature increase/ Extreme temperature Precipitation/ Extreme precipitation	Changes in the incidence and geographic range of vector- and water-borne diseases due to changes in the mean and variability of temperature and precipitation, particularly along the edges of their distribution Undernutrition, with its potential for life-long impacts on health and development and its associated increase in vulnerability to malaria and diarrheal diseases, can result from changing crop yields, migration due to weather and climate extremes, and other factors Increased migration leading to human suffering, human rights violations, political instability and conflict	<ul style="list-style-type: none"> – Exposure to the vectors that propagate malaria and diarrhoeal diseases – Malnutrition – Exposure to extreme events that may cause injuries and life losses

Source: Authors, based on GoM, 2015a and IPCC analysis

6.3 Methodological approach

The adaptation work stream was undertaken in close alignment with work already done in Malawi to increase the climate resilience of the most vulnerable communities and ecosystems. The adaptation assessment was undertaken according to four steps:

- **Step 1:** Review all relevant documents and sources to develop long-list of adaptation measures
- **Step 2:** Assess and prioritise identified measures
- **Step 3:** Develop adaptation indicators for each measure, and targets to inform updated NDC and
- **Step 4:** Assess funding needs, mitigation co-benefits and contribution towards the UN Sustainable Development Goals (SDGs)

The analysis involved extensive review of all relevant studies, programmes and documents relating to vulnerability, resilience and climate adaptation in Malawi. These included the INDC, the NAP, the Third National Communication, the NAPA, the Technology Needs Assessment (TNA), the National Climate Change Investment Plan (NCCIP) and the National Response Strategy (NRS). In reviewing such documents, the first step of the analysis covered the identification of the adaptation actions and measures that could be included within the revised NDC.

In reviewing these documents, the first step of the analysis covered the identification of the adaptation actions and measures that could now be included within the updated NDC. The literature review led to the identification of more than 300 (three hundred) adaptation measures that were initially computed in an excel file with the identification of the sector, the action, the measure, a brief description, the expected resilience effect, and the source of the information. The measures and actions were grouped according to the following sectors:

- (i) Agriculture
- (ii) Biodiversity, tourism, culture and wildlife
- (iii) Energy
- (iv) Disaster risk reduction (DRR) and early warning systems (EWS)
- (v) Fisheries
- (vi) Forestry
- (vii) Human health
- (viii) Infrastructure
- (ix) Social protection and gender
- (x) Water resources and supply
- (xi) Cross cutting

These were later grouped according to the following thematic areas:

- (i) Effective and efficient EWS;
- (ii) Accessible and harmless water;
- (iii) Blooming biodiversity, ecosystems and eco-tourism;
- (iv) Smart agriculture, livestock and fisheries;
- (v) Climate-proofed infrastructures, buildings and energy systems; and
- (vi) Healthy and protected people

The indication of the conditionality of the measure (according to the level of unconditional or conditional support) was also included where such information was available.

After sharing the long-list with the members of the Malawi Adaptation Expert Working Group (EWG), a series of workshops was undertaken in order to undertake prioritization of the interventions based on a use of multi-criteria analysis. These included representatives covering the various sectors, including environment affairs, irrigation, agriculture, economic planning and development and civil society. Based on the outcomes of the workshops, it was decided to cluster and prioritize the measures and then to share this with the EWG and other sector experts, and to engage on one-on-one consultations to validate the short list, and where possible obtain information on indicators, targets and cost estimates.

6.4 Resilience and assessment of adaptation responses

Table 6-2 shows the main adaptation actions by objective and pillar of the adaptation stream of the NDC. The ten strategic options are related to the three pillars – (i) institutional framework, (ii) knowledge, technology and financing and (iii) resilience of the most vulnerable, which support three main objectives – (i) promote an enabling environment to facilitate climate change adaptation (CCA) mainstreaming, (ii) improve capacity for data and information management and sharing, and access to technology and financing for adaptation, and (iii) plan and implement adaptation actions toward an increased resilience of the most vulnerable Malawians.

Table 6-2 Strategic adaptation actions

Objective	Pillar	Strategic Adaptation Actions	Adaptation actions
Promote enabling environment to facilitate CCA mainstreaming	Institutional framework	1. Establishment of the institutional arrangements for the multi-sector coordination of climate change actions, including the definition of its composition and mandate	NAP's mandate
		2. Testing and institutionalization of mechanisms to integrate CCA into the next "National Development Plan" or equivalent and sectoral planning instruments, including the annual sectoral budgets and guidelines	NAP's implementation Definition of guidelines to integrate CCA into sectoral planning and budgeting
Improve the capacity for data and information management and sharing, and access to technology and financing for adaptation	Knowledge, technology and financing	3. Development and implementation of a research programme on climate change impacts and CCA actions	Research programme on climate resilient technologies, including industry and drought tolerant and fast-growing vegetal species
		4. Implementation of a capacity-building plan and integration of CCA into curricula	CB at national and district levels to use the guidelines CB on EWS and data downscaling CB on Wash interventions CB on wildlife and tourism management CB on aquaculture and cage farming CB on diagnose, prevention and control of climate-sensitive diseases and malnutrition Integration of forestry, livelihoods and environmental management in curricula
		5. Implementation of the communication plan	Public campaigns on water conservation measures Campaigns on hygiene and sanitation
		6. Operationalization of an overarching M&E framework covering the NDC and potentially the NAP, SDGs and Sendai Framework	Elaboration of recommendations for climate M&E in the scope of the NDC
		7. Elaboration and implementation of a resource mobilization plan	Preliminary estimates of costing of the actions and measures included in the NDC

Objective	Pillar	Strategic Adaptation Actions	Adaptation actions
Plan and implement adaptation actions toward an increased resilience of the most vulnerable Malawians	Resilience of the most vulnerable	8. Elaboration of NAPs for priority sectors	Elaboration of NAPs for agriculture, biodiversity and ecosystems, fisheries, health, infrastructures and housing, tourism and water resources
		9. Development of CCA planning tools tested in particularly vulnerable communities, demonstrating an integrating CCA approach in various sector	Development of simplified methodologies as a basis to assess risks and identify community-based adaptation options and measures to include in local CCA plans and budgets Design of local EWS
		10. Elaboration of a portfolio of CCA priority actions for the key sectors aligned with sectoral planning and budgeting, using nature-based solutions and ecosystems-based adaptation	Effective and efficient EWS Accessible and harmless water Blooming biodiversity and ecosystems and eco-tourism Smart agriculture, livestock and fisheries Climate-proofed infrastructures, buildings, and energy systems Healthy and protected people

The adaptation actions for each sector are presented below, desegregated according to their constituting measures.

6.4.1 Effective and efficient EWS

An effective and efficient EWS from Malawi can encompass:

1. Establishing community based early warning systems and flood water monitoring systems nationwide and prioritized in problematic rivers
2. Designing, testing and executing multi-hazard contingency plans and
3. Integrating DRM risk assessment and monitoring in all sectors and programmes, including Risk reduction/early warning systems in public works, transport infrastructure.

6.4.2 Accessible and harmless water

To climate-proof the water sector, action is needed in:

1. Drought management
 - a. Scaling up water supply to drought prone areas water point rehabilitation; rainwater catchment; water harvesting and storage technologies
 - b. Construction of multipurpose dams to retain surface runoff during the rainy season, as nearly 24% of annual rainfall is lost as surface run-off and
 - c. Integration of Indigenous Knowledge (IKS) into scientific early warning for drought
2. Flood management
 - a. Improvement of the assessment and planning and systems and construction of dikes and upstream storage dams, storm drains or bunds to re-direct or divert flows to minimize flood damages
 - b. Delineation of flood prone areas with flood zoning maps and the development of appropriate adaptation strategies and measures
 - c. Extension of the installation of telemetry flood forecasting and warning systems to other flood prone areas for timely evacuation of people and
 - d. Integration of IKS into scientific early warning for floods
3. Integrated watershed management:
 - a. Development and strengthening of water policies, integrated land use management policies, plans and approaches in priority watersheds and reservoirs
 - b. Increase of afforestation and reforestation in catchment areas to cover areas not yet considered, and address deforestation and degradation
 - c. Increase of sustainable utilization and monitoring of groundwater resources
 - d. Monitoring of leakage and control in piped networks to avoid water loss
 - e. Water use efficiency
 - f. Improvement in the coverage of rural piped water supply and

- g. Development of nationwide water quality monitoring framework systems.

6.4.3 Blooming biodiversity and ecosystems and eco-tourism

The actions to promote the conservation and flourish biodiversity and ecosystems in a resilient way include:

1. Conservation of biodiversity:
 - a. Promotion of cooperation with regional and international institutions in the conservation and management of wildlife resources
 - b. Provision of watering points at strategic locations of national park/ game reserve and
 - c. Upscaling of measures for controlling the extinction of plant and animal species and degeneration of ecosystems/habitats. Develop and implement invasive alien species management plan and
 - d. Management of elephant population and implementation of diseases' control programmes
2. Promotion of resilient eco-tourism
 - a. Development and implementation of tourism support infrastructure plan
 - b. Development of a tourism crisis management strategy and plan, including emergency situations
 - c. Improvement of tourist facility/buildings designs and standards to integrate climate resilience considerations including the concept of Build Back Better (BBB) and Smarter
 - d. Membership of the Climate Change Crisis Committee and enhancement of tourism facility designs, planning and compliance to environmental and climate resilient regulations standards and
 - e. Mainstreaming climate change adaptation in the tourism investment plans.

6.4.4 Smart agriculture, livestock and fisheries

For increasing the resilience of the sector, the following are proposed, organized by action and measure:

1. Institute and upscale drought mitigation interventions; Establishing locally based plant clinics
2. Establish risk financing and investment including weather index insurance and other solutions at the national and sub national levels inclusive of microfinance and insurance products for smallholder and commercial farmers; Establishment and execution of customized risk and financing solutions for the agriculture sector.
3. Mechanize agricultural production with targeted support to smallholder farmer; Agriculture & mechanisation
4. Establish grain export processing zone; Resilient value chains' and market's development, Value addition and exports

5. Promotion of metallic silos & PICSAs bags for effective grain storage; Upscale post-harvest management linking to disaster risk management
6. Post-harvest management; Promoting proper post-harvest practices to further reduce storage losses
7. Promote farm-based disaster risk reduction and management practices; Crop and diet diversification: through the cultivation of roots and tubers (cassava, sweet potatoes) and other drought tolerant crop cultivars and Winter cropping systems using small-scale irrigation technologies, such as treadle pumps, drip irrigation and stream diversion
8. Manage migratory pests; Surveillance (Integrated Pest Management)
9. Promote legumes and other multiple impact crops Promoting legumes and other multiple impact crops for soil fertility improvement and dietary improvement
10. Farmer managed natural regeneration; Promoting drought-resilient water, soil and catchment conservation
11. Promoting various drought-resilient water, soil and catchment conservation interventions on and off-farm (Resilient Soils); Promoting drought-resilient water, soil and water and catchment conservation
12. Build adaptation capacity in climate resilient agronomic practices for smallholder farmers; Training households in food budgeting, utilisation & preservation
13. Build adaptation capacity in climate resilient agronomic practices for smallholder farmers; Promotion of good agronomic practices
14. Institute and upscale drought mitigation interventions; Developing new irrigation schemes (using drip irrigation kits) & rehabilitating/modernising old schemes
15. Climate Smart Agriculture; Reforestation and Water supply
16. Crop/livestock and fish farming intensification & diversification; Integrated crop-livestock-aquaculture-forest production systems; Animal health year-round for improved food security and nutrition Animal health year-round for improved food security and nutrition
17. Establishing community and multiplication seed banks; Improved community participation in seed selection, storage and management
18. Improved MVAC through linking to Integrated Phase Classification; continue annual assessment of the status of food and nutrition insecurity and biannual SMART Nutrition survey to measure nutrition security situation; Improved MVAC through linking to Integrated Phase Classification; continue annual assessment of the status of food and nutrition insecurity and biannual SMART Nutrition survey to measure nutrition security situation
19. Institute and upscale drought mitigation interventions; Irrigation: Expanded programmes of Greenbelt initiative from 4000 ha to 10000 ha
20. Institute and upscale drought mitigation interventions
 - a. Promoting in-situ & ex-situ rainwater harvesting
 - b. Promoting livestock water points & fodder banks

- c. Scaling up water supply to drought prone areas, water point rehabilitation; rainwater catchment; water harvesting and storage technologies
 - d. Promotion of irrigated agriculture and distributing irrigation equipment
 - e. Support an expanded programme of constructing multipurpose dams for irrigation and aquaculture
21. Resilient diet for smallholder farmers Promoting good animal welfare, health & disease control e.g., standard livestock structures
 22. Resilient value chains and market's development, Value addition and exports:
 - a. Strengthening farmer organizations and market engagement
 - b. ADMARC reforms and reduced market uncertainty and price volatility
 23. "Restocking strategic grain reserves "; Upscale post-harvest management linking to disaster risk management
 24. Up-scaling feed preservation & fodder banks; Resilient diet for smallholder farmers
 25. Value addition & agro-processing; Resilient diet for smallholder farmers
 26. Value chain upgrading, and physical infrastructure improvements; Resilient value chains' and market's development, Value addition and exports
 27. Develop financial mechanisms to support crop insurance targeting smallholder farmers; Provision of agricultural input subsidies & incentives
 28. Drought mitigation "Promoting drought tolerant or early maturing planting material"
 29. Drought mitigation; Constructing water reservoirs & efficient use of water
 30. Flood management; "Restocking strategic grain reserves "
 31. Resilient soil:
 - a. Soil and water conservation and
 - b. Soil fertility improvement.

6.4.5 Climate-proofed infrastructure, buildings and energy systems

To decrease the climate vulnerability of infrastructures, buildings and energy systems Malawi can promote:

1. Resilience of infrastructures to heat and drought:
 - a. Advocate installation of solar shading devices. Harness solar technology for heating and lighting solutions in construction: solar shading devices
 - b. Locating appliances which generate waste heat outside the insulated envelope
 - c. Harness solar technology for heating and lighting solutions in construction: Solar shading devices. Minimizing hard landscaping materials which absorb heat during the day and re-radiate it at night
 - d. Application of ventilation and cooling strategies and
 - e. Application of drought management in the design, construction and management of public and private infrastructure. Increasing the size and number of engineering structures, e.g., culver
2. Resilience of infrastructure to floods

- a. Applying safety and build better and smarter principles including granular protection, beam and base under pinning factor to design assumptions
- b. Revision of existing building standards to incorporate climate change considerations. Integrate flood risk management in the design and construction of public and private infrastructure: Passive cooling measures, Mini-piled underpinning, including pile and beam, cantilever pile caps and piled rafts; Raising roads, road re-alignment, pavements and adding additional drainage capacity; Realigning natural water courses etc.
- c. Conducting slope stability studies in an attempt to minimize incidents of landslides as a result of increased precipitation and
- d. Construction of offshore breakwaters, groins to protect shorelines from coastal erosion.

6.4.6 Healthy and protected people

To promote public health and social protection in the face of climate change, the proposed adaptation actions and measures include:

1. Resilient health
 - a. Boiling drinking water, filtration and chlorination of drinking water and improvement in personal hygiene. Enhance public awareness about water, sanitation and hygiene practices; and enhance health surveillance of Malaria, Diarrhoea and Malnutrition.
 - b. Promotion of insecticide-treated mosquito nets and
 - c. Oral rehydration salts, homemade sugar and salt solution, and cereal based solutions, such as rice water. intravenous fluids, antibiotic treatment, and isolation wards in case of diarrhoeal disease outbreaks
2. Scaling up resilient nutrition
 - a. Increased adoption of improved nutrition-specific and nutrition-sensitive practices. Nutrition assessment, counselling, and support services linked to livelihoods targeting adolescents, adults, and children
 - b. Increased adoption of improved nutrition-specific and nutrition-sensitive practices. Promote dietary diversity and integrate nutrition-sensitive practices across sectors, primarily agriculture, health, education, WASH and
 - c. Increased adoption of improved nutrition-specific and nutrition-sensitive practices. Promote nutrition-specific practices through SUN framework and Care group model, primary health care, therapeutic care, support, and treatment
3. Social support
 - a. Increasing and strengthening the delivery of Micro finance, Public Works Programmes, school meals Programmes, Social cash transfer and Village and Savings and Loans (VSL) schemes

- b. Development of long-term workforce development plan and strategic livelihoods plans to help people move up and out into sound employment opportunities, and plan for managed urban migration
- c. Establishment of Social Support Fund for predictable, timely response (Climatic shock related Social Protection services)
- d. Promotion of gender mainstreaming in policies, programmes and projects
- e. Support capacity building programmes for vulnerable groups and civic education and public awareness and
- f. Linkage of inclusive social support systems to risk financing options with the development and utilization of coordinated system for design and delivery of social support system inclusive of climate related shock sensitive interventions.

6.5 Targets and indicators for resilience

A framework of proposed indicators was compiled using various sources of information available from national reports on climate change adaptation, as well as internationally from nations with similar experience and approaches to resilience enhancement. Analysis undertaken by GIZ was the main source used in this process, since this had already consolidated a set of indicators based on practical experiences in Africa, Asia and Europe (Hammill, et al., 2014).

6.6 Implementation plan

The following tables present a summary of Malawi's NDC Implementation Plan for each of the adaptation measures. As with mitigation, the measures are grouped by sector and summarised according to key aspects of implementation planning, including the responsible government ministries and implementing entities¹¹, the planned timeline, and the estimated funding requirements through 2040¹². Mitigation and low carbon development co-benefits are also shown, as well as key linkages with achieving the UN Sustainable Development Goals.

¹¹ Note that due to space restrictions, acronyms are used throughout; please therefore refer to the list of acronyms and abbreviations included at the front of this report as required.

¹² Where relevant, estimated unconditional and conditional components are denoted in the tables by "uc" and "c".

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
						2020- 2025	2025- 2030	2030- 2040
CLIMATE SERVICES								
EARLY WARNING SYSTEMS AND HAZARD MONITORING								
Nationwide community-based EWS and flood monitoring, prioritized in problematic rivers	Ministry of Forestry and Natural Resources (Department of Water Resources)	DODMA, DCCMS	US\$ 250 million uc: US\$ 70m c: US\$ 180m	Protection of assets that promote low carbon development and mitigation		✓		
Designing, testing, and executing multi-hazard contingency plans	Ministry of Homeland Security Department of Disaster Management Affairs	DCCMS, Department of Water Resources	US\$ 175 million uc: US\$ 75m c: US\$ 100m	Protection of assets that promote low carbon development and mitigation		✓	✓	✓
Integrating DRM risk assessment and monitoring in all sectors, including public works and transport infrastructure	Ministry of Homeland Security Disaster Management Affairs	MOEPD&PSR	US\$ 75 million uc: US\$ 55m c: US\$ 20m	Protection of assets that promote low carbon development and mitigation		✓		

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
						2020- 2025	2025- 2030	2030- 2040
WATER								
DROUGHT MANAGEMENT								

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Water supply, storage, harvesting in drought-prone areas, including water point rehabilitation	Ministry of Forestry and Natural Resources (Department of Water Supply)	Irrigation Department Regional Water Boards Water User Associations	US\$ 108 million uc: US\$ 54m c: US\$ 54m	Savings in energy used to alleviate water shortages		✓	✓	✓
Construction of multipurpose dams for water storage	Ministry of Forestry and Natural Resources (Department of Water Resources)	Department of Water Supply, Department of Fisheries	US\$ 215 million uc: US\$ 125m c: US\$ 90m	Savings in energy used to alleviate water shortages Production of hydroelectricity		✓	✓	✓
Integration of indigenous knowledge into early warning systems for drought	Department of Water Resources and Department of Climate Change and Meteorological Services	Public universities	US\$ 536 million uc: US\$ 25m c: US\$ 11m	Savings in energy used to alleviate water shortages		✓		
FLOOD MANAGEMENT								
Planning, construction, and improvement of flood management structures such as upstream dams, storm drains, dikes, and bunds	Ministry of Forestry and Natural Resources (Department of Water Resources)	DODMA	US\$179 million uc: US\$ 28m c: US\$ 151m	Savings in energy used to alleviate floods Protection of assets that promote low carbon development and mitigation		✓	✓	✓

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Delineation of flood prone areas with flood zoning maps and the development of appropriate adaptation strategies and measures	Ministry of Forestry and Natural Resources (Department of Water Resources)	Ministry of Lands, Department of Disaster Management Affairs (DODMA)	US\$ 90 million 100% conditional	Savings in energy used to alleviate floods Protection of assets that promote low carbon development and mitigation		✓	✓	✓
Extension of the installation of telemetry flood forecasting and warning systems to other flood prone areas	Ministry of Forestry and Natural Resources (Department of Water Resources)	Department of Disaster Management Affairs (DODMA)	US\$ 54 million 100% conditional	Savings in energy used to alleviate floods Protection of assets that promote low carbon development and mitigation		✓	✓	✓
Integration of indigenous knowledge into early warning systems for floods	Department of Water Resources and Department of Climate Change and Meteorological Services	Department of Disaster Management Affairs (DODMA)	US\$ 36 million 100% unconditional	Savings in energy used to alleviate floods Protection of assets that promote low carbon development and mitigation		✓		
INTEGRATED WATERSHED MANAGEMENT								
Development and strengthening of water policies, integrated land use management policies, plans and approaches in priority watersheds and reservoirs	Ministry of Forestry and Natural Resources (Department of Water Resources)	Water Boards and Water Users Associations	US\$ 29 million uc: US\$ 4m c: US\$ 25m	Money savings in energy costs may be used to alleviate floods and droughts Protection of assets that promote low carbon development and mitigation		✓		

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Increase of afforestation and reforestation in catchment areas to cover areas not yet considered, and address deforestation and degradation	Ministry of Forestry and Natural Resources (Department of Forestry)	Department of Water Resources, NGOs	Cost covered under Mitigation	Savings in energy used to alleviate floods Protection of assets that promote low carbon development and mitigation Carbon sequestration		✓	✓	✓
Increase of sustainable utilization and monitoring of groundwater resources	Ministry of Forestry and Natural Resources (Department of Water Resources)	Water Users Associations	US\$ 29 million uc: US\$ 9m c: US\$ 20m	Money savings in energy costs may be used to alleviate floods and droughts		✓	✓	✓
Monitoring of leakage and control in piped networks	Waterboards	Department of Water Supply Water Users Associations	US\$ 29 million 100% unconditional	Money savings in energy costs may be used to alleviate floods and droughts		✓	✓	✓
Water use efficiency	Waterboards	Department of Water Supply Water Users Associations	US\$ 29 million 100% unconditional	Money savings in energy costs may be used to alleviate floods and droughts and water treatment		✓	✓	✓
Improvement in the coverage of rural piped water supply	Ministry of Forestry and Natural Resources (Department of Water Supply)	Waterboards Water Users Associations	US\$ 144 million uc: US\$ 89m c: US\$ 55m	Savings in energy used to water needs		✓	✓	✓

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Development of nationwide water quality monitoring framework systems	Ministry of Forestry and Natural Resources (Department of Water Supply)	Malawi Bureau of Standards	US\$ 29 million uc: US\$ 4m c: US\$ 25m	Savings in energy used to water needs	   	✓	✓	✓

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
						2020-2025	2025-2030	2030-2040
BIODIVERSITY AND ECOSYSTEMS								
CONSERVATION OF BIODIVERSITY								

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Promotion of cooperation with regional and international institutions in the conservation and management of wildlife resources	Department of Wildlife and Parks	Private Sector (e.g., African Parks)	US\$ 41 million uc: US\$ 26m c: US\$ 15m	Carbon sequestration and other ecosystem services, saving energy use		✓	✓	✓
Provision of watering points at strategic locations of national park/ game reserves	Department of Wildlife and Parks	Private Sector (e.g., African Parks)	US\$ 68 million uc: US\$ 38m c: US\$ 30m	Carbon sequestration and other ecosystem services, saving energy use		✓	✓	✓
Upscaling of measures for controlling the extinction of plant and animal species and degeneration of ecosystems/habitats, including the development and implementation of invasive alien species management plans	Department of Wildlife and Parks	Forest Research Institute of Malawi	US\$ 82 million uc: US\$ 32m c: US\$ 50m	Carbon sequestration and other ecosystem services, saving energy use		✓	✓	✓
Management of elephant population and implementation of diseases' control programmes	Department of Wildlife and Parks	Private Sector (e.g., African Parks)	US\$ 82 million uc: US\$ 32m c: US\$ 50m	Carbon sequestration and other ecosystem services, saving energy use		✓	✓	✓
RESILIENT ECOTOURISM								

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Development and implementation of tourism support infrastructure plan	Ministry of Tourism, Wildlife and Culture, and Ministry of Forestry	Private Sector (e.g., African Parks and Wildlife and Environmental Society of Malawi (WESM))	US\$ 14million uc: US\$ 7m c: US\$ 7m	Carbon sequestration and other ecosystem services, saving energy use More resources available to mitigation		✓	✓	✓
Development of a tourism crisis management strategy and plan, including emergency situations	Ministry of Tourism, Wildlife and Culture, and Ministry of Forestry	Private Sector (e.g., African Parks and Wildlife and Environmental Society of Malawi (WESM))	US\$ 18 million uc: US\$ 9m c: US\$ 9m	Carbon sequestration and other ecosystem services, saving energy use More resources available to mitigation		✓	✓	✓
Improvement of tourist facility/buildings designs and standards to integrate climate resilience considerations including the concept of Build Back Better (BBB) and Smarter	Ministry of Tourism, Wildlife and Culture, and Ministry of Forestry	Private Sector (e.g., African Parks and Wildlife and Environmental Society of Malawi (WESM))	US\$ 36 million uc: US\$ 18m c: US\$ 18m	Carbon sequestration and other ecosystem services, saving energy use in lightning and climatization More resources available to mitigation		✓	✓	✓
Membership of the Climate Change Crisis Committee and enhancement of tourism facility designs, planning and compliance to environmental and climate resilient regulations standards	Department of Tourism	Ministry of Transport and Public Works	US\$ 36 million uc: US\$ 18m c: US\$ 18m	Carbon sequestration and other ecosystem services, saving energy use in lightning and climatization More resources available to mitigation		✓		

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE						
Mainstreaming climate change adaptation in tourism investment plans	Department of Tourism	Private Sector (e.g., African Parks and Wildlife and Environmental Society of Malawi (WESM))	US\$ 16 million uc: US\$ 8m c: US\$ 8m	Carbon sequestration and other ecosystem services, saving energy use in lightning and climatization Energy efficiency		<table border="1"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>✓</td> <td>✓</td> <td>✓</td> </tr> </table>				✓	✓	✓
✓	✓	✓										

MEASURES	LINE MINISTRY	OTHER KEY	ESTIMATED	MITIGATION BENEFITS	ALIGNMENT	TIMELINE
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	(FOCAL POINT)	ACTORS	FUNDING		WITH SDGs	2020-2025	2025-2030	2030-2040
AGRICULTURE, LIVESTOCK AND FISHERIES								
AGRICULTURE, LIVESTOCK AND FISHERIES								
Institute and upscale drought mitigation interventions	Department of Irrigation	Environmental Affairs Department	US\$ 55 million uc: US\$ 20m c: US\$ 35m	Save energy in drought response		✓	✓	✓
Establish locally based plant clinics	Department of Agricultural Research and Services (DARS)	Private Sector (e.g., National Smallholder Association of Malawi)	US\$ 11 million uc: US\$ 11m	Carbon sequestration and other ecosystem services		✓	✓	✓
Establish risk financing and investment including weather index insurance and other solutions at the national and sub national levels inclusive of microfinance and insurance products for smallholder and commercial farmers	Ministry of Agriculture and Food Security	NGOs	US\$ 77 million uc: US\$ 37m c: US\$ 40m	Carbon sequestration and other ecosystem services		✓	✓	✓
Mechanize agricultural production with targeted support to smallholder farmer	Department of Agricultural Extension Services	NGOs	US\$ 110 million uc: US\$ 50m c: US\$ 60m	Use of renewable energy sources and promote energy efficiency		✓	✓	✓

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Establish grain export processing zones, and develop resilient value chains	Ministry of Agriculture and Food Security	Private Sector (e.g., National Smallholder Association of Malawi)	US\$ 33 million uc: US\$ 18m c: US\$ 15m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Promotion of metallic silos & PICSA bags for effective grain storage	Department of Agricultural Extension Services	Private Sector (e.g., National Smallholder Association of Malawi)	US\$ 11 million uc: US\$ 11m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Promotion of proper post-harvest practices to further reduce storage losses	Department of Agricultural Extension Services	Private sector and NGOs	US\$ 11 million uc: US\$ 11m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Crop and diet diversification through the cultivation of roots and tubers (cassava, sweet potatoes) and other drought tolerant crop cultivars and winter cropping systems using small-scale irrigation technologies, such as treadle pumps, drip irrigation and stream diversion	Department of Agricultural Extension Services	Private sector and NGOs	US\$ 22 million uc: US\$ 10m c: US\$ 12m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Integrated Pest Management for migratory pests	Department of Agricultural Extension Services	Private sector and NGOs	US\$ 11 million uc: US\$ 11m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Promotion of legumes and other multiple impact crops for soil fertility improvement and dietary improvement	Department of Agricultural Extension Services	Private sector and NGOs	US\$ 55 million uc: US\$ 25m c: US\$ 30m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Promotion of drought-resilient water, soil and catchment conservation through farmer-managed natural regeneration	Department of Land Resources and Conservation	Private sector and NGOs	US\$ 66 million uc: US\$ 36m c: US\$ 30m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Improved livestock husbandry	Department of Animal Health and Livestock Development	NGOs	See mitigation table	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Promotion of various drought-resilient water, soil and catchment conservation interventions on and off-farm	Department of Land Resources and Conservation	NGOs	US\$ 33 million uc: US\$ 13m c: US\$ 20m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Instituting and upscaling drought mitigation interventions such as the development of new irrigation schemes (using drip irrigation kits) and rehabilitating/modernising old schemes	Ministry of Agriculture (Irrigation Department)	NGOs	US\$ 33 million uc: US\$ 13m c: US\$ 20m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓

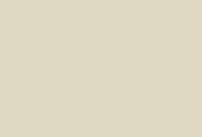
MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Introduction, expansion, and scale-up of Climate Smart Agriculture practices	Department of Agricultural Extension Services	NGOs	US\$ 44 million uc: US\$ 24m c: US\$ 20m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Crop/livestock and fish farming intensification & diversification, through integrated crop-livestock-aquaculture-forest production systems	Department of Animal Health and Livestock Development	Lilongwe University of Agriculture and Natural Resources (LUANAR)	US\$ 55 million uc: US\$ 25m c: US\$ 30m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Improving community participation in seed selection, storage and management, and the establishment of community and multiplication seed banks	Department of Agricultural Extension Services	Private Sector (e.g., National Smallholder Association of Malawi)	US\$ 11 million uc: US\$ 11m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Conducting annual assessment of the status of food and nutrition insecurity and biannual SMART Nutrition survey to measure nutrition security situation	Department of Nutrition, HIV and AIDS	Lilongwe University of Agriculture and Natural Resources (LUANAR)	US\$ 11 million uc: US\$ 11m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		 	✓	✓

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Expand Greenbelt initiative	Ministry of Agriculture (Irrigation Department)	Greenbelt Initiative	US\$ 55 million uc: US\$ 25m c: US\$ 30m	Carbon sequestration and other ecosystem services Use of renewable energy sources		✓	✓	✓
Promotion of good animal welfare, health & disease control	Department of Animal Health and Livestock Development	Lilongwe University of Agriculture and Natural Resources (LUANAR)	US\$ 11 million uc: US\$ 11m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Strengthening of farmer organizations and market engagement	Department of Agricultural Extension Services	National Smallholder Association of Malawi	US\$ 44 million uc: US\$ 24m c: US\$ 20m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Undertaking ADMARC reforms to reduce market uncertainty and price volatility	Agriculture Development and Marketing Corporation (ADMARC)	Ministry of Economic Planning and Public sector Reform	US\$ 11 million uc: US\$ 11m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Promotion of efficient fertiliser use and manure management	Department of Agricultural Extension Services	NGOs	US\$ 11 million uc: US\$ 11m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Restocking strategic grain reserves	National Food Reserve Agency	ADMARC	US\$ 55 million uc: US\$ 35m c: US\$ 20m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Up-scaling feed preservation & fodder banks	Department of Agricultural Extension Services and Department of Animal Health and Livestock Development	NGOs	US\$ 22 million uc: US\$ 10m c: US\$ 12m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Improving agricultural value-addition through agro-processing	Department of Agricultural Extension Services	National Smallholder Association of Malawi	US\$ 22 million uc: US\$ 7m c: US\$ 15m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Improving infrastructure in agricultural value chains	Department of Agricultural Extension Services	National Smallholder Association of Malawi	US\$ 55 million uc: US\$ 35m c: US\$ 20m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Provision of agricultural input subsidies & incentives	Department of Agricultural Extension Services	NGOs	US\$ 22 million uc: US\$ 17m c: US\$ 5m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Promotion of drought tolerant or early maturing planting material	Department of Agricultural Extension Services	NGOs	US\$ 22 million uc: US\$ 12m c: US\$ 10m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Constructing water reservoirs & efficient use of water	Department of Water Resources	NGOs	US\$ 44 million uc: US\$ 18m c: US\$ 26m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Soil management techniques to improve soil fertility and soil conservation	Department of Land Resources and Conservation	NGOs	US\$ 22 million uc: US\$ 12m c: US\$ 10m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
						2020-2025	2025-2030	2030-2040

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
INFRASTRUCTURE								
HEAT AND DROUGHT-PROOFING								
Installation of solar shading devices	Department of Housing	Department of Energy Affairs	Cost unknown	Use of renewable energy sources and promote energy efficiency		✓	✓	✓
Location of appliances that generate waste heat outside the insulated envelope	Department of Housing	Department of Energy Affairs	Cost covered under Mitigation interventions	Use of renewable energy sources and promote energy efficiency		✓	✓	✓
Minimizing hard landscaping materials which absorb heat during the day and re-radiate it at night	Department of Housing	Department of Energy Affairs	US\$ 39 million uc: US\$ 24m c: US\$ 15m	Use of renewable energy sources and promote energy efficiency		✓	✓	✓
Application of ventilation and cooling strategies	Ministry of Transport and Public Works (Buildings Department)	Department of Energy Affairs	US\$ 39 million uc: US\$ 31m c: US\$ 8m	Use of renewable energy sources and promote energy efficiency		✓	✓	✓

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Application of drought management in the design, construction and management of public and private infrastructure, such as by increasing the size and number of water engineering structures (e.g. culverts)	Ministry of Transport and Public Works (Buildings Department)	Department of Water Resources	US\$ 79million uc: US\$ 12m c: US\$ 67m	Use of renewable energy sources and promote energy efficiency		✓	✓	✓
FLOOD-PROOFING								
Applying safety and build better and smarter principles including granular protection, beam and base under pinning factor to design assumptions	Ministry of Transport and Public Works (Buildings Department)	Department of Disaster Management Affairs (DODMA)	US\$ 136 million uc: US\$ 36m c: US\$ 100m	Use of renewable energy sources and promote energy efficiency		✓	✓	✓
Revision of existing building standards to incorporate climate change considerations, such as passive cooling measures, mini-piled underpinning, including pile and beam, cantilever pile caps and piled rafts; raising roads, road re-alignment, pavements and adding drainage capacity; and realigning natural water courses	Ministry of Transport and Public Works (Buildings Department)	Department of Disaster Management Affairs (DODMA)	US\$ 102 million uc: US\$ 12m c: US\$ 90m	Use of renewable energy sources and promote energy efficiency		✓	✓	✓
Conducting slope stability studies to reduce incidents of landslides	Ministry of Transport and Public Works (Buildings Department)	Department of Disaster Management Affairs (DODMA)	US\$ 51 million uc: US\$ 21m c: US\$ 30m	Carbon sequestration and other ecosystem services		✓		

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Construction of offshore breakwaters, groins to protect shorelines	Ministry of Transport and Public Works (Buildings Department)	Department of Disaster Management Affairs (DODMA)	US\$ 51 million uc: US\$ 21m c: US\$ 30m	Carbon sequestration and other ecosystem services		✓	✓	✓

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
						2020-2025	2025-2030	2030-2040
HUMAN WELL BEING								
HEALTH								
Increase practices of boiling drinking water, filtration and chlorination of drinking water and improvement in personal hygiene	Ministry of Health (Department of Preventive Health services)	Department of Water Supply, NGOs	US\$ 30 million uc: US\$ 15m c: US\$ 15m	Use of renewable energy sources and promote energy efficiency		✓	✓	✓
Enhance public awareness about water, sanitation and hygiene practices	Ministry of Health (Department of Preventive Health services)	Department of Water Supply, NGOs	US\$ 30 million uc: US\$ 15m c: US\$ 15m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Enhance health surveillance of Malaria, Diarrhoea and Malnutrition	Ministry of Health (Department of Preventive Health services)	NGOs/ CSOs (e.g., Health Equity Network)	US\$ 30 million uc: US\$ 10m c: US\$ 20m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Promotion of insecticide-treated mosquito nets	Ministry of Health (Department of Preventive Health services)	NGOs/ CSOs (e.g., Health Equity Network)	US\$ 30 million uc: US\$ 15m c: US\$ 15m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Increase adoption of oral rehydration salts, homemade sugar and salt solution, and cereal based solutions, such as rice water. intravenous fluids, antibiotic treatment, and isolation wards to reduce heat stress-related diarrhoeal disease outbreaks	Ministry of Health (Department of Preventive Health services)	NGOs/ CSOs (e.g., Health Equity Network)	US\$ 30 million uc: US\$ 15m c: US\$ 15m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
NUTRITION								
Promotion of dietary diversity and integration of nutrition-sensitive practices across sectors, primarily agriculture, health, education, and WASH	Department of Nutrition, HIV and AIDS	MOEPD&PSR, NGOs/ CSOs (e.g., Health Equity Network)	US\$ 45 million uc: US\$ 30m c: US\$ 15m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Promote nutrition-specific practices through SUN framework and Care group model, primary health care, therapeutic care, support, and treatment	Department of Nutrition, HIV and AIDS	MOEPD&PSR, NGOs/ CSOs (e.g., Health Equity Network)	US\$ 75 million uc: US\$ 50m c: US\$ 25m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
SOCIAL SUPPORT								
Increasing and strengthening the delivery of Micro finance, Public Works Programmes, school meals Programmes, Social cash transfer and Village and Savings and Loans (VSL) schemes	Ministry of Economic Planning Development and Public Sector Reforms (Department of Public Sector Reforms)	MOGCSW, MOE, NLGFC, NLGFC, NGOs/CSOs (e.g., Gender Networks)	US\$ 70 million uc: US\$ 30m c: US\$ 40m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Preparation of long-term workforce development plans and strategic livelihoods plans to help people move up and out into sound employment opportunities, and plan for managed urban migration	Ministry of Labour	MOEPD&PSR, MOGCSW, NGOs/CSOs (e.g., Gender Networks)	US\$ 35 million uc: US\$ 10m c: US\$ 25m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓		
Establishment of Social Support Fund for predictable, timely response (Climatic shock related Social Protection services)	Ministry of Economic Planning Development and Public Sector Reforms (Department of Public Sector Reforms)	MOGCSW, DODMA, NGOs/CSOs (e.g., Gender Networks)	US\$ 105 million uc: US\$ 25m c: US\$ 80m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
Promotion of gender mainstreaming in policies, programmes and projects	Ministry of Gender, Children and Social Welfare	NGOs/CSOs (e.g., Gender Networks)	US\$ 35 million uc: US\$ 35m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Support capacity building programmes for vulnerable groups and civic education and public awareness	Ministry of Gender, Children and Social Welfare	NGOs/CSOs (e.g., Gender Networks)	US\$ 35 million uc: US\$ 35m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓
Linkage of inclusive social support systems to risk financing options with the development and utilization of coordinated system for design and delivery of social support system inclusive of climate related shock sensitive interventions	Ministry of Economic Planning Development and Public Sector Reforms (Department of Public Sector Reforms)	MOGCSW, DODMA, NGOs/CSOs (e.g., Gender Networks)	US\$ 70 million uc: US\$ 35m c: US\$ 35m	Use of renewable energy sources and promote energy efficiency Carbon sequestration and other ecosystem services		✓	✓	✓

MEASURES	LINE MINISTRY (FOCAL POINT)	OTHER KEY ACTORS	ESTIMATED FUNDING	MITIGATION BENEFITS	ALIGNMENT WITH SDGs	TIMELINE		
						2020- 2025	2025- 2030	2030- 2040
CROSS-CUTTING								
Strengthen governance including oversight, capacity building, monitoring, evaluation and learning for effective NDC implementation	Ministry of Forestry and Natural Resources (Environmental Affairs Department)	Economic Planning Department	US\$ 221 million uc: US\$ 131m c: US\$ 90m	Improved implementation and reporting of mitigation progress		✓	✓	✓

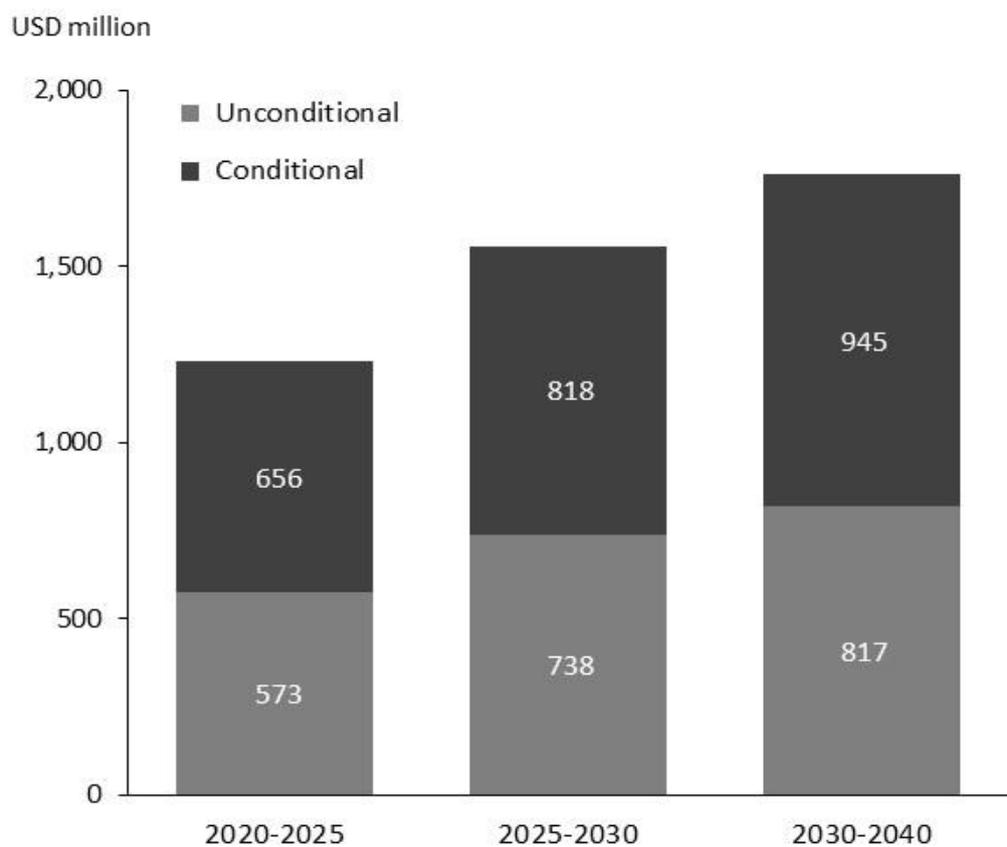
6.7 Funding requirements

According to the NAP framework, every year Malawi loses an average of 1.7% of its GDP as a result of climate change-related disasters, mainly floods and drought. An economic vulnerability and disaster risk assessment conducted by the Global Facility for Disaster Reduction and Recovery (GFDRR) indicates that annual flood damage in the Shire River Basin (the country's most flood-prone area) results in an average loss of 0.7% of GDP per year, while elsewhere in the country drought causes an average economic loss of 1% of GDP annually. In short, climate change is making Malawi's pathway to prosperity more difficult, more complex and costlier. Factors that increase vulnerability to climate change impacts in Malawi are deep-rooted: poverty, rapid population growth that results in overexploitation of natural resources, and high dependence on subsistence rain-fed agriculture. Finding a way to simultaneously finance the promotion of climate proofed development and recovery after the pandemics is therefore key to recovery.

Cost estimates for the prioritised adaptation measures were made for different time periods through 2040. Estimates were made by referring to different planning documents, through discussions with members of the Adaptation Expert Working Group (EWG) and other experts, and through assessing and scaling based on the costs of similar projects. As with the mitigation contribution, some programmes and interventions will be conditional on the availability of external financial support ("conditional") while others are expected to be implemented through domestic funding ("unconditional") or co-financing (internal and external sources of budget).

As shown below, the total implementation of all prioritised adaptation measures is estimated at around 4.5 billion USD through 2040. Through consultation with sector experts, and considering existing government initiatives and planned programmes, the total funding requirements for the adaptation contribution are estimated at around 53% conditional on international support and 47% unconditional. The estimates also show how the bulk of the support is required over the coming decade, reflecting the need to mobilise adaptation funding in order to prepare and manage climate impacts and risks expected to increase in Malawi over the near term.

Figure 6-2 Estimated costs for adaptation measures through 2040



7 Monitoring, reporting and verification framework

7.1 Tracking the NDC target

All Parties to the UNFCCC are required to implement a domestic monitoring, reporting and verification (MRV) system that can annually quantify national GHG emissions by sources and removals by sinks, and report the specific actions made to identify and implemented mitigation measures. This information is at present compiled by Malawi and is submitted to the UNFCCC through two channels:

- **National Communications (NCs)** to be submitted every four years, covering measurements of GHG emissions by sources and removals by sinks compiled in accordance with IPCC reporting guidelines (i.e. a National GHG inventory). These should also include a description of steps made to implement mitigation actions in support of the UNFCCC goal, among other aspects (as required under Decision 17/CP.8 and other decisions on implementation details); and
- **Biennial Update Reports (BURs)** to be submitted every two years. These should include an updated GHG inventory report from that of the NC, a measurement of mitigation actions and their impacts, reporting on the domestic MRV system and a description of needs and international support received. All non-Annex I countries were requested to submit their first BUR by December 2014 and then every two years thereafter (Decision 2/CP.17; Decision 19/CP.18; Decision 9/CP.21).

The Paris Agreement requires accounting for anthropogenic emissions and removals corresponding to the NDC, in accordance with common methodologies and measurement systems evaluated by the IPCC and approved by the CMP (1/CP.21, Paragraph 31). The methodologies evaluated by the IPCC are those used for estimating the National GHG Inventory estimation. The NDC target will be tracked based on the annual emissions estimated in the National GHG Inventory and the projected BAU scenario emissions within the NDC period, as follows:

$$\text{GHG reduction (\%)} = \frac{\text{BAU (t)} - \text{Inventory (t)}}{\text{BAU (t)}}$$

Where:

BAU (t) Emissions (and removals) in baseline in tCO₂e at time *t*
 Inventory (t) Emissions (and removals) in GHG Inventory in tCO₂e at time *t*

The Paris Agreement contains several additional MRV requirements which, when taken together with the existing UNFCCC arrangements, provide an enhanced basis for Malawi’s international reporting requirements relating to its updated NDC. The enhanced transparency framework (ETF) established by the Paris Agreement requires an MRV system to transparently report progress made towards the targets defined in Malawi’s NDC and to track the implementation of mitigation and adaptation actions, as well as the use and results of means of including climate finance. The system should also capture broader non-GHG impacts – such as environmental, social and economic impacts – resulting from implementation of measures for the purposes of evaluating their contribution to achieving broader development goals.

A framework of indicators consistent with the international requirements has been developed. This will allow Malawi to effectively track progress of the mitigation activities identified in this NDC consistent with UNFCCC reporting standards, and carry out ongoing evaluation of whether the country is on course to meet its targets through 2040.

7.2 Institutional arrangements

At the national level, the Malawi Government has put in place robust national planning process involving pillar, enabler, sector and district level coordination structures that are coordinated by the National Planning Commission (NPC) for medium to long term plans and strategies, and the Ministry of Economic Planning, Development and Public Sector Reforms (MOEPD&PSR) through sector working groups (SWGs) that track the short term implementation of sector priorities aligned with the goals of the Malawi Growth Development Strategy (MGDS) III and the National Vision (Malawi 2063).

The top-most structures shall be the Pillar Coordination Groups (PCGs) that link directly and will be responsible for spearheading implementation and reporting progress on the three pillars of the National Vision: Agriculture, Productivity and Commercialization; Industrialization; and Urbanization. The PCGs shall be supported by the Enabler Coordination Group on Environmental Sustainability (ECGES). Co-chaired by MEPD&PSR and MOFNR, with EAD as the secretariat, the ECGES will bring together all relevant

stakeholders (state and non-state) falling under the Environmental Sustainability enabler. Given the cross-cutting nature of environmental sustainability matters, the ECGES will report to each of the three Pillar Coordination Groups (PCGs) on matters relevant to the pillar. The PCGs and ECGES will work closely with the existing National Steering Committee on Climate Change (NSCCC) and the joint Technical Committee on Climate Change and Disaster Risk Management (TCCC&DRM) in defining multi-year pillar and enabler priorities as well as advising Government on the resources required for meeting the defined Vision priorities within their respective pillars and/or enablers. The NSCCC and TCCC&DRM shall receive policy and implementation oversight from the NPC through the ECGES.

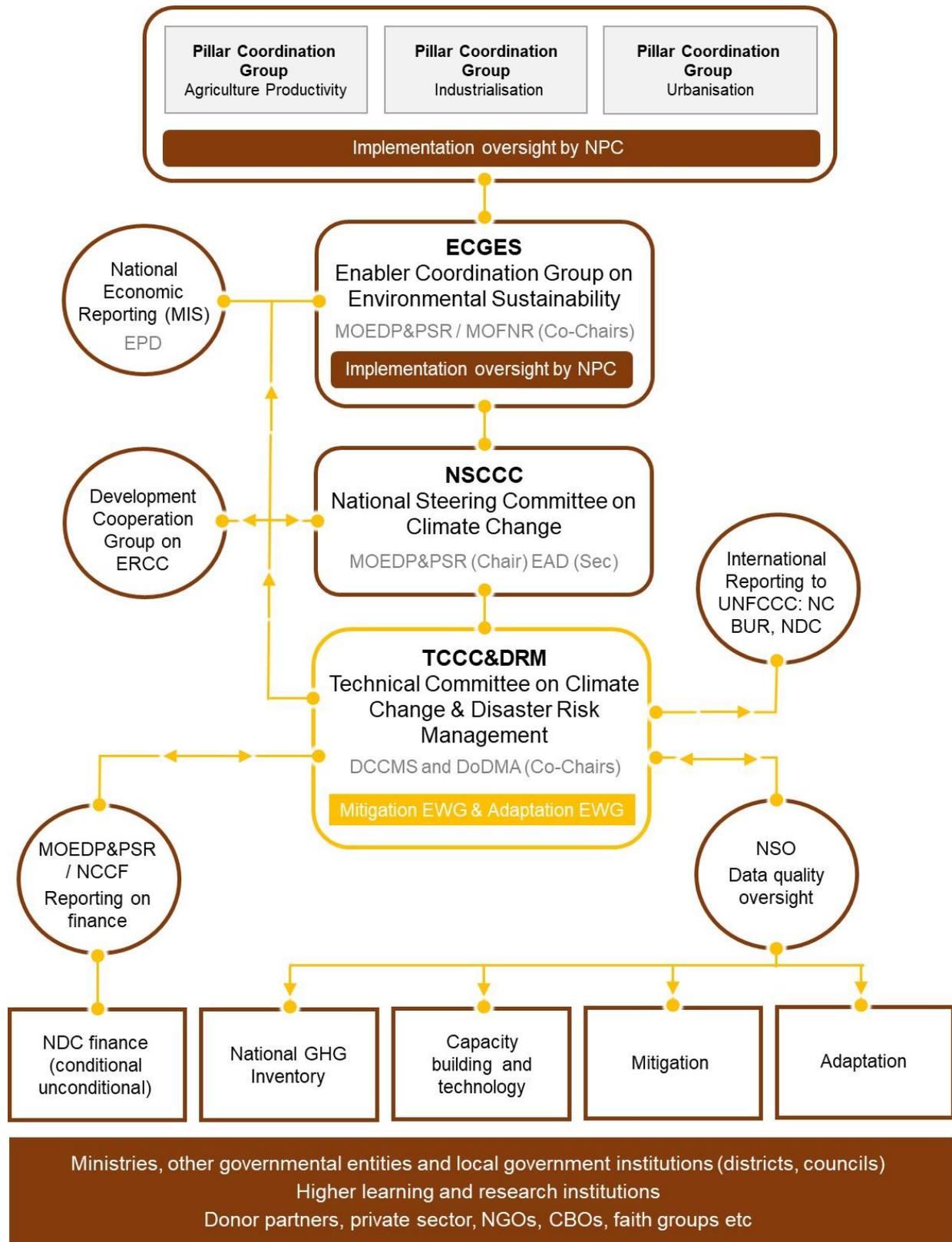
The NSCCC comprises all key ministries and departments and provides strategic direction and inter-ministerial coordination on national climate change policy including Malawi's NDC. The NSCCC is chaired by the MOEPD&PSR, with MOFNR acting as the main implementing partner. It is supported by the joint Technical Committee on Climate Change and Disaster Risk Management (TCCC&DRM) which provides technical guidance on all climate change, disaster risk management and resilience issues in Malawi. The TCCC&DRM reports to the NSCCC and includes representatives from various government entities as well as civil society, donor parties and private sector. The committee is co-chaired by the Department of Climate Change and Meteorological Services (DCCMS) and the Department of Disaster Management Affairs (DODMA). A number of Expert Working Groups (EWGs) provide specialised technical guidance and report to the TCCC&DRM. The working groups are established according to requirement and include Adaptation, Mitigation and Climate Finance.

Within this framework, the Environmental Affairs Department (EAD) of the Ministry of Forestry and Natural Resources (MOFNR) formulates and oversees climate policy development in Malawi including the day-to-day coordination of the NDC development process. EAD is the UNFCCC focal point and serves as the secretariat of both the NSCCC and TCCC&DRM. The EAD has the overall responsibility for, and chairs, the thematic EWGs and also has overall responsibility for preparing and maintaining the national GHG inventory and submitting Malawi's National Communications, BURs, BTRs and NDCs to the UNFCCC.

The TCCC&DRM forum, led by the EAD, is the ideal platform for guiding the analytical framework for reporting, updating and implementing the national mitigation and adaptation priorities under the NDC. The TCCC&DRM acting through the Adaption EWG and Mitigation EWG will serve as the national coordinator for all national institutions that implement sector specific mitigation and adaptation measures, receive finance and other means of support, and oversee tracking and reporting of the NDC at the national level.

Figure 7-1 below summarises these institutional arrangements for tracking of NDC implementation including the national NDC MRV process.

Figure 7-1 Institutional arrangements for tracking Malawi’s NDC implementation



7.2.1 Role of TCCC&DRM in coordinating NDC MRV

Additional to its normal functions, the joint TCCC&DRM shall perform the following functions through the Adaptation and Mitigation EWGs. Where the NDC MRV roles fall beyond the expertise available within the TCCC&DRM, the committee shall co-opt such expertise, as necessary.

The EAD, leading the committee and overseeing the EWGs, will guide the selection of members to provide technical oversight and present the MRV of the NDC annually to the TCCC&DRM for official endorsement. Following the endorsement, EAD will communicate the NDC MRV through the normal national reporting channels including the NSCCCC to inform policy and strategic decisions that ensure NDC MRV effectively supports national sustainable development and is in alignment with the MGDS III and National Vision. The following are key aspects that form part of the mandate of the technical group:

- Review and establish objectives for the group, membership and overall working modalities, principal of which is the endorsement and subsequent reporting of the NDC MRV at both national and international levels;
- Provide advice and feedback on scope, schedule, cost and quality concerns, or guidance on program priorities, that arise during the planning, design and implementation of the NDC;
- Facilitate access to resources necessary to review and report on NDC MRV and approve projects at key milestones;
- Review and examine studies and research activities in line with NDCs to facilitate quality assurance and alignment with strategic priorities (including sectoral plans, MGDS III, and Malawi Vision 2063)
- Develop and operationalize an effective NDC MRV communications plan

These roles build upon the Malawi Climate Transparency Framework, developed as part of Malawi's involvement in the Capacity Building Initiative for Transparency (CBIT).¹³ NDC information can be shared within the CBIT Global Coordination Platform and other relevant platforms and network.

7.2.2 NDC MRV data and information management system

An integrated MRV data and information management system, drawing upon existing procedures and resources, is required as part of a robust M&E framework for NDC implementation. All climate change relevant data including NDC MRV managed and reported by the TCCC&DRM will be processed and accessed through the development of such a system. Assessing and defining the most suitable data sources is important for any MRV system to be effective. The Adaptation and Mitigation EWGs will play a critical role of

¹³ See <https://www.cbitplatform.org/projects/malawi-climate-transparency-framework>

the national level data and information generation and reporting and will be significantly involved in data gathering, transparency, and verification. The TCCC&DRM will ensure that Malawi's NDC MRV system links mitigation, adaptation and finance as well as support for capacity building and technology transfer as critical aspects of NDC implementation.

Primary data collected at the local level will draw upon those sectors and institutions with direct linkages to local levels (Districts) in sourcing relevant action specific data and information. This will be done with support of broad District based stakeholders through the District Executive Committee (DEC), providing an opportunity for engagement of NGOs private sector and development partners to provide inputs into the NDC MRV process. MOLG provides coordination oversight in facilitating local government data management flows to central level institutions.

The NDC MRV system shall be hosted by the Department of Economic Planning and Development (EPD) and integrated within the existing national management information system (MIS). This exists as a robust established platform for reporting on environmental factors, which will be enhanced to report on NDC progress as per an agreed framework of key indicators. As the Co-Chairs of the NSCCC, MOEPD&PSR and EAD will have joint responsibility to provide the overall strategic direction on the MRV and M&E of the NDC. The TCCC&DRM has responsibility for coordinating the NDC MRV, including ensuring engagement of all relevant institutions and stakeholders to provide the data required for inputting to the MIS. Given the timeframe of the NDC implementation plan, an agreement will be reached on the key indicators for integration in the National Planning Commission (NPC) medium to long term reporting system.

The National Statistical Office (NSO) is central to national data processes and has the role of validating national statistics through data and information authentication and therefore approval for national statistics shared externally. The NSO will facilitate development and application of data protocols and annually review national level standards and guidelines for data inputs and aggregation to guide sector and/or agency generated data and information on mitigation and adaptation. MOEDP&PSR is the ideal national institution for tracking NDC MRV related finance. The National Climate Change Fund acting as the national fund for environment and climate change will liaise with MOEDP&PSR to manage data on finance and provide a platform to access finance data and information for national reporting. This information will be critical to guide resource mobilization for the successful implementation of Malawi's NDC.

The NDC MRV information will be prepared using appropriate reporting protocols and formats for national level as well as international reporting. At the national level, NDC MRV will be monitored, analysed and reported annually to the NSCCC and the Natural Resources SWG (uploaded on an IT-based system) using national planning driven process coordinated by MOEDP&PSR to inform policy and strategic planning. The EAD has good experience in reporting to the UNFCCC through National communications (NC) and Biennial Update Reports (BURs). The TCCC&DRM led by EAD will therefore build on this experience to

coordinate national agencies responsible for data generation and management of NDC MRV reporting to UNFCCC. NDC information and indicators can also be provided as part of Malawi's involvement in the Capacity Building Initiative for Transparency (CBIT).

The table below summarises Malawi's framework for tracking and reporting on progress of implementing the mitigation and adaptation goals outlined in the NDC. It indicates the institutions, fora, roles and responsibilities proposed to guide and support implementation of MRV of the NDC at the national level including policy and strategic decision levels. Supporting information on the mitigation and adaptation components are provided further below.

Table 7-1 Institutional arrangements for tracking Malawi's NDC

Overview of Institutional Arrangements	
Policy and strategic decision levels	Roles and Responsibilities
PCGs on Agriculture Productivity and Commercialization; Industrialization; and Urbanization.	The Pillar Coordination Groups (PCGs) will be responsible for spearheading medium to long-term implementation and reporting of progress on the three pillars of the National Vision: Agriculture Productivity and Commercialization; Industrialization; and Urbanization ¹⁴ .
ECG on Environmental Sustainability (ECGES)	The Enabler Coordination Group on Environmental Sustainability (ECGES) will be responsible for coordinating short to long term implementation and reporting of progress on the Environmental Sustainability enabler. The core indicators selected include rate of deforestation, environmental sustainability index and carbon footprint ¹⁵ .
NSCCC (Principal Secretaries)	The National Steering Committee on Climate Change (NSCCC) oversees implementation of the MGDS III, supported by the National M&E Coordination Committee and M&E Technical Working Groups. NDC M&E progress will be regularly presented to the Steering Committee by implementing institutions (see below) to ensure cross sectoral oversight over the NDC in alignment with the strategic aims of the MGDS III. Reports from the Principal Secretaries will be reviewed by the ECG and the Cabinet through the Cabinet Committee on Natural Resources and Environment (CCNRE) ¹⁶ .

¹⁴ To be instituted by way of alignment with Malawi's Vision 2063

¹⁵ As presented in Malawi Vision 2063.

¹⁶ The Cabinet Committee on Natural Resources and Environment (CCNRE) is the highest environmental policy and decision-making body. Its objective is to advise the Cabinet on the protection, conservation and sustainable utilization of renewable and non-renewable natural resources and the environment to ensure equitable and enhanced socio-economic development of the people of Malawi

Overview of Institutional Arrangements

Policy and strategic decision levels	Roles and Responsibilities
MOFNR serves as chair of the Natural Resources SWG (NRSWG)	<p>Acts as a forum for dialogue, ownership and accountability of the environmental and sustainable development agenda and making the case for NDC MRV to all stakeholders at sector level. Activities include:</p> <ul style="list-style-type: none"> • Conduct joint sector reviews (JSR) to facilitate reporting on NDC MRV and advocating for NDC MRV-based decisions to wider sector stakeholders including NGOs, private sector and development partners. • Monitoring progress of the Sector Strategic Plan (SSP) including the NDC M&E, managing the data management system including aggregating data, conducting verification (EAD on NDC MRV) through a central data management system that will serve as the platform and repository for the NDC MRV.
National Steering Committee on Climate Change (NSCCC)	<p>Provides strategic direction, inter-ministerial coordination and policy guidance in relation to Malawi's climate policy including the NDC. Acts as a forum for cross-sectoral review and evaluation of progress in NDC implementation, advised by the TCCC&DRM. EAD has day-to-day responsibility for climate policy and NDC development and acts as the Secretariat to both committees (NSCCC and TCCC&DRM).</p>
Development Cooperation Group on Environment, Resilience and Climate Change (DCERCC)	<p>Supports the NSCCC with its coordination and oversight role and enhances donor coordination and networking between NDC and climate change stakeholders. Acts as a forum for reviewing success and challenges in implementation, and proposing actions to fast track implementation of the NDC in alignment with MGDS III. Also facilitates alignment of programming and financing of NDC measures including tracking finance.</p>
District Executive Committee (DEC)	<p>Comprises heads of government, CSOs/NGOs and relevant private sector institutions operating in the districts. Some of the primary data and information used for tracking the NDC is generated at levels coordinated by districts. District Councils data will be reported to their line ministries and District Executive Committee (DEC).</p> <p>The DEC is also responsible for overseeing planning, coordination and implementation of NDC measures in the districts, including monitoring and evaluation through the Directorate of Planning and Development (DPD). The DEC therefore serves the following key roles:</p> <ul style="list-style-type: none"> • Monitoring and reporting on the implementation of relevant NDC measures undertaken at district level • Promoting cooperation between the public sector, private sector and civil society to help implement the NDC at district level
MOLG	<p>Coordinates the design and operationalisation of the District Development Planning System (DDPS), supports development and implementation of District Development Plans (DDPs) under the MGDSIII and upstream reporting on NDC performance at local levels. Ensures alignment between DDPs and NDC measures.</p>

Overview of Institutional Arrangements	
Policy and strategic decision levels	Roles and Responsibilities
MOEPD&PSR (EPD)	<p>The MOEPD&PSR is responsible for:</p> <ul style="list-style-type: none"> Tracking and reporting on finance provided to NDC measures (domestic and international) Overall coordination of M&E activities from planning, data collection, and reporting at all levels Preparing annual MGDS III reports using the sectoral contribution reports including the environmental and natural resources sector and ensuring that NDC MRV forms part of the annual reporting Monitoring macroeconomic indicators and ensure their integration within the NDC planning, updating and reporting as relevant
National Planning Commission (NPC)	<p>The National Planning Commission (NPC) shall be responsible for coordinating the design and implementation of, and reporting on medium to long term NDC measures to ensure alignment with the MGDSIII and Malawi Vision 2063.</p>
National Statistical Office (NSO)	<p>The NSO will play a role in the M&E of the NDC through the use of the Malawi Socio-Economic Database (MASEDA) and other resources. The NSO will be responsible for:</p> <ul style="list-style-type: none"> Production and dissemination of statistical information required in the development, updating and tracking of the NDC (e.g. key activity data, energy consumption, GDP, population) Supporting surveys including vulnerability to climate change analysis and authenticating data and information for internal and external use and consumption. Promoting use of statistical data for evidence-based policy development and decision making within the NDC framework
EAD serving as the Secretary of the joint Technical Committee on Climate Change and Disaster Risk Management (TCCC&DRM)	<p>The TCCC&DRM will host a core team of experts that forms the NDC MRV Technical Group with the following responsibilities:</p> <ul style="list-style-type: none"> Creating guidelines and common standards, formats and templates to be used for reporting MRV results as part of NC, BURs, and BTRs to UNFCCC, Defining and using common data sources and methods & procedures to compile NDC MRV results Technical level endorsement of NDC MRV and communicating the results for upstream NDC-based policy and strategic decision making (NSCCC) Institutional strengthening, capacity building and training and facilitating linkages through a comprehensive stakeholder engagement process that defines the political, strategic, and practical elements of the NDC MRV system

7.3 Data provision

Table 7-2 summarises the key data providers according to activity and indicator area for the mitigation and adaptation components of the NDC, as well as finance and support as required under the Paris Agreement.

Table 7-2 Key data providers for tracking the NDC

Mitigation			
Line Ministry	Activity / Indicator	Lead Agency	Key data providers / stakeholders
MOE	Energy related indicators ¹⁷	Department of Energy Affairs, MERA	EGENCO, ESCOM, Department of Mines, MOLG, District Councils, District Energy Offices, District Forestry Offices, Area and Village Development Committees, private sector (mining companies, IPPs)
MOTPW	Transport related indicators	Department of Road Traffic and Safety Services, Department of Rail	MOLG, Passenger Associations, Bus Operators Associations, City Councils, Road Transporters Association, Railway Operator, District and City Councils, private sector (transport providers)
MOI	Industry related indicators	Department of Factory Inspectorate, MERA, NCIC	EAD, Department of Housing, , Malawi Bureau of Standards, private sector (cement companies)
MOFNR, MOLG	Waste related indicators	City and Town Councils	Department of Energy affairs, MERA, EAD, Department of Water Resources
MOA	Agriculture related indicators	MOA	Department of Crop Development, Department of Animal Health and Livestock Development, Department of Land Resources and Conservation, MOFNR, DADOs, LUANAR, ADDs
MOFNR	Forestry related indicators	Department of Forestry	FRIM, LUANAR, District Agriculture Development Offices and District Forestry Offices

Adaptation			
Line Ministry	Activity / Indicator	Lead Agency	Key data providers / stakeholders
MOTPW	Build Back Better related indicators for flood mitigation	Buildings Department	Councils, NGOs (e.g. Habitat for Humanity, UN Habitat)

¹⁷ Includes use of low carbon and alternative fuels in other sectors

Mitigation			
Line Ministry	Activity / Indicator	Lead Agency	Key data providers / stakeholders
MOTWC	Resilient tourism related indicators	Department of Tourism	Department of National Parks and Wildlife, EAD, MEPA
MOA	Agriculture related indicators	MOA	Department of Crop Development, Department of Animal Health and Livestock Development, Department of Land Resources and Conservation, MOFNR, DADOs, LUANAR, ADDs, DAES
Department of Nutrition and HIV and AIDS	Nutrition related indicators	Department of Nutrition and HIV and AIDS	Ministry of Health, Academic institutions (LUANAR, Chancellor College)
Health	WASH related indicators	Department of Preventive Health Services	District Health Offices, NGOs
Ministry of Homeland Security	Disaster risk management related indicators including flood-proofing, drought management, early warning systems and hazard monitoring and flood management	DCCMS, MVAC, Water Resources Department, UN Organisations, USAID	DCCMS, MVAC, Water Resources Department, UN Organisations, USAID, NCIC, Buildings Department, MHC, Department of Forestry
Ministry of Tourism, Wildlife and Culture	Resilient Ecotourism indicators	Department of Tourism	Department of Parks and Wildlife, MEPA
MOEPD&PSR	Social Support related indicators	Poverty Reduction and Social Protection Division	Ministry of Education, MOGCSW, Dodoma, National Local Government Finance Committee, Micro finance institutions
MOFNR	Fisheries related indicators	Department of Fisheries	Department of Fisheries, LUANAR
	Integrated Watershed Management indicators	Department of Water Resources	Department of Forestry, Department of Land Resources Conservation, Department of Irrigation
	Biodiversity and Governance indicators	EAD	Department of Forestry, Department of Fisheries, Department of National Parks & Wildlife, National Herbarium & Botanical Gardens, FRIM; MEPA, Economic Planning Department, National Planning Commission

Mitigation			
Line Ministry	Activity / Indicator	Lead Agency	Key data providers / stakeholders
Finance and support (capacity building and technology transfer)			
Line Ministry	Activity/Indicator	Lead Agency	Key data providers / stakeholders
MOEPD&PSR	Total amount of finance mobilised for climate mitigation and adaptation investments (by measure type and sector; conditional and unconditional flows)	National Climate Change Fund (NCCF)	MOFNR, EAD, donors
MOEPD&PSR	Capacity building, technical support and technology transfer	EAD	MOFNR, EAD, NCCF, NCST, MOA (Departments of Agricultural Research, and, Agricultural Extension Services), donors, and all NDC supporting institutions and organizations

8 Means of implementation

According to Article 13 of the Paris Agreement and its associated decisions, developed countries reiterated their previous commitment to channel at least USD 100 billion in annual climate finance to developing countries by 2020. They also agreed to establish a more ambitious climate finance target from 2025. Developing countries are requested to report on the support they have received and any additional needs they have in these areas. For adaptation financing, the Green Climate Fund (GCF) has committed to allocate at least half of its resources to adaptation, and half of its adaptation resources to Least Developed Countries (LDCs), Small Island Developing States (SIDS) and countries in Sub-Saharan Africa. There is also a particular drive by many bilateral donors to scale up their support for adaptation.

To fully implement the mitigation and adaptation contributions described in this document, Malawi will require support in the form of finance, capacity building, and technology transfer. This section provides an overview of these means of implementation.

8.1 Finance needs

The NDC updating process has made use of extensive consultations with sector experts to generate “conditional” and “unconditional” costing estimates for both mitigation and adaptation measures projected through to 2025, 2030 and 2040.¹⁸ These estimates, provided by consultant teams led by the EC, UNDP and Carbon Counts, will guide and position Malawi for strategic resources mobilization to meet its climate action ambition, and help inform a process of tracking climate finance flows towards climate mitigation and adaptation action.

The total estimated cost for Malawi’s identified NDC mitigation measures through 2040 is estimated at around 41.8 billion USD for mitigation measures, and around 4.5 billion USD for adaptation measures, representing a combined funding requirement of 46.3 billion USD. Of this total, around one third is estimated to be required over the next decade (2020-2030), and two thirds in the subsequent decade (2030-2040). For both mitigation and adaptation combined, it can be seen that unconditional measures account for around 24% of the total estimated funding requirements, and conditional measures around 76%.

¹⁸ Estimated in real terms (i.e. 2020 USD)

Figure 8-1 Estimated NDC funding requirements (mitigation and adaptation)

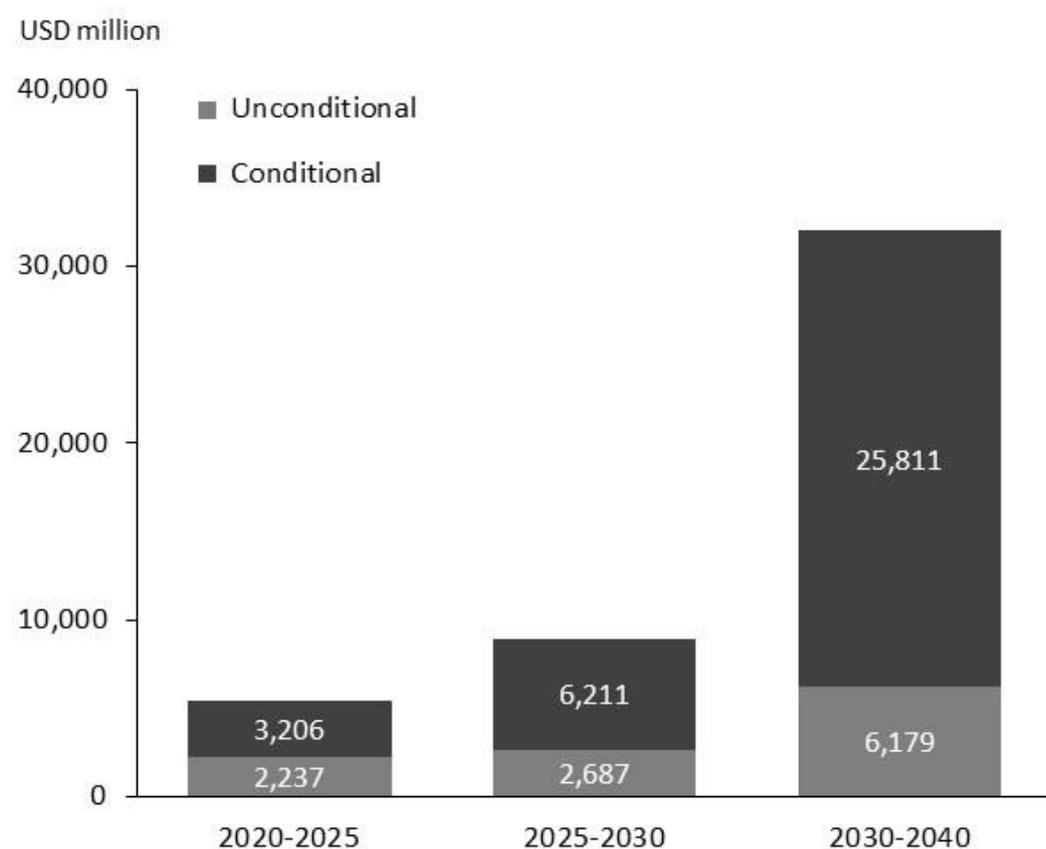


Table 8-1 Estimated NDC funding requirements (mitigation and adaptation)

USD million	2020-2025	2025-2030	2030-2040	Total
Mitigation measures				
Unconditional contribution	1,664	1,949	5,362	8,974
Conditional contribution	2,550	5,393	24,866	32,808
Total	4,213	7,341	30,228	41,782
Adaptation measures				
Unconditional contribution	573	738	817	2,128
Conditional contribution	656	818	945	2,419
Total	1,230	1,556	1,762	4,547
Combined total	5,443	8,897	31,990	46,329

Challenges for climate finance in Malawi include insufficient funds, a limited domestic budget for the implementation of climate actions, and the limited involvement of private sector

investment in environment and climate change activities. In response to these factors, Malawi is currently preparing a resource mobilization strategy which will identify sources of finance and strategies to fund and support the prioritised measures identified in this document.

As reflected in the unconditional contribution described in this document, the Government of Malawi will continue to commit significant resources to climate change relevant strategies, both in relation to mitigation and adaptation. Malawian communities, private sector and NGOs can also contribute significantly to these climate change-related activities through public-private partnerships. In this context, the National Climate Change Fund (NCCF) is expected to play a vital role in financing low carbon projects and programmes and leveraging investment.

Given the estimated funding requirements outlined above there is clearly also a need for increased levels of bilateral and multilateral financial support and the full implementation of the identified strategic mitigation actions is conditional on the support of international stakeholders. The implementation of the prioritised policies and actions assume the continued use of existing and planned national and international financial sources. An initial assessment of the funding requirements for the identified measures has been described in this document, and implementation costs will be further refined as more evidence-based information is obtained, particularly in relation to forestry and other land use (FOLU) measures.

Malawi intends to meet its conditional contribution through the use of climate finance and international market mechanisms where appropriate, building upon its experience of the Clean Development Mechanism (CDM) and other existing market mechanisms. These include the potential involvement in international cooperative approaches under Article 6 of the Paris Agreement. Malawi is also participating in the NDC Partnership, a process that has so far attracted financing for readiness support on developing a pipeline of projects targeting public and private climate finance. The support packages have come most recently through the Climate Action Enhancement Package (CAEP) which is currently implementing projects in relation to project identification (e.g. concept notes), monitoring, reporting and verification (MRV) and NDC implementation planning among other initiatives.

8.2 Capacity building and technology transfer

Under the Paris Agreement, developed countries have also committed to provide technology transfer and capacity building to developing countries. Many developing countries will require enhanced capacities to effectively track inflows of bilateral and multilateral resources and support and identify particular gaps and needs.

Technology transfer and capacity building will be required to fully implement Malawi's mitigation and adaptation contributions. Specific national needs relating to **mitigation** include:

- Building and enhancing climate information systems, including through the National GHG Inventory;
- Gaining access to and overcoming barriers to the application of appropriate clean technologies;
- Promotion of renewable energies and energy efficiency, including through the involvement of the private sector;
- Setting up of public-private partnerships; and
- Improving public awareness, training and skills at national, regional and local levels

In this context, the Government of Malawi plans to:

- Support and encourage the development, transfer and uptake of low carbon and climate technology;
- Provide adequate support for policies and programmes that take into account the interactions between the needs of communities, climate change and development, including the link between the national, regional and local levels of decision-making
- Promote and enhance climate change education, public awareness and capacity building through ongoing communication, training, information and knowledge management; and
- Actively integrate the mainstreaming of gender considerations within climate change measures and where relevant to track climate change issues and indicators according to gender and vulnerable groups;

In relation to **adaptation**, specific capacity and national needs include:

- Improved capability (human resources and technology) to deliver sector specific weather services for averting disaster (including flood, drought and pest infestation) through effective early warning systems and disaster management;
- Access to, and overcoming barriers to the adoption of, climate smart technologies in agriculture, fisheries and water management;
- Up-scaled adoption of alternative energy to biomass for cooking and heating;
- Climate change adaptation measures that are planned with a gender lens and are capable of targeting and tracking progress and outcomes by gender and other sources of vulnerability;
- Humans that realize and exploit ecological goods and services in ways that are mutually beneficial to the social and ecological systems;

- Improved and sustained flows through robust water use management/licensing systems and abstraction measurement and regulation technology, and associated water use management tools (procedures and protocols); and
- Readily available resources for disaster risk reduction and management.

In this context, the Government of Malawi plans to:

- Develop a nation-wide community-based early warning system for multiple hazards including floods and drought, and multi-hazard contingency plans;
- Expand information and communication technology (ICT) infrastructure and human capacity to generate and transform climate data into sector-specific information and knowledge products;
- Upscale climate smart agriculture;
- Implement a national landscape restoration programme that combines promotion of alternative energy sources and afforestation;
- Actively mainstream gender considerations within climate change measures and where relevant to track climate change issues and indicators according to gender and vulnerable groups;
- Develop climate-resilient infrastructure, and enhanced climate-adaptation capacity of all stakeholders, through better access to climate information and early warning and response mechanisms that safeguard lives and livelihoods from shocks;
- Build robust water use licensing systems with detailed procedures and protocols alongside improved flow and abstraction measurement technology;
- Pilot and upscale market-based approaches for the management of ecological services such as Payment for Ecosystem services;
- Upscale resource mobilisation and leveraging for climate and disaster risk financing and investment; and
- Promote and enhance climate change education, public awareness and capacity building through ongoing communication, training, information and knowledge management.

Malawi recently completed the first step of the TNA process. The TNA Reports provide a shop list of technologies and their attributes described in the related Technology Fact Sheets (TFS) appended to the TNA reports. Currently, the country is in the second step of TNA process of identifying barriers for the prioritized climate technologies. Once the technology barriers have been identified and analysed, and enabling framework developed, Technology Action Plans (TAPs) will be developed to guide the implementation and transfer of such technologies (GoM, 2020).

Table 8-2 Prioritised needs for Agriculture and Water Sectors, Adaptation Technologies

Sector	Priority (rank)	Adaptation technology
Agriculture	1	Landscape restoration for improved land productivity
	2	Integrated crop-livestock-aquaculture-forest production systems
	3	Community-based agricultural extension
Water	1	Rainwater harvesting
	2	Integrated river basin management
	3	Integrated flood management

Source: GoM (2020)

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¹⁹ Working version; the final published version was submitted February, 2021



REPUBLIC OF MALAWI