Republic of Malawi

THE MINISTRY OF NATURAL RESOURCES, ENERGY AND MINING

Forest Landscape Restoration Opportunities Assessment for Malawi

June 2017

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List of Acronyms

AF ..... Agroforestry
AFR100..... African Forest Landscape Restoration Initiative
ALAP..... The Africa Landscape Action Plan
ARI..... African Restoration Initiative
BMZ..... Federal Ministry for Economic Cooperation and Development
CA..... Conservation Agriculture
CBA ..... Cost Benefit Analysis
CDCS ..... Country Development and Cooperation Strategy
CBO..... Community Based Organization
DoF..... Department of Forestry
DFID ..... Department for International Development
EI ..... Emmanuel International
EPA..... Extension Planning Area
FAO..... Food and Agriculture Organization of the United Nations
FMNR ..... Farmer-Managed Natural Regeneration
FR..... Forest Reserve
FLR..... Forest Landscape Restoration
GIS..... Geographic Information System
GPFLR..... Global Partnership on Forest Landscape Restoration
GoM..... Government of Malawi
IUCN..... International Union for Conservation of Nature
MCA ..... Multi-Criteria Analysis
MGDS..... Malawi Growth and Development Strategy
NFLRA..... National Forest Landscape Restoration Assessment
NPV ..... Net Present Value
PERFORM ..... Protecting Ecosystems and Restoring Forests in Malawi
REDD+..... Reducing Emissions from Deforestation and Degradation
ROAM..... Restoration Opportunities Assessment Methodology
TA ..... Traditional Authority
USAID..... United States Agency for International Development
VFA ..... Village Forest Area
VNRMC..... Village Nature Resource Management Committee
WRI..... World Resources Institute

Foreword

Nature-based solutions, such as Forest Landscape Restoration (FLR), offer an integrated approach to tackling environmental degradation and enhancing human well-being. This is why, in 2016, Malawi made an ambitious 4.5 million hectare restoration pledge to the Bonn Challenge and the African Forest Landscape Restoration Initiative (AFR100). Achieving our Bonn Challenge commitment will take a 'whole of government' approach and close coordination among different government agencies. Critically, we need local communities to be involved, particularly women who represent 52% of our population and play a valuable role in managing lands.

Forests sustain life on earth. They directly support the livelihoods of 1.6 billion people and indirectly support all of us through the valuable ecosystem services they provide. Despite their immense value, forests continue to be destroyed at an alarming rate, often in the name of development. This is counter-productive. To illustrate, 70-80% of forest degradation is due to the expansion of croplands. Yet, according to the United Nations, one in nine people in the world are undernourished. We see this situation firsthand in Malawi where almost 98% of our cultivated land is rain fed, making our farmers extremely vulnerable to climate change and shifting weather patterns. Every year, erosion results in the loss of 40,000 tonnes of soil, further damaging our agricultural productivity and hindering our socio-economic growth.

We have taken the first step towards operationalising our restoration commitment by applying the Restoration Opportunities Assessment Methodology (ROAM) across all districts in Malawi. The assessment has resulted in the creation of a roadmap for restoration action – identifying the areas we need to prioritise and the most effective interventions we should implement. Importantly, the process was stakeholder driven, ensuring that the design and implementation of restoration is firmly rooted in the needs of local communities.

The ROAM process has identified 7.8 million hectares available for restoration. Our focus now turns to implementation – embedding restoration in our development strategies, building the capacity of government agencies and local communities to conduct FLR interventions, putting in place robust monitoring systems and unlocking funds. Farmer-managed natural regeneration – where farmers are keeping trees on their croplands instead of clearing them – is already happening in many places across Malawi as farmers are learning that it increases the productivity of their lands.

Dr Clement Chilima

Director, Department of Forestry

Executive Summary

This report presents the results of the National Forest Landscape Restoration Assessment (NFLRA) for Malawi. The NFLRA process was launched in February 2016 by the Minister of Natural Resources, Energy and Mining in close collaboration with government departments in the Ministries of Agriculture, Water and Irrigation; Lands; Local Government; Finance; Gender and Social Services; and other concerned stakeholders. The national assessment was designed to identify needs and opportunities for the restoration of the productivity and ecological function of degraded and deforested landscapes in Malawi that will in turn help to achieve Malawi's sustainable development goals related to food, water, and livelihood security and climate resilience.

The NFLRA Report, together with the associated National Forest Landscape Restoration Strategy, provide the data, analyses and vision to achieve large-scale restoration in Malawi. Restoration is achieved by strategically addressing the drivers of land degradation and deforestation that limit agricultural productivity and the potential for sustained economic growth, and the interlinked underlying causes resulting in declining agricultural productivity and decreasing food security, increasing water scarcity, limited sources of household energy and declining supply of biomass energy, and escalating vulnerability to changing climate and other weather-related shocks. In addition, this report and the accompanying NFLR Strategy provide the framework for Malawi to achieve its 4.5-million-hectare national restoration commitment to the African Forest Landscape restoration Initiative (AFR100) under the Bonn Challenge.

The NFLRA Process

National leadership for the NFLRA was provided by the Department of Forestry. A multi-sector Task Force was organized to guide and support the national assessment process, which included three technical working groups that contributed to stocktaking and mapping activities, policy and institutional analyses, and economic and financial analyses. Consultations with district authorities and communities, and site visits formed important components of the assessment.

The stocktaking and mapping technical working group completed two complementary spatial assessments, one which focused on the identification of appropriate areas for prioritized restoration interventions, and a multi-criteria analysis that used spatial data to help prioritize investment in FLR interventions along the themes of food security, resilience, and biodiversity based on an underlying assessment of functional degradation.

The policy and institutional working group researched and delineated the laws, policies, and practices that both supported and hindered restoration activities in Malawi. Their analysis is based on interactions with key policy makers and a thorough review of Malawi's enabling framework as well as international laws and conventions.

The economics and finance working group used the results of the intervention mapping to perform a cost-benefit analysis on the transitions to "restored" land uses based on the financial capital and opportunities costs of each restoration transition and its estimated area in Malawi. The financial analysis determined the total investment needed in FLR for Malawi to achieve its commitment of 4.5 million hectares under the AFR100 and Bonn Challenge, and recommends ways these costs can be borne by both public and private financing sources.

Gender mainstreaming in NLFRA aimed to ensure that both women and men are involved in planning and implementing restoration activities, that these activities respond to their different needs and that both share the benefits of restoration in an equitable way. NFLRA provides opportunities to advance national goals on gender equity and empowerment of women and girls – and in fact, cannot be successfully implemented without attention to full participation of affected communities and key stakeholders.

NFLRA activities were designed using the tools and methods documented in the publication 'Assessing forest landscape restoration opportunities at the national level: A guide to the Restoration Opportunities Assessment Methodology (ROAM)' (IUCN & WRI, 2014), which provides a flexible framework to rapidly assess the opportunities for forest landscape restoration (FLR) at the national and sub-national levels.

Key Findings: Stocktaking and Mapping

Stakeholder consultations identified a number of biophysical and socioeconomic challenges related to land use that are most critical for restoration to address in Malawi (Table 1).

Table 1. *Biophysical and socioeconomic challenges identified by stakeholders as priorities for restoration to address in Malawi.*

Biophysical challenges:	Socioeconomic challenges:
Declining soil fertility	Food insecurity
Soil erosion	Poverty
Poor land husbandry	Limited income sources
Deforestation and reduced forest cover	Limited energy sources
Poor water quality	Increased burden on women-led households
Climate (flood/ drought)	Reduced availability of timber products
Water shortage	Limited land holding sizes

To address these land use challenges, five priority FLR interventions (agricultural technologies, soil and water conservation, forest management, river and stream-bank restoration, community forests and woodlots) were identified through stakeholder consultations as having been successfully implemented on a small scale in all or most districts, and thus were proposed for scaling up across Malawi. The areas available for each of these interventions were then calculated in a GIS using a series of biophysical criteria to determine the hectares available for each intervention within Malawi. In total, nearly 7.7 million hectares, which is 80% of the total land area of Malawi, has opportunities for restoration. Of this area, 6.4 million hectares (67%) is suitable for one restoration intervention and more than 1.2 million hectares (13%) are suitable for two or more restoration interventions. The total opportunities for each restoration intervention are summarized below.

Table 2. *Priority restoration interventions and their estimated opportunities area based on geospatial analysis.*

Priority Restoration Interventions	Opportunity Area (ha)	Percent of country
Agricultural technologies (Conservation agriculture, Farmer-managed natural regeneration, Agroforestry)	3,730,790	39%
Forest management	3,401,279	36%
Soil and water conservation	1,043,768	11%
Community forests and woodlots	753,471	8%
River and stream-bank restoration	36,478	0.4%

Socioeconomic data (e.g., poverty level, flood risk, market accessibility) were used to further refine the areas mapped as suitable for each restoration intervention to assist in prioritizing locations to begin implementation planning.

Refining FLR interventions for food security, resilience and biodiversity

A multi-criteria analysis (MCA) was applied in Malawi to identify where FLR interventions might achieve food security, increase resilience, and support biodiversity. The MCA was used to a) identify priority areas for each scenario and for the combination of all three scenarios and b) align these thematic priorities with the total opportunities area (ha) identified for each of the five identified FLR intervention.

This analysis provides the information necessary to design FLR interventions that can be implemented with specific attention paid to the severity and type of degradation in these areas, and the contributions landscape restoration can make to food security, resilience, and biodiversity. This necessary information can now be integrated into district planning for social an d economic resilience and can unlock different streams of financing for restoration.

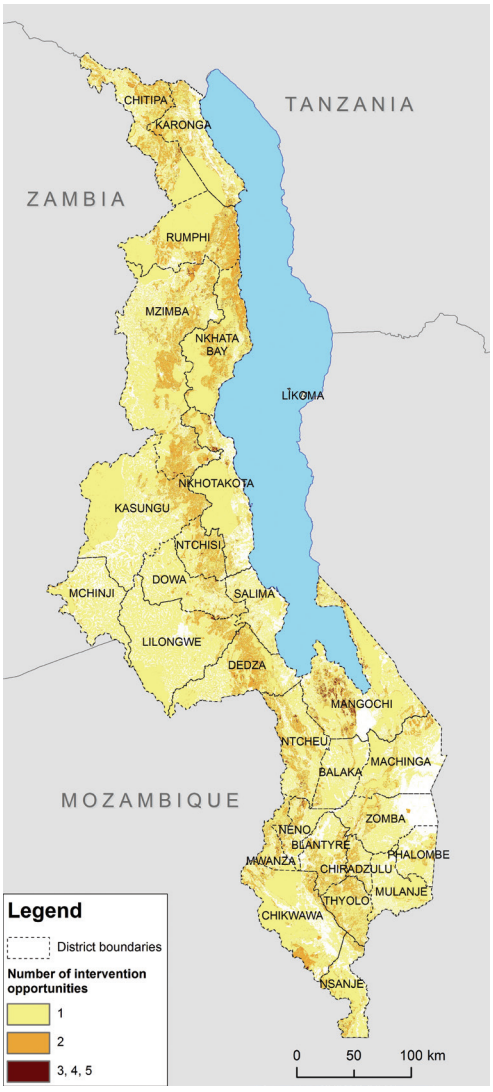

Figure 1. *Map of composite opportunities area in Malawi for one or more restoration opportunities.*

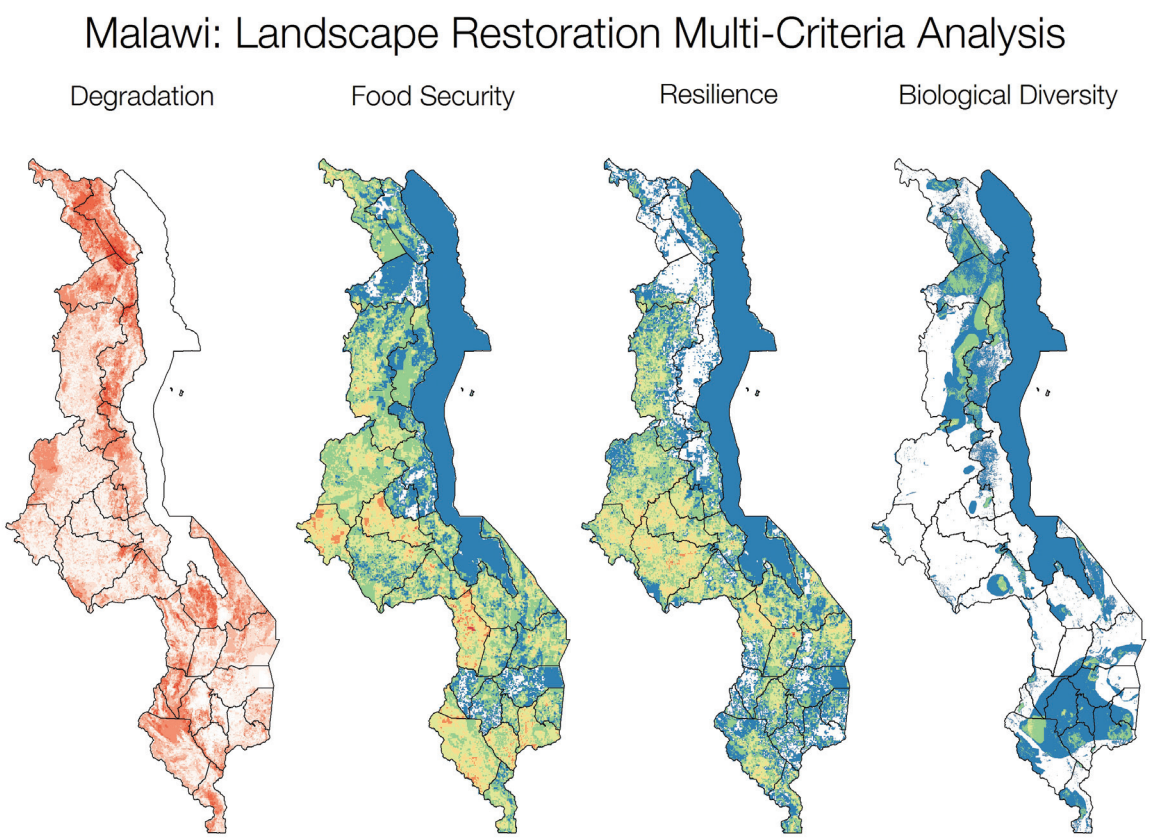

Figure 2. *The base layer representing functional degradation of Malawi and the representation of the three scenarios.*

Key Findings: Economics and Financial Analysis

Malawi has committed to restore 2 million hectares of deforested and degraded land by 2020 and 2.5 million hecatres by 2030 and a financial analysis was conducted to estimate how much funding is needed to achieve this goal. Based on estimated costs and benefits of selected restoration interventions, achieving Malawi's commitment will require approximately 279 billion MWK or approximately 62,000 MWK per hectare, as shown in Table 3. Both public and private funds are necessary to overcome the financial gap between current levels of investment and what is needed to reach the 4.5-million-hectare target.

Malawi Restoration Opportunities assessment is positive and shows that smallholders who adopt these activities would likely be better off in the long run than their peers who did not.

The results from the CBA suggest agricultural technology-based restoration activities produce more private benefits than public benefits and could be paid for with grassroots investments made directly by smallholders and also with funds distributed through private financing businesses like microfinance institutions and

Table 3. *Net present values of restoration activities in Malawi in MKW/ha.*

	Opportunity Cost (NPV_D)	NPV_R	NPV_R with Public Goods	Additional Benefit (NPV_{RT})	Ratio of Public/Private Benefits
Agricultural-based Activities					
Conservation Agriculture	1,478,157	3,019,698	3,021,399	1,541,541	0%
Intensive Agroforestry	1,478,157	3,009,610	3,555,376	1,531,453	11%
Farmer Managed Natural Regeneration	1,478,157	3,606,330	3,726,136	2,128,173	3%
Forestry-based Activities					
Community Plantations and Private Woodlots	1,490,064	7,276,893	7,396,791	5,786,829	2%
Natural Forest Management	1,490,064	-4,302,376	-4,182,478	-5,792,440	3%

Table 4. *Total financial costs of bringing restoration activities to scale in Malawi.*

Land Use	Financial Costs in Excess of Baseline Activity (MWK)	Hectares	Total Financial Cost (Millions MWK)
Conservation agriculture	50,400	200,000	10,080
Intensive agroforestry	200,500	200,000	40,100
Farmer managed natural regeneration	6,400	1,800,000	11,520
Soil and water conservation	50,400	200,000	10,080
Community plantations and private woodlots	103,800	580,000	60,204
Natural forest management & watershed protection	96,500	1,520,000	146,680
Total		**4,500,000**	**278,664**

other businesses that offer farm credit. In contrast, some types of forestry-based restoration interventions, especially activities designed to improve sediment retention or flood control, generate a large number of public benefits. As a result, forest management-based restoration interventions that will positively impact the creation of public goods may be best financed with public funds since their nature may make it difficult for any single investor to capture the benefits and earn a return.

Key Findings: Policy and Institutional Analysis

In terms of motivating factors, Malawi is well-positioned for recognizing the benefits of restoration, but the main barrier to implementation is that a strong and well-understood legal framework with sufficient economic incentives supporting restoration is not in place. In addition, large-scale restoration successes that could inspire commitment to and adoption of restoration practices are not well documented, and similarly, restoration champions are not yet supported with a robust communication strategy. Government leadership and commitment to a national restoration target is not yet widely appreciated.

The biophysical environment is highly conducive to restoration, but barriers to action include unchecked drivers of land degradation (e.g., increasing demand for charcoal), poor enforcement of existing forest-protection laws, social inequity in the beneficiaries of restoration, and ineffective coordination among institutions on restoration programming. Capacity and availability of resources present the greatest barriers to restoration in Malawi, where there is not yet a common approach to accelerate the adoption of restoration interventions.

Key Findings: Gender-Responsive Restoration

To facilitate a gender-responsive national assessment process, a gender working group was organized including representatives from the Ministry of Gender, Children, Disability and Social Welfare (MoGCCD), the Department of Forestry, and IUCN gender specialists. The working group conducted the gender analysis using the Gender Responsive FLR Analysis Framework, and collected data using a questionnaire distributed to representatives from 14 districts as well as using secondary literature.

The data generated from the questionnaires, literature and field visits revealed gendered differences in women's and men's forest access and use, collection and availability of forest products, and commercialization of forest products. For example, gender roles and power relations influence the way various gender categories utilize and conserve agricultural biodiversity. Gender dynamics influence the adoption and expansion of the FLR interventions because men and women have differentiated knowledge and preferences regarding how natural resources are managed, governed and used. Benefits from FLR interventions will also affect more women and girls in areas where they make up a greater proportion of the population. Restoration that is implemented in a gender-responsive manner can advance gender equality in addition to improving ecosystem functioning. Recognizing women's roles in FLR projects through gender-responsive programming can help ensure both women and men in forest-dependent communities can sustainably use and manage land, be included in decision making, and partake in the diverse benefits provided by forest landscapes and ecosystems to bolster local food security and nutrition.

Recommendations

The results of the NFLRA have yielded a number of recommendations for next steps in implementing restoration at scale in Malawi. These recommendations are summarized below by theme.

Stocktaking and Mapping

- Integrate the identified restoration interventions into District Development Plans and resource allocation decisions, using the estimates of intervention opportunities area per district from the NFLRA and additional prioritization through multi-criteria analysis as a guide for setting priorities and orienting interventions, such as:
  - Increase resources to implement agricultural technologies, given that it is the most widespread Restoration Opportunities across Malawi and is key to improving Malawi's food security and the well-being of smallholder farmers.
  - Increase resources devoted to establishing new village forest areas and encouraging private woodlots to remove pressure from forest reserves and help to alleviate poverty by improving availability of forest products, especially fuelwood stocks that are accessible to local communities.
  - Enhance training and assistance for establishing soil and water conservation measures such as check dams and infiltration ditches, to protect investments in croplands from flooding and erosion.
  - Rehabilitate degraded natural forests and protect existing natural forest stands to capitalize on the flood and erosion mitigation benefits and biodiversity value, and prioritize interventions in community-managed forests and national forest reserves located in degraded watersheds close to major water bodies.
  - Provide seedlings and other material resources and associated training to encourage river- and stream-bank tree planting and regeneration to secure water resources and mitigate erosion and flood risks.
- Use the results of the multi-criteria analyses to develop localized, technical FLR intervention packages (based on the unique combinations of MCA input criteria) within each of the five identified restoration interventions areas.
- Reduce threats to food security from climate change, degradation, and deforestation by: (1) Developing local capacities, including extension services, to increase adoption of FLR interventions that specifically address food security and poverty alleviation; (2) Disseminating national FLR food security assessment outcomes to agricultural and food security response programmes to foster cross-sectoral collaboration as well as access to finance for agricultural technologies; and (3) Using the food security and agriculture policy frameworks highlighted in the NFLRA as a platform for greater synergies.
- Enhance and promote resilience through FLR by: (1) Integrating FLR planning in District Development Plans, in particular into disaster risk management projects and programmes; (2) Integrating the national FLR strategy and action plan into the National Resilience Plan and related policies, programmes, and sustainable development planning processes and strategies; and (3) Applying the NFLRA to unlock finance from the Disaster Risk Management and Resilience sector.
- Employ FLR strategies to enhance biodiversity by: (1) Supporting a both a reduction in natural resource provision threats to vulnerable and endangered species and prioritizing areas that are especially important for biodiversity, for example, by using native plant species to restore degraded habitats and corridors, to improve biodiversity in fragmented landscapes; and (2) Using the results of the MCA in the National Biodiversity Strategy and Action Plan (NBSAP) and District Development Plans to support the restoration of areas important to biodiversity, address threats to biodiversity and the challenges affecting implementation of biodiversity programmes.

Economic and Financial Analysis

- Prioritize the implementation of restoration interventions with relatively lower costs and higher benefits such as agricultural technologies including conservation agriculture, farmer managed natural regeneration, and other forms of agroforestry.
- Prioritize the implementation of forestry-based restoration like natural forest management in gazetted forest reserves with steep slopes and near important water resources like the Shire River.

- Provide support for improved data collection, analysis, and monitoring of costs and benefits from a variety of proven restoration interventions as they are implemented at scale.
- Shift domestic government budget allocations from subsidies for mineral fertilizers to support for increased extension services, training and outreach programs.
- Create and support institutions to extend farm credit to smallholders.
- Support active research to improve the monitoring of significant outcomes and impacts of investments in restoration.
- Focus the government public works programme (cash-for-work) scheme on restoration activities.
- Build restoration-focused financial infrastructure at district and community levels.

Policy and Institutional Analysis

- Position FLR as a national priority consistently across policies and laws.
- Position the National Environment Policy (2006) as the overarching framework instrument for forest landscape restoration.
- Harmonize laws and strengthen policies directly related to FLR.
- Establish appropriate legal provisions, incentives, and compliance mechanisms to strengthen enforcement of related laws and policies.
- Integrate FLR into the educational curriculum on climate change being implemented by schools in Malawi.
- Connect the Forest Department with school administrators to strengthen establishment and management of woodlots and tree nurseries on school grounds; assess and improve school and institutional use of fuel wood for cooking.
- Closely involve Traditional Authorities in land use planning, restoration planning, and implementation.
- Build national ownership for FLR interventions through a comprehensive communications strategy.
- Build on supportive cultural aspects that have a bearing on forest use—including *Gulewamkulu* and others—to spur greater community mobilization, and address cultural barriers to restoration including production, transport, and use of charcoal.

Gender-Responsive Restoration

- Use cross-sectoral policies that recognize both gender gaps and women's rights as a mechanism to target women in vulnerable situations and tailor FLR intervention packages to households' needs around livelihoods and income, food security, and water and energy access.
- Increase women's roles in implementing restoration activities.
- Promote women's participation in decision-making at the household, community, district and national levels.
- Promote women's empowerment and access to and control over resources.
- Propose and mainstream FLR implementation in capacity development programmes at all levels, building on the suite of policies outlined in the NFLRA that recognize gender and capacity development priorities.

The information presented in this report demonstrates a comprehensive and practical source of knowledge, tools, and information to facilitate Malawi's national commitment to landscape restoration.

Introduction

This report presents the results of the National Forest Landscape Restoration Assessment (NFLRA) for Malawi. It aims to equip the Government of Malawi with a framework to address land degradation and deforestation, and to leverage both technical support and financing to implement FLR at scale.

The NFLRA process was launched in February 2016 by the Minister of Natural Resources, Energy and Mining in close collaboration with government departments in the Ministries of Agriculture, Water and Irrigation, Lands, Local Government, Finance and Economic Planning, and Gender and Social Services and other concerned stakeholders. The national assessment was designed to identify degraded and deforested land, and to prioritize intervention needs and opportunities for the restoration of the productivity and ecological function landscapes in Malawi.

National goals for forest landscape restoration in Malawi are to:

- Increase agricultural productivity and food security
- Enhance community resilience to climate change
- Address water scarcity for household consumption, irrigated agriculture and hydropower generation
- Enhance the availability and sustainability of biomass energy, and other forest products

Implementation of many of the suggestions in this report will also accelerate progress towards achieving Malawi's 4.5 million hectare restoration commitment. The Government of Malawi established this target in September 2016 to capture the benefits afforded by forest landscape restoration and to make significant contributions to the achievement of national development objectives, Aichi Targets, and multiple Sustainable Development Goals related to hunger, climate action, and poverty alleviation among others.

Restoring degraded and deforested land in Malawi will help to achieve these development objectives and address underlying challenges of food insecurity, water shortages, lack of sufficient or alternative sources of income in rural areas, vulnerability to climate change and natural disasters such as drought, floods and severe storms. Successfully restoring degraded land can also help to address the challenges of declining soil fertility and low crop yields, high rates of erosion and rainfall runoff and interrupted stream flow. Restoration can also be a means to address the growing demand for charcoal and the negative impacts of unsustainable charcoal production.

At IUCN Congress in September 2016, Malawi formally pledged 2 million hectares by 2020 and 2.5 million hectares by 2030 to the Bonn Challenge, for a total of 4.5 million, which AFR100 is also counting, as stated and as a contribution to the regional target of the AFR100 initiative to restore 100 million hectares throughout Africa by 2030.

Initial estimates of landscapes targeted for restoration amount to 1.5 million ha for improved forest management and 3 million ha for increased tree cover and soil and water conservation on agricultural land, including river and stream-bank restoration. Additionally, while National Forest Landscape Restoration Opportunities Assessment and Restoration Opportunities Assessment Methodology is present throughout Malawi, analyses identified specific localities that would benefit the most from FLR activities. The combined area represents 48 percent of Malawi's land area. Further information about the extent of opportunities to scale up these FLR practices, the drivers of degradation that can be addressed, and the knowledge and information to do so is presented in this assessment report. In addition to the main technical report, supporting reports for each district have been prepared to summarize the results of district level consultations with stakeholders about degraded landscapes that are most in need of restoration, and recently completed and on-going restoration successes that could be scaled up.

To guide the implementation of this NFLRA and to mobilize the necessary investments from the public and private sectors, Malawi is preparing a National Forest Landscape Restoration (FLR) Strategy. The strategy will present key findings and recommendations from the NFLRA to: highlight restoration opportunities and priority areas for implementation, present a framework for priority interventions, and make the case for investing in FLR implementation. It will highlight measures to enable and encourage Malawians in civil society, the private sector, and government to restore degraded and deforested landscapes.

Report roadmap

This report includes the following information:

- Executive summary of the assessment report, including key findings
- Report introduction including a summary of the results of the pilot application of the National Forest Landscape Restoration Opportunities Assessment and Restoration Opportunities Assessment Methodology (ROAM) in the Machinga District
- Description of the process used to apply ROAM tools and methods at the national level
- Review of the major challenges and drivers associated with land degradation and deforestation, and identification of major goals and objectives of restoration interventions
- Detailed results from the mapping of opportunities to implement five types of restoration interventions which were identified as having the greatest potential for scaling-up across Malawi to address existing degradation and land use challenges: 1) Agricultural technologies (including conservation agriculture or CA, farmer-managed natural regeneration or FMNR, and agroforestry or AF); 2) Establishing community forest areas and woodlots; 3) Improving natural forest and plantation management; 4) Implementing soil and water conservation measures; and 5) River and stream-bank tree-planting and natural regeneration
- Each intervention includes analysis of:
  - Institutional and policy opportunities and constraints, including the identification of "key success factors" for the widespread adoption of the restoration intervention at scale;
  - Economic and financial costs and benefits of restoration at scale, including detailed activity budgets for a cost benefit analysis for targeted restoration interventions, sensitivity and gap analysis, national cost estimates and a review of the financial resources available; and
  - Gender aspects and implications for gender-responsive restoration strategies
- Results from a multi-criteria analysis of restoration priorities with attention to optimizing outcomes for improved food security, resilience and ecosystem function.
- Consolidated synthesis of findings and recommendations, summarizing actions and actors to implement FLR at scale.

ROAM pilot in Liwonde landscape

A pilot application of the National Forest Landscape Restoration Opportunities Assessment and Restoration Opportunities Assessment Methodology (ROAM)[1] was carried out in the Liwonde Forest Reserve landscape in Machinga District between October 2015 and February 2016 by the Department of Forestry and USAID/ Malawi-funded Protecting Ecosystems and Restoring Forests in Malawi (PERFORM) project with technical support from the World Resources Institute. This pilot activity organized stakeholder consultations with district officials, traditional authorities, local communities and development partners in Machinga to identify specific land use challenges, the scope and extent of major types of restoration interventions that could be scaled-up in the targeted landscape, the key factors and specific barriers to be overcome for successful implementation of restoration, including recommended next steps.

The Machinga District and Liwonde Forest Reserve landscape were selected for this pilot activity due to the scale of degradation and deforestation noted by prior assessments and data collection efforts, and recognition that this landscape could benefit greatly from restoration. Information from baseline surveys and other analysis conducted in 2014-2015 by the PERFORM team provided extensive background information about the "who" and "why" of forest loss in Machinga and direct drivers of deforestation and forest degradation in the Liwonde Forest Reserve. The assessment team carried out a preliminary diagnostic of political, institutional, financial and socio-economic barriers to be addressed in order to implement restoration at scale in the district. Critical barriers were related to land use pressures and declining soil fertility, low literacy, high dependency on firewood and charcoal from natural forests, weak coordination of upstream and downstream interventions, deficiencies in enforcement of existing regulations governing sustainable use of forest resources, and limitations in extension, training and technical support for scaling up restoration practices through integrated landscape management.

1 The Restoration Opportunities Assessment Methodology (ROAM), produced by IUCN and the World Resources Institute (WRI), provides a flexible and affordable framework for countries to rapidly identify and analyse areas that are primed for forest landscape restoration (FLR) and to identify specific priority areas at a national or sub-national level. See more at: www.iucn.org/roam

Stakeholder participation in workshops and field visits provided insights into where restoration could be socially, economically and ecologically feasible, and enabled the assessment team to identify and map the extent of restoration opportunities in the Liwonde landscape. A geospatial analysis was performed using more than a dozen datasets related to biophysical, geographic and topographic features. Using identified criteria for specific types of observed restoration practices, the area of land suitable for scaling up these proven practices were mapped. Out of the total area of 110,813 hectares in the targeted landscape, the assessment process identified 62,934 ha or 57% of the landscape where one or more of the proposed restoration interventions could be implemented. The largest restoration opportunities were natural forest management (23,923 ha), and agricultural technologies including conservation agriculture (14,939 ha), and other agroforestry practices on cropland such as farmer-managed natural regeneration (7,954 ha). Smaller areas were identified as having opportunities to implement restoration through check dams and contour bunds for erosion control and water harvesting, assisted natural regeneration of degraded forests, promotion of village forests and woodlots, and tree planting and assisted regeneration along stream-banks.

In addition, key success factors associated with successful restoration practices—those already being implemented on the ground and delivering a range of benefits to local communities—were discussed and summarized. The Liwonde assessment team identified both priority interventions and priority areas for implementation—with a focus on communities that have strong leadership, active community-based organizations, devolution of authority, and effective enforcement of bylaws to protect and regenerate trees across the landscape. Additional recommendations included development of communication and capacity building strategies to support extension and peer-to-peer learning about restoration interventions, and facilitation of multi-sector, integrated landscape management approaches. Stakeholder workshops at the district and national level were organized to obtain feedback of the assessment results and to discuss next steps and priorities for local level implementation.

1. NFLRA process

Background

The NFLRA process was launched following the National Forest Landscape Restoration Opportunities Assessment and Restoration Opportunities Assessment Methodology assessment conducted in Malawi's Liwonde landscape. After preliminary findings from the Liwonde landscape had been presented to the Department of Forestry and other stakeholders, the Minister of Natural Resources, Energy and Mining launched a follow-on assessment at national scale. As noted in previous sections, this assessment report aims to highlight opportunities to apply FLR as a pathway for achieving Malawi's national and international commitments on environment and development.

Process

National leadership for the NFLRA was provided by the Department of Forestry. A multi-sector national Task Force was organized to guide and support the national assessment process. The Task Force was supported by three technical Working Groups organized to oversee stocktaking and mapping activities, policy and institutional analysis, and economic and financial analysis. Field visits and consultations with communities were a central component of the assessment.

The main activities of the NFLRA process were organized from February to November 2016 with technical and financial support from the USAID/Malawi-funded PERFORM project. Additional assistance was provided by the World Resources Institute (WRI) with support from BMZ, and by the International Union for the Conservation of Nature (IUCN) with support from UKaid.

WRI and IUCN supported the NFLRA team in Malawi to apply tools and methods documented in the Guide to the National Forest Landscape Restoration Opportunities Assessment and Restoration Opportunities Assessment Methodology (ROAM). ROAM provides a flexible framework to rapidly assess the opportunities for forest landscape restoration (FLR) at the national and sub-national levels.

In Malawi, the key steps involved in the national assessment, supported by ROAM tools and methods included:

- Stakeholder consultations at national, district and rural community levels
- Stocktaking of successful restoration interventions, with participation from all 28 District Assemblies in Malawi
- Spatial analysis and mapping of degradation and restoration opportunities
- Economic and financial analysis of restoration costs and benefits
- Identification of baseline information and proposed monitoring indicators
- Policy and institutional analysis in support of restoration
- Stakeholder consultations to ensure gender responsive restoration

Outputs from each of these steps informed opportunities assessments for five restoration interventions and the relative impact of each intervention. Specifically, focal interventions are:

Gender mainstreaming throughout the NFLRA aimed to ensure that both women and men are involved in planning and implementing restoration activities, that these activities respond to their different needs, and that both groups share the benefits of restoration in an equitable way. The assessment involved equal and active participation of stakeholders in decision-making processes on FLR interventions and implementation, which helped to clarify gender-differentiated practices and knowledge in relation to natural resources. Gender mainstreaming entailed a focus on:

- Identifying primary stakeholders of forests, forest management and agricultural practices;
- Strengthening or creating equitable systems for benefit sharing, equal land and resource rights as well as supporting the effectiveness and sustainability of restoration outcomes;
- Contributing to the effective participation of women and men in decision-making;
- Augmenting the positive impacts of healthy landscapes on the livelihoods of women and men;
- Generating financial opportunities for FLR-related institutions and initiatives; and
- Weakening and eliminating institutional gender biases.

For methodology used please refer to Annex 14: Gender responsive NFLRA.

Table 5. *Opportunities assessments for the five restoration interventions and their relative impact.*

Types of FLR Interventions	***Targeted Areas and Restoration Objectives***	***Example approaches to implement FLR at Scale***
1. Agricultural technologies (conservation agriculture, farmer-managed natural regeneration, and agroforestry)	Increase tree cover on degraded, low-yielding cropland and pastures in agricultural landscapes	Engage farmers and herders to protect and manage regeneration of shrubs and trees on farms through farmer-managed natural regeneration (**FMNR**); combining FMNR and tree planting with conservation agriculture and **climate-smart agriculture**
2. Community forests and communal/private Woodlots	Restore forest cover of degraded customary forest land and non-arable land, and expand woodlots in agricultural landscapes	Protect **graveyard forests**, expand area and improve management of **village forests** (managed by communities) and **woodlots** (managed by individuals and small groups) through demarcation, cultural institutions and norms, bylaws and agreements for protection, fire control, sustainable use and regeneration
3. Forest management	Restore forest cover and improve management in degraded and deforested forests, including forest reserves and other protected areas, natural forests outside reserves, and plantations	Strengthen **participatory forest management** with a focus on improved protection, enrichment, regeneration, sustained yield harvesting and equitable benefit distribution through community based management and co-management of **forest reserves** and other protected areas
4. Soil and water conservation	Conserve soils and increase infiltration in areas with high rates of rainfall runoff, erosion and source areas for downstream sedimentation	Expanded extension and community mobilization to construct **check dams, gully plugs, infiltration ditches**, assisted natural regeneration and **reforestation**
5. River and stream bank restoration	Increase tree cover in denuded buffer zones of rivers and streams	Expanded extension and community mobilization for **tree planting** (afforestation, reforestation) and **assisted natural regeneration** along streambanks

2. Rationale for Forest Landscape Restoration in Malawi

Extent and drivers of land degradation and deforestation

Land degradation is a physical process leading to the long-term loss of ecosystem functions and land productivity. Land degradation through soil degradation, soil erosion and nutrient loss creates significant economic, social and environmental challenges in Malawi that include lower crop yields, a reduction of food production from dry season irrigated gardens, and decreased food and livelihood security. Degradation has also been shown to shrink the supply and raise the price of wood energy, increase the time burden of collecting firewood (and the labor burden borne largely by women and children). Landscape degradation affects climate regulation, lowering resiliency to climactic shifts, and increasing the risk both of floods and of drying of seasonal streams thus lowering the water table (Akinnifesi, Makumba, and Kwesiga 2006).

Data on land use/land cover in Malawi varies considerably, along with the estimates of the country's forest resources and deforestation rates. Malawi does not have a national land cadaster or an approved land use land cover classification. Recent efforts supported by various donors indicate considerable differences in estimations of forest cover and rate of deforestation. Approximately one third of Malawi's land area is classified as forest, and includes the area of forest reserves and other protected areas, national parks and game reserves, government and private plantations, and natural and planted forests on customary land (FAO, 2010). Most of the natural forests of Malawi are Miombo woodlands with relatively low annual growth rates.

Table 6. *Deforestation between 1972 and 1992 in Malawi (Source: Kainja, S, 2000).*

Region	1972 Forest Extent (ha)	1992 Forest Extent (ha)	Forest Lost (ha)	Rate of Deforestation (%)
North	1,507,266	470,238	1,037,028	3.4
Central	1,488,110	777,217	710,893	2.4
South	1,404,510	650,860	753,650	2.7
Total	4,399,886	1,898,315	2,501,571	2.8

A study on forests in Malawi published in 2000 indicated that 57 percent of Malawi's forests were lost between 1972 and 1992; a comparison of Landsat images from these two periods indicated that the forest cover declined from 4.4 million hectares to 1.9 million ha. This represents an annual loss of 2.8% or 125,079 ha/year, totaling 2.5 million ha during this period of 20 years (Kainja, 2000).

Consistent with estimates developed by the Department of Forestry and PERFORM, the Global Forest Watch (GFW) mapping tool indicates that Malawi has about 2 million ha with 30% tree cover (WRI, Global Forest Watch). This amounts to about 16% of the country. Estimates of tree canopy cover loss in 2014 based on data from Global Forest Watch amount to approximately 16,000 ha (or 0.8%).

In strictly economic terms, land degradation cost Malawi an estimated $244 million between 2001 and 2009 (Kirui, 2015). The Government of Malawi (GoM) has estimated that 29 metric tons of soil per hectare are lost each year, costing the country an estimated 8% of its annual gross domestic product (GDP) (GOM 2001). Unchecked deforestation and land degradation are currently impacting hydro-electric power generation, decreasing an already limited supply of electricity and increasing costs to consumers. The Water Boards, responsible for the supply drinking water to urban residents, have been similarly impacted by reductions in supply and increased costs for treating drinking water. Watershed degradation also undermines the successful development of Malawi's potential for expansion of irrigated agriculture.

There are numerous indirect drivers of degradation, most notably a lack of alternatives to firewood and charcoal for household energy use; forest clearing on traditional land driven largely by agricultural expansion; and inadequate policies to address land use pressures including for tobacco and brick production. Other indirect drivers stemming from agricultural activities include inadequate policies and strategies to boost crop yields, adverse agricultural policies promoting ridge tillage and practices that impede the adoption of conservation farming, subsidies for mineral fertilizers, and inconsistent guidance from extension workers on sustainable land management practices. Indirect drivers related to forest resource use include population growth and urbanization,

weaknesses in forest governance and law enforcement, insufficient devolution of rights to communities and land managers, and insufficient incentives and technical support for participatory forest management and scaling up of restoration interventions. These drivers, along with the demand for poles and stakes associated with tobacco farming and curing have also contributed to the pressure on tree and forest resources and to their unsustainable use. The lack of involvement of traditional authorities was also cited. Climate change is also an increasingly important factor that can exacerbate land degradation during periods of irregular rainfall, droughts and floods; it is also an indirect driver of degradation in that it intensifies unsustainable coping strategies.

District and national-level participants in zonal workshops cited a long list of direct drivers of deforestation and degradation. Unsustainable harvesting for commercial firewood and charcoal production and agricultural expansion (including hillside and riverbank cultivation) emerged as the most significant direct drivers. Other direct drivers include brick and tobacco production, overgrazing, bush fires, and—to a lesser extent—mining and quarrying. Insufficient documentation on best management practices and a shortage of a resources to document and publicize restoration successes are also contributing factors. Lastly, community mobilization and extension efforts are undermined by the lack of widespread understanding of the economic benefits of targeted restoration practices at the landscape scale.

Table 7. *The benefits of FLR interventions in Malawi.*

Paradigm shift potential within the current practices in agriculture and forestry	**Forest Landscape Restoration Interventions and potential benefits for poverty alleviation and food security (Annex 20)**
Agriculture: 3.82 million MT of maize (assumes maize is grown on 2.4 million hectares at an average yield of 1.6 tons per hectare)	Restoring 2.4 million hectares of degraded cropland would increase maize production by 1.55 million MT per year, an increase of 40 percent. The total additional cost of increasing production would equal approximately 2.4 billion MWK. Based on this cost, each additional ton of maize would cost approximately 46,300 MWK. Although, it is not recommended to solely rely on this estimation, the CBA results of this study indicate the additional outputs to food availability from maize production. The income is also estimated to increase through improved crop yields. According to World Agroforestry Centre survey the Malawian farmers who have adopted agroforestry farming methods have reported increase in maize yields, increase in income as well as improved food security (Kaczan, Arslan, Lipper, 2013).
Forests in Malawi are a significant source of income for households and communities, but their unsustainable use is threatening the ability of forests to continue to serve this role, but restoring degraded forests with more sustainable management practices could improve household income.	In the absence of the humanitarian assistance, food security is likely to deteriorate for already impacted households. Half of the population are already living on less than US$1 per day. According to the results from the cost benefit analysis, restoring degraded forestland with community woodlots, natural forest management, pine plantations, and soil and water conservation forest activities would increase household income by 2.9 to 3.1 million MWK in present value terms over a 20-year period. From these finding, CBA indicates the increase farmers' purchasing power to access additional food.
Non-timber forest products can be a significant resource for women and men from communities living near forests. Women for example can use NTFPs to supplement their agricultural activities by foraging for wild food, like mushrooms and insects. Additionally, NTFPs can provide a source of cash income in difficult circumstances. As forest areas in Malawi continue to be degraded through encroachment and over use their ability to produce NTFPS is threatened, but their ability to supply NTFPs can be restored.	Wide-scale adoption of natural forest management could increase the flow of NTFPs by as much as 164 billion MWK, annually. Results from the stakeholder engagements suggest that a hectare of forest restored with natural forest management could produce 100,000 MWK of NTFPs each year. In total, there are approximately 1.6 million hectares of degraded forest that could be restored with natural forest management. Studies have shown that NTFPs serve as additional source of income and serve as safety nets at the time of crop failure and during the lean season. (Cavendish, 2002; Kristensen and Balslev, 2003; Angelsen and Wunder, 2003; IUCN, 2015).

FLR can enhance food security and alleviate poverty

One of the most critical benefits that restoration can achieve is enhanced food security. A number of restoration activities have the potential to improve food security in Malawi. For instance agroforestry, FMNR, conservation agriculture, and other restoration-related agricultural technologies that directly respond to the causes of land degradation and improve soil fertility could improve yields by 50 to 250% (Saka, 1994). Wide-scale adoption of these activities could increase crop yields by 40%, which would increase yields from 1.6 tons per hectare (average maize yield in Malawi in 2006, as cited in the 2006/7 National Census of Agriculture and Livestock) to 2.25 tons per hectare. Maize yields in particular could be increased by 1.55 million metric tons per year at an average cost of 46,300 MWK per MT.

Restoration can also contribute significantly to poverty alleviation. Cost-benefit analysis suggests that restoration activities with forest tree species could improve household incomes, in present value terms, by 1.5 to 2.1 million MWK over a twenty-year period. Additionally, restoring degraded and fragmented forests with natural forest management could increase the supply of non-timber forest products (NTFPs) by as much as 164 billion MWK each year. Table 12 details the potential benefits that restoration can bring in Malawi.

3. Restoration interventions and opportunities areas

A Stocktaking and Mapping working group led the process to identify which restoration interventions are possible in, and best suited to, various areas in Malawi. The working group—comprised of geospatial experts, field practitioners, gender focal points, and other technical specialists from a range of government, intergovernmental, NGO, and civil society organizations including Malawi's Department of Forestry, Department of Surveys, Land Resources Conservation Department, Department of Agricultural Extension—participated in field visits, assisted with data collection and guided the spatial data analysis and mapping process.

A key activity of the working group was to "take stock" of restoration successes, both large and small, which included visits and consultations with rural communities and actors at the field level. These field visits provided opportunities to discuss with communities what land use challenges and drivers of degradation are most prevalent, and then identify what types of specific restoration interventions or approaches are working to address these issues. Sites visited were located in Blantyre, Mwanza, Mzuzu, Rumphi, Kasungu and Lilongwe districts, and included several projects such as the Community Vitalization and Afforestation in Middle Shire (COVAMS II), the Improved Forest Management for Sustainable Livelihoods (IFMSLP) Programme and the Protecting Ecosystems and Restoring Forests in Malawi (PERFORM) project.

In addition to these field visits, the working group conducted a series of workshops designed to capture information at the district level, where representatives from Malawi's 28 districts provided information on local-scale restoration activities and development objectives. This information was vital because much of the planning and resource allocation for development projects occurs at the district level.

Taken together, the results from the field visits and the zonal stocktaking workshops indicate the following about the status of restoration in Malawi:

- Rural communities are motivated to restore land for a variety of reasons; the most often cited reasons are to: improve soil fertility, boost crop yields, reduce erosion and siltation in waterways, increase supplies of firewood and other forest products, secure sources of income, and reduce impacts from flooding.
- Many examples of restoration practices are in place throughout Malawi, including many that have been supported by different rural development and environmental conservation projects. The most commonly implemented restoration interventions are: conservation agriculture, soil and water conservation, river and stream-bank tree planting, agroforestry, and afforestation.
- More efforts are needed to closely assess the costs and benefits of specific restoration practices and interventions over time to guide strategies to scale up the most successful and cost-effective practices.
- Project-assisted efforts to control erosion and conserve soil and water have been sustained in cases were water supplies and agricultural production were increased.
- Farmers are incorporating new crops such as pigeon pea and other legumes into their farming system, with apparently beneficial effects on soil fertility and income; improved access to information as well as seeds and political as well as technical support seem to have played a critical role in accelerating adoption.
- Major investments in commercial forest plantations have not yet resulted in the successful development of large-scale expanses of sustainably managed tree plantations and expansion of forest based enterprises.
- Farmer-managed natural regeneration (FMNR) has been broadly adopted in many areas in Malawi, driven by the need to restore soil organic matter, and to increase crop yields and supplies of wood, fodder, fruit and other products from farming systems.

The field visits and workshop consultations enabled the working group to identify critical landscape challenges at national and district levels and synthesize information on successful restoration interventions in Malawi that have potential to be scaled up beyond local level.

The following biophysical and socioeconomic challenges related to land use were identified as being most critical in Malawi:

Table 8. *The biophysical and socioeconomic challenges related to land use.*

Biophysical:	**Socioeconomic:**
Declining soil fertility	Food insecurity
Soil erosion	Poverty
Poor land husbandry	Limited income sources
Deforestation and reduced forest cover	Limited energy sources
Poor water quality	Increased burden on women-led households
Climate (flood/ drought)	Reduced availability of timber products
Water shortage	Limited land holding sizes

The following restoration interventions were demonstrated to have been successfully implemented on a small scale in all or most districts, and thus proposed to address the above challenges:

1. Agricultural Technologies (CA, FMNR, and AF)
2. Community forest areas and woodlots (including: private woodlots/village forest areas)
3. Forest management (including: protection of existing natural forest; rehabilitation of degraded and deforested forest areas; improved management of existing plantations)
4. Soil and water conservation (including: check dams, gully protection, terracing, contour bunds, infiltration trenches, and/or ridges)
5. River and stream-bank restoration (including: tree planting and/or natural regeneration along rivers/ streams)

With guidance on data and methods from the working group, a geospatial analysis was performed to quantify the opportunities for restoration in Malawi. The analysis incorporated more than a dozen geospatial datasets representing biophysical, geographic and topographic information. Proposed locations for, and potential extent of, each intervention are detailed below. These data were consolidated into a geographic information system (GIS), where criteria associated with each type of potential restoration intervention were applied. The datasets representing these criteria were overlaid and combined with each other, and areas where they intersected were identified as opportunities areas. This process was replicated for each of the restoration interventions identified by stakeholders to create maps of opportunities areas. Areas were summarized at the district level to convey opportunities within an applicable context.

Prioritizing FLR interventions using socio-economic data

Following the development of the intervention opportunities maps, which is based primarily on biophysical criteria, a second “prioritization” analysis was performed that incorporated more information on socioeconomic and environmental conditions that are highly relevant to the land use challenges that are being addressed by the intervention. The purpose of this second analysis was to identify those areas that either had the greatest chance of success or would likely lead to the greatest benefits for local communities given the socioeconomic and environmental conditions, and target these areas for implementation of those interventions. Socio-economic indicators related to food insecurity, poverty, gender, and poor market access were included among other indicators.

3.1 Agricultural technologies (conservation agriculture, FMNR, agroforestry)

Agricultural technologies refer to any type of intercropping of trees with crops and include conservation agriculture (CA), farmer-managed natural regeneration (FMNR), and agroforestry (AF). Trees on croplands stabilize the soil and improve soil fertility, which helps to boost crop yields and increase food security, with the added benefit of providing fodder for grazing animals. FMNR is a specific type of agricultural technology in which farmers do not plant trees but rather manage and cultivate the natural regrowth of trees on their farms instead of eliminating them. FMNR also uses leguminous – or nitrogen fixing – trees to enhance the productivity of agricultural land and research has shown that farmers who have adopted the activity have seen yields increase by between 50-250% (Saka, 1994). Natural regeneration can originate from multiple sources, including livestock waste, root systems, or seed (outlined in the graphic below).

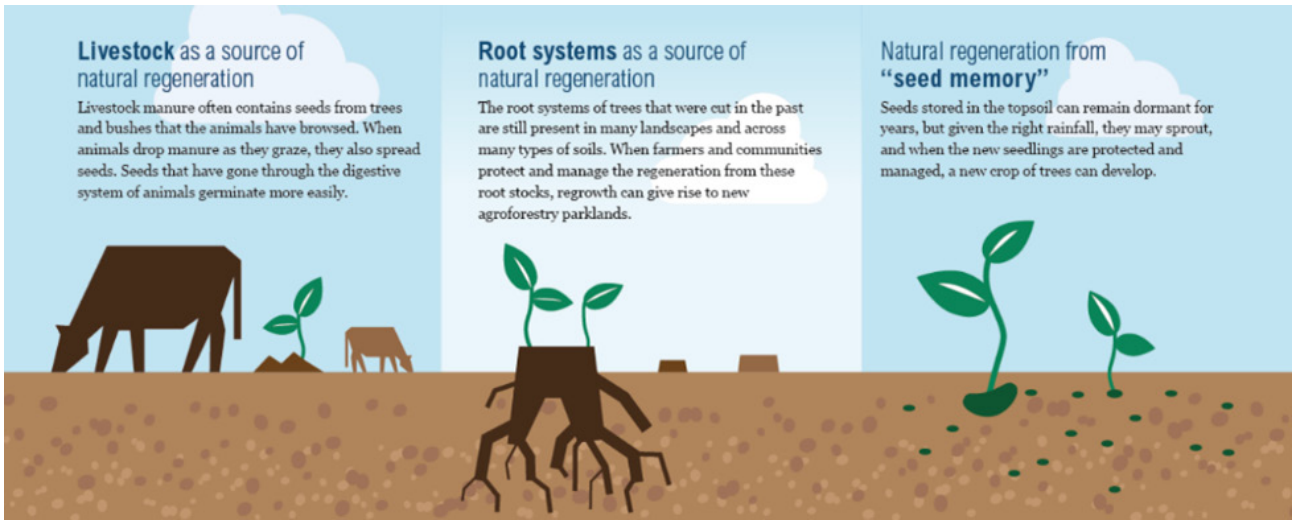

Figure 3. *Sources of natural regeneration. Source: WRI, Scaling up Re-greening - 6 Steps to Success.*

3.1.1 Intervention mapping: Agricultural technologies

Mapping areas potentially suitable for agricultural technologies (including CA, FMNR, AF) were mainly defined as areas of annual cropland with very low or no existing tree cover. The data inputs included land use/land cover classified as annual cropland, tree canopy cover less than 15 percent, slope less than 20 percent, and exclusion of protected areas or forest reserves. The slope threshold was implemented to exclude marginal lands that are unsuitable for any type of agriculture because of their steepness, even if they are already under cultivation. Combining these datasets produced the map of opportunities area for agricultural technologies (CA, FMNR, AF), as shown in Figure 4. The total opportunities area for agricultural technologies (CA, FMNR, AF) in Malawi is 3.73 million hectares, which is nearly 40% of the total land area of the country. Figure 4 summarizes the opportunities area as a proportion of the total area of the district.

The potential for agricultural technologies (CA, FMNR, AF) is the highest of any of the restoration interventions mapped as part of this analysis. Because the opportunities are so expansive, the prioritization criteria are a particularly important first step in planning targeted implementation where the intervention is needed most to address relevant social or environmental issues. Three socioeconomic and climate-related conditions with available data were identified and agreed upon by stakeholders as those where agricultural technologies (CA, FMNR, AF) could have the greatest impact. The three prioritization criteria overlaid with agricultural technology opportunities were: 1) areas of highest poverty, defined as areas where more than 70 percent of the population is living on less than $1.25 USD per day; 2) areas of highest food insecurity, where food stocks were at stressed or critical levels in 2014 and 2015; and 3) areas of highest drought exposure, which composites data on population density and drought likelihood (Table 9). While many factors influence the ultimate selection of implementation sites, including many that are difficult to map due to a lack of data, such as willingness and interest of communities, these prioritization criteria provide a high-level estimate of where to start focusing implementation plans.

The final step in the prioritization approach was to combine the three criteria into a composite map to show where multiple priorities could be achieved (Figure 9). Based on the composite criteria, the districts with the greatest potential for agricultural technologies (CA, FMNR, AF) to collectively alleviate poverty, improve food security, and/or alleviate drought effects are in Mulanje, Nsanje and Phalombe districts.

3.1.2 Institutional and policy implications from agricultural technologies

Policies and institutions working group members cited numerous agriculture, forest, and climate policies that could be better harmonized to create an enabling environment that fosters widespread adoption of restoration-related agricultural technologies such as conservation agriculture and FMNR. Landscape-level governance will require the alignment and joint action of many institutions supported by appropriate and, where possible, progressive policies, laws, and regulations. The need to strengthen cross-sectoral linkages and enhance policy coordination relevant to FLR is reflected in the National Agriculture Policy (2016), which is a 5 year guide for developing agricultural policies and strategies for sustainable agricultural production among other areas.

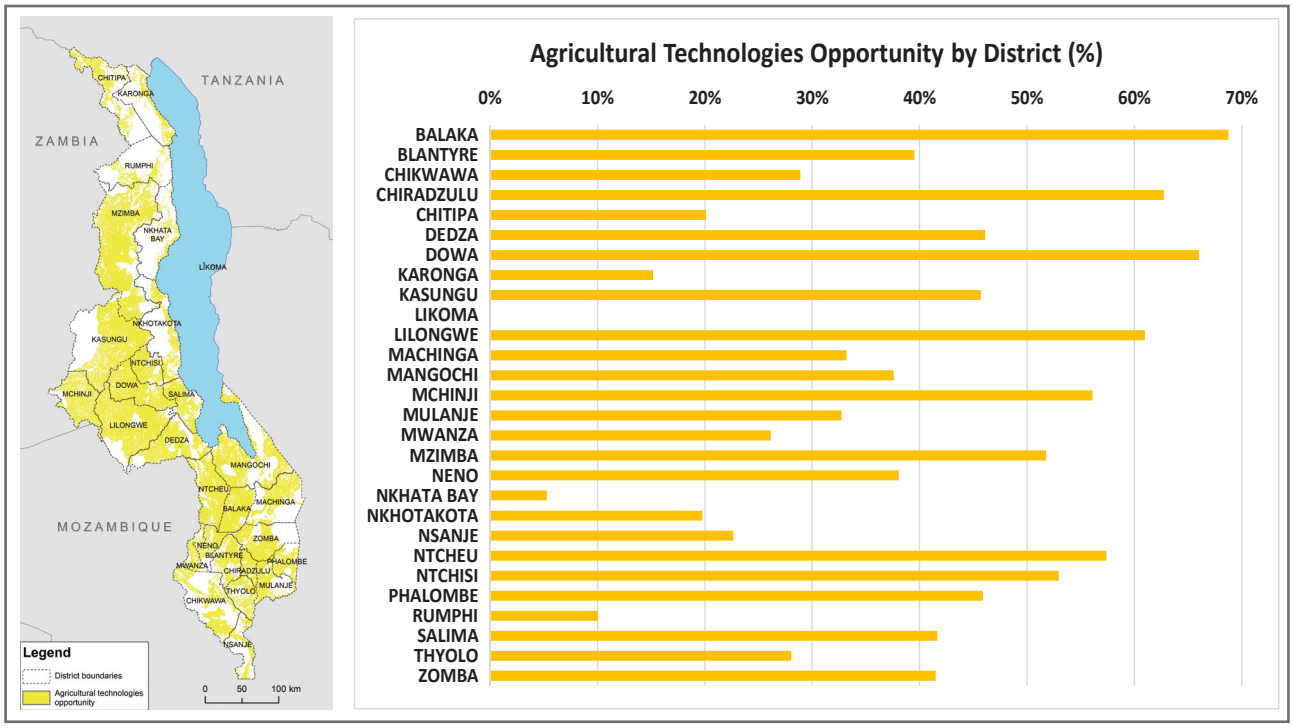

Figure 4. *Map of agricultural technologies opportunities area, and agricultural technology opportunities by district.*

The National Forest Policy (2016), which focuses on sustainable management of forest resources and promotes regeneration and agroforestry practices as a means of enhancing Malawians' quality of life and achieving sustainable development goals. The policy has strong linkages with other sectoral policies including the National Land Policy (2002)—which encourages community and village development organizations to practice agroforestry on community lands.

The National Climate Change Policy (2015) includes a focus on adaptation and mitigation in the agriculture sector and can be a useful tool to drive large-scale implementation of agricultural technologies. The policy advocates for integration of climate change strategies into agriculture programs, and emphasizes agroforestry as an important approach to boosting climate change resilience, increasing carbon storage, and strengthening food security and household income. The National Climate Change Investment Plan (2013) also highlights agriculture as a key sector through which enhance climate change resilience, while Malawi's National Adaptation Programme of Action (2006) outlines agricultural interventions aimed at boosting women's resilience to climate change.

A mechanism—likely stemming from the suite of climate change legislation, policies, and plans—can be developed to integrate policy and law development and prevent these processes from occurring in sectoral silos. Complementary processes are needed to align formal policy and law development with informal community-based and government-related cultural practices.

There are multiple key success factors that could be leveraged to enable the widespread adoption of restoration-related agricultural technologies. This includes the preparation of documentary films, rural radio programs and other efforts that amplify farmers' voices in raising awareness about the full range of benefits of technologies like FMNR. Additional success factors include: developing more coherent, coordinated extension materials and training programs; facilitating farmer visits and peer-to-peer trainings; reinforcing the security of tree tenure on cropland; and strengthening the authority of local leadership to enforce community

Table 9. *Criteria selected for prioritizing implementation of agricultural technology (CA, FMNR, AF) activities.*

Prioritization Criteria	**Justification**
Gender	Areas of high proportion of women and women-led households will benefit most from local, easily accessible sources of fuelwood, since women are most often collect it for their households.
Access to markets	Locations with better market access have more opportunities for supplement income from selling forest products.
Poverty	Areas of high poverty (where the majority of the population lives on less than $1.25 USD per day) are in greater need of sustainable fuel wood sources.

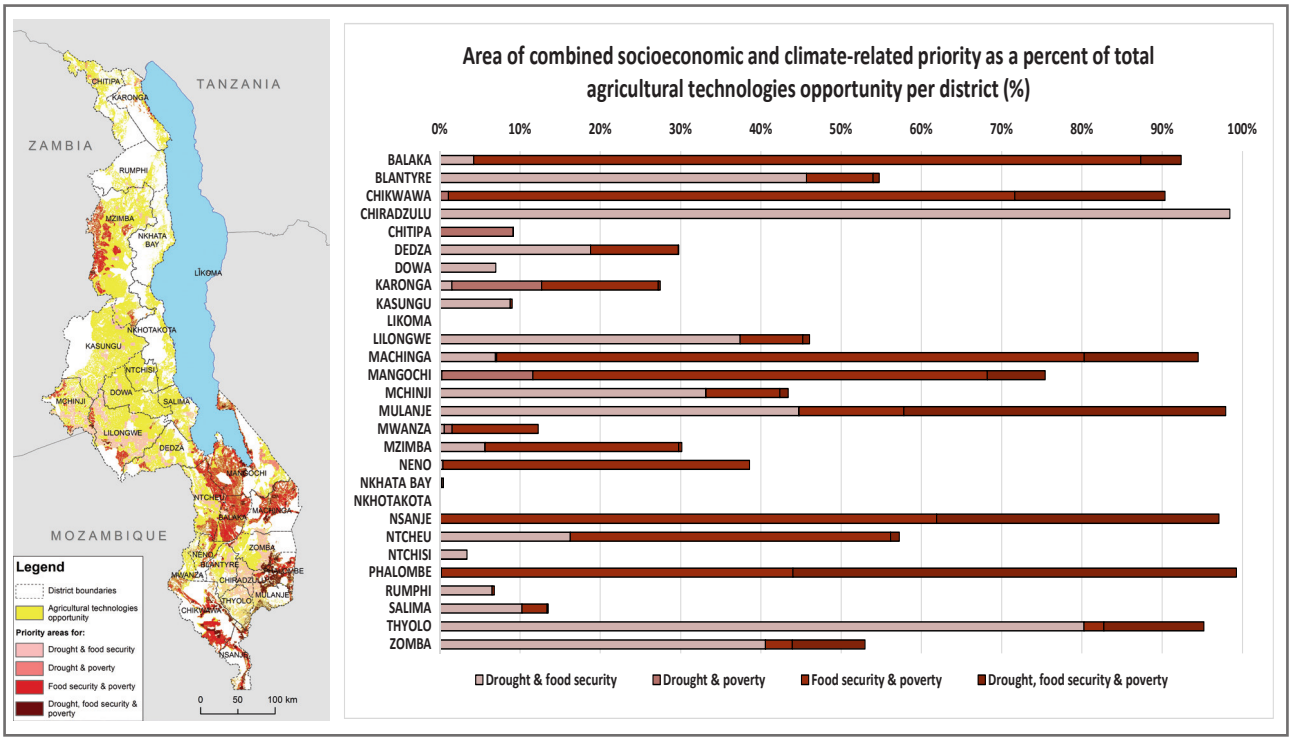

***Figure 5**. Map of opportunities area for agricultural technologies (CA, FMNR, AF) highlighting composite priority areas for poverty alleviation, food security, and drought alleviation, where at least two of these priorities could be achieved; and bar chart of composite priority areas as a percentage of the total agricultural technology opportunities area per district.*

by-laws against uncontrolled cutting of trees on farms and on customary land. Traditional authorities and high-level political figures can help to trigger widespread adoption of agricultural technologies through outreach activities such as competitions, prizes, and recognition of local restoration champions.

3.1.3 Costs and benefits of agricultural technologies

The results from the cost-benefit analysis are presented in Table 10. The net-present-value (NPV) of each agricultural restoration technology considered as part of the Malawi National Forest Landscape Restoration Opportunities Assessment and Restoration Opportunities Assessment Methodology assessment is positive. The NPV of agricultural-based restoration technologies ranges from 3.6 million MWK for farmer managed natural regeneration to 3.0 million MWK for conservation agriculture and intensive agroforestry when only private benefits are accounted for. The opportunities cost of the agricultural-based restoration activities is of degraded conventional maize, which is equal to 1.5 million MWK. When the opportunities cost of the agricultural-based restoration activities is subtracted from their NPV, the results show that all three activities generate additional benefits – compared to degraded conventional maize agriculture – of between 1.5 million MWK and 2.1 million MWK per hectare over a twenty-year period. Despite requiring more labor than degraded conventional maize agriculture as well as additional material inputs, all three agricultural-based restoration activities generate new flows of benefits that more than compensate for the additional costs. As a result, smallholders who adopted these activities would likely be better off in the long run than their peers who did not.

When the values of the public benefits (i.e. carbon sequestration and sediment retention) are accounted for the results show that all three transitions for agricultural-based restoration technologies create tangible values that will benefit smallholders. However, the results show that the value of public goods considered by this analysis represent a small fraction of the NPV of each transition. In fact, the value of public goods accounted for in this analysis represents less than 11% of the total NPV of each agricultural-based restoration activity. A more complete accounting of public benefits – including the value of services like water yield or increasing biodiversity habitat - would certainly change the results, but the important point to take away is that even when the value of public goods are excluded from the analysis, all three activities produce benefits for smallholders.

***Table 10.** NPV and opportunities cost of agricultural restoration technologies.*

	Opportunity Cost	NPV	NPV with Public Goods	Additional Benefit	Ratio of Public/Private Benefits
Agricultural Technologies					
Conservation Agriculture	1,478,157	3,019,698	3,021,399	1,541,541	0%
Agroforestry	1,478,157	3,009,610	3,555,376	1,531,453	11%
Farmer Managed Natural Regeneration	1,478,157	3,606,330	3,726,136	2,128,173	3%

Table 11. *Additional labor and financial investments required for agricultural restoration technologies.*

Agricultural Technology	Labor (Days per Year)	First Year Financial Cost	Financial Costs in Excess of Baseline Activity
Degraded Conventional Agriculture	63	115,400	-
Conservation Agriculture	13	165,800	50,400
Intensive Agroforestry	47/10	315,900	200,500
Farmer Managed Natural Regeneration	19	121,800	6,400

The financial costs in the activity budgets are analyzed to estimate the first-year financial cost for each activity in the first year (Figure 4). The first-year financial costs can be thought of as the minimum capital investment that is necessary to successfully manage the restoration activity. It represents investments in equipment such as saws, shovels, seedlings, and other necessary implements. In many cases smallholders may already have the tools and inputs that are required. For example, according to the Malawi Agricultural and Livestock Census of 2006/7, 99% of households own a hoe, 55% own a sprayer, and 54% own a *panga* knife. As a result, the financial cost estimates reported here reflect upper bounds. It is also an important metric for understanding how much additional financial capital smallholders may need access to in order to adopt the restoration activities. If a woman or a man smallholder cannot make the proper investments in inputs and equipment it will be difficult or impossible for them to capture the potential benefits of restoration activities and other, low-input, restoration activities may be more appropriate.

This is also an important metric because Malawian households may not have the financial capital to make the necessary investments out of their own pockets and more importantly, they may also be unable to borrow the money because they lack access to credit markets (MNSO 2010). As of 2010, less than 15 percent of all households in Malawi had some interaction with the credit market and only 1.2 percent of households successfully obtained an agricultural loan. Additionally, gender information from Malawi shows that female-headed households face more constraints to accessing credit than male headed households. Large financial gaps will suggest that additional sources of funding will need to be secured and distributed to smallholders as part of a larger scaling-up effort.

Degraded conventional agriculture is the baseline activity that the agricultural-based restoration activities are compared against. According to the activity budgets, degraded conventional agriculture requires 63 days of labor each year as well a financial investment of 115,400 MWK. By comparison, all of the agricultural-based restoration activities require larger investments of labor and financial capital. Conservation agriculture requires 13 days of additional labor because, in addition to performing all the activities required by a conventional maize operation, the smallholders must also spend time mulching and applying a top dressing. Additionally, conservation agriculture requires an additional upfront financial investment of 50,400 MWK during the first year. Intensive agroforestry requires 47 days of additional labor during the first year and 10 days thereafter. The required financial investment during the first year is 200,500 MWK more than what is required from degraded conventional agriculture. Farmer managed natural regeneration requires 19 days of additional labor each year and the financial investment required in the first year is only 6,400 MWK more than the baseline activity.

Malawi has committed to restore 2 million hectares of deforested and degraded land by 2020 and 2.5 million hectares by 2030 and there is significant interest to know how much funding is needed to achieve this goal. The first-year financial gaps of each activity represent the lower-bound of the implementation costs for each activity. Scaling the first-year financial gaps by the number of hectares that could be restored with each activity produces a lower-bound estimate for the total financial investment that would be required to achieve the target (Table 12).

Table 12. *Total financial costs of agricultural restoration activities in Malawi during the first year.*

Agricultural Technologies	Financial Costs in Excess of Baseline Activity (MWK)	Hectares	Total Financial Cost (Millions MWK)
Agroforestry	200,500	700,000	140,350
FMNR/CA/Soil and Water Conservation	28,400	3,000,000	85,200
Total		**3,700,000**	**225,550**

Achieving Malawi's opportunities to restore 3.7 million hectares of Agricultural land by 2030 will require approximately 225 billion MWK of financial investment. This estimate is an approximation that assumes restoration in Malawi follows a mix of high, medium, and low-cost activities. Restoration activities focused on commercial production may require more financial investment, but if low-cost restoration interventions, like FMNR, are adopted at scale the total financial requirements would be less than what is reported in Table 12.

3.1.4 Gender considerations in agricultural technologies

Recognizing women's roles in agricultural technologies through gender-responsive FLR programming can help ensure that both women and men in forest-dependent communities use and manage the land in a sustainably way, be included in decision making, and partake in the diverse benefits provided by forest landscapes and ecosystems to bolster local food security, food sovereignty and nutrition.

Information gathered from the gender questionnaire from the 14 districts indicated that both women and men participate in agroforestry and conservation agriculture activities and both were able to identify benefits from these activities. Gender roles and power relations influence the way women and men utilize and conserve agriculture biodiversity. Women tend to use agro-biodiversity resources in a more sustainable manner than their male counterparts. They also have more knowledge on the use of indigenous species and varieties. Men on the other hand tend to deplete the resources for commercial purposes at the expense of conserving agro-biodiversity (Ministry of Agriculture and Food Security, 2011).

Data gathered from 14 districts revealed the high participation of women in on-farm agriculture-related activities compared to men and children. However, the participation of boys and men in livestock activities were higher than women. Women also contribute significant amounts of labor to grow and process cash crops, but have very limited access to and control over income from such crops. This is partly due to gender inequality and partly due to market arrangements (Sibale, 2010). Women face serious constraints related to access to markets for their goods, services and products, especially those in the agricultural sector that produce perishable farm products. In addition, women, relative to men, face more serious constraints in access to information and technologies for production and marketing of their goods and services.

Rural women are clustered in unstable and in low wage jobs and their participation in paid employment is hampered by a significant domestic (usually unpaid) activities than their male counterparts (FAO 2011). Around half of rural working women devote between 11 and 30 hours per week to domestic activities, while 4 percent of men do so. Additionally, there is more mobility and migration by males than females in the agriculture sector which results in loss of family labor, agricultural knowledge and skills (Ministry of Agriculture and Food Security. 2011). Migration flows are leading to a 'feminization' of agriculture (Parket, et al. 2016).

Though women comprise 70% of Malawi's smallholder farmers, provide 70% of the work in this sector, and produce 80% of food for home consumption they receive less than 15% of agricultural extension services and have smaller average land holding sizes (UNDP 2009; FAO 2007). Men dominate decision making in relation to crop cultivation, what agricultural inputs to buy, how to use income and how much land to use for agriculture and non-agricultural uses (Sibale et al 2010; FAO 2011). Sex disaggregated data from 14 districts also indicated that men have control over and own the majority of the agriculture assets, such as land, tools and equipment, and decide how these resources may be used.

Though women contribute significantly to the forestry-agricultural sector, they have limited access to, control over, and ownership of agriculture-forest assets and capital such as land, credit, inputs and income. These gender gaps can be reduced by equipping stakeholders with knowledge and tools on gender responsive FLR (including via Farm Radio Programmes) and by ensuring full and active participation by women in training and capacity building programmes for FLR implementation.

3.2 Community forests and woodlots

Community forests (such as graveyards, village forest areas (VFAs)) and woodlots are areas of customary or private land set aside and managed for wood and range of provisioning, regulating and non-wood-cultural services including , non-timber products, medicinal plants and burial. They may be managed by a Traditional Authority, a community, a family or an individual. Community non-cultural forests and woodlots, if planned and managed properly, can provide a regular supply of products (e.g., poles, timber, fuel wood, fruit, etc.) for household consumption and/or for sale. Both through provision of wood products and income, community forests can reduce pressure on forest reserves and other protected areas. In the case of the cultural forests, they are closely linked to traditional and cultural institutions and so are deeply embedded in the social fabric of society, and express cultural values related to forests. Generally the graveyard forests have high cultural

value and are local reservoirs of biodiversity. They are under degradation pressure but are small in size and so could not be effectively mapped in the analysis so have not been included in the following discussion on intervention mapping. Recommendations for their restoration are, however, made later in the report.

3.2.1. Intervention mapping: Community forests and woodlots

The criteria for mapping areas potentially suitable for community forests and woodlots targeted areas that are unsuitable or less desirable for cultivation, and thus would not interfere with a community's ability to produce food given the high value and competition for agricultural land. These areas were defined in this analysis as uncultivated lands on steep slopes with shallow soils, given that these conditions limit agricultural productivity. It was also important to make sure the proposed areas were within a reasonable distance of village centers because their primary benefit is to provide a local, sustainable source of fuel wood for households. To this end, the data inputs included: land cover that is currently not cultivated or used primarily for cultivation; slopes greater than 20 percent; very shallow soils (less than 30 cm) and/or soils with more than 80 percent coarse mineral fragments; areas within 5-km of a village center; and areas outside of the forest reserve and other protected area boundaries. Combining these datasets produced the map of opportunities area, as shown in Figure 6.

The total estimated opportunities area for community forests and woodlots in Malawi is more than 753,000 hectares, which is approximately 8% of the total land area of the country (shown in Figure 6). The bar chart in Figure 7 summarizes the total opportunities area as a percent of the total district area. Chitipa, Nkhata Bay, and Rumphi districts have the highest proportion of opportunities for these interventions of any districts.

Three socioeconomic and climate-related conditions with available data were identified and agreed upon by stakeholders as those where establishing community forests and woodlots would be the most successful and/or have the most benefit to local communities. The three prioritization criteria overlaid with community forest and woodlot opportunities were: 1) areas where female population is highest, since women are most often tasked with collecting fuelwood and would benefit most from these interventions; 2) areas near major roadways and markets, where communities would have better opportunities for selling derived forest products; and 3) areas of highest poverty, and thus people are in greatest need of alternative sources of income (Table 13). While many factors influence the ultimate selection of implementation sites, including many that are difficult to map due to a lack of data, these prioritization criteria provide a broad estimate of where to start focusing implementation plans.

The final step in the prioritization approach was to combine the three criteria into a composite map showing where multiple priorities could be achieved (Figure 7). Based on the composite criteria, the districts with the greatest potential for community forests and woodlots to collectively provide benefits to women, alleviate poverty, and generate marketable forest products are in Phalombe, Balaka, and Mangochi districts (Figure 7).

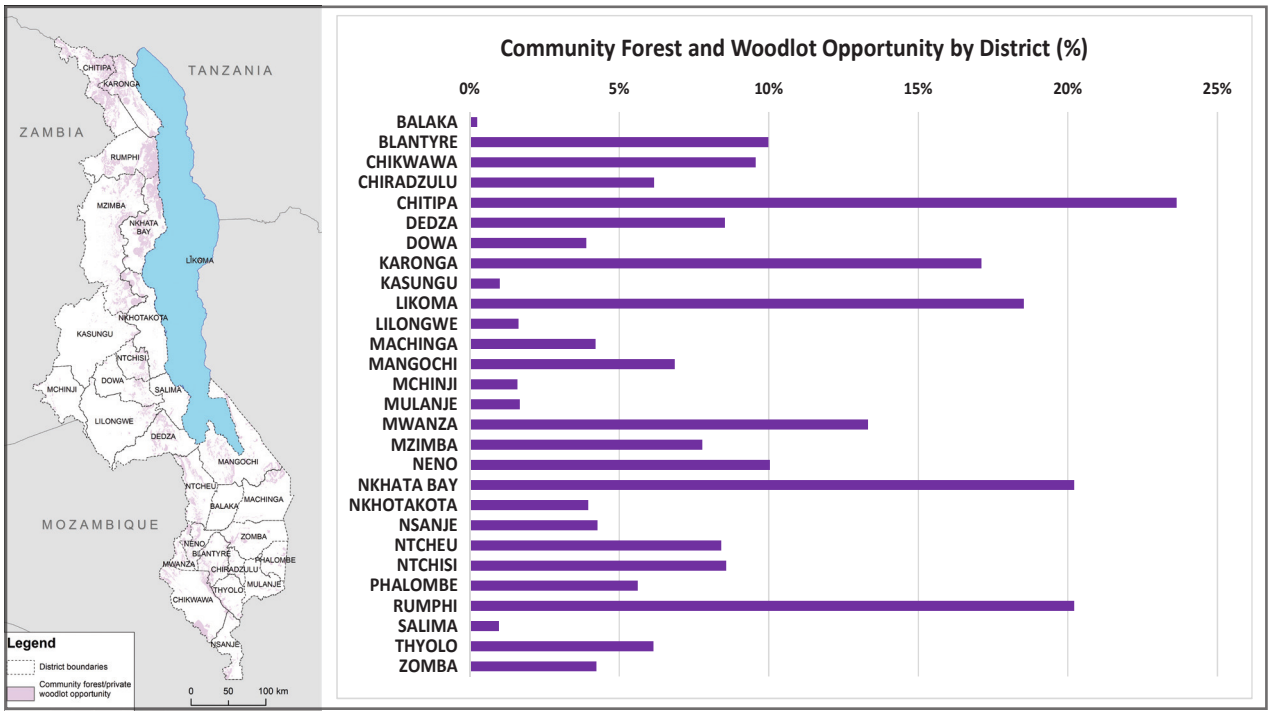

Figure 6. *Map of community forests and woodlots, and opportunities area for community forests and woodlots as a percentage of the total area of the district.*

Table 13. *Criteria selected for prioritizing establishment of community forests and woodlots.*

Prioritization Criteria	Justification
Gender	Areas of high proportion of women and women-led households will benefit most from local, easily accessible sources of fuelwood, since women are most often collect it for their households.
Access to markets	Locations with better market access have more opportunities for supplement income from selling forest products.
Poverty	Areas of high poverty (where the majority of the population lives on less than $1.25 USD per day) are in greater need of sustainable fuel wood sources.

3.2.2 Institutional and policy implications from community forest and woodlots

The policies and institutions working group cited strengthening community forest management through incentives, policies, laws, and regulations as a major priority to accelerating large-scale FLR. The National Forest Policy (2016) in particular has provisions to conserve and develop forest resources for economic and environmental benefits through community-based forest management that, if enforced, could significantly accelerate FLR. The National Forest Policy also contains provisions to promote tree growth, including through the establishment of woodlots, as a means of achieving self-sufficiency of firewood and charcoal. Provisions in the Environmental Management Bill (2015) are poised to promote community-based natural resource management. The National Land Policy (2002) presents the legal framework governing land rights and has significant bearing on the implementation of these policies; it includes provisions that the Government of Malawi support community participation in land management and communities' right to a share of revenue derived from any public land established on land managed by Traditional Authorities, and that communities have authority to protect land areas reserved for communal use against encroachment and should manage community forests and woodlands.

Key success factors and other favorable enabling conditions that are particularly important to facilitate and accelerate the implementation of restoration involving community forests and woodlots include the improved enforcement of existing forest regulations against the uncontrolled and unsustainable production of charcoal. Capacity building is needed within the Department of Forestry and at the District level and in targeted communities to assist in the formal demarcation of community forests and in the development of simple forest management plans to govern the sustainable use and decentralized management of these forests, with an accent on more

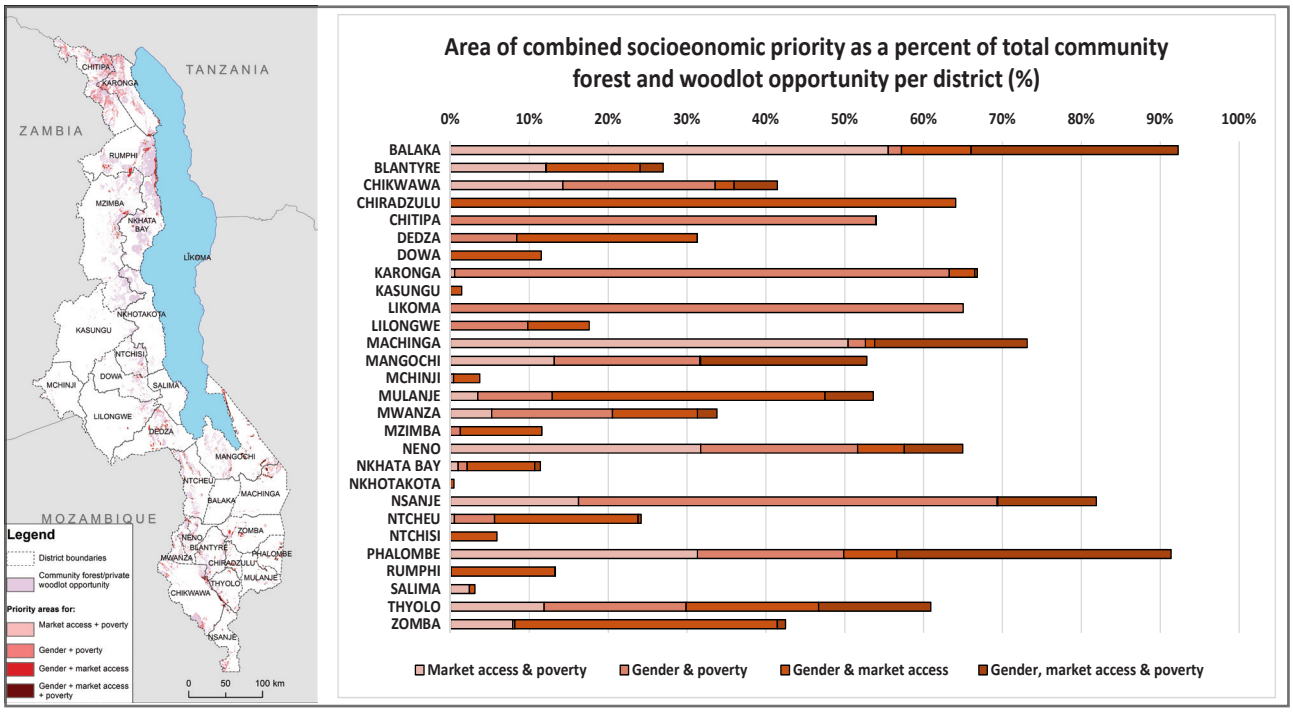

Figure 7. *Map of opportunities area for community forests and woodlots highlighting composite priority areas for women, market access, and poverty alleviation, where at least two of these priorities could be achieved (left) and bar chart of composite priority areas as a percentage of the total opportunities area per district (right).*

effective protection and assistance of natural regeneration. Community user groups, especially women and local entrepreneurs can be encouraged and assisted to establish and manage woodlots as economically viable businesses organized to produce a steady supply of forest products. Increased technical support must also be mobilized to assist with site and species selection, seed supply, site preparation and tree-planting, and sustained yield management and regeneration. Assistance with increased local investments in establishing and managing community forests and woodlots should also be complemented with small grants and technical support to strengthen associated forest product value chains and to reinforce the economic returns and incentives for communities and user groups to invest in these restoration interventions. This could include assistance with the development of bee-keeping and honey production, and value added processing and marketing of a range timber and non-timber forest products from community forests and woodlots.

Traditional authorities play an important role in allocating land for communal forests, the protection, expansion and rehabilitation of graveyard forests and the establishment of new ones. Given the changes in land use policy it is important that adequate communal forest land resources are set aside as the country moves towards individual/private tenure over larger areas of land. Stakeholders with knowledge on restoration should be involved with the development of the new land guidelines. TAs with their responsibility for land and for cultural resources are critical to engage as an institution with the restoration efforts. Communal woodlots and forest can be established by natural regeneration, but with a greater emphasis on succession based sustainable use, with restoration yielding immediate returns but with increasingly higher values in future years.

3.2.3 Costs and benefits of community forest and woodlots

The NPV of community forests and woodlots is 7.2 million MWK when only private benefits are accounted for. The opportunities cost of community forests and woodlots is the NPV of degraded forest and woodlands with light agriculture, which is equal to approximately 1.5 million MWK. When the opportunities cost is subtracted from NPV of community forests and woodlots, the results show that community forests and woodlots generate additional benefits – compared to degraded forest and woodlands with light agriculture – of 5.7 million MWK (Figure 9) over a twenty year period. The activity requires substantially more financial and labor investment compared to the degraded land use, but it creates several sources of revenue that smallholders can benefit from. Importantly, smallholders can generate short-term benefits from the activity by harvesting and selling fuelwood five years after the woodlots and/or plantations have been established. Without this benefit source, smallholders would not receive benefits until the end of the rotation interval, twenty-years later.

When the values of carbon sequestration and sediment retention are accounted for the results show that the NPV of community forests and woodlots becomes larger by 2%. A more complete accounting of public benefits – including services like water yield or biodiversity habitat - would certainly change the results, but the important point to take away is that even when the value of public goods are excluded from the analysis, community forests and woodlots create tangible benefits for smallholders.

The financial costs in the activity budgets are analyzed to estimate the first-year financial cost community forests and woodlots (Table 15). The first-year financial costs can be thought of as the minimum capital investment that is necessary to successfully manage the restoration activity. It represents investments in equipment such as saws, shovels, seedlings, and other necessary implements. In many cases smallholders may already have the tools and inputs that are required.

Table 14. *NPV and opportunities cost of community forests and woodlot restoration.*

	Opportunity Cost	NPV	NPV with Public Goods	Additional Benefit	Ratio of Public/Private Benefits
Forestry-based Activities					
Community Woodlots	1,490,064	7,276,893	7,396,791	5,786,829	2%

Table 15. *Additional labor and financial investments required for community forests and woodlot restoration.*

Restoration Activity	Labor (Days per Year)	First Year Financial Cost	Financial Costs in Excess of Baseline Activity
Degraded woodland/forest	36	15,100	-
Community Woodlots	79/9	118,900	103,800

Degraded forest and woodlands with light agriculture is the baseline activity that the agricultural-based restoration activities are compared against. According to the activity budgets, degraded forest and woodlands with light agriculture requires 36 days of labor each year as well a financial investment of 15,100 MWK each year. By comparison, community forests and woodlots require larger investments of labor and financial capital. Community forests and woodlots require 79 days of additional labor in the first year, but only 9 days per year thereafter. Additionally, community forests and woodlots require an additional upfront financial investment of 103,800 MWK during the first year compared to the baseline activity.

The first-year financial gaps of each activity represent the lower-bound of the implementation costs for each activity. Scaling the first-year financial gaps by the number of hectares that could be restored with each activity produces a lower-bound estimate for the total financial investment that would be required to achieve the target (Table 16).

Achieving Malawi's opportunities to restore 753,000 hectares of degraded forestland with community forests and woodlots by 2030 will require approximately 78 billion MWK of financial investment.

Table 16. *Total financial costs of community forests and woodlot restoration in Malawi during the first year.*

Land Use	Financial Costs in Excess of Baseline Activity (MWK)	Hectares	Total Financial Cost (Millions MWK)
Community woodlots	103,800	753,000	78,161
Total		**753,000**	**78,161**

3.2.4 Gender considerations in the community forest and woodlots intervention

The data generated from the field visits and questionnaires revealed gendered differences in women's and men's forest access and use, collection and availability of forest products, and commercialization of forest products (see Table 17 below).

In relation to control over tree and forest resources, men largely decide on forest resource use. Sex disaggregated data on the management of the forest resources though the community based forest management (CBFM), Village Natural Resource Committees (VNRCs) and Village Forest Areas (VFAs) was limited, thus, not part of this analysis. In almost all the main ethnic groups, both patrilineal (predominant in the Northern region) and matrilineal (mostly in the parts of Central and Southern regions), customary law provides men with a superior status than that of women and, accordingly, gives them greater power in political and family leadership and land holding (FAO, n.d.). Information gathered from 14 districts on the existence of programs and initiatives which promote women's empowerment at the district level reveal list of government initiatives such as COMSIP, MASAF or non-governmental organizations such as CARE, Action Aid implementing different types of activities to promote women empowerment. In relation to women participation in decision making at the district level, formal organizations including the VNRMC, VDCs ADCs have both men and women participating in the committees. Results also indicate that village clan heads are mostly men. Despite this women play important roles in appointing the normally male only traditional authorities, and women are increasing being appointed in they positions, for example, as group village heads. In terms of solidarity-group based financial institutions (e.g. Village Savings and Loans Associations) women often make up 75% of the membership and are an influential route to women's empowerment.

Actions led by the Government of Malawi that promote FLR aims to recognize that women and men in the country have different needs and interests but can also contribute in different ways to restorations due to their gender roles and relationship with the forest resources in the landscapes. Special attention to gender roles and land tenure rights as well as access to finance will empower disadvantaged women and girls.

3.3 Forest management

As part of the interventions identified in this assessment, forest management restoration includes three types of activities. One is protecting existing forests, inside and outside forest reserves and other protected areas. This restoration type implements fire prevention and control, enforces restrictions on tree cutting for commercial uses, and uses other methods of protection. The second activity is regenerating recently degraded or deforested areas through managed natural regeneration and enrichment plantings to encourage regrowth of natural forest. This may also occur inside and outside forest reserves and other protected areas, and presents the fastest and most cost effective option to re-establish forest cover. The third activity identified in Malawi for scaling-up is improving the management of existing forest plantations for sustainability, profitability, and efficiency. The benefits of all forest management activities include soil stabilization and watershed protection,

Table 17. *An indicative list the differentiated benefits and use of tree and forest resources identified by women and men collected at district level.*

Common tree name	Benefits and use by women	Benefits and use by men
Mango	Food, fire wood, fruits	
Tangerines	Food, fruit selling	Fruit selling
Avocados	Medicine and food	Fruit selling
Oranges	Food and selling	
Guava	Fruits and medicine	
Moringa	Medicine	
Neem	Firewood, powder as medicine	Firewood, powder as medicine
Mpoza	Medicine, fruit selling	
Mnyozi	Fire wood	
Muwanga	Fire wood	
Eucalyptus	Fire wood	Poles
Melina		Timber, poles, firewood, animal fodder
Mombo		Poles and timber for construction and
Mkulu		Most preferred for furniture and carvings
Mnyozi		Preferred for charcoal
Msangu	Fertility fixation	Fertility fixation
Leucena x		Nitrogen fixing

increased availability of forest products such as timber and fuelwood, improved biodiversity and habitat for wildlife, and increased resilience to climate change. Natural forest management also expands communities' foraging opportunities for non-timber forest products.

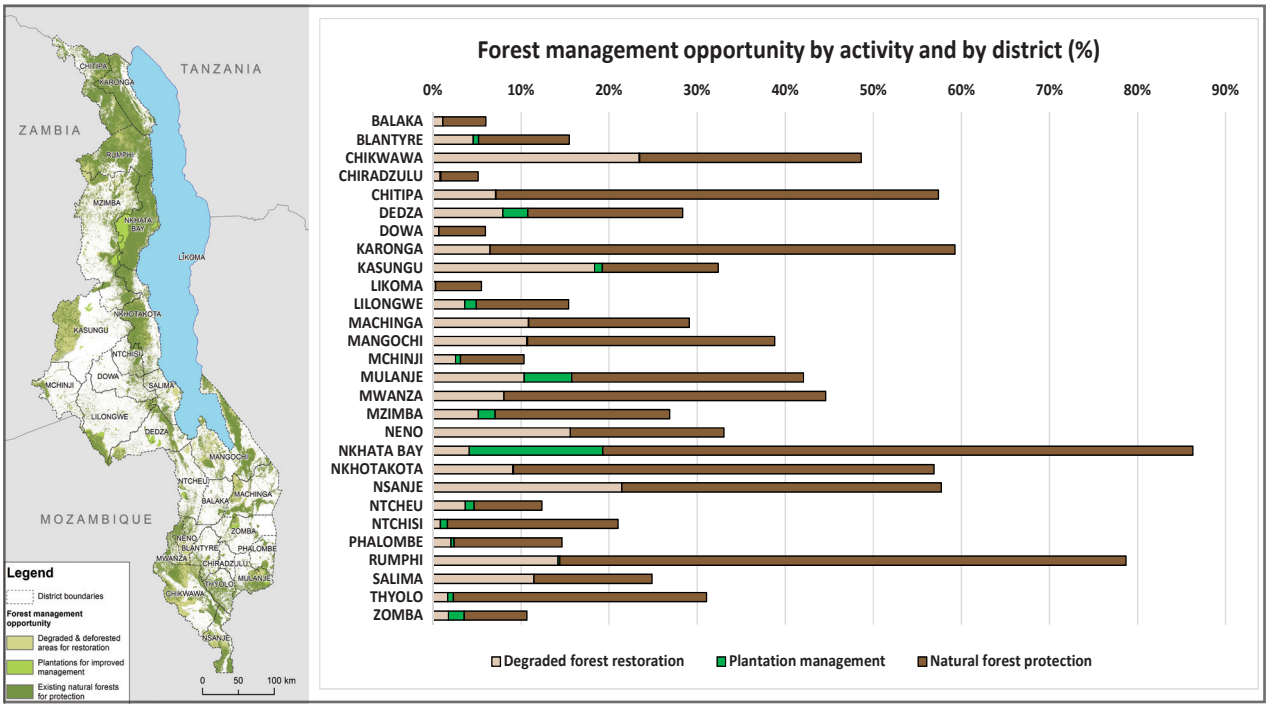

Figure 8. *Map of opportunities for forest management, and opportunities area for three types of forest management activities as a percentage of the total area of the district.*

3.3.1 Intervention mapping: Forest management

Degraded and deforested areas for restoration were mapped using data on recently burnt forest areas between 2002 and 2012, as well as tree canopy cover loss (15-100% loss) between 2000 and 2010. Improved plantation management was mapped based on data on existing forest plantations from the Department of Forestry in combination with those derived from a land use / land cover map. Natural forest protection was mapped using data on existing tree canopy cover greater than 20 percent, in stands of at least 5 hectares. Combining these datasets produced the map of intervention opportunities area, as shown in Figure 12. The total estimated intervention opportunities area for forest management in Malawi is 3.4 million hectares, which includes 2.4 million hectares of natural forest protection, 820,000 hectares of degraded forest restoration, and 138,000 hectares of improved plantation management. The bar chart in Figure 8 summarizes the opportunities area as a proportion of the total district area.

Table 18. *Criteria selected for prioritizing establishment of forest management activities.*

Prioritization Criteria	**Justification**
Flood risk	Catchments upstream of areas with flood/landslide risk are in greatest need of protective forest to stabilize water flow and soils.
Mining site rehabilitation	Watersheds with mining sites are often severely degraded due to extraction activities and in greatest need of restoration to stabilize soils and improve water quality.
Biodiversity	Areas with high biodiversity value can provide ecotourism opportunities and income/ resource opportunities diversity of forest products.

Three ocioeconomic and climate-related conditions with available data were identified and agreed upon by stakeholders. The three prioritization criteria overlaid with forest management opportunities are outlined in Table 18 below. While many factors influence the ultimate selection of implementation sites, these prioritization criteria can help to narrow the scope of where to focus implementation plans.

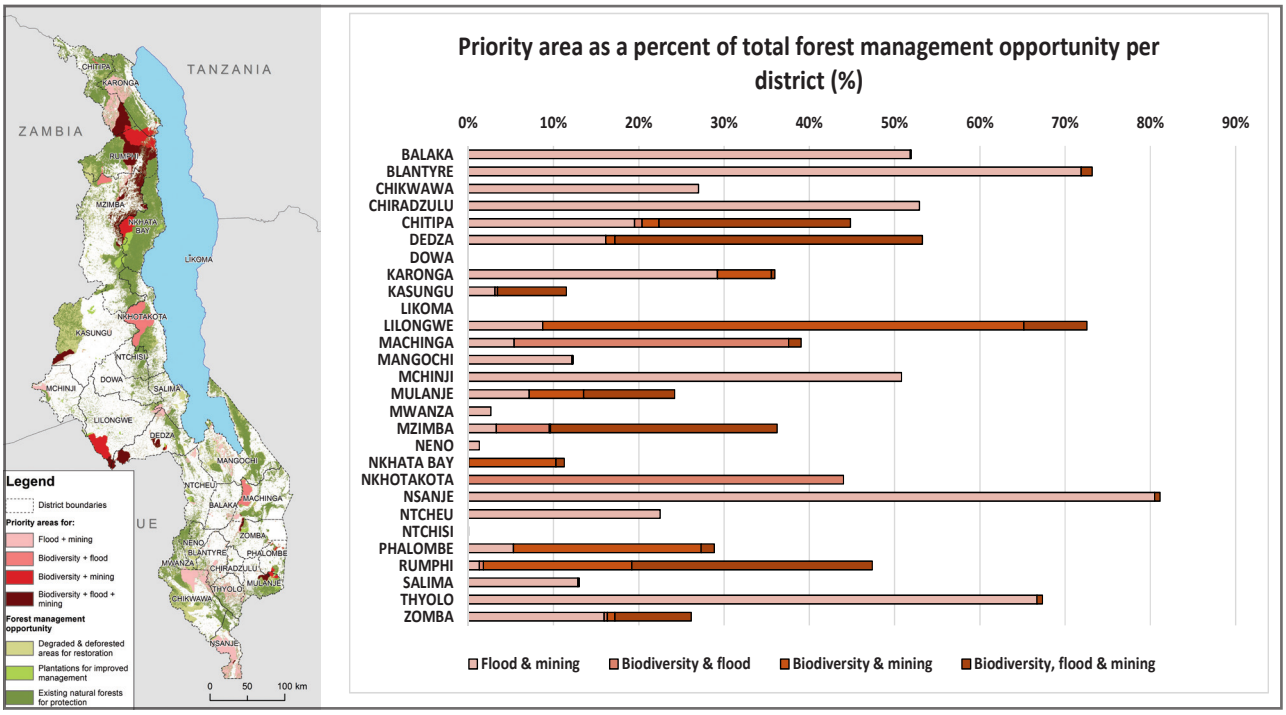

Figure 9. *Map of opportunities area for forest management activities highlighting composite priority areas for flood mitigation, mining site rehabilitation, and biodiversity improvement, where at least two of these priorities could be achieved (left) and bar chart of composite priority areas as a percentage of the total opportunities area per district (right).*

The final step in the prioritization approach was to combine the three criteria into a composite map showing where multiple priorities could be achieved (Figure 9). Based on the composite criteria, the districts with the greatest potential for forest management activities to collectively mitigate flood risk, rehabilitate degraded mining sites, and/or improve biodiversity are in Nsanje, Blantyre, and Lilongwe districts.

3.3.2 Institutional and policy implications from forest management

As was the case for community forest management and woodlots, strengthening enforcement of forest clearing restrictions and sustainable forest management provisions was cited as a major priority. If enforced effectively, a number of existing policies could accelerate FLR through forest management. For example, the National land Policy (2002) includes provisions to prohibit tree-cutting on steep slopes, hilly areas, and watershed areas unless done under strict control and guided by selective pruning. The National Land Resources Management Policy (2000) promotes tree planting, natural regeneration, and conservation of forests; the Food Security Action Plan (2008) and Malawi's National Action Programme includes a focus on tree planting (of species that can increase soil fertility) and on promoting regeneration of native tree species; and the National Forest Policy (2016) promotes both regeneration on degraded land and improved management of industrial plantations for sustainability, profitability, and efficiency.

In addition to more effective enforcement of existing forest policies, laws, and regulations, other key success factors that can be leveraged to a greater extent to spur local participation in forest management include improving the transparency and accountability of participatory forest management and forest co-management structures, such as block management committees and other bodies responsible for forest protection, regeneration, management and harvesting. Equitable benefit sharing agreements and procedures should be established and respected, with provisions to avoid elite capture and to ensure that community level participation is appropriately compensated. Provisions must be made for full participation and local level accountability in forest management decision-making and governance. Traditional authorities should be enabled and empowered to work in concert with Department of Forestry authorities and locally established forest management committees and associated user groups. Capacity building and institutional support must be reinforced to ensure that forest management objectives, management plans and implementation procedures take account of local development needs and priorities as well as other ecological and socio-economic factors. Increased attention must be given to effective protection organized with local support, assisted natural regeneration as well as enrichment planting and to sustained yield management supported by regular monitoring of forest resource stocks and conditions.

Department of Forestry leadership is recommended to focus on the integration and coordination of the implementation of the National Charcoal Strategy and the National Forest Landscape Restoration Strategy, with special attention being given to controlling commercial firewood extraction and charcoal production in Forest Reserves, other protected areas, and areas targeted for forest management interventions. To reduce pressures on remaining areas of natural forest and miombo woodlands, significantly increased support is needed to spur private investment in the establishment and management of commercial plantations aimed at production of pine and other saw timber and high value forest products with lower valued woodfuels as a by-product. Specific policy directives and enabling conditions should be reinforced with the aim of reducing barriers to financing and to increase the economic incentives and market access for sustainable and certified forest products from well-managed forests and plantations, including sawlogs and charcoal.

The restoration of Malawi's forests presents a major opportunities at 36% of the area of the country. The restoration of forests is particularly important where forest reserves and other protected areas form the upper catchment of river basins and their degradation is contributing to soil erosion, sediment loading, flooding and disasters. The degradation has also contributed to the loss of biodiversity and lost significant timber resources. In the past Malawi has made a number of efforts towards engaging local communities in forest protection and management through participatory forest management (PFM) of forest reserves especially under the IFSLMP project. A number of appropriate provisions were put in place, however, the benefits for joint management were not sufficient to outweigh the costs in the face of high levels of timber harvesting and charcoal-making and associated vested interests. As a result over utilization continued with many forest slipping further into degradation. The basic premise of these attempts at PFM were correct but the balance of costs and benefits, including secure use tenure, were insufficient to fully incentivize community protection. Forests and in particular catchment forests should be viewed as essential 'natural water infrastructure' as corollary to and support of 'built water infrastructure' for the countries water provision and disaster risk reduction with commensurate level of investment. This awareness is now growing and the increased recognition of the importance of forests is being reflected in a wide range of policies and laws and regulation. These include, for example, the suite of climate polices, including REDD+, and the NBSAP. With the new Forest Policy (2016) and the new Charcoal Policy the time is right to make renewed efforts at devolved forest management at Forest Reserves and other protected areas, in a way that incentivizes effective management and restoration. The focus should be on increased institutional effectiveness for policy and law implementation as this has been an area of weakness. This will include the full involvement of TAs (including capacity building training and financial support), the incentivizing of adjacent communities through mechanisms such as VSLA and CECF, sustained by large scale investment opportunities, for example through the Dedicated Grant Mechanism under the World Bank Forest Investment Programme and the Green Climate Fund

3.3.3 Costs and benefits of forest management

The NPV of forest management is -4.3 million MWK when only private benefits are accounted for (Table 19). The activity requires substantially more financial and labor investment compared to the degraded land use. While the NPV of the transition from degraded forest and woodlands with light agriculture to forest management is negative, the result should not be interpreted as a sign that natural forest management is inefficient and should therefore be left out of Malawi's national restoration strategy. Instead, the result should be interpreted as saying that natural forest management is most beneficial when it is done on landscapes with low agricultural and forestry opportunities costs or in areas where the public benefits of natural forest management are high (e.g., upstream from Water Board reservoirs and hydro-electric generating facilities).

Forest management will be most beneficial when it is used to restore forest reserves and other protected areas that have already been gazetted and therefore, by legal definition, have no opportunities cost. Similarly, forest management will be net beneficial in areas with steep slopes that are in close proximity to important water features, like the Shire River. In these areas, the returns to agriculture are likely to be low because the steep slopes make cultivation difficult and costly and more importantly, reducing soil erosion and increasing water yields in this areas will create large benefits for downstream users, such as the Electricity Supply Corporation of Malawi and downstream agriculturalists (Wiyo et al. 2015).

Table 19. *NPV and opportunities cost of forest management restoration.*

	Opportunity Cost	NPV	NPV with Public Goods	Additional Benefit	Ratio of Public/Private Benefits
Forestry-based Activities					
Forest management	1,490,064	-4,302,376	-4,182,478	-5,792,440	3%

When the values of carbon sequestration and sediment retention are accounted for the results show that they compose as little as 3% of the NPV.

The financial costs in the activity budgets are analyzed to estimate the first-year financial cost for each activity in the first year. The first-year financial costs can be thought of as the minimum capital investment that is necessary to successfully manage the restoration activity. It represents investments in equipment such as saws, shovels, seedlings, and other necessary implements. In many cases smallholders may already have the tools and inputs that are required.

Degraded forest and woodlands with light agriculture is the baseline activity that forest management restoration is compared against (Table 20). According to the activity budgets, degraded forest and woodlands with light agriculture requires 36 days of labor each year as well a financial investment of 15,100 MWK each year. By comparison, forest management requires a larger investment of labor and financial capital. Forest management requires 476 days of additional labor in the first year due to the need to patrol the forest from illegal activities and timber clearing. Additionally, forest management would require an additional upfront financial investment of 96,500 MWK during the first year compared to the baseline activity.

The first-year financial gaps of each activity represent the lower-bound of the implementation costs for each activity. Scaling the first-year financial gaps by the number of hectares that could be restored with each activity produces a lower-bound estimate for the total financial investment that would be required to achieve the target (Table 21).

Table 20. *Additional labor and financial investments required for forest management restoration.*

Restoration Activity	Labor (Days per Year)	First Year Financial Cost	Financial Costs in Excess of Baseline Activity
Forest management	476	161,600	96,500

Achieving Malawi's opportunities to restore 3.4 million hectares of degraded forestland with natural forest management by 2030 will require approximately 328 billion MWK of financial investment.

Table 21. *Total financial costs of forest management restoration activities in Malawi during the first-year.*

Land Use	Financial Costs in Excess of Baseline Activity (MWK)	Hectares	Total Financial Cost (Millions MWK)
Forest management	96,500	3,400,000	328,100
Total		**3,400,000**	**328,100**

3.3.4 Gender considerations in forest management

As farmers, foresters, caretakers, and household providers, women and men have unique and differentiated knowledge and experiences with natural resources and forests and therefore have varying ideas of how to use, manage, and govern them. Restoration that is implemented in a gender-responsive manner can advance gender equality in addition to improving socio ecological systems.

Information from the district questionnaires showed the gender differences in perception of forest condition. Participants were aware of trees becoming scarce due to deforestation, as well as its impact on water resources. The depletion of forest resources disproportionally increases burdens on women as they play key role meeting household food and fuel needs. A study in Malawi found deforestation was forcing elderly women to walk more than 10 km a day to collect fuel wood (FAO, n.d.). The data gathered in the gender analysis also reinforces this fact, by revealing that women generally walk long distances to fetch water or collect firewood. In addition, the water borne disease has caused women to spend their time caring for the sick, leaving them little time to pursue other activities. As for men, their concerns were about building poles, timber, beekeeping and charcoal. Both men and women have concerns about exhaustion of natural resources that provide medicinal products.

Firewood was shown to be the key forest product collected for household energy-use and for commercial sale. Data gathered from 14 districts on firewood use for cooking, heating and charcoal, showed high participation of women and children collecting them compared to men. Although, both women and men sell firewood, the sale of charcoal, brick making and timber production are activities mainly done by men. Of crucial importance is promotion of sustainable on-farm or in-reserve firewood production, ideally as by-products of the production of higher value wood products. In order to support and enhance sustainable production is sustainable use of firewood, and clean cook stoves can be promoted. This initiative not only results in efficient use of the firewood, but along with sustainable and proximate production, it also helps to reduce the amount of hour women and children spend collecting firewood and also reduces indoor air pollution. Additionally, the clean cook stove production by rural women can economically empower them.

Both women and men identified different tree species by their use and benefits. Tree species identified by women demonstrated that their knowledge tends to be linked more directly to household food consumption and health, which is particularly important during food crises. In the case of men, the species identified in relation to the use and benefits are more related to generate income by producing charcoal, furniture or poles for construction.

Honey, bushmeat, caterpillars, insects and termites are the most important animal-based products, while mushrooms, fruits, fodder, medicinal plants, vegetables and fibers are the most important plant-based products (FAO, 2000). Data concerning NTFPs, showed that in Northern Malawi women harvest mushrooms and grass; men are more involved in honey production and the elaboration of baskets; and both women and men go to the forest to collect medicinal plants. In southern Malawi, women collect and sell local fruits and mushrooms; men are in charge of honey production and basket weaving; and both women and men are involved in collecting thatch grass, medicinal plants and bamboo. In eastern Malawi, women harvest and sell mushrooms and collect grass; men weave baskets; and both women and men participate in beekeeping and collecting medicinal plants. Although the data on central Malawi was not available from the district level questionnaires, according to literature review, in central Malawi, mushrooms and fruits are documented to be the most important (FAO, 2000).

Promoting forest landscape restoration in Malawi will require people to change to more sustainable resource use and management. Education and awareness are important strategies in order change these behaviors and move away from unsustainable use of resources. Due to the inequality in education level among women and men in Malawi, education on forest landscape restoration should be adapted for both women and men to overcome these inequalities and ensure equal access to information and knowledge. Interventions at the district level should be developed in a participatory way, ensuring that needs of both stakeholders will be considered in issues such as the different species of trees planted, non-timber forest product harvesting, and that participation and flow of benefits is equitable for men and women.

3.4 Soil and water conservation

The soil and water conservation intervention involves establishing small-scale infrastructure such as check dams, terraces, infiltration trenches, and contour bunds along slopes and hillsides for the purposes of regulating water flow during heavy rains to prevent intense erosion and gully formation. These types of infrastructure are particularly important where croplands are located at the base of these hillsides and thus are more vulnerable to soil and nutrient loss and crop damage from heavy or rapid water flow. The check dams and terraces serve to reduce the force of water flow downslope while the infiltration ditches and contour bunds absorb and accumulate soil and water. Planting vetiver grass and other vegetation along the slopes also adds to the absorption and mitigation benefits. Soil and water conservation can improve food security

by improving households' ability to access food during times of drought or low yields, and expand access to alternative energy sources and clean water. The soil and water conservation measures are integrated with and supported by the other interventions which combined aim to enhance water management across the landscape to reduce the speed of water flow, prevent the build-up of large volumes of water, enhance infiltration and prevent sediment loading.

3.4.1 Intervention mapping: Soil and water conservation

Mapping opportunities areas for soil and water conservation, such as check dams, contour bunds, and infiltration ditches, involved identifying areas of high erosion risk either on or near cultivated croplands. The objective was to locate the areas that would benefit most from infrastructure that would manage extreme water flow that causes gully formation, particularly as it impacts croplands. The data used in the analysis included soils classified as having high erosion risk, areas with slope of 5 to 50 percent, areas with less than 20 percent tree cover, and cultivated croplands or uncultivated lands within 500-m of cultivated croplands. Combining these datasets produced the map of opportunities area, as shown in Figure 10, and the bar chart summarizes the opportunities area as a percentage of the total district area. More than one million hectares in Malawi meet the opportunities criteria for soil and water conservation interventions, which is 11% of the total country area. Because soil and water conservation is most valuable in areas with steeper terrain and erodible soils, districts with this type of landscape present the greatest opportunities—particularly Thyolo in the south and Ntchisi in the central region.

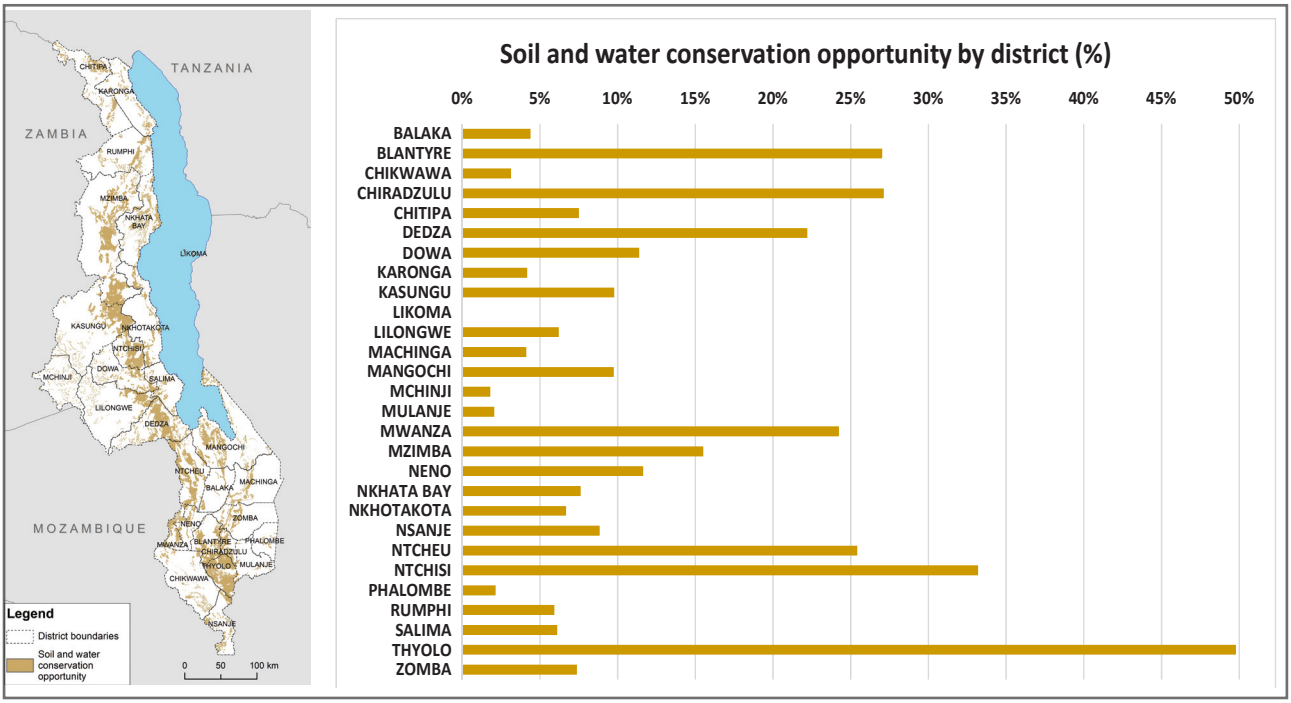

Figure 10. *Map of opportunities area for soil and water conservation infrastructure (left), bar chart of opportunities area for soil and water conservation as a percentage of the total area of the district (right).*

The prioritization criteria identified by stakeholders as being important for focusing implementation efforts for soil and water conservation, were in major flood risk zones (Table 22). The map in Figure 11 overlays these priority areas with the opportunities area for soil and water conservation, and the bar chart summarizes the flood risk priority as a proportion of the total opportunities area per district. The highest opportunities for mitigating flood risk through soil and water conservation infrastructure is in Blantyre, Thyolo, and Kasungu districts

Table 22. *Criteria selected for prioritizing establishment of soil and water conservation infrastructure.*

Prioritization Criteria	**Justification**
Flood risk	Catchments upstream of areas with flood/landslide risk are in greatest need of infrastructure to stabilize water flow & soils to protect crops downslope

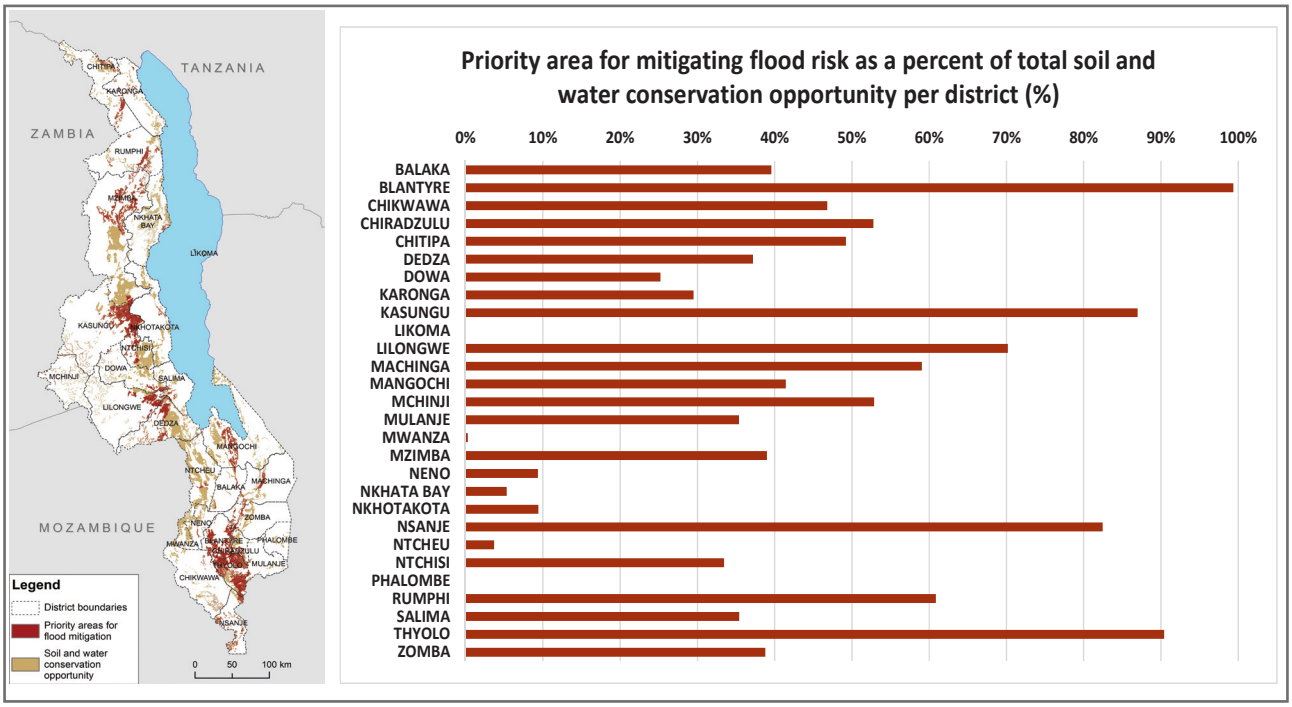

Figure 11. *Map of opportunities area for soil and water conservation infrastructure highlighting priority areas for flood risk mitigation (left), bar chart of priority area for flood risk mitigation as a percent of total opportunities area per district (right).*

3.4.2 Institutional and policy implications from soil and water conservation

Harmonization of cross-sector policies related to soil and water conservation would facilitate widespread adoption of FLR practices. Soil and water conservation are recognized in the National Climate Change Policy (2015) as vital for attaining food security, livelihoods, and natural resource resilience and an important approach to achieving adaptation outcomes; it also underscores the importance of good catchment management to boost water retention and soil health. This is reinforced in the National Land Policy (2002) which encourages forest cover for river headwaters and water catchment areas, in the Malawi Growth and Development Strategy II (2011-2016) which promotes water conservation techniques as a means of achieving economic growth and development, and in the Food Security Action Plan (2008) which aims to build farmers' capacity to carry out water conservation activities.

3.4.3 Costs and benefits of soil and water conservation

The NPV of soil and water conservation restoration is approximately 3 million MWK when only private benefits are accounted for (Table 23). When the opportunities cost of the agricultural-based restoration activities is subtracted from their NPV, the results show that soil and water conservation generates additional benefits – compared to degraded conventional maize agriculture – of approximately 1.5 million MWK per hectare over a twenty-year period. Despite requiring more labor than degraded conventional maize agriculture as well as additional material inputs, soil and water conservation activities generate new flows of benefits that more than compensate for the additional costs. As a result, smallholders who adopted this activity would likely be better off in the long run than their peers who did not.

When the values of the public benefits (i.e. carbon sequestration and sediment retention) are accounted for the results show that the NPV do not change. A more complete and accurate accounting of the public benefits of this transition would result in a higher NPV, however.

Table 23. *NPV and opportunities cost of soil and water conservation restoration.*

	Opportunity Cost	NPV	NPV with Public Goods	Additional Benefit	Ratio of Public/Private Benefits
Agricultural-based Activities					
Soil and water conservation	1,478,157	3,019,698	3,021,399	1,541,541	0%

Table 24. *Additional labor and financial investments required for soil and water conservation restoration.*

Restoration Activity	Labor (Days per Year)	First Year Financial Cost	Financial Costs in Excess of Baseline Activity
Degraded conventional agriculture	63	115,400	-
Soil and water conservation	13	153,100	37,700

The financial costs in the activity budgets are analyzed to estimate the first-year financial cost for each activity in the first year (Table 24). The first-year financial costs can be thought of as the minimum capital investment that is necessary to successfully manage the restoration activity. It represents investments in equipment such as saws, shovels, seedlings, and other necessary implements. In many cases smallholders may already have the tools and inputs that are required.

Degraded conventional agriculture is the baseline activity that soil and water conservation restoration is compared against. According to the activity budgets, degraded conventional agriculture requires 63 days of labor each year as well a financial investment of 115,400 MWK each year. By comparison, soil and water conservation requires a larger investment of labor and financial capital. Soil and water conservation activities require 13 days of additional labor in the first year due to the need to prepare check dams, mulch, and other inputs to the activities. Additionally, soil and water conservation would require an additional upfront financial investment of 37,700 MWK during the first year compared to the baseline activity.

Malawi has committed to restore 2 million hectares of deforested and degraded land by 2020 and 2.5 million hectares by 2030 and there is significant interest to know how much funding is needed to achieve this goal. The first-year financial gaps of each activity represent the lower-bound of the implementation costs for each activity. Scaling the first-year financial gaps by the number of hectares that could be restored with each activity produces a lower-bound estimate for the total financial investment that would be required to achieve the target (Table 25).

Table 25. *Total financial costs of soil and water conservation activities in Malawi during the first year.*

Land Use	Financial Costs in Excess of Baseline Activity (MWK)	Hectares	Total Financial Cost (Millions MWK)
Soil and water conservation	50,400	1,000,000	50,400
Total		**1,000,000**	**590,464**

Achieving Malawi's opportunities to restore 1,000,000 hectares of degraded agricultural land with soil and water conservation activities by 2030 will require approximately 590 billion MWK of financial investment.

3.4.4 Gender considerations in soil and water conservation

There are significant gender differences as well in use and management of water. In relation to water and agriculture, for example, women are managing the tension between securing water for use at household level and at the farm level, which is intensified around seasonal peaks of water scarcity and farm labor. At the end of the dry season, when water is scarce, women spend more time collecting water – walking long distances and queuing at water points. The benefits of irrigation for women are also constrained by their limited access to key assets and opportunities. Land and water rights are often related, and women may not have the formal title or credit facilities to invest in irrigation equipment. Even when women have access to irrigation schemes, water allocation is frequently controlled by male-dominated water user associations (Parket, et al. 2016).

The division of labor results in different priorities for water use and management for men and women. Women play an important role in water management and use for household consumption, as well as for agricultural uses as such as for vegetables. On the other hand, male counterpart usually prioritize it for irrigation purposes. Accordingly, due to differentiated skills and tasks, the gendered roles and needs at household level in the district FLR intervention planning procedures for soil and water conservation should be prioritized. By recognizing the gaps between national legal frameworks and the situation on the ground, the NSAP could promote women's roles and knowledge in water conservation and management, and develop programmes that promote, encourage, and serve the needs of women and their households.

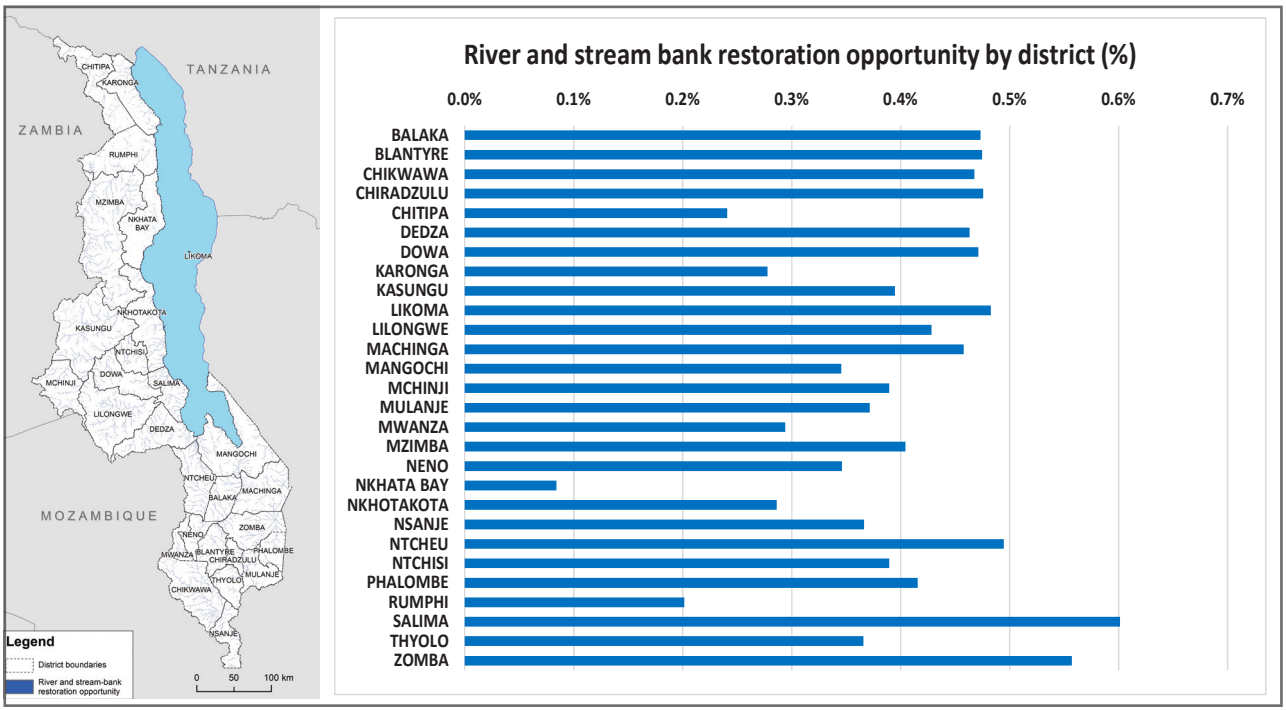

Figure 12. *Map of opportunities area for river and stream-bank, and opportunities area for river and stream-bank restoration as a percent of total district area restoration.*

3.5 River and stream-bank restoration

In the context of this analysis, river and stream-bank restoration/water resources management focuses on establishing buffers of trees along streams and rivers courses to stabilize the soil, either through active planting or natural regeneration. The benefits of these protective buffers include decreased erosion and sedimentation into waterways, which improves water quality and quantity. This practice is particularly important in watersheds with downstream hydropower and reservoir infrastructure, where sedimentation is a major impediment to their efficiency and sustainability.

3.5.1 Intervention mapping: River and stream-bank restoration

River and stream-bank restoration in Malawi is important for managing sedimentation in streams and rivers to improve water flow and quality. For the purpose of this mapping exercise, river and stream-bank restoration is defined as plantings or natural regeneration of trees along the banks of major and minor water courses. The criteria for mapping river and stream-bank National Forest Landscape Restoration Opportunities Assessment and Restoration Opportunities Assessment Methodology included identifying areas within 15 meters on each side of a stream or river that currently have low or no tree cover. The 15-meter buffer is based on guidelines issued by the Ministry of Agriculture, Irrigation and Water Development. The specific data inputs for the analysis were stream and river networks, a 15-m (each side) buffer of these networks, and areas of tree canopy cover less than 20 percent, excluding areas that are suitable for tree plantings (i.e., not wetlands). Combining these datasets produced the map of opportunities area, as shown in Figure 12. The bar chart in Figure 12 summarizes the opportunities area as a percent of the total district area. More than 36,000 hectares in Malawi are suitable for river and stream-bank restoration, with fairly even distribution of the opportunities throughout all districts. Salima, Zomba, and Ntcheu districts have slightly higher opportunities levels than other districts.

Table 26. *Criteria selected for prioritizing implementation of river and stream-bank restoration activities.*

Prioritization criteria	**Justification**
Catchments with existing or proposed hydropower	Hydropower infrastructure is most efficient when erosion and sedimentation are low.
Catchments with high flood risk	Areas with high flood and landslide risks are in greatest need of trees to stabilize water flow and protect soils.
Catchments with major dams and reservoirs	Reducing sedimentation in reservoirs, especially sources of drinking water for large population centers, is a high priority for protecting the water supply.

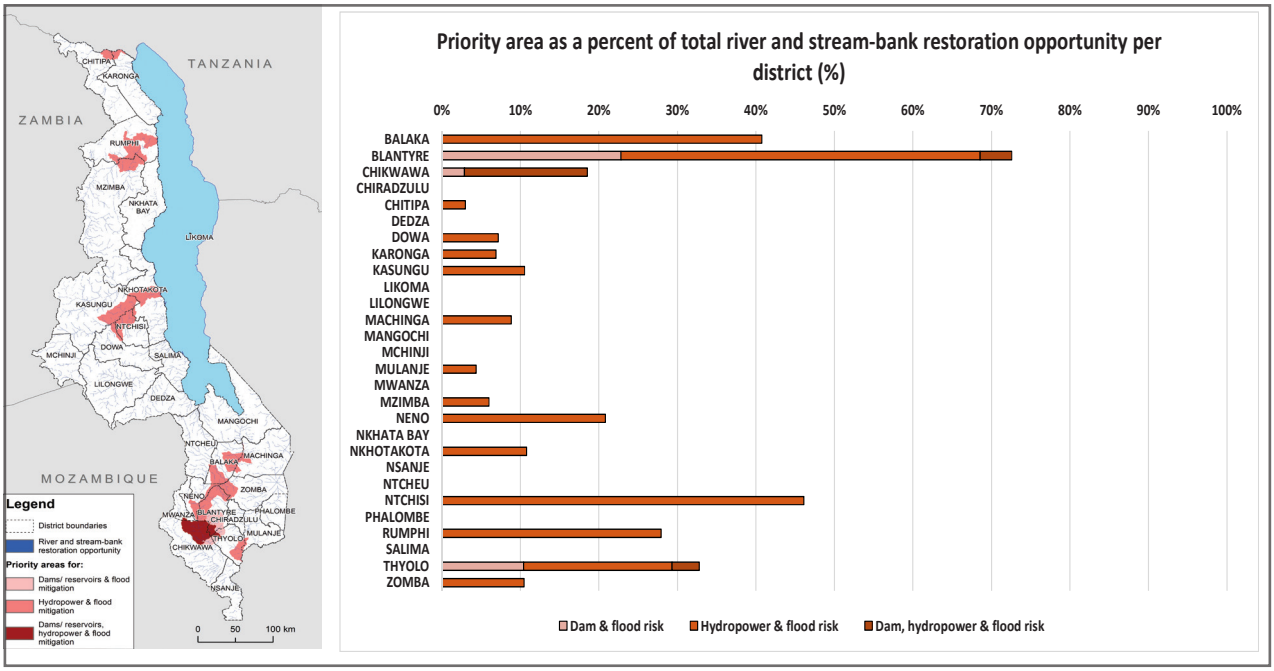

Figure 13. *Map of opportunities area for stream-bank restoration highlighting composite priority areas for dam/reservoir management, flood risk mitigation, and hydropower potential, where at least two of these priorities could be achieved (left) and bar chart of composite priority areas as a percentage of the total opportunities area per district (right).*

Three socioeconomic and climate-related conditions with available data were identified and agreed upon by stakeholders as those where the river and stream-bank restoration activities would have the most benefit. The three prioritization criteria overlaid with river and stream-bank National Forest Landscape Restoration Opportunities Assessment and Restoration Opportunities Assessment Methodology were: 1) catchments with existing or proposed hydropower infrastructure; 2) catchments upstream of where flood risk is highest; and 3) catchments with major dams and reservoirs (Table 26). While many factors influence the ultimate selection of implementation sites, these prioritization criteria can help to narrow the scope of where to focus planning efforts. Based on the composite criteria, the districts with the greatest potential for water resources management activities to collectively mitigate flood risk, and improve sustainability of hydropower and dam and reservoir infrastructure are in Ntchisi, Blantyre, and Balaka districts (Figure 13).

3.5.2 Institutional and policy implications from river and stream-bank restoration

Again, policies and institutions working group members cited policy harmonization as key to creating an enabling environment that accelerates FLR through adoption of river and stream-bank restoration. In particular, forest policies stipulate river bank protection measures that do not align with agricultural policy that promotes irrigation and cultivation close to rivers. These forest and aagricultural should be re-examined with a view to aligning with river bank protection stipulated in forest policies. As things currently stand, lack of harmonization in these policies creates confusion about where and how to protect and manage protective vegetation adjacent to wetlands, lakes, rivers, streams and other water bodies.The National Land Policy (2002) could be a vehicle to harmonize these approaches, as it has a provision to introduce buffer zones in areas where agriculture conflicts with forestry or grazing land.

Stronger enforcement of river bank protection measures, including to counter cultivation of marginal areas, is also needed in order to realize the vision of the National Forest Policy (2016).

In addition, river and stream-bank restoration is overlooked in policies such as the Energy Regulation Act (2004) where it has potential to achieve policy goals including sustainable power generation and biomass energy production.

At 0.4% of Malawi's land area, river and stream-bank restoration represents the smallest geographical extent. In terms of ecosystem function, however, the importance of river and stream-bank protection is disproportionate to its size. This is particularly important for reducing sediment loads and supporting both hydro power plants and reducing disasters. The protection of river and stream-banks by not cultivating along them has been a statue that has been on the laws of most countries in eastern and southern Africa since before independence

but has proven notoriously difficult to enforce and been universally ignored/overlooked by most communities and responsible authorities. The policy and institutional emphasis here centers on implementation. It is in this context, therefore, that the protection of over 150km of river and stream-bank in northern Uganda by using the Community Environmental Conservation Fund (CECF) incentive mechanism is notable. This modest grant to communities was effective in restoring wetlands and ensuring water supplies to commercial users and so operates as a type of PES scheme. Given the importance of river-bank protection to hydropower commercial investments in this type of PES incentive scheme present an appropriate financing mechanism. While it is important to replace crop agriculture with permanent vegetation (grasses and trees) along water courses this does not preclude using high value commercially important permanent crops especially where markets exist. This approach can also incentivize this land use change. There is some indication that the policy to protect river banks under the Forest Law is in conflict with agricultural policy that promotes irrigation in the, the former however, is most important in the upper basins and the latter more appropriate in lower catchments.

3.5.3 Costs and benefits of river and stream-bank restoration

The NPV of river and stream-bank restoration is -4.3 million MWK when only private benefits are accounted for (Table 27). The activity requires substantially more financial and labor investment compared to the degraded land use. While the NPV of the transition from degraded forest and woodlands with light agriculture to river and stream-bank restoration is negative, the result should not be interpreted as a sign river and stream-bank restoration is inefficient and should therefore be left out of Malawi's national restoration strategy. Instead, the result should be interpreted as saying that river and stream-bank restoration is most beneficial when it is done on landscapes with low agricultural and forestry opportunities costs or in areas where the public benefits of reducing erosion and increasing water quality are high

River and stream-bank restoration will be most beneficial when it is used to restore watersheds that have already been gazetted and therefore, by legal definition, have no opportunities cost. Similarly, river and stream-bank restoration will be net beneficial in areas with steep slopes that are in close proximity to important water features, like the Shire River. In these areas, the returns to agriculture are likely to be low because the steep slopes make cultivation difficult and costly and more importantly, reducing soil erosion and increasing water yields in this areas will create large benefits for downstream users, such as the Electricity Supply Corporation of Malawi and downstream agriculturalists (Wiyo et al. 2015).

When the values of carbon sequestration and sediment retention are accounted for the results show that they compose as little as 3% of the NPV.

The financial costs in the activity budgets are analyzed to estimate the first-year financial cost of river and stream-bank restoration (Table 28). The first-year financial costs can be thought of as the minimum capital investment that is necessary to successfully manage the restoration activity. It represents investments in equipment such as saws, shovels, seedlings, and other necessary implements. In many cases smallholders may already have the tools and inputs that are required.

***Table 27**. NPV and opportunities cost of river and stream-bank restoration.*

	Opportunity Cost	NPV	NPV with Public Goods	Additional Benefit	Ratio of Public/Private Benefits
Forestry-based Activities					
Streambank restoration	1,490,064	-4,302,376	-4,182,478	-5,792,440	3%

Degraded forest and woodlands with light agriculture is the baseline activity that the river and stream-bank restoration activity is compared against. According to the activity budgets, degraded forest and woodlands with light agriculture requires 36 days of labor each year as well a financial investment of 15,100 MWK each year. By comparison, river and stream-bank restoration requires a larger investment of labor and financial capital. Natural

***Table 28.** Additional labor and financial investments required for stream-bank restoration.*

Restoration Activity	Labor (Days per Year)	First Year Financial Cost	Financial Costs in Excess of Baseline Activity
Streambank restoration	476	161,600	96,500

forest management requires 476 days of additional labor in the first year due to the need to patrol the restored area from illegal activities and timber clearing. Additionally, river and stream-bank restoration would require an additional upfront financial investment of 96,500 MWK during the first year compared to the baseline activity.

Malawi has committed to restore 2 million hectares of deforested and degraded land by 2020 and 2.5 million hectares by 2030 and there is significant interest to know how much funding is needed to achieve this goal. The first-year financial gaps of each activity represent the lower-bound of the implementation costs for each activity. Scaling the first-year financial gaps by the number of hectares that could be restored with each activity produces a lower-bound estimate for the total financial investment that would be required to achieve the target (Table 29).

Achieving Malawi's opportunities to restore 36,000 hectares of degraded forestland with stream-bank restoration by 2030 will require approximately 3.4 billion MWK of financial investment.

Table 29. *Total financial costs of stream-bank restoration activities in Malawi during the first year.*

Land Use	Financial Costs in Excess of Baseline Activity (MWK)	Hectares	Total Financial Cost (Millions MWK)
Streambank restoration	96,500	36,000	3,474
Total		**36,000**	**3,474**

3.5.4 Gender considerations in river and stream-bank restoration

Women and girls and other vulnerable groups are disproportionally effected by lack of water flow and quality, especially when flooding negatively impacts on downstream water supplies. Building community resilience start with community development restoration programmes integrating gender interests in stream-bank restoration and preservation as well as in land and water management practices. Households' waste that may end in rivers and stream can contaminate water bodies. The gender responsive approach not only can assist the implementing restoration interventions but can also improve prevention contamination of water bodies.

In relation to watershed management, women, relative to men, face more serious constraints in access to information. Poverty is higher amongst women than men and affects female headed household the worst. Major poverty indicators do not favour women in Malawi and these aggravate the disadvantaged position of women. For example, illiteracy levels are higher for women than for men and limit their participation in decision-making positions, as well as their capacity to adopt agricultural innovations (Sibale et al 2010 and FAO 2011).

3.6 Summary of restoration intervention mapping results

Each of the five restoration interventions were mapped individually and thus there is the potential for some interventions to overlap. Figure 14 shows all restoration interventions compiled into one map, and displays locations where there is opportunities for one, two, or three or more interventions (the area for three, four and five interventions were combined). In total, nearly 7.7 million hectares, which is 80 percent of the total land area of Malawi, has opportunities for restoration. Of this area, 6.4 million hectares (67%) is suitable for one restoration intervention and more than 1.2 million hectares (13%) are suitable for two or more restoration interventions.

Table 30 (at the end of this section) centralizes information for all five interventions, showing how the scale of opportunities compares across districts and across interventions, both in hectares and as a percentage of the total district area. With expansive croplands and subsistence farming across Malawi, 3.7 million hectares of agricultural technologies displays the greatest potential which is roughly 40% of Malawi's land area. On a proportional basis Balaka, Dowa and Chiradzulu districts have the highest levels of opportunities for agricultural technologies. The other significant intervention opportunities are in forest management, with more than 3.4 million hectares, or 36% of the country. This intervention opportunities is mainly concentrated in the northern region of Malawi, which is less densely populated and has more expansive areas of natural and plantation forest. Nkhata Bay, Rumphi, and Karonga districts in the northeast have the highest potential for forest management interventions.

They also represent some of the areas, most critical for biodiversity conservation as indicated in the biodiversity multi-criteria analysis (Figure 14). Other restoration interventions present significant potential. More than one million hectares in Malawi meet the opportunities criteria for soil and water conservation interventions, which is 11% of the total country area. Because soil and water conservation is most valuable in areas with steeper terrain and erodible soils, districts with this type of landscape present the greatest opportunities—particularly Thyolo in the south and Ntchisi in the central region. The opportunities area for establishing community forests and woodlots totals more than 750,000 hectares across Malawi, or 8% of the country. Similar to forest management, the opportunities tends to be more widespread in the northern region such as in Chitipa, Nkhata Bay, Rumphi districts, but every district in Malawi has at least some potential for establishing community forests and woodlots. River and stream-bank National Forest Landscape Restoration Opportunities Assessment and Restoration Opportunities Assessment Methodology has the lowest total opportunities across Malawi at 36,000 hectares, mainly due to the nature of the opportunities in that it is focused exclusively on river and stream-banks, but it is important for managing sedimentation and runoff into waterways. As such, the opportunities are evenly distributed across all districts in Malawi. The larger districts of Mzimba, Kasungu, and Mangochi have some of the overall highest opportunities for river and stream-bank restoration interventions.

The next section on multi-criteria analysis will demonstrate how restoration interventions throughout Malawi can refined and prioritized based on the underlying drivers of degradation and where restoration investments could be best optimized to achieve multiple benefits for themes like food security, resilience, and biodiversity.

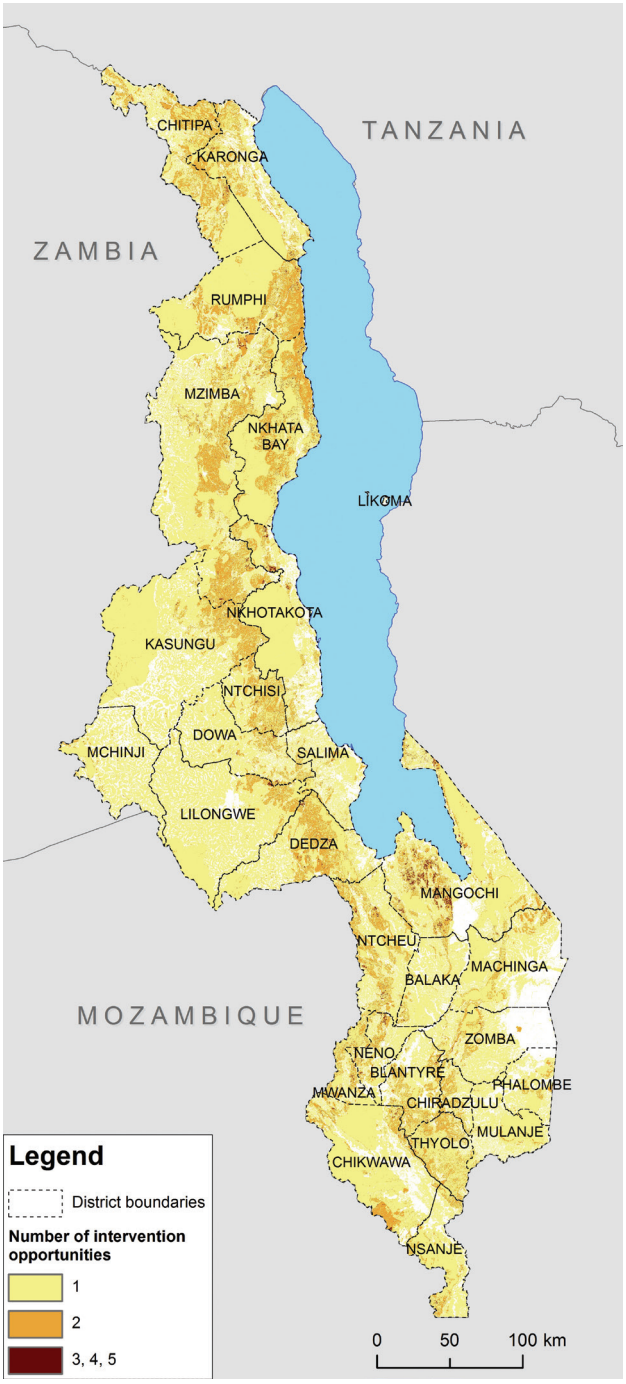

Figure 14. *Compilation of all restoration interventions, with locations where there is opportunities for one, two, or three or more interventions displayed.*

Table 30. *Summary of opportunities area for each intervention, in ha and as percent of total district area.*

		Agricultural technology (CA, FMNR, AF) opportunity		Community forest/ woodlot opportunity		Forest management opportunity		Soil & water conservation opportunity		River and stream-bank restoration opportunity	
DISTRICT	**Area of district (ha)**	**Area (ha)**	**Percent of district**	**Area (ha)**	**Percent of district**	**Area (ha)**	**Percent of district**	**Area (ha)**	**Percent of district**	**Area (ha)**	**Percent of district**
Balaka	213,385	146,730	69%	530	0%	12,817	6%	9,396	4%	1,010	0.5%
Blantyre	202,411	79,974	40%	20,214	10%	31,337	15%	54,707	27%	961	0.5%
Chikwawa	489,166	141,371	29%	46,765	10%	237,852	49%	15,363	3%	2,287	0.5%
Chiradzulu	76,306	47,876	63%	4,707	6%	3,916	5%	20,707	27%	363	0.5%
Chitipa	424,773	85,478	20%	100,396	24%	243,774	57%	31,870	8%	1,023	0.2%
Dedza	374,845	172,827	46%	31,968	9%	106,339	28%	83,271	22%	1,736	0.5%
Dowa	309,334	204,223	66%	12,062	4%	18,395	6%	35,240	11%	1,458	0.5%
Karonga	341,639	51,843	15%	58,443	17%	202,545	59%	14,288	4%	949	0.3%
Kasungu	804,355	367,686	46%	8,097	1%	260,591	32%	78,686	10%	3,174	0.4%
Likoma	2,072	-	0%	384	19%	114	6%	-	0%	10	0.5%
Lilongwe	620,182	378,254	61%	10,127	2%	95,544	15%	38,526	6%	2,655	0.4%
Machinga	393,161	130,553	33%	16,543	4%	114,512	29%	16,245	4%	1,800	0.5%
Mangochi	675,053	253,802	38%	46,307	7%	261,893	39%	65,836	10%	2,332	0.3%
Mchinji	312,986	175,653	56%	4,998	2%	32,356	10%	5,656	2%	1,219	0.4%
Mulanje	200,459	65,600	33%	3,370	2%	84,341	42%	4,121	2%	745	0.4%
Mwanza	102,388	26,743	26%	13,641	13%	45,659	45%	24,826	24%	301	0.3%
Mzimba	1,059,961	548,739	52%	82,443	8%	284,877	27%	164,525	16%	4,286	0.4%
Neno	129,468	49,262	38%	12,987	10%	42,780	33%	15,080	12%	448	0.3%
Nkhata Bay	419,587	22,105	5%	84,811	20%	362,012	86%	31,982	8%	353	0.1%
Nkhotakota	432,911	85,663	20%	17,142	4%	246,292	57%	28,916	7%	1,239	0.3%
Nsanje	196,206	44,472	23%	8,379	4%	113,258	58%	17,352	9%	719	0.4%
Ntcheu	322,089	184,904	57%	27,108	8%	39,841	12%	81,864	25%	1,593	0.5%
Ntchisi	170,969	90,567	53%	14,667	9%	35,915	21%	56,766	33%	666	0.4%
Phalombe	142,400	65,346	46%	8,006	6%	20,849	15%	3,072	2%	592	0.4%
Rumphi	465,060	46,625	10%	93,981	20%	365,945	79%	27,571	6%	937	0.2%
Salima	213,935	89,130	42%	2,101	1%	53,222	25%	13,084	6%	1,286	0.6%
Thyolo	164,270	46,067	28%	10,091	6%	51,043	31%	81,804	50%	601	0.4%
Zomba	311,537	129,297	42%	13,201	4%	33,260	11%	23,014	7%	1,735	0.6%
TOTAL	**9,570,908**	**3,730,790**	**39%**	**753,471**	**8%**	**3,401,279**	**36%**	**1,043,768**	**11%**	**36,478**	**0.4%**

4. Multi-criteria spatial analysis of FLR

A multi-criteria analysis (MCA) was applied in Malawi to identify where FLR interventions can: 1) achieve food security, 2) increase resilience, and 3) support biodiversity (from this point forward they will be referred to as 'scenarios'). The base layer for the three scenarios is the functional degradation map (for more details on the methodology used please see Annex 18). An MCA approach makes it possible to map various criteria that contribute to each of these three scenarios, so that the multiple benefits of landscape restoration can be visualized prior to on-the-ground decision-making. The MCA approach can therefore assist with the decision-making process, prioritization, and planning of FLR interventions for each scenario, or for all three scenarios as a composite.

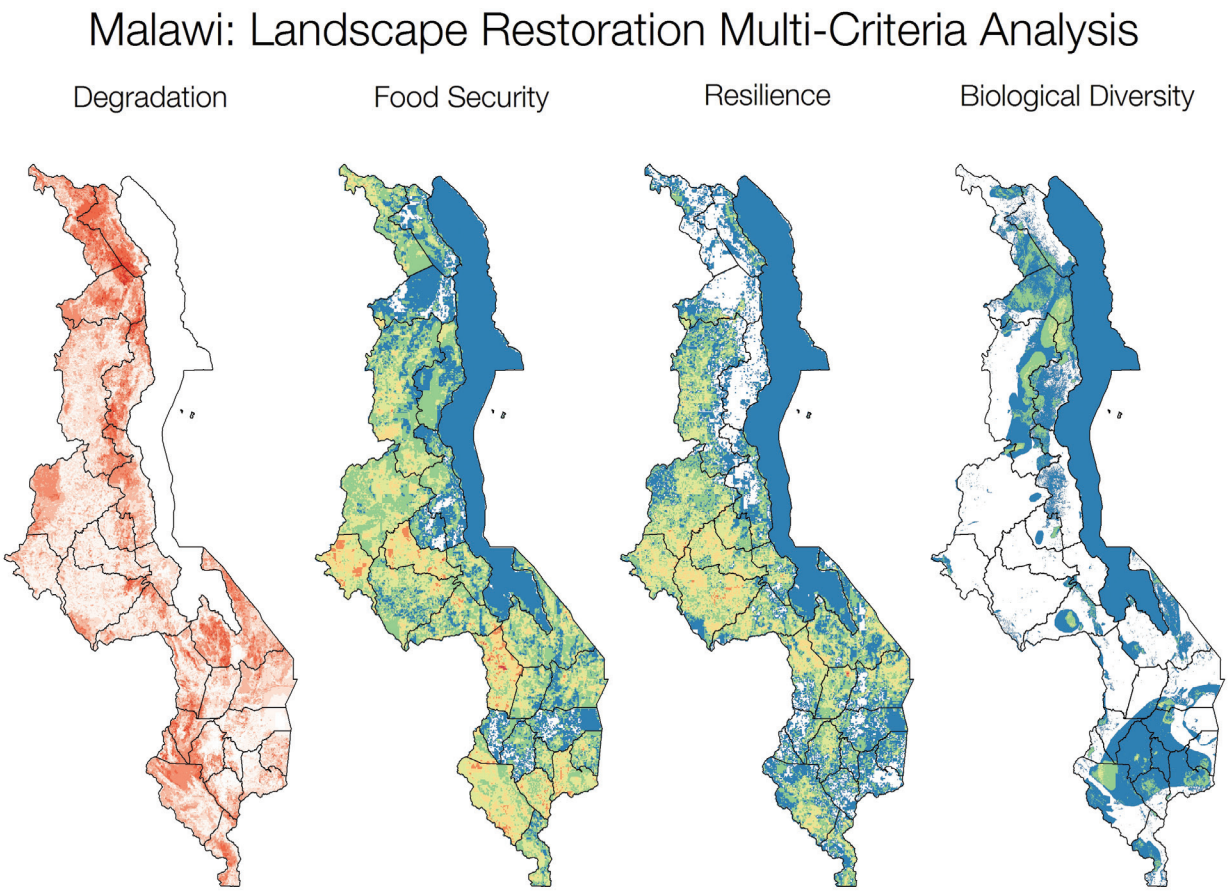

Figure 15. *The base layer representing functional degradation of Malawi and the representation of the three scenarios.*

These scenarios were considered of particular relevance, based on Malawi's national priorities for FLR, where the focus lies on improving human welfare and livelihoods. Food security has been a persistent concern, and the effects of climate change and population growth have exacerbated this issue. Malawi recognizes the importance of well-functioning and resilient ecosystems in the provisioning of goods and services to its citizens and national economy, which is underpinned by its biological diversity.

4.1 Functional degradation

Degradation is a composite issue and should be defined in the context of Malawi. Since there are many driving factors behind the problem of degradation, and not all of them are spatial, in this MCA we utilize the concept of functional degradation to describe the context of deforestation and degradation in Malawi. The result is a spatial analysis of where the functionality of the landscape may be lost, to enable the creation of a theory of change that can ultimately lead to the mitigation of degradation drivers.

The analysis of degradation culminating here in a MCA of functional degradation, forms the basis for identifying and prioritizing FLR opportunities for the remaining scenarios and interventions outlined in this report. The input criteria for the functional degradation map, and the parameterization of criteria, are explained in more detail in Annex 18 and visualized in Figure 16. The functional degradation map will be used in all subsequent MCAs for each scenario to help identify where the intensity of degradation may overlap with restoration opportunities for food security, resilience, or biodiversity.

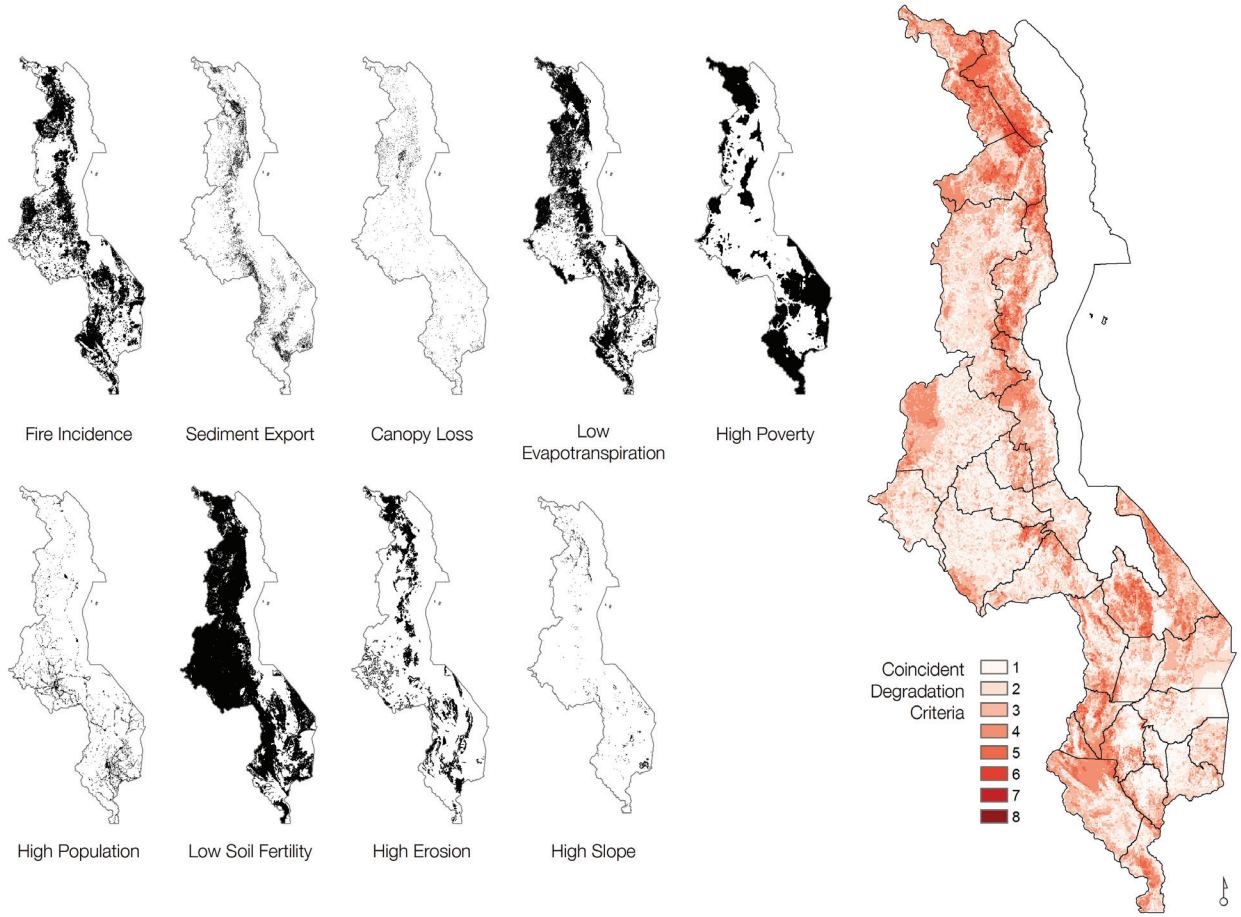

Figure 16. *Nine (9) input criteria were used as proxies for the multi-criteria functional degradation map. The map on the right shows the result of stacking each of these input criteria in a multi-criteria analysis. Darker red indicates a larger number of coincident criteria in a specific area, which, based on the input criteria, form a functional measure of landscape degradation severity.*

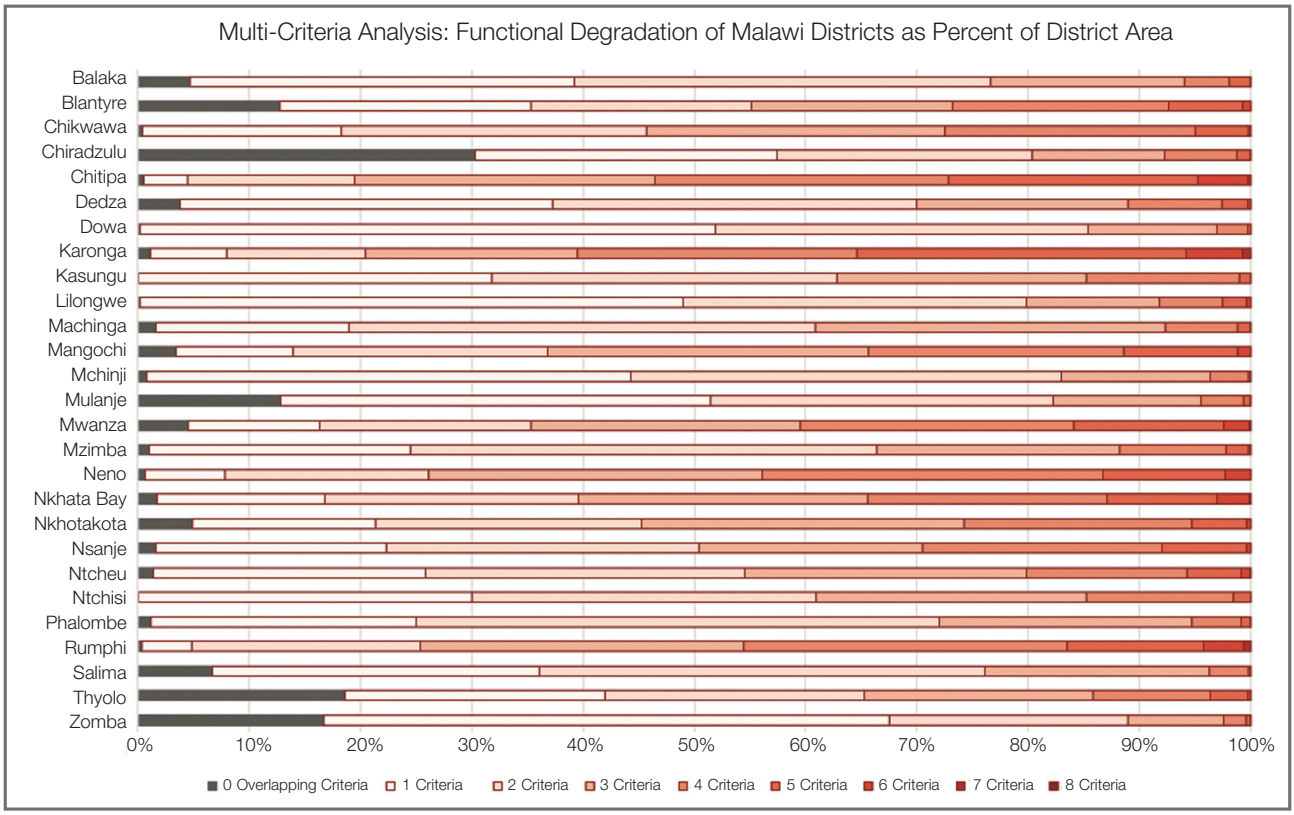

Figure 17. *This figure illustrates the number of overlapping functional degradation criteria per district, based on the spatial input data used and parameterized in the multi-criteria analysis. Since not all input data were available for Likoma it could not be included in the analysis.*

4.2 Food security

Malawi's landscape restoration commitment requires developing and implementing diversified FLR interventions that both mitigate the causes of food insecurity, and provide opportunities for poverty alleviation – two persistent issues in Malawi. Land degradation, widespread deforestation, decreasing agricultural yields, gender gaps in agricultural production, dependence on rain-fed agriculture, increasing food prices and poverty are threatening Malawi's ability to feed its people. These threats are exacerbated by climate change, which weakens the stability of food production systems (World Food Programme, 2016).

Climate change impairs both crop quality and quantity (World Food Programme, 2016). In Malawi, food production systems have already shown their extreme vulnerability to disasters, increasing the risk of hunger and impacting dietary diversity and calorie intake (World Food Programme, 2016). In 2016, the El Niño-induced dryness throughout the South and Central regions of the country, and seasonal flooding in the North, resulted in a decline in crop yields (maize, rice and wheat) by over 15% from 2015 and 34% from the previous five year average (FAO, 2016).

Land degradation and deforestation also affect the quantity and quality of water, which can lead to a lack of irrigation and livestock water supplies, intensify food insecurity, cause water-related diseases, and impact energy production. With a projected annual population growth of 3.1% the pressure on the land and natural resources will increase in the coming years, especially in densely populated areas of the South where food insecurity is severe (World Bank, 2015). As a result, it will become even more difficult to expand and intensify food production due to water scarcity.

The NFLRA examined where, why and what proportion of people lack food security in Malawi and how forest landscape restoration interventions can enhance the current coping strategies. The assessment also estimated the benefits of restoring degraded and deforested land at a national level for food production and income generation. These results should equip decision makers with information to prioritize restoration in landscapes where benefits for food security and poverty alleviation can be captured.

Food security status at national level

Food security exists when people have adequate physical, social or economic access to sufficient, safe and nutritious food (FAO, 2003). In 2011, the Integrated Household Survey reported that 33% of Malawi's population had very low food security, with a higher proportion in rural areas than urban areas, and higher insecurity in female headed households (IHS3, 2011). The 2016 Malawi Vulnerability Assessment Committee (MVAC) projected that 6.5 million people (about 39% of current population) will be food insecure during 2016–2017 (Ministry of Finance, Economic Planning and Development, 2016). Food insecurity has high social and economic costs that impact long term economic growth and development.

Both the National Food Insecurity Response Plan and the Malawi Vulnerability Assessment Committee (MVAC) National Food and Nutrition Security Forecast of 2015 and 2016 reveal a decrease in maize yield from 2.78 to 2.43 million metric tonnes, an increase in the number of food insecure people from 2,833,212 to 6,491,847 people; and an increase in costs for providing food aid to vulnerable communities (both cash and food transfer) from $118,860,000 to $307,505,000 US Dollars (Government of Malawi, 2015). Malawi's total maize output for 2016 [2,431,313 metric tons] was significantly below the 3,215,135 metric tons that was required to meet national needs (Record et al., 2016). The impact in economic terms is estimated to equal 5.6 percent of Malawi's GDP (Record et al., 2016). The resource gap to mitigate the crisis in both years is also significantly higher: $303, 810, 099 USD in 2016 and $147, 878, 000 USD in 2015 (Government of Malawi, 2016; Government of Malawi, 2015).

The National Food Insecurity Response Plan vary from the cash-based to food-based that is mobilized at national level to address the food insecurity crisis throughout the country. National Food Insecurity Response Plan indicates the different programme responses out of which the food security cluster (food and cash assistance) accounts for USD 307.5 million in 2016 and 118,860 million in 2015 (Government of Malawi, 2016; Government of Malawi, 2015). These results are important to consider, as the food-aid responses are difficult to mobilize, specifically to cover the deficit for the remaining gaps. Therefore for the long term sustainability, interventions such as FLR make sense economically to enhance the resilience of food production systems.

Lack of access to food and under-nutrition

One in three households have inadequate food to maintain an active and healthy life in Malawi (Government of Malawi, 2016). Approximately 81% of poor households consume less than 2,100 kilocalories per person per day (Record et al., 2016). Households involved in subsistence farming are more vulnerable to food insecurity (Kakota et al., 2015). Access to food can be impacted by unemployment, physical capacity to perform labor (due stunting and malnutrition), purchasing power, poverty rate, and market prices just to mention a few factors.

Fifty-five percent of Malawi's population depends on maize for daily caloric intake; though it lacks the necessary protein and vitamins that are needed for daily nutrient requirements. According to seven nutrition surveys, conducted in 25 districts covering 9 livelihood zones, overall Global Acute Malnutrition (GAM) was classified as normal (2.5%), but overall nutrition situation deteriorated from 2015 to 2016 in South region (Kakota et al., 2015;

Government of Malawi, 2016). One of the effects of the under-nutrition is lower productivity and some cases can lead to mortality. In 2012, child under-nutrition resulted in a productivity loss equivalent to 10.3% of nation's GDP (Ministry of Finance, Economic Planning, and Development, 2012). In addition, the study has shown that child mortality due to under-nutrition has reduced Malawi's work force by 10.7% (World Food Programme, 2016).

The majority of households use a negative coping strategy to respond to food insecurity, by relying on low-cost and less-preferred foods; limiting the number and size of meals; and decreasing consumption by adults. According to the surveys conducted by World Food Programme in December 2015 and February 2016, the negative coping levels across the nation indicated that the median reduced coping strategy index (rCSI) has increased from 13 in 2015 to 16 in 2016 (World Food Programme, 2016). A high rCSI means that households are using more severe coping strategies and the negative rCSI means borrowing food; limiting portion sizes; reducing the number of meals; restricting adult consumption so children can eat; and switching to less expensive food (World Food Programme, 2015). The results also indicate that the female-headed households are more vulnerable to food insecurity than male headed households and women use more negative coping strategies and have lower daily wage rates (World Food Programme, 2016).

Landscape restoration potential for food security

Multi-criteria analysis using biophysical and socio-economic data proxies for food security allowed for a specific prioritization of areas where landscape restoration may support food security at a national scale. The results of this technique are shown in Figure 18. Landscape Restoration Potential for Food Security and can be used to guide restoration to areas of importance for food security, and accordingly construct FLR interventions to enhance the resilience of Malawi's food production and distribution systems.

Considering the above analysis of the food security situation in Malawi, women are more severely impacted by food insecurity, access to markets can positively influence coping strategies, and because many of Malawi's population are engaged in subsistence farming, access to natural resources (with non-timber forest products as a proxy for analysis) is of critical importance. In the MCA for food security we have included these criteria as well as others such as rain-fed areas, and areas with low yields.

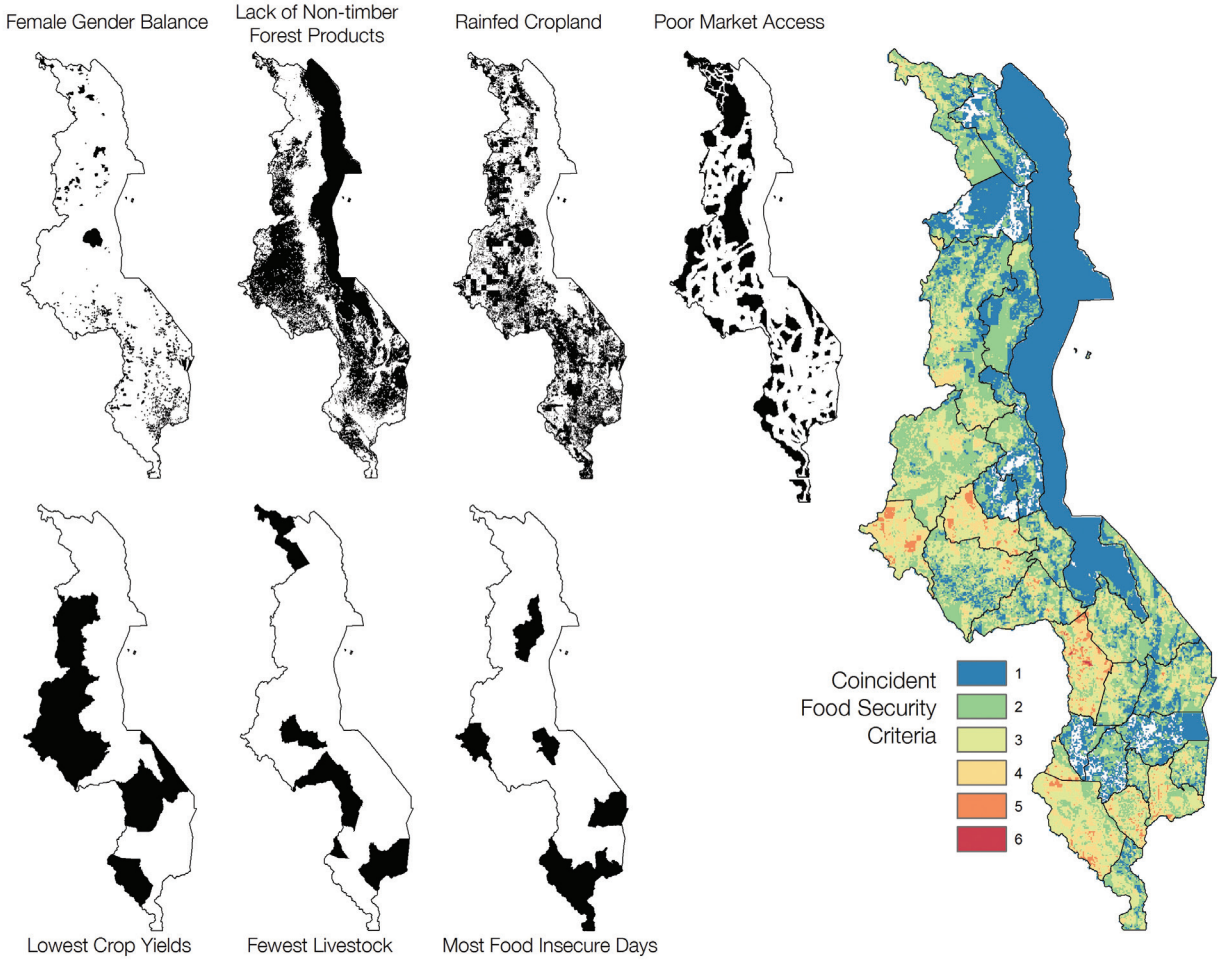

Figure 18. **Multi-criteria Analysis for food security** *shows the seven input criteria that were used as proxies for the spatial analysis of food security potential for landscape restoration. The result of the multi-criteria analysis is the colored map on the right. Blue indicates areas where food insecurity may be lower while red areas indicate potential priority areas for addressing food insecurity.*

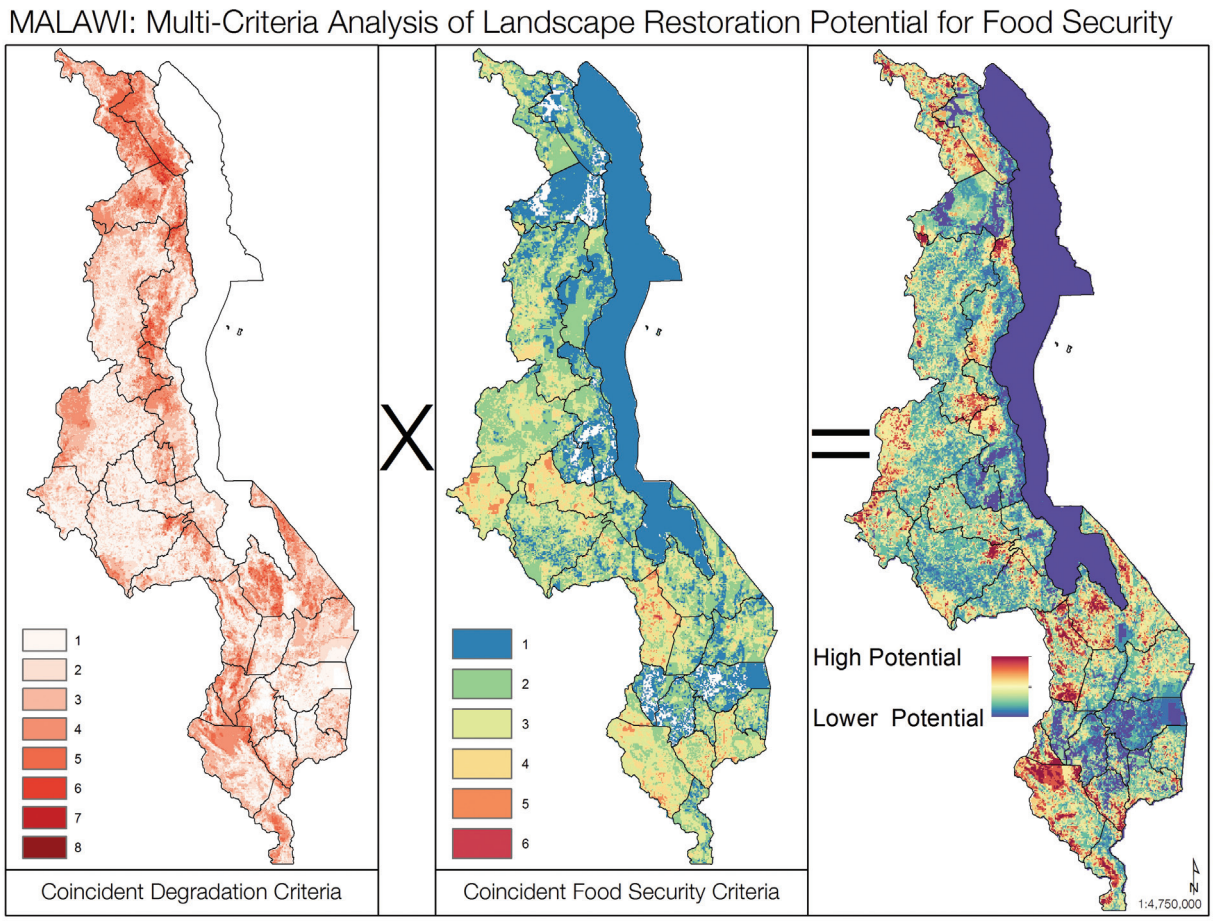

Figure 19. *The product of multiplying the results of the functional degradation map with the results of the food security MCA. This indicates where areas of high functional degradation may overlap with areas of high food security priority, leading to more targeted approaches to landscape restoration.*

The MCA of food security will play a guiding role in developing site-specific FLR implementation packages that account for the wider socioeconomic and biophysical environment, in order to produce the multiple benefits of restored landscapes for food security. Additionally, this will help to unlock finance from food security response programmes and projects at national and district level by integrating agricultural technologies (CA, FMNR, AF), for example, as strategic initiative for poverty alleviation and improving food security.

Table 31. *These are the combinations of criteria, or the occurrence of a single criteria, for totals larger than 100.000 ha for the food security scenario. This information can be used to design appropriate technological packages for forest landscape restoration that will benefit food security as well as other associated factors in the MCA.*

Criteria, and combinations thereof, to be considered in the development of FLR technical packages to address food security (above 100,000 ha, at national level)	**Hectares**
Rainfed Cropland	2,244,700
High poverty, poor market access	446,000
High poverty, limited NTFP, few livestock	416,000
Low soil fertility	292,400
Low evapotranspiration, rainfed cropland	202,000
Sediment export, female gender balance, poor market access	151,400
Canopy cover loss, sediment export, poor market access	120,000
Low soil fertility, high poverty, rainfed cropland, low crop yield, few livestock, food insecure	115,400
Female gender balance, few livestock	111,500
High slope, high/moderate erosion, low soil fertility, canopy cover loss, few livestock	104,700
Canopy cover loss, high population density, sediment export, rainfed cropland, low crop yield	104,000
Total	**4,204,100**

To achieve food security and sustain healthy ecosystems, inter-sectoral approaches will be needed at all levels (nationally, regionally and at the local level) to capture the necessary synergies needed for effective landscape restoration for food security. The integration of forestry and agriculture will positively impact food production systems. The MCA on food security, whereby socio-economic and environmental factors are analysed, will be useful for developing technical packages and FLR strategies at all levels and for each sector.

Malawi is heavily dependent on smallholder, rain-fed agriculture, and that this single criteria composes roughly half of the total opportunities area is hardly surprising. Appropriate technologies such as improved water retention strategies, species choices, irrigation where feasible, will help those areas deal with droughts for example. Noticeably, 416,000 hectares are identified as areas with high poverty, low access to non-timber forest products, with few livestock. Restoration planning that can address these specific criteria through diversified interventions and technical packages, will achieve approximately 10% of Malawi's landscape restoration commitment under the Bonn Challenge.

4.3 Resilience

There are various factors at play that reduce the resilience of landscapes and communities to climatic extremes (dry seasons, floods, siltation, etc.). In Malawi one of these factors is the high dependence on a single crop such as maize, which increases the vulnerability to shocks (USAID, 2013). Forest land and natural resources are being degraded due to ongoing clearing for farming, increased demand for biomass for fuel, as well as poor agricultural practices. Biomass (charcoal and firewood) represent over 90% of Malawi's aggregated energy demand and consumption, and is a significant driver of degradation. Hydropower that is highly vulnerable to droughts, has large implications for those dependent on hydro-electricity. As a result of longer dry seasons and dried up water supplies, have damages for the water sector has been estimated to be $11.8 million USD (World Bank, 2016). 90% of Malawi agriculture is rain-fed and is the least resilient to climate change (Ministry of Agriculture, 2016). Crop diversity and food diversification is a key challenge for Malawi. Maize, which is a temperature sensitive crop, composes 70% of agricultural production and 60% of the caloric intake of

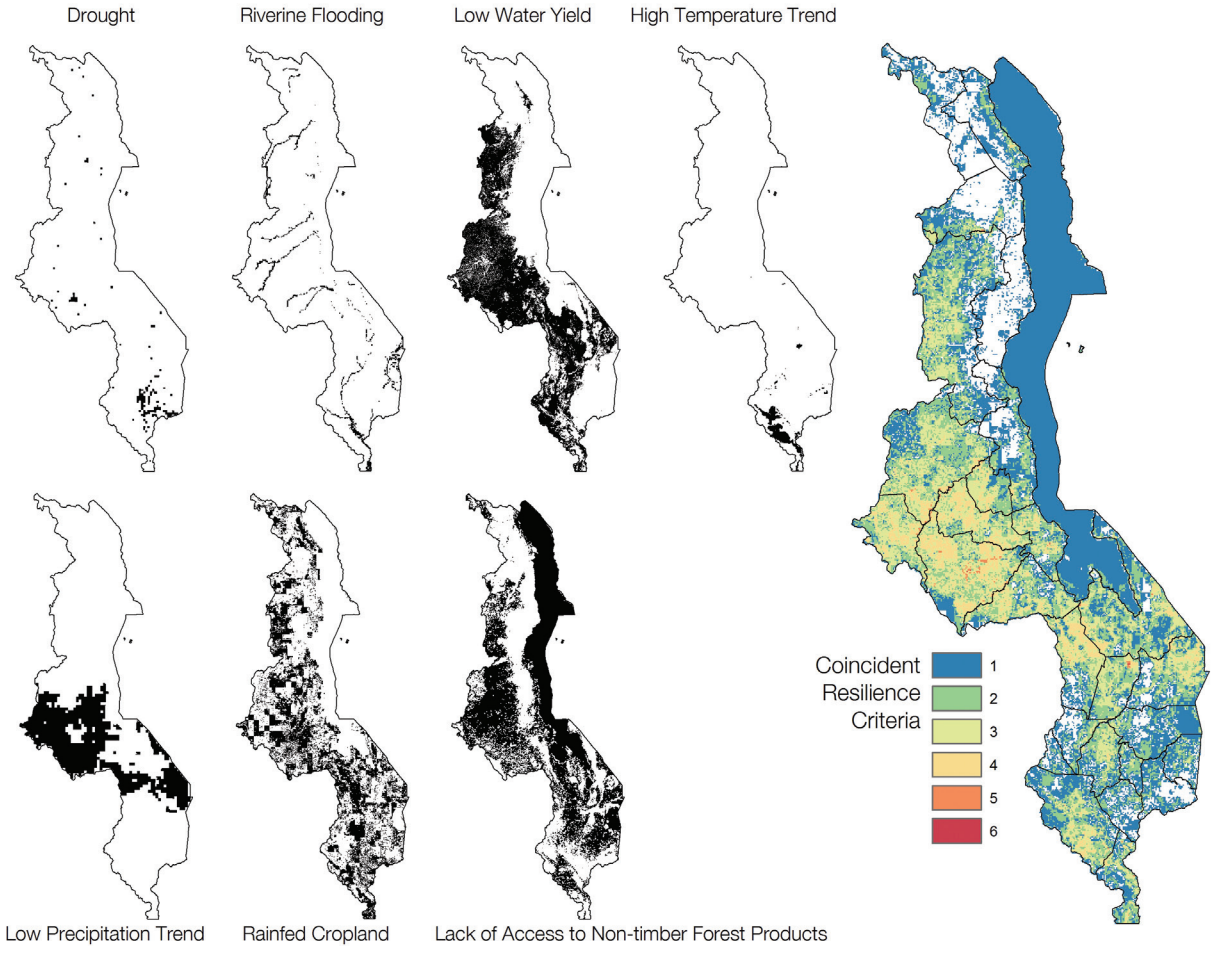

Figure 20. *Multi-criteria analysis for Resilience: shows the seven input criteria for assessing resilience at the national level in Malawi, and the output from the MCA on the right. Specifics for each criteria and parameterization of the criteria, can be found in Annex 19. Based on these results, central Malawi shows significant potential for addressing resilience through landscape restoration.*

households (USAID, 2013). Smallholders usually cultivate less than 1 ha parcels of land (about 0.61 ha) and small-holder farming consists for 90% of agriculture sector, contributing 70 percent of agriculture GDP (Tchale, 2009; Ministry of Agriculture, 2016). Overall, the economic fluctuations, poverty, dependency on informal labour, lack of diversification (including access to NTFP's), limited market access and absence of off-farm labour, have significant social impact during crop failure and food shortages. Decline in food production and climate change induced extreme weather events have led to higher incidents in malnutrition, malaria, cholera. Poor households, especially female-headed families, are disproportionately affected by food insecurity and malnutrition.

The objective of FLR for Resilience is to enhance Malawi's adaptive capacity and recovery from natural hazards and disaster. Restoring degraded landscapes will strengthen *"the ability of people, households, communities, countries and social or ecological systems exposed to hazards to mitigate, adapt to, and recover from shocks and stresses in a manner that reduces chronic vulnerability and facilitates inclusive growth (IPCC, USAID, DFID, EU, OECD) including through the preservation and restoration of its essential basic structures and functions and without jeopardizing their medium and long-term future" (UNISDR, BMZ)]* (Sturgess and Sparrey, 2016.) In this assessment, the MCA focusses on where people and systems in Malawi may be vulnerable to specific shocks (drought, flood), and where FLR opportunities exist for enhancing resilience to those shocks. The indicators such as drought, riverine flooding, low water yield, high temperature trend, low precipitation trend, rain-fed cropland, lack of NTFP (shown in Figure 20 below) are important determinants for prioritizing areas for enhancing resilience and adaptive capacity of social and ecological systems.

Based on the MCA for Resilience we can identify and prioritize where FLR can achieve maximum benefits to increase resilience and adaptability to shocks. For example, in areas with high temperature trends and droughts, FLR interventions for agricultural technologies should consider species selection in accordance with this trend. Planting of trees in degraded riverine areas to help increase water absorption and retention may increase the resilience and recovery from riverine flooding. Community forests and woodlots could improve people's ability to respond to shock by increasing access to non-timber forest products (diversification) in times of need, in those areas where access is now limited or absent. In areas with rain-fed agriculture

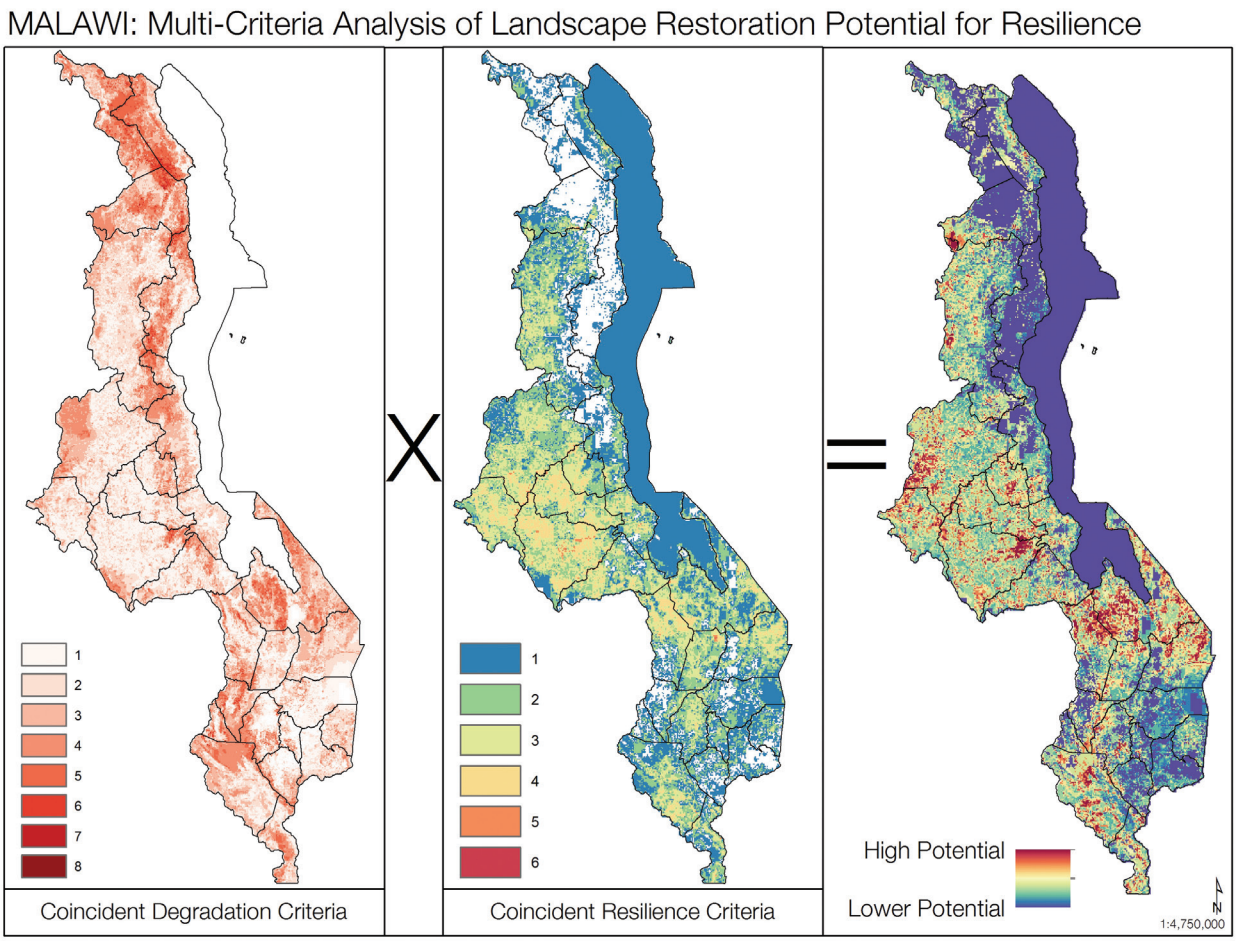

Figure 21. *Landscape Restoration Potential for Resilience shows the product of multiplying the results of the functional degradation map with the results of the resilience MCA. This indicates where areas of high functional degradation may overlap with areas of high resilience priority, leading to more targeted approaches to landscape restoration.*

***Table 32**. Overlapping MCA criteria.*

Criteria, and combinations thereof, to be considered in the development of FLR technical packages to address resilience (above 100,000 ha, at national level)	**Hectares**
Limited NTFP	2,228,002
Low soil fertility, low water yield, rainfed cropland, limited NTFP	250,519
Low soil fertility, low water yield, limited NTFP	217,981
Low soil fertility, low water yield, low precipitation, limited NTFP	211,620
Low soil fertility, low water yield, low precipitation, rainfed cropland, limited NTFP	206,727
Low evapotranspiration, low soil fertility, high poverty, burned areas, low water yield	151,070
Low soil fertility, low water yield, low precipitation	135,779
Low soil fertility	133,210
Low evapotranspiration, low soil fertility, high poverty, burned areas	126,850
Low soil fertility, low water yield, low precipitation, rainfed cropland	125,993
Low evapotranspiration, low soil fertility, burned areas	113,394
Low soil fertility, limited NTFP	103,853
Low soil fertility, low water yield	102,630
Total	**4,107,626**

and droughts it will be critical to build water retention capacity of soils, and develop irrigation schemes where possible. The MCA provides the locality and confounding of these criteria so that appropriate FLR interventions can be designed. In order to do that the elements in the landscape that drive degradation and the status of degradation must also be considered. The combination of the MCA for resilience and MCA for degradation, illustrated below (Figure 21) gives us the best information available to achieve this goal.

Table 32 above shows unique combinations of criteria for the functional degradation and resilience MCAs, for totals larger than 100,000 hectares. Within this scenario, the largest factor by far, as single criteria, is the lack of access to non-timber forest products, which accounts for over half of the total surface area. For the other 2 million hectares, different combinations of criteria for functional degradation and resilience should be considered when developing appropriate FLR strategies and technical packages. An estimated 126,850 hectares could benefit from a restoration intervention that specifically addresses low evapotranspiration, low soil fertility, high poverty, and burned areas.

4.4 Biodiversity

Preliminary analysis has shown that if Malawi achieves 12% of the Bonn Challenge pledge (4.5 million) in degraded areas important for biodiversity, all Malawi's high priority degraded terrestrial Key Biodiversity Areas can be restored. Changes in vegetation and habitats due to longer dry seasons, fires, flooding or deforestation/ degradation has impacted certain species and their habitats. In particular the drought of 2015-2016 significantly impacted plant species, wildlife, water, and tourism with a total estimated damages of USD 4.2 million (World Bank, 2016). Significant gains for biodiversity through landscape restoration can be achieved by targeted FLR interventions in just three districts (Mzimba, Rumphi, Nkhata Bay) and nearly all of these areas occur in less than 10 land use/land cover categories.

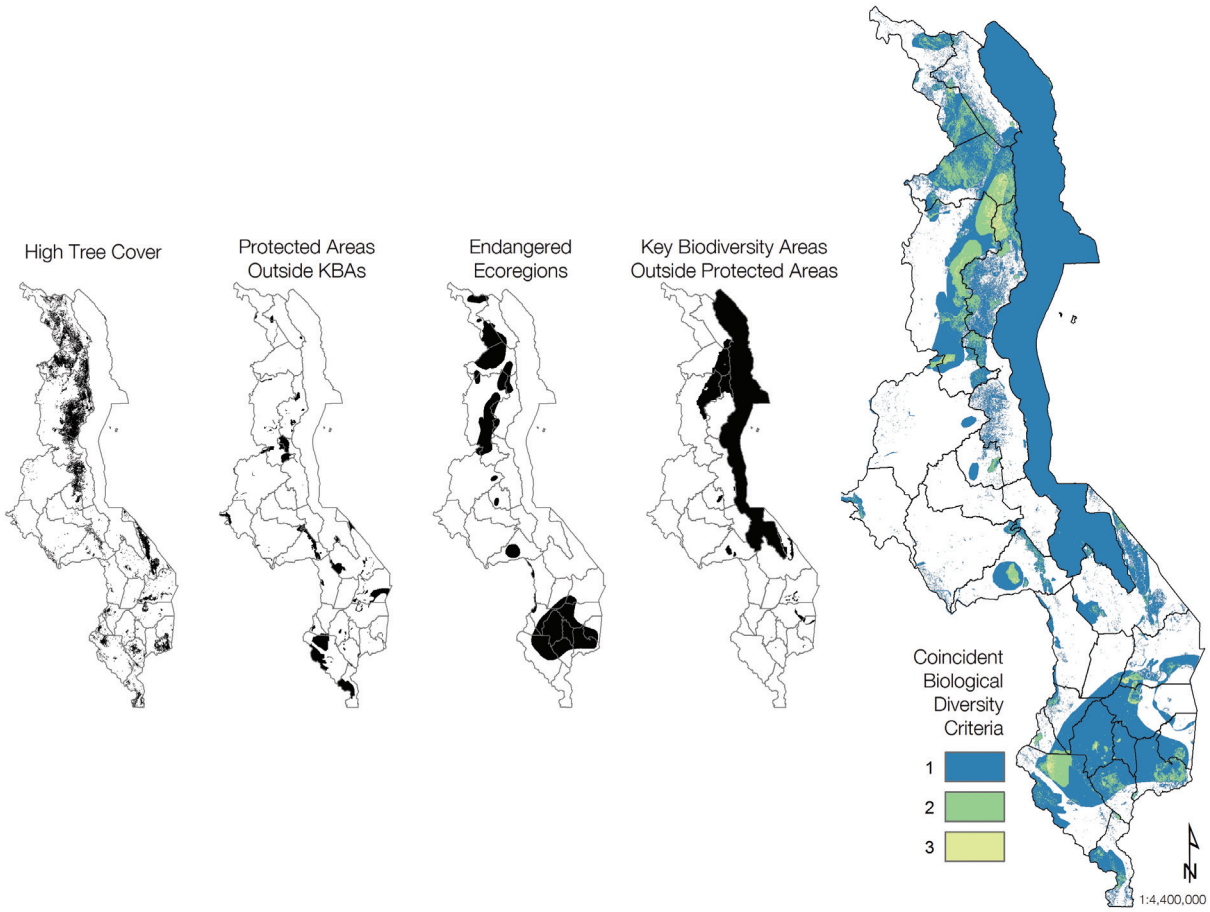

Figure 22. *Multi-criteria analysis for biological diversity: demonstrates the four input criteria that were used as proxies for a spatial analysis of biological diversity potential for landscape restoration. The result of the analysis is the colored map on the right. Blue indicates areas where landscape restoration for biodiversity potential may be lower while green areas indicate potential priority areas for addressing biodiversity conservation and restoration.*

Biodiversity and ecosystem services underpin ecological productivity and economic activity, especially in Malawi where over 90% of agriculture is rain-fed. Landscape restoration that identifies and integrates interventions that are sympathetic to biodiversity have a higher chance of success and can provide significant contributions to long-term resilience (Lamb et al. 2005). Restoration in areas identified as a priority for biodiversity also have the potential to contribute to Malawi's national ambitions for restoration and will directly contribute to Malawi's commitments under the Convention of Biological Diversity and the National Biodiversity Strategy Action Plan (NBSAP).

Landscape restoration that addresses biodiversity also supports ecosystem resilience and food security. Apart from threatened species, restoration interventions that harness the benefits of biodiversity and the successional pathways that plants and landscape follow as they grow and mature, can generate immediate livelihood benefits that also include long-term solutions to persistent human and landscape challenges. Restoration strategies that use a diverse assemblage of species are less prone to failure and disease and there is significant potential to design strategies that support viable economic activities and products within an ecologically sustainable framework. As such, identifying areas that are particularly important for species diversity can provide insights into the benefits that can be acquired by and tangential to landscape restoration.

In terms of threatened species, Malawi is currently responsible for the conservation and management of at least 250 threatened species, as defined by the IUCN Red List. This includes, 119 species of fish, most of which are cichlid fish endemic to Lake Malawi. There is sufficient and potential opportunities for landscape restoration activities to have added biodiversity benefits for these and other threatened species. For instance, FLR interventions that include measures designed to mitigate the erosion of topsoil and the sedimentation of waterways will have positive impacts on the efficiency of hydropower facilities. More than half of the species of threatened cichlid fish have "sedimentation" listed as a major threat. Through targeted intervention activities with complementary biodiversity benefits in mind – like reducing sedimentation- FLR can directly contribute to economies and livelihoods as well as directly reducing extinction pressures on threatened species.

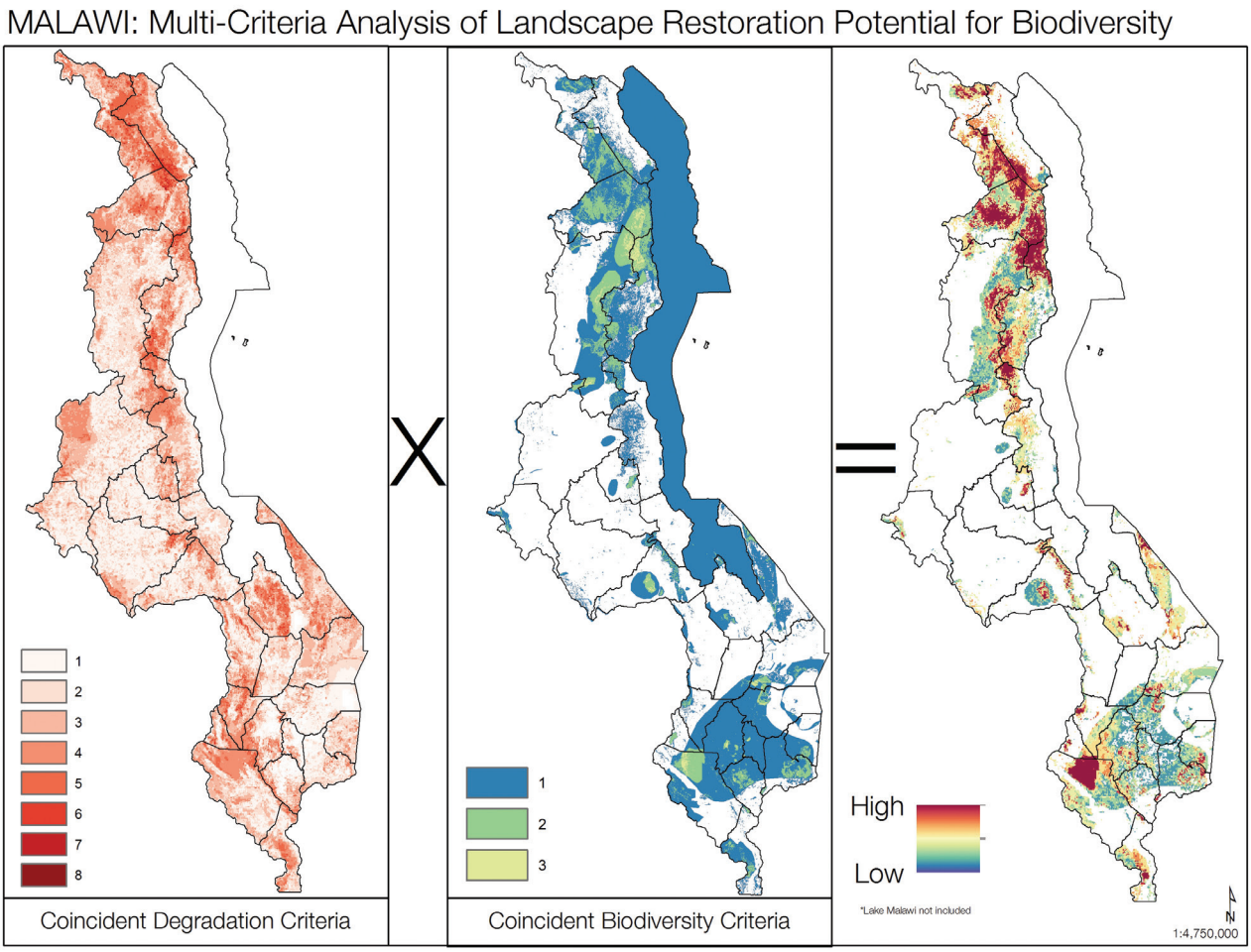

Figure 23. *The product of multiplying the results of the functional degradation map with the results of the biodiversity MCA. This indicates where areas of high functional degradation may overlap with areas of high biodiversity priority, leading to more targeted approaches to landscape restoration.*

Table 33. *Input criteria combinations accounting for more than 50,000 hectares between the functional degradation MCA and the biodiversity MCA.*

Biodiversity and Degradation Criteria Combinations up to 50,000 ha	Hectares
low soil fertility, endangered ecoregion	220,600
Low evapotranspiration, low soil fertility, endangered ecoregion	89,000
Low evapotranspiration, low soil fertility, high poverty, fire incidence, endangered ecoregion	88,100
Low soil fertility, fire incidence, endangered ecoregion	82,400
Low evapotranspiration, low soil fertility, fire incidence, endangered ecoregion	61,700
Low evapotranspiration, canopy cover loss, high poverty, sediment export, high tree cover	55,000
High poverty, endangered ecoregion	52,500
Low soil fertility, Key Biodiversity Area outside Protected Area	51,200
Total	**700,500**

Table 33 shows each of the input criteria combinations that account for more than 50,000 hectares between the functional degradation MCA and the biodiversity MCA. These figures show the potential criteria that could be addressed through restoration activities that consider and support biodiversity in the areas where these specific criteria overlaps occur. For instance, there are an estimated 55,000 hectares in Malawi where an appropriately designed restoration intervention or technical package could address low evapotranspiration, canopy cover loss, high poverty, sediment export in areas of high tree cover. In this situation there are probably both restoration and conservation actions that would be appropriate and the alignment with ongoing or planned conservation activities could benefit livelihoods and biodiversity. With a relatively disproportionate investment in restoration activities that explicitly consider and support the conservation and restoration of biodiversity, both human livelihood and biodiversity objectives can be achieved.

4.5 Refining FLR interventions for food security, resilience and biodiversity

The ultimate goal of this multi-criteria analysis is to provide stakeholders with additional information that can assist with the identification, prioritization and design of FLR opportunities and the design of interventions to support achievement of local, national and international goals and commitments. Through these analyses, stakeholders now have results demonstrating how both degradation and FLR opportunities areas for each scenario can be delineated and prioritized. The results of these analyses support an evidence-based and diversified approach to restoration strategies that can be implemented at a local scale and within a broader landscape context. This is achieved through the quantification of National Forest Landscape Restoration Opportunities Assessment and Restoration Opportunities Assessment Methodology by district and/or watershed along with spatial assessments of how different land uses can contribute to supporting multiple FLR criteria and where specific combinations of criteria overlap.

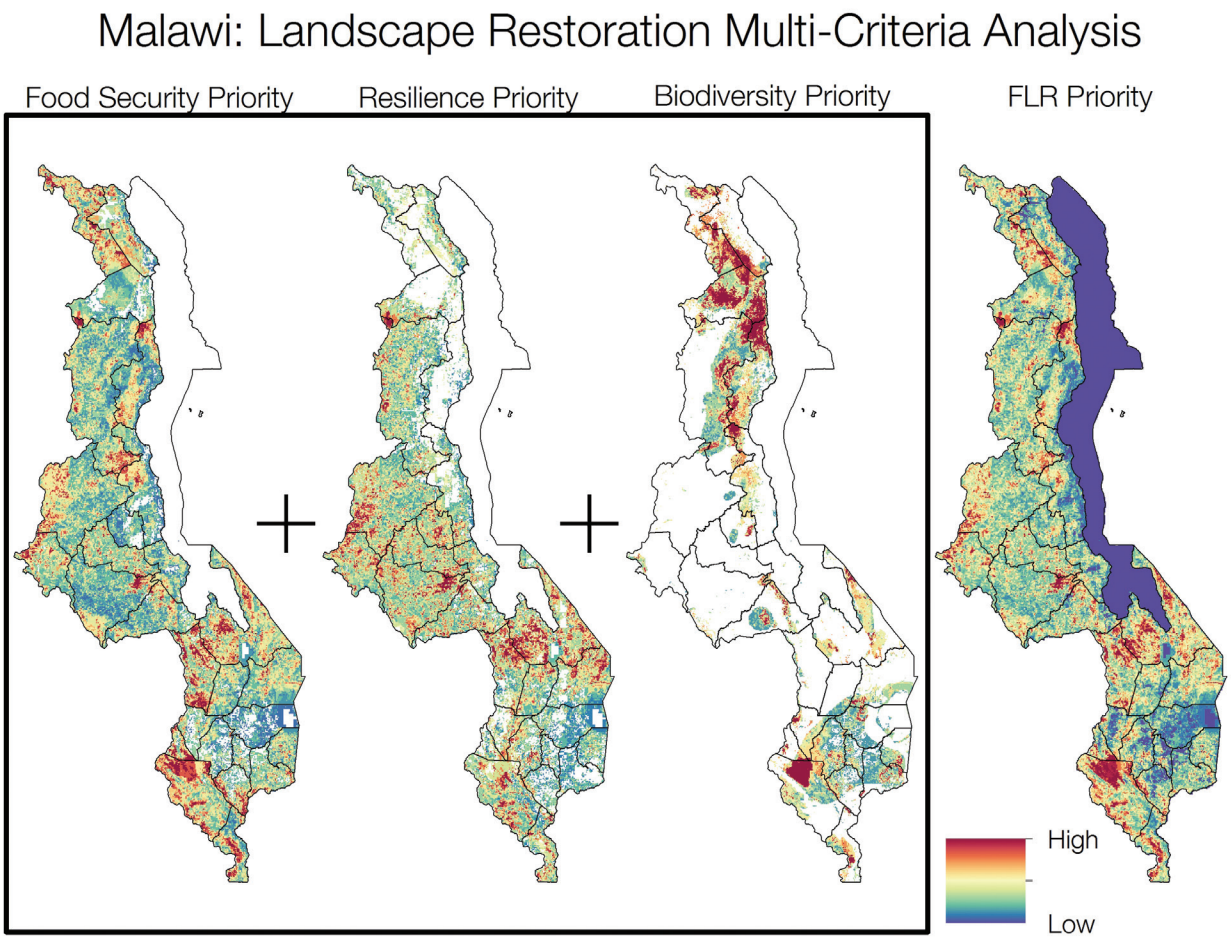

Figure 24. *Priority areas identified through multi-criteria analysis: this figure shows the sum of all of the landscape restoration scenario multi-criteria analyses. The scenario MCA have not been standardized and so results are somewhat dependent on the number of input criteria. Nevertheless, the map on the right can provide a useful guide for decision-makers looking to address the drivers of degradation in Malawi for the three scenarios outlined here at the national scale.*

This information can be used to design targeted and specific intervention activities that are aligned among local context and realities, national development and restoration goals, and international commitments to biodiversity, food security, climate change, and forest landscape restoration. Within the intervention activities that have been identified for scaling up in Malawi, the multi-criteria analysis will lend prioritization and specificity in these and other intervention activities. It can provide the necessary information to help prioritize restoration in different areas for different objectives and provides a series of proxy opportunities and degradation baselines against which restoration success can be monitored and measured in the future.

Furthermore, using multi-criteria analysis, NFLRA has a) identified priority areas for each scenario and for the combination of all three scenarios (shown in Figure 24 above.) and b) matched this to the total opportunities area (ha) identified for each FLR intervention (agricultural technologies, community forest and woodlots and so forth). This is summarized in five tables, one for each of the FLR intervention and for all three scenarios: Food Security, Resilience, Biodiversity, as follows:

Table 34. *The hectares calculated by district for the agricultural technology intervention, and the hectares of priority area that each of the three scenarios could independently contribute to restoration using agricultural technologies. Even though the totals for food security and resilience are similar, this is most likely due to the total available area within each district and because resilience and food security are closely linked, many separate criteria were used in the MCAs and the total areas are statistically different. This will require that a suite of FLR strategies and associated technological packages be adopted, based on considerations derived from (combinations of) criteria.*

DISTRICT	Total Area of district (ha)	Agricultural technologies opportunity			
		Estimated Intervention Area (ha)	Priority Area (ha) Food Security	Priority Area (ha) Resilience	Priority Area (ha) Biodiversity
Balaka	213,385	146,730	141,414	139,260	17,345
Blantyre	202,411	79,974	54,549	58,427	61,234
Chikwawa	489,166	141,371	139,388	135,101	39,737
Chiradzulu	76,306	47,876	30,674	27,684	32,635
Chitipa	424,773	85,478	81,440	51,235	16,303
Dedza	374,845	172,827	163,900	159,472	38,459
Dowa	309,334	204,223	204,223	201,940	200
Karonga	341,639	51,843	38,627	41,766	9,641
Kasungu	804,355	367,686	367,686	361,532	13,535
Likoma	2,072	-	-	-	
Lilongwe	620,182	378,254	371,861	376,042	709
Machinga	393,161	130,553	128,436	124,967	16,881
Mangochi	675,053	253,802	249,957	244,134	39,122
Mchinji	312,986	175,653	173,138	171,003	591
Mulanje	200,459	65,600	52,632	38,412	43,154
Mwanza	102,388	26,743	17,381	15,212	2,104
Mzimba	1,059,961	548,739	542,022	507,072	200,627
Neno	129,468	49,262	39,446	38,496	23,399
Nkhata Bay	419,587	22,105	20,701	5,644	8,128
Nkhotakota	432,911	85,663	74,269	73,605	857
Nsanje	196,206	44,472	43,828	43,170	1,500
Ntcheu	322,089	184,904	176,160	162,718	5,454
Ntchisi	170,969	90,567	77,657	90,567	11,000
Phalombe	142,400	65,346	63,574	53,902	34,097
Rumphi	465,060	46,625	34,711	39,733	29,818
Salima	213,935	89,130	82,434	81,915	441
Thyolo	164,270	46,067	34,332	24,164	20,156
Zomba	311,537	129,297	98,173	101,218	64,947
TOTAL	**9,570,908**	**3,730,790**	**3,504,345**	**3,369,203**	**502,985**

Table 35. *The hectares calculated by district for the community forest/woodlot-type intervention, and the hectares of priority area that each of the three scenarios could independently contribute to restoration using interventions of this type. A suite of FLR strategies and associated technological packages should be adopted, based on considerations derived from (combinations of) criteria during the MCA.*

DISTRICT	Total Area of district (ha)	Community forest/ woodlot opportunity			
		Estimated Intervention Area (ha)	Priority Area (ha) Food Security	Priority Area (ha) Resilience	Priority Area (ha) Biodiversity
Balaka	213,385	530	242	530	-
Blantyre	202,411	20,214	14,872	17,937	19,662
Chikwawa	489,166	46,765	45,750	36,650	14,016
Chiradzulu	76,306	4,707	4,707	2,897	4,603
Chitipa	424,773	100,396	96,377	29,231	60,308
Dedza	374,845	31,968	31,968	24,973	17,556
Dowa	309,334	12,062	12,062	12,062	500
Karonga	341,639	58,443	49,947	25,536	27,416
Kasungu	804,355	8,097	8,097	6,096	851
Likoma	2,072	384			
Lilongwe	620,182	10,127	10,055	9,584	252
Machinga	393,161	16,543	16,511	15,788	3,708
Mangochi	675,053	46,307	46,307	44,169	10,489
Mchinji	312,986	4,998	3,630	3,964	400
Mulanje	200,459	3,370	3,316	1,146	3,370
Mwanza	102,388	13,641	8,232	2,011	809
Mzimba	1,059,961	82,443	82,443	43,143	61,563
Neno	129,468	12,987	12,364	5,408	6,325
Nkhata Bay	419,587	84,811	84,811	13,585	82,439
Nkhotakota	432,911	17,142	17,142	5,303	11,116
Nsanje	196,206	8,379	8,379	6,911	3,963
Ntcheu	322,089	27,108	26,934	22,441	3,956
Ntchisi	170,969	14,667	10,438	14,667	7,096
Phalombe	142,400	8,006	6,895	3,593	3,988
Rumphi	465,060	93,981	54,235	36,839	86,336
Salima	213,935	2,101	2,045	1,137	796
Thyolo	164,270	10,091	10,091	5,532	5,875
Zomba	311,537	13,201	8,372	7,311	10,925
TOTAL	9,570,908	753,471	676,222	398,444	448,318

The five scalable FLR interventions (agricultural technologies, soil and water conservation, forest management, river and stream-bank restoration, community forests and woodlots) that have been identified, can be implemented with specific attention paid to the severity and type of degradation in these areas, and the contributions landscape restoration can make to food security, resilience, and biodiversity. This can be integrated into district planning, and can unlock different types of financing for restoration.

The output information of combinations of criteria from the MCAs, will help to identify the suite of FLR strategies and associated technological packages needed per ha for each of the intervention types. This is a good basis for more in-depth cost-benefit analysis, development of business models, and can serve as a baseline for monitoring.

Table 36. *The hectares calculated by district for forest management-type interventions and the hectares of priority area that each of the three scenarios could independently contribute to restoration using interventions of this type. A suite of FLR strategies and associated technological packages should be adopted, based on considerations derived from (combinations of) criteria during the MCA.*

DISTRICT	Total Area of district (ha)	Forest management opportunity			
		Estimated Intervention Area (ha)	Priority Area (ha) Food Security	Priority Area (ha) Resilience	Priority Area (ha) Biodiversity
Balaka	213,385	12,817	11,210	7,995	5,189
Blantyre	202,411	31,337	20,438	24,223	31,337
Chikwawa	489,166	237,852	228,432	206,640	184,026
Chiradzulu	76,306	3,916	3,902	2,583	3,851
Chitipa	424,773	243,774	239,338	57,233	173,639
Dedza	374,845	106,339	100,264	82,581	57,978
Dowa	309,334	18,395	18,395	18,395	749
Karonga	341,639	202,545	172,329	82,761	105,131
Kasungu	804,355	260,591	251,807	233,721	13,088
Likoma	2,072	114			
Lilongwe	620,182	95,544	92,828	87,559	26,550
Machinga	393,161	114,512	114,045	75,306	51,122
Mangochi	675,053	261,893	259,886	225,405	152,794
Mchinji	312,986	32,356	28,960	31,038	17,172
Mulanje	200,459	84,341	77,733	24,434	71,897
Mwanza	102,388	45,659	27,863	14,724	14,366
Mzimba	1,059,961	284,877	284,877	181,677	207,548
Neno	129,468	42,780	42,780	34,512	33,203
Nkhata Bay	419,587	362,012	360,541	69,608	314,274
Nkhotakota	432,911	246,292	213,143	116,684	150,633
Nsanje	196,206	113,258	104,982	90,210	75,127
Ntcheu	322,089	39,841	39,841	29,818	8,009
Ntchisi	170,969	35,915	24,238	35,506	19,812
Phalombe	142,400	20,849	20,819	10,989	14,307
Rumphi	465,060	365,945	288,533	114,680	321,211
Salima	213,935	53,222	52,546	47,445	8,773
Thyolo	164,270	51,043	41,747	27,284	29,475
Zomba	311,537	33,260	14,162	12,808	24,952
TOTAL	9,570,908	3,401,279	3,137,811	1,946,529	2,116,213

Table 37. *The hectares calculated by district for soil and water conservation-type interventions and the hectares of priority area that each of the three scenarios could independently contribute to restoration using interventions of this type. A suite of FLR strategies and associated technological packages should be adopted, based on considerations derived from (combinations of) criteria during the MCA.*

DISTRICT	Total Area of district (ha)	Soil and water conservation opportunity			
		Estimated Intervention Area (ha)	Priority Area (ha) Food Security	Priority Area (ha) Resilience	Priority Area (ha) Biodiversity
Balaka	213,385	9,396	9,070	9,396	24
Blantyre	202,411	54,707	36,645	45,303	50,219
Chikwawa	489,166	15,363	14,830	15,010	7,149
Chiradzulu	76,306	20,707	17,113	15,533	20,261
Chitipa	424,773	31,870	29,317	12,603	19,549
Dedza	374,845	83,271	82,510	79,064	18,841
Dowa	309,334	35,240	35,040	35,240	323
Karonga	341,639	14,288	9,718	9,359	4,276
Kasungu	804,355	78,686	78,686	71,602	6,364
Likoma	2,072	-			
Lilongwe	620,182	38,526	36,539	37,554	2,961
Machinga	393,161	16,245	16,245	11,702	9,520
Mangochi	675,053	65,836	64,252	62,074	12,214
Mchinji	312,986	5,656	5,656	5,656	100
Mulanje	200,459	4,121	4,121	1,912	1,573
Mwanza	102,388	24,826	12,414	8,875	1,298
Mzimba	1,059,961	164,525	159,440	139,568	89,485
Neno	129,468	15,080	15,080	12,417	4,208
Nkhata Bay	419,587	31,982	31,429	6,150	18,382
Nkhotakota	432,911	28,916	27,269	21,546	1,554
Nsanje	196,206	17,352	17,352	13,970	6,590
Ntcheu	322,089	81,864	77,558	68,800	6,564
Ntchisi	170,969	56,766	37,994	56,766	5,016
Phalombe	142,400	3,072	2,057	2,299	1,600
Rumphi	465,060	27,571	14,169	14,739	24,276
Salima	213,935	13,084	13,084	11,902	1,146
Thyolo	164,270	81,804	65,034	44,484	35,162
Zomba	311,537	23,014	12,286	13,479	19,305
TOTAL	9,570,908	1,043,768	924,908	827,003	367,960

Table 38. *The hectares calculated by district for river and stream-bank restoration interventions and the hectares of priority area that each of the three scenarios could independently contribute to restoration using interventions of this type. A suite of FLR strategies and associated technological packages should be adopted, based on considerations derived from (combinations of) criteria during the MCA.*

DISTRICT	Total Area of district (ha)	River and stream-bank restoration			
		Estimated Intervention Area (ha)	Priority Area (ha) Food Security	Priority Area (ha) Resilience	Priority Area (ha) Biodiversity
Balaka	213,385	1,010	411	911	250
Blantyre	202,411	961	746	961	721
Chikwawa	489,166	2,287	2,287	2,009	1,400
Chiradzulu	76,306	363	121	-	236
Chitipa	424,773	1,023	484	484	100
Dedza	374,845	1,736	965	1,210	185
Dowa	309,334	1,458	1,357	1,270	-
Karonga	341,639	949	642	949	136
Kasungu	804,355	3,174	3,174	3,174	239
Likoma	2,072	10			
Lilongwe	620,182	2,655	2,655	2,647	100
Machinga	393,161	1,800	1,800	1,348	200
Mangochi	675,053	2,332	2,070	1,748	100
Mchinji	312,986	1,219	1,219	1,021	-
Mulanje	200,459	745	363	366	306
Mwanza	102,388	301	121	242	100
Mzimba	1,059,961	4,286	4,017	4,207	1,690
Neno	129,468	448	448	448	278
Nkhata Bay	419,587	353	349	-	245
Nkhotakota	432,911	1,239	1,056	857	229
Nsanje	196,206	719	719	664	-
Ntcheu	322,089	1,593	968	1,314	15
Ntchisi	170,969	666	547	666	142
Phalombe	142,400	592	418	484	221
Rumphi	465,060	937	608	550	937
Salima	213,935	1,286	594	726	-
Thyolo	164,270	601	539	148	601
Zomba	311,537	1,735	1,735	678	108
TOTAL	9,570,908	36,478	30,413	29,082	8,539

If the interests are to enhance the resilience of human-ecological systems, the multi-criteria analysis can serve as a feasibility study to mobilize funding from resilience programmes with these objectives in Malawi. If in the Mzimba District, for example, stakeholders would like to address resilience, the MCA analysis indicates that from the total opportunities area for agricultural technologies (548,739 ha) (CA, FMNR, AF), 507,072 ha are a priority for resilience (92%).

Similarly for Forest Management, of the 284,877 ha, 181,677 ha are a priority for resilience (64%). The results can be proposed as site-specific FLR implementation packages to calculate the total cost and benefits for implementation. This can be further strengthened by the National Resilience Plan as an enabling factor for cross-sectoral implementation.

5. Synthesis

5.1 Institutional and policy analysis

A Policies and Institutions (P&I) working group was formed to review policies, laws, and regulations affecting restoration, assess the extent to which enabling conditions for large-scale restoration are in place, and develop strategies to bring priority interventions to scale. Technical support was provided by IUCN and WRI, in coordination with Malawi's Department of Forestry and the PERFORM project team. The P&I working group came together for workshops in June 2016 and November 2016 to provide input. Leaders from all 28 of Malawi's districts came together during a series of workshops between July and September 2016 to provide valuable input of policy and institutional opportunities and constraints within their respective districts.

An analysis of 16 successful restoration case studies in several countries (Hanson et. al 2015) suggests that a successful restoration process exhibits three common themes:

1. **A clear motivation.** Decision makers, landowners, and/or citizens were inspired or motivated to catalyse processes that led to forest landscape restoration.
2. **Enabling conditions in place.** A number of ecological, market, policy, social, and institutional conditions were in place that created a favourable context for forest landscape restoration.
3. **Capacity and resources for sustained implementation.** Capacity and resources were mobilized to implement forest landscape restoration on a sustained basis on the ground.

The working group analysed the enabling conditions for restoration in Malawi by identifying both 'key success factors' as well as barriers to large-scale restoration. The application of the Restoration Diagnostic tool (Hanson et. al 2015), stakeholder interviews, and literature review jointly-led with the working group served to identify gaps in the policy and institutional enabling environment for large-scale restoration and a rationale for prioritizing specific policy reforms.

As detailed in the sections below, working group members cited FLR as relevant for achieving a number of ambitious, cross-sector environmental and development goals embedded in national strategies and policies. However, numerous key policies were found to be uncoordinated and, and the legal and regulatory framework was found to be inconsistently enforced. In certain instances these shortcomings result in a lack of the policy and legal coherence needed to enable and accelerate widespread adoption of some restoration interventions.

Departmental inputs and recommendations

Working group members from seven different technical departments of government ministries identified 20 policies and laws relevant for FLR implementation, and co-led an analysis to highlight key provisions that support the implementation of FLR, or pose significant barriers to scale up FLR. This working group then made preliminary recommendations for strengthening the existing policy framework and deepen the engagement of key government institutions to support the implementation of FLR at scale. Findings are as follows:

Education Inspectorate and Advisory Services

The list of policy and laws housed in the department that has been identified as very relevant to FLR implementation are: **Education Act (2013)**[2] that provides the establishment, organization, governance, control, regulation and financing of schools and colleges; imparting in students' knowledge and skills for sustainable environmental use and management; and **National Education Standards (2015)** that highlights the expectations of education quality and aims at improving education standards in Malawi. They are relevant because Education Act, for example, targets a large population of Malawians (i.e. all primary and secondary school learners as well as teacher training students) and develops environmental awareness in young people. Implementing the Education Act, however, has barriers such as lack of technical skills for FLR, issues relate to encroachments from surrounding communities as well as issues related to lack of land. The National Education Standards, on the other hand, specify both minimum requirements and what constitutes effective practice in education provision and practice. Although National Curriculum (syllabus) was not listed as relevant, it is particularly pertinent to FLR since the schools are required to have woodlots (although many do not have sufficient land for these), and for school feeding programmes parents often contribute firewood. Both

2 Note: Key provisions that support FLR are listed to be - Section 5 (1), 2(c),(d),(e),(f), (i),(l), Reclaiming degraded land

policies are very recent and is not envisioned to be renewed anytime soon. However, the recommendations of relevance to the National FLR Strategy and Action Plan as follows:

- Most schools are implementing climate change programmes which can integrate FLR. This will require the alignment with the structures at school level that are responsible for environmental management issues e.g. Wildlife Clubs, Environment Management Clubs.
- Department of Forestry was requested to give advice to schools to strengthen the establishment and management of woodlots and tree nurseries.
- Address the issue of schools not having sufficient land though requests for communal land through the Traditional Authorities (for example by including in the new Community Land Guidelines).
- Link school FLR activities with parents associations and wider community Perhaps by coordinating and supporting best practices in FLR were reported by NGOs e.g. LEAD in Lake Chilwa Basin.
- Support the school access to communal land.
- Assess and improve school / institutional use of fuel wood for cooking.
- Link the content of the national curriculum with the content that is needed for FLR and use the standards to review and improve practices in schools.

Department of Forestry

The National Forest Policy (2016), Forest Act (1997) and the **National Forest Programme (2001)** are housed at the Department of Forestry. The National Forest Policy (2016) focuses on sustainable management of forestry resources for the enhancement of life of all Malawians, was indicated to be very pertinent to FLR because it promotes both afforestation and re-afforestation, regeneration and agricultural technology (CA, FMNR, AF) practices. The provisions on community based forest management and biomass energy, industrial plantation management and financing mechanism can particularly support the FLR implementation. The weak protection of the river banks and the ongoing cultivation of marginal areas were identified as barriers for FLR.

National Herbarium

The **National Herbarium Botanical Gardens (1989)** studies the plant diversity in terms of classification, conservation, ecology, recreation and sustainable utilization. It was indicated to be relevant to FLR since it deals with the plant conservation, ecology and sustainable utilization. It is envisioned to upgrade the Herbarium in five years, which can create space for integrating the knowledge generated as part of the FLR assessment and National Strategy and Action Plan in Malawi.

Department of Environmental Affairs

From the following laws, instruments and policies - **Vision 2020, Malawi Growth and Development Strategy (MGDS) I and II, National Environmental Policy 2004, Environmental Management Act (1996), Economy Recovery Plan** - Vision 2020[3] was highlighted to be moderately relevant as there are some elements addressing the issues of land and forest; and National Environmental Policy (2004)[4] as very relevant to FLR implementation. Because the National Environment Policy (2004) is an overarching framework instrument (1.8), it was recommended to undertake policy gaps and make recommendation on areas for mainstreaming/ improvement for FLR.

Department of Physical Planning

The Department of Physical Planning hosts **Land Use Policy, Urban Policy and Physical Planning Act**, of which, the Land Use Policy was highlighted to be moderately relevant to FLR. This policy is not directly involved in the implementation of forest restoration but encourages the Department of Forestry to be vigilant. A key provision that supports FLR is to make sure land for forestry is protected for forests and one of the barriers highlighted was the conflict of land uses which may result in land being taken out of forestry. The policy is planned to be revised in five years. One of the recommendations for the National FLR Strategy and Action Plan was to harmonize the laws and policies directly related to Forest Landscape Restoration

3 Note: Key provision under Vision 2020 that supports FLR is listed as 1.59

4 Note: Key provisions under National Environment Policy (2004) that support FLR are listed as 2.2.3, 2.2.4, 3.1, 3.2, 4.1, 4.2, 4.13, 5.1, 5.2.

National Statistics Office

The Statistics Act (2013) provides high quality, timely and independent statistical information and promotes its use for policy formulation, decision making, research, transparency and general public awareness. It has been ranked as moderately relevant to FLR as Act doesn't have any direct elements addressing issues of land and forest. Every 5 years the Act is revised, and it is suggested that applicable FLR information from the assessment could be integrated, this will be particularly important with regard to monitoring achievement of Malawi's restoration target of 4.5 million hectares.

Other institutions and their relevance to restoration

Key government institutions and the laws and policies that they promote have been discussed at length above. This sections describes some other institutions (in their broadest sense) of relevance to restoration. This section might not be comprehensive.

Local community institutions

Cultural institutions

Cultural factors are understood to encompass the beliefs, arts, and customs of a particular society or group and relate to ways of thinking, behaving, or working in a given setting. Cultural institutions are particularly strong in Malawi. Interviews were carried on cultural dimensions of forest landscape restoration using a tool developed specifically for this Malawi restoration assessment from several ethnic groups including Lomwe, Yao, Ngoni, Tumbuka and Sena as well as with administrators from 16 Districts (Wild, 2016). Common themes across the interviewees were the use of traditional and cultural authorities to support FLR the conservation of graveyard forests, the relation of specific cultural practices to specific trees (e.g. Nsangu tree, Chilema tree) and forests, medicinal plants, construction material and different ceremonies related to trees and forests including those to bring rain.

The protection of graveyard forests is a particularly important recommendation from the interviews being a cultural link with FLR. The graveyard forests are in themselves a community institution used for burial as well as supporting indigenous trees – although many are under threat from shrinkage, the use of the trees for coffins and the increasing trend of building elaborate graves. Two of Malawi's traditional dances have been inscribed by UNESCO as Intangible Cultural Heritage of Humanity. These are *Gulewamkule* also known as the 'Great Dance of Malawi' (Chewa) and *Vimbuza* (Tumbuka). For the Chewa the graveyard forests area also maskyards, where the Gule dancers keep their mask and the dancers 'mask-up' before entering the communities to dance. The dances carry social meaning and in some instances Gule has been use for the promotion of health and environmental messages.

Information from stakeholders indicate there is in general a low overall culture of forest conservation in Malawi and that restoration isn't viewed as "a way of doing things." Significant cultural barriers include charcoal making, fire burning practices, and millet farming on burnt logs. Despite this a number of strong, and specific conservation and restoration-related practices were cited. The Policy and Institutions working group, itself, noted that cultural factors and local knowledge are in some instances a barrier but are also essential in bringing restoration to scale.

Community institutions for finance

A brief survey with DDP (Annex 11) showed that there are institutions through which communities can save and borrow, but that especially borrowing options are limited, and mostly come from Village Savings and Loans Associations (VSLA)[5]. In the absence of accessible borrowing mechanisms wage labour or piecework, commonly known as '*ganyu*' in Malawi, along with natural resources exploitation (predominantly unsustainable charcoal-making and fishing) are key ways to access cash for emergencies. In terms of access to financial services, solidarity groups (e.g. VSLA), traditional rotating savings groups (e.g. Chilemba or Chiperegani), and money lenders are the commonest financial institutions at the community level and there is no access to formal banks and very little to cooperatives. Ganyu is a particularly important source of cash at the village level, a fact backed up by other studies (Whiteside, 2000). There is generally an absence of financial institutions that directly support restoration at the village and district level.

5 Village Savings and Loans Associations (VSLA) are a CARE International community-finance model that was developed in Niger and that over the last 20 years has revolutionized rural access to finance in Africa. It is now expanded to 150,000 groups in 26 African countries, serving nearly 3.8 million members. It has developed financial literacy and savings capacity in many communities and about seventy five percent of VSLA beneficiaries are women. http://www.care.org/work/economic-development/microfinance

Traditional and cultural authorities

The Traditional Authorities in Malawi are particularly important and act as custodians of the cultural and traditional values of the community. They have the control of customary land ensuring that authority over land is passed in succession from one generation to another. They also perform a semi-judicial function settling customary disputes over land. Finally, they lead development initiatives and act as chairpersons of **Area Development Committees** (ADCs). In fact they exercise a lot of influence over their constituents mobilizing the people to participate in the developmental activities (FAO 2017). While the Traditional Authorities are a hereditary cultural position there are links with government and they fall under the Ministry of Local Government and Community Development.

District Councils

Malawi has a single tier of local government comprising four city councils, 28 district councils, two municipal councils and one town council. They are all on the same level with no subsidiary or supervisory structure. The initial 34 councils consisting of four cities, 28 districts and two municipal councils were introduced after the 2010 Local Government Act Amendment. Responsibility for local government rests with the Ministry of Local Government and Community Development (MLGCD).

5.2 Analysis of enabling conditions

Working Group members applied the Restoration Diagnostic tool to systematically assess which political, social, market, and institutional enabling conditions for large-scale restoration were or were not in place to facilitate large-scale restoration. A subset of these enabling conditions were then ranked according to urgency and ease of implementation, to determine which conditions should be prioritized under the National Restoration Strategy and Action Plan.

Out of the 32 factors included in the Restoration Diagnostic, 18 were deemed important to address in Malawi's national restoration strategy. These 18 factors include 7 that were determined to be "missing" through the Restoration Diagnostic exercise, 10 that are "partly in place," and 2 that are already in place

Of the 25 total factors included in the Restoration Diagnostic, seven factors were deemed to be not yet fully in place. The working group conducted an exercise to prioritize which success factors to focus on in order to accelerate large-scale restoration. Four factors emerged as priorities to focus on: secure land and resource tenure (deemed partly in place), empowerment of local people to make decisions about restoration (deemed partly in place), restrictions and effective enforcement on clearing natural forests (deemed partly in place), and awareness of social and environmental benefits—i.e., benefits of restoration are publicly communicated (deemed partly in place).

Table 39. *Restoration Diagnostic results.*

Feature	Factor	Response	Notes on response
MOTIVATE			
Benefits	Restoration generates economic benefits		Yes, the economic benefits are recognised. Specifically the following multiple benefits were recognised: • Boosting the productivity of croplands and forests to improve food security and increased sources and supply of biomass energy (firewood & charcoal) and forest products • Diversify and intensify rural production systems and increase resilience to climate change. Currently the exact economic benefits have not been calculated and are not well known, but the beneficiaries are expected to include the rural population including vulnerable households
	Restoration generates social benefits		Yes, the social benefits were identified and expected to be improved social capital, cohesion and self-confidence with reduced conflicts. Restoration is expected to reduced poverty for vulnerable households and to improve gender equity including: • Reduced workload for women due to reduced distances to fetch water and firewood, • Time saved for women to engage in development activities
Awareness	Benefits of restoration are publicly communicated		There is partial communication in some sectors of society and some geographic locations, however, the message is not considered to be comprehensive and the mode of communication not efficient. There is recent evidence of farmer uptake of FMNR and that 'peer to peer' communication of the benefits of trees is taking place.
Legal requirements	Law requiring restoration exists and are enforced		There is no specific legal requirement for land owners to restore their land. Estate owners are, however, required to retain 10% of their land under trees. In general supportive laws are in place but can be improved particularly by enhancing tree tenure on private land, improving tenure, and other incentives and improving enforcement.
	Law requiring restoration is broadly understood and enforced. Policy and financial incentives in place that support legal compliance		Not in place. While there are generally supportive laws in place they are not well understood by relevant actors, enforcement is weak, mis-management is widespread and governance poor. This is an area that is considered very difficult to resolve. Appropriate incentives for compliance are not in place which is an area that needs active exploration.
ENABLE			
Ecological conditions	Soil, water, climate, and fire conditions are suitable for restoration		The response to this question is yes as trees can grow well in Malawi. Overall the soils, rainfall, temperature are good for growth. Fires are problematic but would not normally and are essentially a social constraint discussed in social factors below.
	Plants and animals that can impede restoration are absent		Yes, generally livestock are not considered a major impediment to restoration in Malawi. There are invasive alien plants in the country (e.g. *Prosopis jubifloa, Lantana camara*) and indigenous species that encroach on (usually disturbed or degraded) land but these are not currently considered to have a major impact, but may problematic in specific landscapes. This situation may, however, change over time.
	Native seeds, seedlings, or sources populations are readily available		Individual trees and patches of remnant Miombo woodland and other vegetation types remain in the landscapes and native species readily regenerate on farmland. Other tree seeds/propagative material are less availability.

Table 39. *Restoration Diagnostic results (contd.)*

Feature	Factor	Response	Notes on response
Market conditions	Competing demands (e.g. food, fuel) for degraded or lost forest lands are declining		No, the demand for a wide range of biomass products (especially charcoal, firewood and timber) remains very high. Remaining forest areas are under very high pressure. The resolution of this is deemed to be very “important” but very “difficult” by stakeholders.
	Value chains for products and services from restored forests exist		As yet restoration-based value chains are not in place. Currently the markets for forest products are dominated by 'degradation products' especially charcoal. The high urban demand combined with weak governance means that it will take time before the switch to 'restoration products' can be made. Efforts are underway to bring the charcoal trade into control and a new policy is in place. This success factor was deemed “important” and “slightly difficult” by stakeholders.
Policy conditions	Land and natural resource tenure is secure		Currently land tenure is based on customary rules with the Traditional Authorities playing a key role in the allocation of land, with strengths and weaknesses. This is now set to change, however, with a new land policy and act in place. This act will allow for the recognition of communal land (e.g. sacred groves and community forests), however, this will have to be implemented very well to avoid risks of misappropriation of land and inequitable land distribution. Of concern here for stakeholders is the lack of political will to address the issue. Malawi made significant efforts to manage natural forests on a participatory basis however, this was not very successful and it is considered that the balance of rights and responsibilities might not have been adequate.
	Policies and laws affecting restoration are aligned and streamlined		Generally the current NRM laws are in place and adequate, few, however, are directly focused on restoration itself. The existing policies and laws could be improved and better harmonised, however, implementation remains the main barrier to maintenance of existing tree and forest resources and restoring degraded areas.
	Restrictions on clearing remaining natural forest exist		Yes these restrictions are in place specifically the National Forest Policy (2016), Forest Act (1997), National Forest Programme (2001). Laws do not exist to establish the amount of tree cover on farm land.
	Forest clearing restrictions are enforced		Very weak enforcement of existing forest laws are seen as one of the critical factors that is absent. Contributing elements are the high demand for timber and fuelwood, limited financial and human resources, rent seeking behavior and corruption risks. Stakeholders considered this a "very important” but also a “very difficult” barrier to restoration.
Social conditions	Men and women are empowered to make decisions about restoration		Empowerment was seen as partially in place. Decision-making is different between farmer's own land and over government forests. Weak tenure and ownership disparities between men and women present a barrier to restoration, on their own land. PFM systems for forests are in place but the balance between rights and responsibilities are judged not yet to support restoration over degradation. The limited information on restoration was considered by some to be a barrier.
	Men and women are able to benefit from restoration		Currently most men and women live in degraded landscapes and are not enjoying the benefits of restoration. Natural resource benefit flows are not equitable and are contributing to degradation. Over half of Malawi is considered degraded and while in theory men and women could and will benefit from restoration generally they are not. There as some indications that farmers are increasing tree cover on their land through FMNR. However, the level of this movement is not considered to outweigh the overall picture.

Table 39. *Restoration Diagnostic results (contd.)*

Feature	Factor	Response	Notes on response
Institutional conditions	Roles and responsibilities for restoration are clearly defined		No roles and responsibilities are not clearly understood and with no clear authority. The Traditional Authorities have the authority, but are not often engaged in restoration by the line ministries.
	Effective institutional coordination is in place		Mechanisms exist but are not utilized. Each project has own coordinating mechanisms--sometimes conflicting---which is confusing at community level.
IMPLEMENT			
Champions and political will	National and/or local restoration champions exist		There are champions for forest conservation and restoration in Malawi and some individuals were named. A case was cited, however, where the forest was degraded when the champion passed away. Thus, while champions are important, they must be embedded in a stronger, institutional, social and economic foundation for restoration.
	Sustained political commitment exists		There is recent interest and commitment at high levels within government to restoration with a national target and commitment of 4.5million ha of degraded land to be restored that was internationally announced in August 2016. Further work will be needed to promote the target within all level of government and so it is adopted and sustained.
Technical design	Restoration design is technically grounded and climate resilient		There is limited knowledge about restoration in the country at farm level, in the districts and the country a whole. There is experience within project and there is evidence of local level adoption of farmer managed natural regeneration (FMNR) and this presents a good opportunity. Restoration best practices and experience are now emerging from different countries but this remains a systemic gap in Malawi
	Restoration limits “leakage” i.e. transferring forest clearing activities to other locations		The restoration analysis has shown that seven out of nine million hectares of Malawi are degraded, including many in forest reserves. With biomass still the largest source of energy for rural and urban house holds the pressures on natural resources remain very high. The situation is therefore acute. The type of restoration practiced in Malawi needs to be such that returns on investments must be realised in the short term and help fill the resources 'gap'. At least within national borders there are few places where degrading factors can be displaced to.
Finance and incentives	“Positive” incentives and funds for restoration outweigh “negative” incentives for status quo		Restoration incentives are not in place and the fundamental drivers of degradation remain. One potential incentive that was discussed at length during the assessment is the use of 'cash for work' programmes. Currently these do not support restoration and could be relatively easily be redirected towards restoration.
	Incentives and funds are readily accessible		The analysis revealed that there are few if any funds or incentives for restoration at the community/district level. Unsustainable resource utilisation is one way that many households meet immediate needs for cash. Cash for work/piecework (locally called ganyu) is a critical source of income for many households. Traditional saving schemes now augmented by accumulating savings and credit associations do demonstrate that savings schemes are viable but these are not currently aimed at restoration.
Feedback	Early wins are communicated		While there is some limited communication occurring, there is not a coordinated communication system around restoration in place. Often the existing information is locked in specific areas (usually project sites).

5.3 Economic and financial analysis

The results of the cost-benefit analysis have shown that the benefits of every proposed restoration activity exceed the costs with only the exception of forest management/stream-bank restoration. The first question to ask, then, is why people are not adopting these activities in large numbers over large areas of land?

There are certainly several answers to this question, but one answer stood out during the field visits in June, 2016. In the communities visited by the assessment team, communities had enthusiastically adopted restoration activities after they had been told about them and given opportunities to learn how to implement them. Based on this observation, access of information by women and men, or the lack of it, appears to be a large practical barrier to adoption.

People will not adopt activities they do not know about, perceive as risky, and/or lack the skills to implement. Many more households would likely be willing to adopt restoration activities if they knew about them, but poor extension and outreach coverage limit this potential. According to the 2014 Welfare Monitoring Survey, only 17% of households in Malawi received advice on farm planning and practices, while on 7% received information on forest and woodlot management (MNSO 2014). In addition, gender gaps on access to information and extension services can contribute to the lack of adoption. For example, women receive less than 15% of agricultural extensions services in the country.

There are several ways to reduce the information barrier to promote more widespread adoption of restoration activities. A first step might be to increase investment in extension, outreach & knowledge sharing programs tailor- made for women and men to reduce knowledge and skill barriers and promote adoption at large-scale. The Japanese International Cooperation Agency (JICA) has piloted one approach to extension that others could learn from and expand across the country (JICA 2016). The project, known as COVAMS II, helps smallholders gain knowledge and skills with restoration activities in addition to developing their capacity to access the resources that are necessary to implement the activities. Once a smallholder receives training that information can be passed on through farmer-to-farmer training. Additionally, outreach activities, like farm radio programs, can also reduce information barriers by discussing the practical steps of implementing different restoration activities and highlighting the benefits that smallholders could expect to receive.

Labor requirements may also constrain smallholder's ability to adopt restoration activities, especially female headed households. As the results showed, restoration activities generally require more labor as compared to current land uses, especially in the first year. While most households have a surplus in their labor supply, during certain times of the year, especially around planting and harvesting time, the labor supply of most smallholder households may be quite constrained. As a result, households may not have access to enough labor to successfully implement some restoration activities. For example, in Kenya labor constraints reduce incentives for smallholders to clear woodland regrowth following a fallow period and instead, they cultivate continuously even though it leads to a reduction in land productivity (Woodhouse 2009).

Public health crises, like the HIV/AIDS pandemic, may further constrain household labor supplies, further undermining their ability to adopt restoration activities. The burden of supplying additional labor may also fall disproportionately on women and girls because they are responsible for the bulk of household duties like planting and weeding. Labor constraints can be overcome by providing smallholders with a large menu of restoration activities to choose from. Evidence from Rwanda suggests that smallholders view different agriculture activities as unique technologies and they choose the activity that best fits their constraints as well as their needs (Bucagu 2011).

The timing of benefits is an important concern for many smallholders. If smallholders have to wait too long for the benefits of restoration activities to occur, they might chose to use their land to produce anything else that could generate immediate cash incomes. This may lead to smallholders adopting unsustainable land uses practices, like continuous cultivation, for the long run. NGOs and government programs can help smallholders to bridge the gap between the upfront investment in restoration activities and the time when the benefits of those investments will start to flow by offering incentives or small payments or social safety nets to smallholders. Examples of this type of mechanism can be found in other countries that have undertaken large restoration programs, like Costa Rica, where a local NGO called FUNDECOR partners with forest plantation owners to purchase a share of the future timber harvest for an upfront cash payment.

Up-front financial costs are also greater for restoration interventions as compared to current land uses and this poses a problem for poor households who may not have the financial resources to make investments in restoration activities. According to the Malawi Integrated Household Survey of 2010, less than 15 percent of all households in Malawi had some interaction with the credit market and only 1.2 percent of households successfully obtained a loan (MNSO 2011). In addition, according to the IHS 3, women often lack access to credit from banks and microfinance institutions because of collateral and security guarantees (Ministry of Gender, Children, Disability and Social Welfare 2014)[6]. This suggests that households must either pay for the additional financial costs of adopting restoration activities from their own savings or additional sources of funding will have to be secured and distributed to smallholders across the country in the form of farm credit.

This discussion also raises the question of how Malawi can raise the funds needed to make the necessary investment to fulfill its commitment to restore 4.5 million hectares of degraded land by 2030. This discussion is addressed in the finance section of the report.

5.4 Financing sources for restoration in Malawi

Meeting Malawi's restoration commitment will require both private and public sector financing to fund different activities of its national restoration strategy. This will require innovative financing partnerships with both the private and public sectors, and importantly finding ways to incentivize smaller holder and community's own investments in the restoration of their own lands. It will also require cross-sector institutional coordination and bottom-up/top-down coordination of program implementation to scale up restoration successes.

The analysis of restoration costs in Malawi allows us to estimate the gap between current finance in support of restoration activities and the level of finance needed to achieve Malawi's 4.5 million ha restoration target over the next thirteen years. The previous analysis suggested that restoring 4.5 million hectares of degraded land in Malawi would cost at least 279 billion MWK or approximately 62,000 MWK per hectare. In this section, we will first discuss several types of financial resources from which funds can be raised to close the financing gap. This will include international, national and private sources. Furthermore, we will review the existing financing mechanisms that can be used to pay for restoration activities in practice, and discuss the existing barriers for restoration finance in Malawi.

Studies estimate that the restoration costs of forests in developing countries are in the order of $1,000-$3,000 per ha (Laestadius et al., 2014), whereas agricultural land restoration can cost even more depending on the extent of the project and infrastructure used (NCE, 2016). However, due to the high uncertainties and risks of financial returns and the lack of bankable projects, opportunities for private investors to fund restoration projects are limited to very specific circumstances. The Sustainable Infrastructure Imperative Report (NCE, 2016) suggests that public investment will continue to be a key part of the solution to financing sustainable land uses in the short run; whereas scaling up investment in landscape restoration will require blending various proportions of public development finance (targeting the agriculture and forestry sectors) and public climate finance (targeting at mitigation and adaptation) with private capital.

The results from the CBA suggest agricultural-based restoration activities produce more private benefits than public benefits and could be paid for with grassroots investments made directly by smallholders and also with funds distributed through private financing businesses like microfinance institutions and other businesses that offer farm credit. The capacity of investment in the activities can vary according to aspect such gender and age. Less mainstream approaches for financing smallholder restoration activities should also be promoted and scaled-up where appropriate. The International Union for Conservation of Nature has piloted one such approach based on community mobilization of funds. IUCN's Community Environment Conservation Fund concept is an adaptation of the VSLA model to incentivize the generation and implementation of community level restoration plans has led to the protection of over 150km of river banks, a reduction of making of charcoal from mature trees and other restoration actions (IUCN, 2013; Kakuru, W. and Masiga, M. 2016). This approach now has 5-years' experience in different locations in Uganda and is being piloted in the Shire Basin in Malawi as well as in Kenya.

In contrast, forestry-based restoration activities, especially activities designed to improve sediment retention or flood control, generate a large number of public benefits. As a result, forestry-based restoration activities that will positively impact the creation of public goods may be best financed with public funds since their nature would make it difficult for any single investor to capture the benefits and earn a return. One way to pay for restoration activities with large public-good components would be to create a general restoration

6 Ministry of Gender, Children, Disability and Social Welfare 2014. Malawi country report, Implementation of the Beijing Declaration and platform for action (1995) and the outcomes of the twenty third special session of the general assembly (2000) in the context of the of the twentieth anniversary of the Fourth World Conference on Women and the adoption of the Beijing Declaration and platform for action 2015.

fund, like the proposed Malawi Reforestation and Environmental Protection Authority suggested by Wiyo et al. (2015). The fund would be capitalized with money from the private and public sectors as well as a small levy on producers of beer, electricity, sugar, tea, coffee and tobacco and other industries that would benefit from the impacts created through restoration activities. The fund would play two roles: it would be a lender of last resort, providing restoration financing for viable, beneficial projects when no one else will, and it would also act as a coordinating body for restoration activities across the country to ensure that true landscape restoration is undertaken.

The remainder of this section will discuss possible sources of revenue to grassroots finance, private finance, fund activities that are necessary to bring restoration to scale in Malawi and to capitalize a national restoration fund.

Domestic public funding sources

While international financing mechanisms will remain a key source of finance to support restoration activities in developing countries, one of the largest potential sources of financing for restoration is to re-program and re-align existing sources of public funding to ensure that the money helps catalyze and accelerate the scaling-up of restoration activities across the country. The GoM is recommended to consider how to reform its existing fiscal system and re-align existing sources of public funding to create incentives for smallholders to adopt restorative, rather than degrading, land uses. Re-programing the country's public funding to focus on restoration will also create new opportunities to address the country's food insecurity and environmental challenges by making strategic investments in areas that are suffering from food insecurity and/or environmental challenges like sedimentation in key watersheds. There are two main options to redirect and augment public financing in support of restoration in Malawi.

Subsidy removal

Governments around the world spent an estimated US$1.1 trillion subsidizing consumption of resources such as water, energy and food in 2011 (Dobbs, et al., 2011). Subsidies based on inputs such as pesticides, nitrogen fertilizers, electricity (to pump irrigation water), and agricultural vehicle diesel, can create incentives for overproduction or overuse of environmentally harmful inputs. Subsidies can also undermine conservation. A recent ODI study found Brazil and Indonesia spent more than 120 times more in subsidies to the palm oil, timber, soy, beef and biofuels sectors between 2009 and 2012 than the US$346 million they received in international conservation aid. Therefore, phasing out harmful subsidies such as the direct agricultural input subsidies would not only remove distortions that currently encourage the wasteful use of resources, but also free up financial resources in government budgets to support land restoration and conservation activities. For instance, the sheep and horticultural sectors in New Zealand have benefitted greatly from the removal of harmful subsidies in the 1980s, which helped increase the sector's incentives to respond more effectively and efficiently to price signals by switching to new or different types of production. As a consequence, the national sheep flock was sharply reduced from 70 million in 1983 – 1984 to 40 million in 2004 – 2005, whereas the lambing percentages have actually increased by 25% compared (Vitalis, 2007). In Malawi, the removed harmful subsidies such as fertilizer subsidy can be used to increase the support to agro-environmental measures (e.g. supporting functional FLR), and provide incentives to plant and manage forests and agro-systems sustainably (FAO and Global Mechanism of the UNCCD, 2015).

National restoration fund

In addition to phasing out harmful subsidies, the government could follow the example set by Costa Rica and transfer a portion of tax revenues generated to create a national restoration fund that finances sustainable land use and restoration activities. Costa Rica uses 3.5 percent of revenues from a sales tax on fossil fuels to finance its Payments for Ecosystem Services programs. The money is managed and distributed by the National Forest Financing Fund (FONAFIFO), a semi-autonomous agency. Between 1997 and 2004, the fund distributed approximately US$ 200 million through payment for ecosystem service schemes to protect over 460,000 hectares of forests, establish forestry plantations and to provide additional income to more than 8,000 forest owners (TEEB, 2009).

Decentralized funds

Sources of decentralized funding, including the Local Development Fund and Malawi Social Action Fund present significant opportunities for district restoration priorities. There is strong potential to leverage this funding for efforts including construction of small-scale infrastructure or cutting of fire breaks among others.

Private Investments

National and international (public-) private investment is a further source of restoration financing. Private investors require a sound return. Total bankable assets of retail and institutional investors amounted to $175 trillion in 2014 (UNFCCD and Mirova Responsible Investing, 2016). Therefore, decision makers in finance and planning request economic information as much and precise as possible on the benefits and trade-offs of ecosystem service changes resulted from specific restoration activities. To do this, it is important to distinguish between public and private benefits and identify the restoration beneficiaries and responsibilities, as many of the ecosystem benefits gained from restoration activities are public goods in nature and not traded in markets. Moreover, despite of plenty of capital available at a global level, there are numerous barriers in allocating it to promising FLR related project ideas that are not "ready" or "bankable" just yet. In this context, microfinance agencies may serve as an intermediate between the private investors and smallholder farmers in Malawi, providing services for entrepreneurs and small businesses lacking access to banking and related services and helping develop bankable projects at a larger scale that will be attractive enough to international private investors.

Landscape restoration is currently at an early stage of growth where the business models are not well understood and cash flows are unpredictable. Given the high level of uncertainty, it is best suited to private investors with a high risk tolerance. Moreover, private investors will also need to better understand the costs of capital and opportunities. Private sector investments in smallholder-based restoration activities may be too risky and too costly in terms of transaction costs, but there are opportunities for the private sector to invest in activities that source and add value to restoration products.

Business models in forest landscape restoration

Small and medium forest enterprises (SMFEs) in the forest sector are constituted by individuals or groups that reside in the communities in which they operate and address the issues of forest sustainability and tenure rights directly. The SMFEs focus on a variety of forest based goods ranging from value added wood and non-wood products for domestic markets. Successful SMFEs examples can be found in many countries across Africa, for example, Malawi, Uganda, Tanzania and Ghana.

About 13% of enterprises in Malawi sell forest-based products (National Statistics Office, 2012). These enterprises are more common in rural areas (14.6%) than urban areas (9.8%) with the highest percentage in the southern region (16.3%), compared to the central region (10.2%) and the northern region (12.9%), especially in the rural south where 19% of enterprises sell forest-based products (National Statistics Office, 2012). More male-headed households are engaged in these enterprises (13.9%) compared to female-headed households (10%) (National Statistics Office, 2012). However, female-headed households source their forest-based products from their own land, from forest or wild park reserves and from communal land more often than male-headed households, who often purchase their products from someone to sell (National Statistics Office, 2012).

In Malawi some of the major SMEFs are involved in the production of charcoal, firewood, timber, wood carvings and forest based foods. Examples—detailed below—include timber production and processing in Viphya plantation, fruit juice production at Kamwamba area in Neno district by the Village Hands Company, and wood carving in Machinga district and Blantyre city.

Commercial plantation and rural community participation in tree planting are the key aspects of the approach at Viphya plantation. Commercial plantations include both centralised and privately initiated plantations. Among the more important government-owned plantations are Dzalanyama in Lilongwe, Ngara in Kasungu, Mulanje and Nanchidwa in Mulanje, Zomba in Zomba, Dedza in Dedza, and Viphya in Mzimba district. Local authority (district and town assembly) plantations have also been promoted in Karonga, Kasungu, Lilongwe, Zomba, and Blantyre. Examples of parastatals and private organisations that have established their own plantations include various tea estates, farming and tobacco estates.

In order to ensure community participation in tree planting, the government promotes tree planting by rural households, individuals, estates and other industries in the forest development strategy. There are a few large forest enterprises in Malawi (e.g. Viphya) but SMFEs tend to dominate the sector and comprise the majority of forest enterprises in Malawi. They are scattered throughout the country, with production centres mostly in rural areas and in and around forest reserves (natural and planted) and other protected areas. The points of sale for these enterprises are concentrated mainly in urban centres where there is a growing demand from industrial and housing development.

One way of promoting sustainable management of indigenous trees is to develop them as a source of revenue. In Neno district, the community-run Village Hands Company produces fruit juice from baobab fruits, collected from the *Adansonia digitata* tree. The community benefits financially from this venture and therefore has an incentive to protect the trees upon which the enterprise is based. Village Hands produces more than 10,000 cartons of juices per annum. The revenue raised is used to improve the livelihoods of local communities in the surrounding areas. Village Hands is an approximation of the Chichewa phrase *"Luso la anthu a kumudzi"*, which literally means "skills from village people". The company originally formed to stop deforestation caused by charcoal making by providing alternative employment. Initially, the company was involved in several activities, including rearing guinea fowl, cane furniture making, and wine production from baobab and tamarindus. Village Hands registered as a company in 2004 and has a board of trustees made up of people from the village, a board of directors comprised of villagers and outsiders such as members of the Wildlife and Environmental Society of Malawi (WESM), and a local operations manager.

Village Hands is the only fruit processing company owned and managed by villagers. GTZ, the Germany technical cooperation agency, helped Village Hands establish the processing plant, and people from 14 villages were trained in natural resource management. The members sell their fruit to the processing plant; the idea is that they will be encouraged to protect their fruit trees, rather than destroying them to make charcoal. The company specialises in making fruit juice from baobab fruit (*Adansonia digitata*), called Malambe Juice, and tamarind fruit, called Bwemba Juice. The company also processes honey.

Wood carvings are produced in rural areas near forest reserves and other protected areas and sold in urban areas. The main products are safari chairs, face masks, miniature animals, and games such as chess boards and pieces, *bawo*, cups, wooden cups, plates, knives, and boxes. The following tools are used to produce the carvings: bow saws, *pangas*, knives, planes, scrapers, sand paper, polish, wood chisels, wood glue, and seal. The common trees used are *mwanga* (*Pterocarpus angolesis*), *gmelina* (*Gmelina arborea*), bluegum (*Eucalyptus spp*), cindrella (*Toona ciliata*) and *mtumbu*. These trees are all hardwoods, with the exception of *gmelina*, which is polished dark-brown to give it an appearance of red mahogany or black to give it the appearance of ebony. This process is locally known as kujudula10 and is done to increase the value of the piece.

The production of woodcarvings is a highly segmented process involving a number of specialised players. The wood is usually bought either from farms or from people living near a forest reserve or other protected areas. The tree is either cut into logs for transportation to the production/selling site or, if the processing point is far away, is processed roughly into the shape of the end product. Carving gives the product its final shape and wood glue or seal is used to fill any cracks. Sand paper is used to smooth the product before it is polished to the colour of choice. At the selling point, the product is polished to give it an attractive appearance. The major markets for woodcarvings are in Lilongwe, Blantyre, Mzuzu and Zomba. Wood carvings are also sold on the roads to and at the main tourist attraction centres of Mangochi, Salima, and Nkhata Bay. Carvings are mainly sold on the spot, but can be bought in bulk for exporting.

The financing sources outlined above focus on three dimensions that are equally important, with international funding being the most accessible in the short term. As elaborated below, it is recommended that Malawi first focus on attracting resources from international donors and through multiple national funds; as ODA has been declining since 2012 particular attention should be given to new funding sources such as the GCF. In the short-term, the Government of Malawi may rely on international financing sources for starting funds to initiate large scale restoration projects and cover most of the upfront costs. In addition, fiscal reforms must be made to ensure that restoration programs are sustainable over the long term; suggestions include removing harmful agriculture subsidies that may undermine the outcomes of restoration projects, and imposing an environmental tax or setting aside a portion of the tax revenues in a fund to support the long-term finance needs of restoration projects. Finally, from the bottom up, institutional reforms will be needed to provide favorable market environment for SMEs to invest. It is advised that the Government of Malawi provide subsidies to new businesses that promote the sustainable uses of forest resources and the exchange of traditional knowledge.

International Funds and Sources for Restoration Financing

In developing countries like Malawi, where domestic financial resources are limited, international public finance is vital. Below we discuss several potential sources of funds to capitalize a national restoration fund.

Development finance institutions (DFIs)

DFIs are alternative financial institutions that include microfinance institutions, community development financial institutions and revolving loan funds. DFIs were created to address failures in the private markets for capital that prevented funds from flowing to viable and beneficial projects because the private returns were either too low because the projects were designed to create mostly public goods or because the projects were too risky. According to Levere, Schweke, and Woo (2006) DFIs serve two primary functions today. First, they work with private investors to provide 'catalytic' capital, reduce the risk of investments and create other financial incentives to secure the involvement of mainstream finance. Second, DFIs deliver financial products and services in marginalized communities and industrial sectors. These functions have earned DFIs with the title of 'Market Makers' because their activity in a community or an economic sector can unlock previously untapped economic potential.

Recent trends in the DFI industry of Malawi may make them potentially good sources of funds for agricultural-based restoration activities. According to a 2006 report on expanding access to financial services in Malawi, the DFI industry has begun earmarking large sums of money to develop community managed savings and credit groups similar to IUCN's Community Environment Conservation Fund concept (UNCDF 2006). Additionally, DFIs could work with more mainstream lenders and microfinance institutions to de-risk investments in small-scale activities that are too risky to be eligible for traditional sources of financing.

The Global Environment Facility (GEF)[7]

Set up by the World Bank, the United Nations Environment Program (UNEP) and the United Nations Development Program (UNDP) to support the three major Rio Conventions (the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD) and the United Nations Convention to Combat Desertification (UNCCD). The GEF, which was established in 1991, was created to distribute grants to developing countries that support actions to address critical threats to the global environment. Since 2006, when land degradation became a focal area, the GEF has invested more than US$876 million in resources for at least 190 projects and programs that encourage use of sustainable land management, leveraging more than US$3 billion of private co-financing (NCE, 2016).

The GEF could be a potential source of funding for specific restoration activities/projects in Malawi, especially forestry-based restoration projects that are designed to create large public benefits and are therefore unattractive to private investors. Since joining the GEF, Malawi has received over $42 million from the GEF to fund 18 national projects and 25 small grants. The GEF investments helped to secure more than $197 million in co-financing (GEF 2012). Malawi has also participated in 17 regional and global projects financed by the GEF totaling more than $94 million and attracting over $170 million in co-financing. Previous projects financed by the GEF include sustainable land management projects like the "Private Public Sector Partnership on Capacity Building for Sustainable Land Management." The project was created to reduce land degradation in the Shire River basin by improving institutional, policy and payment for environmental service agreements. In the 6th overall performance of the GEF, which runs from July 1st, 2014, to June 30th, 2018, Malawi has been allocated $9.8 million in grants across three thematic areas related to restoration: land degradation, climate change, and biodiversity (GEF 2016). According to the GEF, Malawi has already allocated $8 million and has $1.7 million remaining to be allocated for biodiversity related purposes.

The Green Climate Fund (GCF) and other climate related funds[8]

In 2010, the Green Climate Fund (GCF) was created under the UNFCCC to become the major fund for financing climate mitigation and adaptation activities, which include projects, programs, policies and other activities. As an example, the GCF finances activities to both enable and support adaptation, mitigation (including REDD+), technology development and transfer (including CCS), capacity-building and the preparation of national report (GCF 2016). The GCF is meant to leverage additional private-sector finance, but nevertheless requires a substantial share of public funding. Pledges from several donor countries amounted to some $35 million by 2014, although the UNFCCC's objective is to distribute $100 billion through the fund, annually, by 2020. Other climate change related funds also harbor opportunities for Malawi. The REDD+ program, which refers to "reducing emissions from deforestation and forest degradation in developing countries", was set up by

7 The GEF has a gender component, which means it could be advantageous for the country to include gender as a central theme in any GEF proposals.

8 The GCF has a gender component, which means it could be advantageous for the country to include gender as a central theme in any GCF proposals.

the UNFCCC to mobilize funds for preventing deforestation and forest degradation in developing countries in order to reduce GHG emissions (Büge et al, 2015). In addition to direct financing flows to REDD+, many other multilateral climate funds also support GHG emission reductions from land use. For instance, the BioCarbon Fund Initiative Sustainable Forest Landscapes – a multilateral fund of US$280 million was created in 2013 to reduce GHG emissions from land use through REDD+ and sustainable agriculture, as well as smarter land use planning, policies and practices.

Malawi appears to be well positioned to acquire GCF and other climate change related funds for to support several aspects of designing and implementing a national restoration strategy. Malawi is a signatory to all three major Rio Conventions and the country has actively participated in the UNFCCC COPs. According to The REDD Desk, Malawi has been working in earnest on a national REDD+ program and the GoM is also in the process of finalizing a National Climate Policy (Redd Desk 2016). The 2012 draft of the National Climate Change Policy would prioritize both adaptation and mitigation and identifies various mitigation measures, including reducing deforestation, sustainable crop and livestock production, controlling vehicle emissions, and promoting low carbon technology (EAD 2012). Malawi has used these documents to advocate at the COPs for a REDD+ window within the GCF in order to fund the country's increased commitments to improve the productivity of agriculture in order to help smallholders adapt to climate change and improve the country's overall food security.

GCF funds could support multiple aspects of Malawi's national restoration strategy if they are deemed to have the potential to transform the agriculture and forestry sectors and add value to existing funding. Activities could include an expansion of restoration extension & knowledge sharing programs, the creation of a multi-sectoral taskforce to review the feasibility of creating a national restoration fund to pay for activities and material inputs that are necessary for the to achieve the Country's restoration commitment, but that may not generate returns for private sector investors, and a regulatory framework and tax regime to cover the fund's annual operating expenses and the establishment of a task force to review agricultural and forest subsidies that could be phased out and tax revenue that could be transferred to support restoration activities and a transition to a restoration economy. GCF funding could also be used to support institutional capacity building to create market conditions that incentivize restoration.

Official Development Assistance (ODA)

Malawi received approximately $930 million in Overseas Development Assistance (ODA) in 2014 (OECD 2016). These funds are channeled via multilateral organizations (earmarked contributions), but not the core contributions to the GEF and other multilateral agencies such as the World Bank or Regional Development Banks (RDBs). The funds have been allocated across many different thematic areas and this is what makes ODA so attractive as a source of funding for Malawi's national restoration strategy. Malawi has used ODA funds to invest in institutional reform, infrastructure development, capacity building, and a number of other unrelated activities. In short, ODA is a flexible source of funding that can pay for investments in areas that the private sector would not be interested in. Like the GCF, ODA funding could be used to invest in multiple aspects of Malawi's national restoration strategy. However, in order to take advantage of the opportunities to invest ODA funds in a national restoration strategy the GoM would potentially need to re-allocate some of its ODA funding toward restoration activities because ODA allocations have been falling since 2012 (OECD 2016).

Recommendations

This assessment has yielded a number of recommendations to inform Malawi's National Strategy and Action Plan for FLR. Recommendations are as follows:

Restoration interventions and opportunities

Five types of mutually-supportive restoration interventions were identified as having the greatest potential for scaling-up across Malawi to address existing degradation and land use challenges. These were: 1) Agricultural technologies; 2) Community forests and woodlots; 3) Natural forest and plantation management; 4) Soil and water conservation; and 5) River and stream-bank tree-planting and natural regeneration. Based on the results of the National Forest Landscape Restoration Opportunities Assessment and Restoration Opportunities Assessment Methodology mapping assessment, the key recommendations are to:

- Integrate these restoration interventions into district-level development and resource allocation decisions, using the estimates of intervention opportunities area per district from the NFLRA as a guide for setting priorities and orienting interventions.
- Provide for the full participation and empowerment of women and take steps to enhance gender equity in all communications and outreach, training, technical assistance and other support for restoration interventions.
- Focus more resources on implementing agricultural technologies, given that it is the most widespread National Forest Landscape Restoration Opportunities Assessment and Restoration Opportunities Assessment Methodology across Malawi (nearly 40% of the country) and is key to improving Malawi's food security and the well-being of smallholder farmers. Reallocation of fertilizer subsidies by the Ministry of Agriculture, and improved coordination between the Department of Forestry and Department of Agriculture would help to align and increase resource allocations in support of agricultural technologies.
- Dedicate more resources to communication and outreach about the benefits of agricultural technologies through rural radio, expanded extension services and support for NGOs providing training for communities.
- Reinforce local environmental governance by supporting the adoption and enforcement of strong community by-laws to reduce the uncontrolled cutting of trees on and off farms and damage from fire and livestock.
- Rehabilitate degraded natural forests and protect existing natural forest stands to capitalize on the flood and erosion mitigation benefits and biodiversity value, and prioritize interventions in community-managed forests and national forest reserves located in degraded watersheds close to major water bodies.
- Focus more resources on establishing new village forest areas and encouraging private woodlots to remove pressure from forest reserves and other protected areas and help to alleviate poverty by improving availability of forest products, especially fuelwood stocks that are accessible to local communities.
- Enhance training and assistance for establishing soil and water conservation measures such as check dams and infiltration ditches, to protect investments in croplands from flooding and erosion.
- Provide seedlings and other material resources and associated training to encourage river- and stream-bank tree planting and regeneration to secure water resources and mitigate erosion and flood risks.
- Increase support for farmer-to-farmer and community exchange visits to facilitate peer-to-peer learning and direct dialogue about successful restoration practices.
- A landscape approach that emphasizes inter-sectoral approaches and co-location of investments should underpin all of the above efforts.

Policies and institutions

Analysis of enabling conditions for large-scale FLR led to a number of recommendations for policies and laws, enforcement, education and awareness, cultural factors, and finance.

Key recommendations related to education, awareness, and cultural factors are:

- Reflect FLR as a national priority consistently across Government. Apply an integrated, multi-sectoral approach that embeds mechanisms—such as a joint sector review established by the Office of the President and Cabinet—to ensure collaboration among different sectors to restore degraded land to productivity.
- The National Environment Policy (2006) is recommended as the overarching framework instrument for forest landscape restoration. The Policy (2006) is recommended to undertake further policy gap analysis and to identify additional options to mainstream FLR and improve implementation. This effort should establish a rolling policy and legal review timetable and engage each policy and law review process to enhance the FLR provisions. This process should led by the Ministry of Natural Resources, Energy and Mining and Department of Environmental Affairs.
- Harmonize laws and strengthen policies directly related to FLR. The above 'rolling review timetable' will facilitate progressive harmonizing and strengthening of the body of polices and laws related to FLR, including policies on physical planning, water management, forestry and agriculture. Where different policies and laws contradict each other these contradictions should be addressed. One notable contradiction to be addressed is between agricultural policy that promotes irrigation and cultivation close to river banks but does not align with river bank protection stipulated in forest policies; this creates a tension between where and how protective vegetation is used.
- Establish appropriate compliance mechanisms to strengthen enforcement of related laws and policies, in particular for forest clearing restrictions and for community forest management. Weak enforcement of forest laws—underpinned by high resource demand, limited financial and human resources, rent seeking behaviour, and corruption risks—was identified as a main barrier to achieving FLR at scale

Key recommendations related to education, awareness, and cultural factors are:

- Integrate FLR into the climate change curriculum being implemented by most schools in Malawi. This will entail collaboration with Wildlife Clubs, Environmental Management Clubs, and other entities within the school structure responsible for environmental management and associated programs.
- The Education Department's National Curriculum was also cited as important to increase adoption of FLR, as schools are required to have woodlots (though many do not have sufficient land to do so). Connecting the Department of Forestry with school administrators could help to expand the establishment, and strengthen management, of woodlots and tree nurseries on school grounds. This effort would be linked with a broader campaign to mainstream FLR in climate change curricula.
- Connect the Department of Forestry with school administrators to strengthen establishment and management of woodlots and tree nurseries on school grounds. Assess and improve school and institutional use of fuel wood for cooking.
- Closely involve Traditional Authorities in planning district restoration interventions and implementation.
- Build national ownership for FLR interventions through a comprehensive communications strategy. Link school FLR activities with Parents Associations and wider community groups. Build on supportive cultural aspects that have a bearing on forest use—including *Gulewamkulu*—to spur greater community mobilization, and address cultural barriers to restoration including production, transport, and use of charcoal. Include financial institutions in advocacy and awareness campaigns.

Economics and finance

Key recommendations to capitalize on the potential economic and financial benefits of restoration interventions are:

- Prioritize the implementation of restoration interventions with relatively lower costs and higher benefits including conservation agriculture, farmer managed natural regeneration, and other forms of agroforestry.
- Prioritize the implementation of forestry based restoration like natural forest management in gazetted forest reserves with steep slopes and near important water resources like the Shire River and urban Water Board dams.

- Diversify domestic government budget allocations from subsidies for mineral fertilizers to support for increased extension services, training and outreach programs to promote forest landscape restoration activities.
- Create and support institutions to extend farm credit to smallholders with an interest in investing in plantation forestry, expansion of woodlots and value added processing and marketing of tree and forest products.
- Provide support for improved data collection and analysis of costs and benefits from a variety of proven restoration interventions that are being implemented at scale.
- Support active research to improve the monitoring of significant outcomes and impacts of investments in restoration, with attention to the valuation of public goods associated with the restoration of degraded and deforested landscapes.
- Focus the government public works programme (cash-for-work) scheme at restoration activities, in particular watershed management. A significant proportion of households depend on *ganyu* for household income. This comes from employment by other households in the community (mainly assistance with agricultural production), but also cash-for-work programmes. These programmes (especially the World Bank funded Malawi Social Action Fund and its Public Works Programme), provide significant inputs that could be more strongly directed towards restoration actions at the village level.
- Build restoration-focused financial infrastructure at district and community level, and build on the Village and Savings Associations (VSLA) to incentivise restoration. Financial mechanisms at the village or the district level for restoration must be strengthened. Introduce new financial mechanisms including a revolving fund at the village level, and provide incentives for restoration through local financial institutions. The VSLA are the most widespread and effective of community-level financial interventions. These most commonly deliver a double bottom line of financial and social benefits to members. To align these with the Sustainable Development Goals (especially Goal 15) they must add environmental sustainability objectives. Methods to do this have been identified (Wild et al., 2008) and applied in Uganda.

Gender

Key recommendations are:

- Reduce the gender gap in agriculture to help to address the root causes of land degradation, scale up sustainable land management, forest landscape restoration practices, and improve food security. Women should have equal access information about restoration practices that are especially well suited to improve food security.
- Use cross-sectoral policies that recognize both gender gaps and women's rights as a mechanism to target women in vulnerable situations and tailor FLR intervention packages to households' needs around livelihoods and income, food security, and water and energy access. These policies—including the NBSAP (2015), NAPA (2006), National Forestry Policy (2016), INDC (2015), National Land Policy (2002), National Agriculture Policy (2016), MGDS III (2016-2020), Gender Policy (2012-2017), and Gender Equality Bill (2012)—are significant mechanisms for facilitating gender mainstreaming across sectors and are important instruments for gender responsive FLR implementation.
- Since women have higher demands on their time, their ability to participate in implementing restoration activities can be limited, yet, it is critical that measures be taken to increase women's role in implementation especially in areas with higher percentages of female populations. Facilitating access to technology, promoting women empowerment and their rights, changing of cultural practices that constrain women's participation and access to productive resources can all promote women's participation in decision-making at the household, community, district and national level.
- Promote women's empowerment and women's access to and control over resources such as loans, land, extension services and training.
- Promote generation and dissemination of sex-disaggregated data and gender indicators in the FLR monitoring and evaluation framework.
- Propose and mainstream FLR implementation in capacity development programmes at all levels, building on the suite of policies outlined in the NFLRA that recognize gender and capacity development priorities.

FLR implementation guided by multi-criteria analysis (MCA)

The multi-criteria analysis identified, prioritized and refined the five FLR intervention categories for their impact on three scenarios: 1) food security, 2) resilience and 3) biodiversity. This process resulted in maps and spatial data on the number of hectares for each of the three MCA scenarios within the area identified for each of the five intervention types. To implement these FLR intervention types it will be necessary to look at the combinations of criteria during the MCA, and develop appropriate technical packages. For example, in agricultural technology interventions where multiple benefits are desired for food security and resilience, the analysis clarifies the location and area where a combination of food security and resilience criteria occur and associated restoration packages that respond to these criteria can be developed. These would also form the basis of additional cost-benefit analysis and associated business models. These next steps will be critical for fund raising and attracting investors.

Next steps include: (1) use the MCA to develop technical intervention packages (based on the combinations of MCA input criteria) for each of the 5 interventions, (2) develop district-level plans for implementation of FLR packages and action plans for business model development, 3) conduct economic and financial cost-benefit analysis at district level, for each scenario or along value chains and business models and (4) identify funding mechanisms for investment-ready business models.

Food Security

Sustaining healthy ecosystems will require an approach that integrates sectors and scales and captures synergies among ecosystems and food security. Integration of forestry and agriculture can positively impact food production systems. This strategy can complement a cross-sectoral approach and merge significant socio-economic and environmental opportunities. Malawi's cross-sectoral policies, actions and strategies are consistent with FLR objectives, in particular regarding food security and increasing resilience of food production systems. Key recommendations to boost food security and reduce threats to food security from climate change, degradation, and deforestation are:

- Develop local capacities, including extension services, to adopt FLR interventions, specifically for food security and poverty alleviation.
- In accordance with nationally defined priorities, the FLR NSAP should be applied as a forest-agriculture implementation mechanism.
- Disseminate NFLR food security assessment outcomes to agricultural and food security response programmes and strategies, to foster cross-sectoral collaboration as well as access to finance for agricultural technologies and natural regeneration.
- Promote agricultural technologies, soil and water conservation, water management, community forest/ woodlot and natural regeneration, and trees on farms as a pathway toward more resilient livelihoods.
- Use the food security and agriculture policy frameworks highlighted in the NFLRA as a platform for greater synergies, aligned with the FLR NSAP.
- Institutionalize the critical role of ecologically diverse and productive landscapes in agricultural planning.
- Include the underlying causes and inter-linkages of food insecurity, poverty, land degradation and deforestation (outlined in the NFLRA) in multi-sector policies, specifically food security plans and poverty reduction strategies.
- A suite of FLR strategies and associated technological packages are needed that respond to the underlying drivers of degradation and the specific challenges associated with food insecurity. Including tailored agricultural technology intervention strategies that immediately support food production as well as long term ecological and economic sustainability.

Resilience

Adopting FLR interventions will enable smallholder farmers to enhance resilience and adaptive capacity to the ongoing adverse impacts of climate change and landscape degradation. In addition, Malawi National Adaptation Plan Stocktaking Report indicated that for long-term resilience the smallholder farmers can reduce vulnerability by growing a diverse assemblage of drought-tolerant crops and planting drought-tolerant, fast-growing tree species as well as adopting conservation agriculture and agroforestry amongst others (Reddy et al., 2016).

Key recommendations are (1) integrate FLR planning through District Development Plans, in particular into disaster risk management projects and programmes, (2) integrate the FLR NSAP into the National Resilience Plan and related policies, programmes, and sustainable development planning processes and strategies, and (3) apply the NFLRA to unlock finance from the Disaster Risk Management and Resilience sector, including via projects from UNDP Malawi, the European Community Humanitarian Office's Disaster Preparedness (DIPECHO), Enhancing Community Resilience Project (ECRP) funded by DFID, Irish Aid, and Norway, the World Bank Shire River Basin Management Programme (SRBMP), and Integrated Flood Risk Management Plan (IFRMP).

Biodiversity

Malawi's iconic freshwater and terrestrial biodiversity remain an important natural resource. Landscape restoration activity should take a precautionary approach to biodiversity especially within Key Biodiversity Areas. The MCA has identified specific areas within Malawi where restoration can support a both a reduction in threats to vulnerable and endangered species and/or the restoration of areas that are especially important for biodiversity if native plant species are used to restore degraded habitats and corridors.

Additionally, the National Biodiversity Strategy and Action Plan (NBSAP) and District Development Plans can utilize the information in this analysis to address threats to biodiversity loss and the challenges affecting implementation of biodiversity programmes, including:

- Inadequate human and institutional capacities for biodiversity conservation.
- Inadequate coordination among and within institutions dealing with biodiversity.
- Lack of framework legislation on biodiversity.
- Weak enforcement of existing legal mechanisms.
- Inadequate integration of biodiversity conservation into sectoral plans.
- Inadequate public awareness on the importance of biodiversity.
- Inadequate community participation in biodiversity management, and
- Inadequate funding for biodiversity management.

Applying the NFLRA to improve capacity and knowledge on biodiversity issues, and mainstreaming biodiversity outcomes of the NFLRA into sectoral and district development planning will be essential to achieving these goals.

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Annexes

Annex 1: Timeline of Malawi's commitment to FLR

September 2015	Participation in roundtable on restoration opportunities in Africa at the World Forestry Congress, Durban, South Africa
October 2015	Launch and organization of field work and data collection and analysis for the pilot application of ROAM tools and methods to assess restoration opportunities in the Liwonde Landscape
October 2015	African Union adopts resolution to initiate the restoration of 100 million hectares of degraded and deforested land in Africa by 2030 within the framework of the African Resilient Landscape Initiative (ARLI) and as a contribution to the Bonn Challenge and New York Declaration on Forests
November 2015	Malawi commits to participate the AFR100 regional initiative, organized following the September roundtable and AU resolution
December 2015	Malawi participates in the formal launch of the AFR100 initiative at the Global Landscapes Forum organized during the UNFCCC COP21 in Paris, France
February 2016	Presentation and validation of results from the assessment of restoration opportunities in the Liwonde landscape (Machinga District
February 2016	Ministerial launch of the National Forest Landscape Restoration Assessment
March 2016	Formulation of terms of reference for the national Task Force and Technical Working Groups to guide the NFLRA, and for technical support to the process by WRI and IUCN
April 2016	Formation and nomination of members of the NFLRA Task Force
May 2016	Preparation of the initial meetings of the Technical Working Groups
June 2016	Orientation workshop on gender issues in restoration; Inception and Orientation Workshop for the NFLRA organized in Blantyre
June-July-August 2016	Field visits and four Zonal Stocktaking and Mapping workshops organized with working groups, district officials and key stakeholders in eastern, southern, northern and central zones to identify land degradation and land use challenges and to take stock of successful restoration activities
July 2016	Participation in High Level Bonn Challenge Roundtable in Kigali, Rwanda
August - Sept 2016	Consultations to review preliminary results of mapping and to orient data collection for economic analysis
September 2016	Participation in IUCN World Conservation Congress, Hawaii, USA and announcement of Malawi's national target for forest landscape restoration
September 2016	Focus Group discussions on gender and food security issues in FLR, and meetings with Farm Radio Trust on Her Farm Radio programming in Mangochi and Machinga districts
October 2016	Participation in AFR100 regional conference and presentation of status of FLR assessment
November 2016	Organization of Task Force / Working Group meetings to present and validate findings on FLR opportunities mapping, restoration diagnostic, and economic and financial analysis

Land Degradation: Northern Zone

Types of degradation:
- Deforestation
- Infertile soils
- Low crop yields
- Gully formation
- Soil erosion
- Silted rivers

Drivers of degradation:
- Tobacco farming/curing
- Charcoal production
- Fuelwood collection
- Pine overharvesting
- Mining/quarrying
- Population growth
- Estate farming
- Slash & burn cultivation
- Riverbank cultivation
- Brickmaking
- Overgrazing
- Lack of nutrient inputs
- Poor law enforcement
- Urbanization
- Hemp farming
- Demand for land
- Canoe production
- Shortage of extension workers

Successful Restoration Activities per District: Northern Zone

Chitipa (? ha)
- Mgmt of Mughese FR
- Afforestation
- Catchment mgmt (soil conservation, gully reclamation)

Rumphi (5,860 ha)
- Natural forest regeneration
- Manure making
- Afforestation of bare hills/land

Mzimba (1,300 ha)
- Conservation agriculture
- Agroforestry
- Soil & water conservation (manure, box ridges, marker ridges, contours)

Karonga (? ha)
- Communal woodlots
- Riverbank protection
- Natural regeneration

Nkhata Bay (1,020 ha)
- Afforestation on customary land
- Natural forest regeneration
- Est. Village Forest Areas

Likoma (45 ha)
- Afforestation
- Vetiver planting/check dams
- Natural regeneration

Nkhotakota (6,180 ha)
- Afforestation
- Soil & water conservation
- Agroforestry
- Conservation agriculture

Land Degradation: Central Zone

Types of degradation:
- Deforestation
- Bare land
- Infertile soils
- Low crop yields
- Gully/gorge formation
- Soil erosion
- Silted rivers
- Drying up of rivers
- Water shortage

Drivers of degradation:
- Charcoal production
- Fuelwood collection
- Mining
- Tobacco curing
- Bush fires
- Population growth
- Riverbank cultivation
- Hillside cultivation
- Brickmaking
- Overgrazing
- Agricultural/ settlement expansion
- Lack of nutrient inputs
- Poor law enforcement
- Lack of resource bylaws
- Need for disposable income
- Demand for land
- Poor leadership
- Climate change
- Conflicting policies

Successful Restoration Activities per District: Central Zone

Kasungu (? ha)
- Agroforestry
- Riverbank planting
- Est. woodlots/VFAs

Dowa (700 ha)
- Afforestation
- Rainwater harvesting
- Gully reclamation

Mchinji (20,179 ha)
- Establish VFAs
- Conservation agriculture
- Land resources conservation technologies

Lilongwe (? Ha)
- Establish VFAs
- Gully reclam./vetiver planting
- Agroforestry/CA

Ntchisi (222 ha)
- Establish woodlots
- Conservation agriculture
- Natural regeneration on bare hills

Salima (19,072 ha)
- Natural forest regeneration
- Soil & water cons. (contour ridges/vetiver hedgerows)
- Agroforestry

Dedza (? Ha)
- Individual/communal tree planting
- Natural regeneration
- Agroforestry/CA

Land Degradation: Eastern Zone

Types of degradation:
- Deforestation
- Infertile soils
- Low crop yields
- Degraded rivers
- Poor water quality
- Water shortage
- Bare hills
- Soil erosion

Drivers of degradation:
- Charcoal production
- Fuelwood collection
- Poor law enforcement
- Pit sowing
- Encroachment/demand for land
- River & streambank cultivation
- Population growth
- Lack of income opps.
- Cultivation in marginal areas
- Poor farming practices
- Erratic rains
- Lack of nutrient inputs
- Floods
- Lack of grazing area

Successful Restoration Activities per District: Eastern Zone

Ntcheu (2,009 ha)
- Check dams, marker ridges, gully reclamation
- Natural regeneration
- Conservation agriculture

Balaka (8,097 ha)
- Gully reclamation
- Streambank planting
- Manure application

Neno (? ha)
- Riverbank planting
- Conservation agriculture
- Natural forest regeneration

Mangochi (44,937 ha)
- Co-mgmt in Mangochi FR
- Agroforestry
- Conservation agriculture

Machinga (? ha)
- Riverbank planting
- Bare hill planting

Zomba (? ha)
- Conservation agriculture
- Riverbank planting
- Natural regeneration

Phalombe (? ha)
- Est. tree nurseries
- Soil & water conservation
- Energy-saving stoves

Land Degradation: Southern Zone

Types of degradation:
- Deforestation
- Infertile soils
- Low crop yields
- Gully formation
- Soil erosion
- Silted / dried up rivers
- Bare hills
- Poor water quality
- Water shortage

Drivers of degradation:
- Charcoal production
- Fuelwood collection
- Riverbank / marginal land cultivation
- Poor law enforcement
- Lack of bylaws
- Overgrazing
- Sand mining
- Weak gov't policies
- Political interference
- Theft
- Population growth
- Brick molding & curing
- Collection of Nkhunguni
- Bushfires
- Timber production
- Overharvesting forest products (Calumbo roots)
- Encroachment/demand for land
- Lack of VFA mgmt. plans

Successful Restoration Activities per District: Southern Zone

Blantyre (? ha)
- *TBD*

Mwanza (6,428 ha)
- Soil & water conservation (ridges, gully control, swales)
- Natural forest regeneration
- Afforestation

Chikhwawa (811 ha)
- Watershed management
- Afforestation
- Natural regeneration

Nsanje (29,164 ha)
- Restoration of Masenjere FR
- IFMSL Matandwe FR
- River bank planting

Chiradzulu (310 ha)
- Mgmt of VFAs
- Homestead tree planting
- Conservation agriculture

Mulanje (1,109 ha)
- Riverbank tree planting
- Watershed management
- Mountain cedar planting

Thyolo (320 ha)
- Conservation agriculture
- Agroforestry
- Forest management

Annex 2: Stocktaking objectives and methodology

A key activity at the outset of the ROAM process is to review and "take stock" of restoration successes, both large and small. This stocktaking activity is part of the initial phase of work focused on the review of available information on land use challenges and restoration, identification of major actors, consultations with key stakeholders, and a rapid assessment of the current policy framework and recent, ongoing and completed investment programs related to forest landscape restoration.

Field visits and consultations with rural communities and actors at the field level are the foundation of stocktaking. These field visits provide opportunities to identify and investigate what types of specific restoration practices or techniques and interventions or approaches are working to restore the productivity of degraded and deforested lands. These practices might include protection and management of forest and tree regeneration, establishment of tree plantations and woodlots, construction of water harvesting structures like infiltration ditches and check dams. Specific interventions or approaches might include support for cross-visits and provision of training to women groups interested in establishing woodlots and to farmer unions to promote the adoption of "farmer managed natural regeneration", or organization of participatory forest management committees and assistance with more equitable benefit sharing plans for co-managed forests.

During the stocktaking field visits, information is gathered in response to key questions or topics of enquiry:

- What is being done (specific practices, interventions and associated behavior changes)?
- Who are the primary actors (farmers, livestock herders, community organizations, enterprise groups and businesses, CSO and NGO partners, government agencies, others)?
- Where is it happening, and at what scale (to what extent)?
- Why is it happening – what are key motivating factors; what constraints were overcome and what economic incentives or other enabling factors were significant in encouraging or supporting adoption of the restoration practices?
- What difference has it made – what are the impacts, results, associated benefits?

During the organization of stocktaking field visits, it is important to take stock of landscape level changes, broad trends and local innovations in natural resource management that may or may not be directly associated with project supported interventions, and which may or may not be widely appreciated by persons with minimal opportunities to interact directly with rural communities. In fact, it can be particularly helpful and informative to look out for signs of practices that are being widely adopted and "self-scaling" to some extent, often because they are well adapted to local conditions, responsive to priority concerns, technically feasible and economically viable, and because they are cost-effective and generate significant benefits.

For the assessment process in Malawi, an initial round of field visits was organized to immediately follow the inception and orientation workshop. The workshop brought together representatives of government and others working in multiple sectors, and helped to develop some preliminary information about key land use challenges such as declining soil fertility, low crop yields, low incomes, water scarcity, declining supplies of firewood, unsustainable wood harvesting and production of charcoal and the like. It also provided an initial working list of possible restoration interventions such as reforestation, agroforestry and improved forest management.

The field visits were organized to take stock of community level experiences in addressing these land use challenges and in successfully restoring degraded lands. In addition to providing opportunities to assess landscape level land use dynamics, the stocktaking included visits to sites where several projects had provided technical support and other assistance, including the Community Vitalization and Afforestation in Middle Shire (COVAMS II), the Improved Forest Management for Sustainable Livelihoods (IFMSLP) Programme and the Protecting Ecosystems and Restoring Forests in Malawi (PERFORM) project. This phase of field visits included sites in Blantyre, Mwanza, Mzuzu, Rumphi, Kasungu and Lilongwe districts.

During the assessment, information from other sites, projects, support organizations and districts was incorporated through a series of four zonal workshops organized in the eastern, southern, central and northern zones. In each of the four zonal workshops, participants discussed and identified locations within each district where the landscape was severely degraded and should be targeted for restoration, along with sites where successful restoration activities have been carried out. Approximate areas of both degraded land and where restoration practices were underway were noted in many districts (see graphics).

Additional details about the primary drivers of degradation, and motivating factors and other key success factors for restoration were summarized. On-going problems that hindered restoration were listed, along with organizations engaged in assisting restoration. Summary information and maps for 27 districts were prepared as part of this assessment and are now available and can be used as a basis for further planning of restoration interventions.

Annex 3: Stocktaking results and discussion

Taken together, the results from the field visits and the zonal stocktaking workshops indicate the following:

- Rural communities in Malawi are motivated to restore land for a variety of reasons; most communities want to improve soil fertility and boost crop yields, secure water supplies, increase supplies of firewood and other forest products, and secure rural livelihoods and sources of income.
- There are many examples of restoration practices, including many that have been supported by a many different rural development and environmental conservation projects.
- More efforts are needed to closely assess the costs and benefits of specific restoration practices and interventions over time to guide strategies to scale up the most successful and cost effective practices that are proving to be the most effective in addressing key land use challenges and in delivering the desired benefits and impacts.
- Project assisted efforts to control erosion and conserve soil and water have been sustained in cases were water supplies and agricultural production were increased.
- Conservation farming and certain types of agroforestry practices based on tree-planting are not yet widespread; some surveys indicate that adoption rates are belong 20 percent.
- Farmers are also incorporating new crops such as pigeon pea and other legumes into their farming systems, with apparently beneficial effects on soil fertility and income; improved access to information as well as seeds and political as well as technical support seem to have played a critical role in accelerating adoption.
- Major investments in commercial forest plantations have not yet resulted in the successful development of large-scale expanses of sustainably managed tree plantations and expansion of forest based enterprises.

There are significant opportunities to facilitate and accelerate the widespread adoption of a range of restoration practices, including agroforestry, improved forest management and commercial tree plantations. Effective approaches will need to address the need for improved access to training and extension services, increased communication and outreach about economic benefits, increased support for farmer to farmer visits and community and district level exchange visits. In the case of participatory forest management, attention to forest governance and transparent, equitable benefit distribution is vital. In the case of commercial tree plantations, access to start up financing and credit for value -added processing and marketing, as well as the development of insurance markets and risk-avoidance strategies could be very important.

Perhaps one of the most unexpected and notable results from the stocktaking activity of this assessment is the new information that has emerged about the adoption of a specific restoration practice known as “farmer managed natural regeneration” or FMNR. Extensive field visits in June and in October, in combination with observations from prior fieldwork and consultation with organizations such as Total Land Care and World Vision indicate that large numbers of farmers are adopting FMNR and changing their farming practices to systematically protect and manage the regeneration of a wide range of mainly indigenous tree and shrub species, mainly on cropland. Over the past 5-10 years, FMNR has been adopted on approximately 1 million hectares of cropland. This “movement” to adopt FMNR at scale is being driven by the need to restore soil organic matter, and to increase crop yields and supplies of wood, fodder, fruit and other products from farming systems. While some support is being provided by World Vision and others, the practice of FMNR has not yet been formally promoted in a concerted manner by government extension agencies, the Ministry of Agriculture or the Department of Forestry.

Scaling up FMNR and related restoration practices which directly increase the productivity of cropland could have a major impact on food security and rural incomes in Malawi. Restoration of millions of hectares could be achieved in less than 10 years with significant positive impacts and at relatively low cost by investing in a scaling up strategy based on expanded communications (with a focus on rural radio programs), peer to peer training and other practical interventions to facilitate and accelerate knowledge sharing by farmers and mobilization of grass roots support for the widespread adoption of FMNR.

Annex 4: Methodology for geospatial analysis of restoration opportunities

The geospatial analysis performed to quantify restoration opportunities in Malawi incorporated more than a dozen datasets including elevation, slope, land use/land cover, tree cover, water bodies, forest reserve boundaries, and administrative areas. These data were consolidated into a geographic information system (GIS), where criteria associated with each type of potential restoration intervention were applied. The datasets representing these criteria were overlaid and combined with each other, and areas where they intersected were identified as opportunities areas. This process was replicated for each of the restoration interventions to create maps of opportunities areas. Areas were summarized at the district level to convey opportunities within an applicable context. Following the development of the intervention opportunities maps, which is based strictly on biophysical criteria, a second "prioritization" analysis was performed that incorporated information on socioeconomic and environmental conditions that are highly relevant to the land use challenges that are being addressed by the intervention. The purpose of this second analysis was to identify those areas that either had the greatest chance of success or would likely lead to the greatest benefits for local communities, given the socioeconomic and environmental conditions, and target these areas for implementation of those interventions.

Development of the Restoration Opportunities maps relied heavily on stakeholder engagement and consultation. The inception workshop, zonal stocktaking workshops and site visits, held between June and August 2016, were fundamental to defining the land use challenges, restoration objectives, and proposed restoration interventions that are part of Steps 1 and 2 in the mapping process. Consultation with in-country partners, particularly the PERFORM team, Land and Resources Conservation Department, the Forestry Research Institute of Malawi, and Department of Forestry, were critical to compiling the best-available spatial data that were inputs to the geospatial analysis and production of the maps, as part of Steps 3 and 4. A second stakeholder workshop was held in November 2016 to obtain feedback on the maps and discuss next steps and priorities for implementation, as part of Steps 5 and 6.

Annex 5: Elements of MGDS II relevant for FLR

1. Agriculture and Food Security *Goal: To increase agricultural productivity and diversification.*	
Strategy	**Focus Actions and Activities**
Reduced land degradation; Promoting soil and water conservation techniques.	Promote conservation farming; Promote land and water management systems and technologies that protect fragile land; community participation in soil and water management; Subsidize inputs to raise forestry and fruit tree seedlings.
9. Natural Resources and Environmental Management *Goal: To ensure sustainable management and utilization of the environment and natural resources.*	
Strategy	**Focus Actions and Activities**
Improving coordination of environment and natural resource programmes.	Develop Sector Wide Approach for management of Natural Resources and Environment; Integrate environmental and natural resources management issues into national and sectoral development plans and policies; Harmonize sectoral policies.
Strengthening education and public awareness programmes on environment and natural resources management.	Review and develop advocacy materials; conduct outreach programs on environment; intensify environment and natural resources education.
Enhancing environmental protection, restoration and rehabilitation.	Promote stakeholder participation in land use planning; rehabilitation and protection of catchment ecosystems.
Promoting biodiversity conservation programs.	Develop and implement projects on biodiversity conservation and rehabilitation of the environment.
Promoting voluntary carbon markets and Reduced Emissions from Deforestation and Degradation of Forest (REDD) projects.	Develop policy and legislation on voluntary carbon markets / REDD plus; implement and monitor carbon voluntary markets/ REDD plus projects or programs; promote research, dissemination and utilization of voluntary carbon markets and REDD plus initiatives.
Increase forest cover; Developing, conserving and protecting forest plantations, customary estates and natural woodlands.	Replant and rehabilitate forest plantations; Rehabilitate bare and degraded areas on customary estate; Undertake natural woodland regeneration activities on customary estate; Undertake fire management activities in plantations and forest reserves; Undertake various silvicultural operations in plantations and forest reserves; Conserve and protect all riverine vegetation
Improving forestry extension services, research, and information management.	Undertake tree planting campaigns; Train communities in tree management and silvicultural operations.

Source: Information extracted from the Malawi Growth and Development Strategy II (2011-2016).

Annex 6: INDC targets and action plans relevant for FLR

	Unconditional	Conditional	Total Target
MITIGATION			
Afforestation	1 $MtCO_2eq$/year	1.6 $MtCO_2eq$/year	2.6 $MtCO_2e$/year
Conservation Plans: protection and conservation of Protected Areas			Emission reduction potential 4.8 $MtCO_2e$
REDD+ programme action plan			
Energy Plans			Renewable Energy: Biofuels, Solar, Hydro Clean cooking and heating: efficient cookstoves
ADAPTATION			
Agriculture	Increase irrigation at smallholder level, increase land under irrigation through Greenbelt initiative from 20000 to 40000 ha, promote on-farm water conservation technologies	expanded programmes of Greenbelt imitative form 40000 ha to 10000 ha by 2030, support an expanded programme of construction multipurpose dams for irrigation and aquaculture	
Crops	promote the rowing of drought tolerant crop varieties		
Agricultural technologies	promote improved land use practices	implement conservation agriculture, farmer-managed natural regeneration, and agroforestry practices Land and soil management	
Disaster Risk Management	build adaptation capacity in climate resilient agronomic practices for smallholder farmers		
NEAP, NEP		provide watering points at strategic locations of national park/game reserve Implement disease control programs, support CB in wildlife institutions to lead in adaptation initiatives e.g. translocation and culling	
Water	promote water harvesting technologies at all levels	implement integrated catchment conservation and management programme	
Energy			Promote use of biomass briquettes as substitute for firewood and charcoal Promote an energy mix that moves people away from use of biomass
LULUCF/FORESTRY/ afforestation	support research in drought tolerant and fast growing tree species	expand afforestation and forest regeneration programmes	
Transport		construct infrastructure for flood control	

Annex 7: Summary of restoration diagnostic results

Theme	*Feature*	*Key success factor*	*Response*
Motivate	a. Benefits	Restoration generates economic benefits	Yes
		Restoration generates social benefits	Yes
		Restoration generates environmental benefits	Yes
	b. Awareness	Benefits of restoration are publicly communicated	Partially
		Opportunities for restoration are identified	Yes
	c. Crisis events	Crisis events are leveraged	Yes
	d. Legal requirements	Law requiring restoration exists	Partially
		Law requiring restoration is broadly understood and enforced	No
Enable	e. Ecological conditions	Soil, water, climate, and fire conditions are suitable for restoration	Yes
		Plants and animals that can impede restoration are absent	Yes
		Native seeds, seedlings, or sources populations are readily available	Yes
	f. Market conditions	Competing demands (e.g., food, fuel) for degraded forestlands are declining	No
		Value chains for products from restored areas exists	No
	g. Policy conditions	Land and natural resource tenure are secure	No
		Policies affecting restoration are aligned and streamlined	Partially
		Restrictions on clearing remaining natural forests exist	Yes
		Forest clearing restrictions are enforced	No
	h. Social conditions	Local people are empowered to make decisions about restoration	Partially
		Local people are able to benefit from restoration	No
		Cultural factors support and do not impede restoration	Partially
	i. Institutional conditions	Roles and responsibilities for restoration are clearly defined	No
		Effective institutional coordination is in place	No
Implement	j. Leadership	National and/or local restoration champions exist	Partially
		Sustained political commitment exists	Partially
	k. Knowledge	Restoration "know how" relevant to candidate landscapes exist	Partially
		Restoration "know how" transferred via peers or extension services	Partially
	l. Technical design	Restoration design is technically grounded and climate resilient	Partially
		Restoration limits "leakage"	No
	m. Finance and incentives	Positive incentives and funds for restoration outweigh negative incentives	No
		Incentives and funds are readily accessible	No
	n. Feedback	Effective performance monitoring and evaluation system is in place	No
		Early wins are communicated	No

Annex 8: P&I working group's perception of critical factors for large-scale restoration

Key Challenges	**Key Success Factors**
Situational factors	
• Over population • High illiteracy[1] • Charcoal burning • Lack of alternative sources of energy • Lack of alternative livelihoods	• Effects for the drought in the recent past have created fertile grounds for FLR implementation • Negative feedback loops leading to success [with similar meaning as above] • Attitude change – overcoming business as usual position
Governance factors	
• Lack of political will • Gender issues in the restoration processes • Non-compliance by the community • [Poor][2] leadership • [Unclear/weak] land ownership • Political correctness leading to failure	• Government reform programme which advocate for decentralization for development management which will empower rural communities • Through IRD FLR will be achieved by enhancing, coordination, pooling resources together, etc. • Build local institutions for managing trees • Enabling policies and forestry law • Engage Youth • Create a "movement"
Development and development assistance factors	
• Many institutions focusing on the same issues • Limited financial resources/financial constraint for up scaling/adequate or lack of funding (3)[3] • Project and donor driven initiatives • Uncoordinated initiatives/collaboration of different institutions in the restoration process a challenge (2) • Too many pilots • Sustainability of restoration efforts (short term project based) • Not focused on implementation	• Coordinated implementation of restoration efforts • Small pilots that may be scaled up • Rural transformation which is under the MDGs for integrated rural development (IRD) • Mainstream agricultural technologies into existing and new agricultural development projects
Note 1: The challenge of 'illiteracy' provoked discussion with a response that 'who is illiterate'? The strong level of local 'indigenous technical knowledge', with consistently poor policies and policy implementation that the political and technical leadership that may be considered illiterate when it comes to natural resources management. Note 2: Clarifying words not on original card in square brackets Note 3: Numbers indicate the number of cards on the same topic	

Annex 9: Interview with traditional authority Senior Chief Kwataine

Ngoni culture: Ntcheu District 7/6/15

Preamble: Are forests related to culture?

Forests are very strongly linked to culture. Many cultural artifacts depend on trees. E.g. certain tribes use masks and other cultural artifacts made from wood. In our Ngoni the cloth from bark from fig trees is worn during the chief's ngoma (dance). Forests are important to the Ngoni, as warrior and hunting culture, as hunting can only be done in forests. The tradition the ceremony for the initiation of girls takes place in a forest. Regarding graveyard forests he forest is very important. If a graveyard was without trees the ancestors would only have a bare ground which is not good. Thus most graveyards are dressed in trees and are very cool and shady. Thus the forest is clothing for the ancestors. Forest trees are used as medicine, for example by digging roots and tubers, to teat illness. When baby born use traditional medicine tubers roots from trees to strengthen the infant.

Questions on culture for FLR:

Give the name and brief description of country, sub-national area or specific landscape:

Ntcheu District.

1. Is there an existing culture of forest landscape restoration in the area?
   a. Yes – from the Traditional Authority – TA[9] (and structure described at end) but also from community.

2. To what extent is culture an important factor that can bear influence over FLR in the area?
   a. It is an important factor – culture represents a group of people who depend for survival for the forest, e.g. when some trees are wiped out some people die due to loss of medicine. Forest is source of very big water scheme – if we cannot restore the forest, the dam can dry up.

3. What are the main themes or domains where culture influences FLR?
   a. Related to land, land tenure and rights:
      i. Land tenure – individuals want to restore their land but it is difficult, as a group people can work jointly to restore lands.

   b. Related to specific landscapes, features in the landscape, and/or specific sites (forest or non-forest):
      i. Graveyards. Graveyard forests occur in Ngoni culture, (but there is no maskyard/dance tradition as in Chewa graveyard forests). Grave yards are different sizes, and are respected and are not diminishing in size[10]. They can expand and people do come around a graveyard to plant trees.
      ii. We also go to distant forest to pray ancestors/god – go to under big tree to bring rain. This cannot be done on bare ground – trees are very important for rain brining.
      iii. Mountains have a cultural value – we have go to mountains for ceremonies

   c. Related to specific plant and animal species:
      i. Food [not asked]
      ii. Taboos and beliefs [and ceremonies]
         1. Some special due to medicine – in a graveyard can be any type of tree –according to function on riverback etc
         2. Funeral fires. During burial ceremonies a fire is kept alive for several days – if we have no firewood we cannot do the ceremony effectively.
      iii. Medicines [as per preamble]
      iv. Construction: traditional buildings depend on local trees – when the trees go we cannot build traditionally.
      v. Others [not asked]

9 Traditional leadership is prominent in Malawi. A Group Village Headman is selected by the village headsmen and is responsible for five or more villages. Senior chiefs have authority over all sub-chiefs, and sub-chiefs have authority over the hereditary traditional authority positions (CLGF, 2011). Commonwealth Local Government Forum (CLGF), 2011: "Country Profile: Malawi." From https://localdemocracy.net/countries/africa-southern/malawi/ Last accessed 10/6/16, NB this is a good source of information on Malawi institutions.

10 A common feature in many sacred forests and groves in Africa is they are shrinking due to peripheral pressures.

d. Arts and crafts: [not asked]

e. Related to institutions and cultural leadership:
   i. Traditional Authorities are instrumental related to trees – the stronger the TA the more trees preserved. Some area stronger than others. TA is an inherited position and some TA are not well educated, thus the level of understand different.
   ii. ***Q. How is traditional leadership adapting to the modern need of gender equity? The understanding is different by different people. In my own area several women are appointed as headmen. In some cased the chiefs are nominated by women. At a certain stage of the nomination process the word of the women is very important. In some cases a man may be nominated by the men but if the women say no to that candidate - it is no!***

f. Related to spirituality and religion:
   i. Culture is very closely related to spirituality. There is a strong link to the ancestors and strong belief in spirits.

4. Are there cultures that could be described as forest cultures? What is their status in the country? [not asked]

5 In your opinion is culture an opportunity for or a barrier to FLR in the area?
Culture is positive – because if someone wants to cut a tree they have to ask permission form the traditional leadership. They are able to control this.
   a. If a barrier how? [not discussed]
   b. If it is an opportunity how? [not discussed]

6 How does culture influence other key social elements, ethnicity, politics, arts and economics?
   a. Yes it does influence these areas – for example when it comes to choice of representative at ward level, also during harvest the TA gives inform on harvesting crops to avoid hunger. The TA helps design economic enterprises – where to develop where to leave so the TA provided guidance and advocacy. Sensitization of community. We are the gatekeepers of the community at the traditional level, we are messengers, we are investigators and even witness in case of wrong doing.
   b. It is a voluntary position, with a small honoraria from central government. It is a very small MKA 2,000/20,000 ($3-$30)/month depending on the level
   c. ***Q What are the criticisms of the TA system? There are challenges, some individuals concentrate on politics leave the TA role. Instead of collaborating with government of the day – they join it instead.***

7. Are there 'centres of excellence' on culture that can be consulted for a deeper understanding of cultural dimensions of forests, landscapes and FLR?
   a. Not a centre as such but most culture have a day to celebrate and even go to Zambia to join festivals there – e,g, the Ngoni of Zimba organize a cultural day. Those days could be a platform to be explain about FLR and it would work well

8. Are their cultural or religious institutions that could make a subnational commitment to the Bonn Challenge?
   a. TAs can make BC commitment[11], they can make bylaws, they can invite experts at the cultural gatherings, etc.

9. Is any relevant culture or cultural services recognised in existing national laws, conservation or science programmes e.g. WHC, NBSAP, Living Cultural Heritage Convention
   a. The TA is not well recognized at national level.

10. In what way should the FLR progamme that is being designed take into account culture, and can a restoration culture be developed?
   a. Several problems the government is missing – we have failed to manage family sizes leading to poverty, the population getting bigger day and night. Population is an issue that needs to be addressed we have not been able to discuss this.
   b. There is currently a lot of pressure on the forests. People are flocking to the forest reserves to make charcoal. If TA had a stronger role this would support the restoration. We are closer to the people and can set the bylaws. But the DoF seems to working in competition with us. Even in the time of the IFMSLP we were not very involved and the forests are in the hands of no-one

11 Bonn Challenge commitments are normally made in hectares so this would need further clarification.

c. Forestry can be taken care of by leave it in hands of community, the government/project should provide technical know-how – the laws are in place. There is a need for capacity building at the community level, you have to advise to community which button to switch or otherwise it will just be hitting in the dark. Forestry should be much more in in hands of community – so it is the level of capacity building that matters most.
d. The DoF are very understaffed at the district – they have no mobility – no motor cycles – not even a car in some districts – their pay comes too later – few offices, the DFO don't have money to visit the community.
e. ***Q. Can districts raise their own funding?***

A. Yes.

f. ***Q. In Tanzania some districts have a sustainable charcoal programme, where charcoal is harvested from village forest reserves on a strict rotation. The District levy 15% tax for their own operations. Do you think sustainable charcoal is a good alternative to unsustainable charcoal?***

A. A big tree produces very little charcoal just two bags and very little money. So we need to cut lots of trees to get enough bags. I think 'sustainable charcoal' is wrongly packed – we cannot go on cutting forever – let us ban the burning of charcoal. When you talk of sustainable is a political statement – it is if you are saying we don't want to stop charcoal. Let us target the soil fertility and not go into a different direction. The main problem is population – let us manage the population make sure enough land is there.

11. ***Q. Do you think there could be a restoration programme for TA? Let us learn from Niger on their type of restoration – take 1-2 chiefs to meet their fellow chiefs – we did a similar thing with a safe motherhood programme with chiefs, now this programme is left in hands of TA. We have a tug of war with the foresters – with the community in the middle busy cutting down the forests. Let us work as partners not competitors as there seems to be some kind of competition – foresters get training – chiefs get no training.***

N.B. The structure of the Traditional Authorities in Malawi was described as follows

- Traditional Authority (TA) – e.g. 8-9000 people in the area and still responsible for different ethnicities in the area.
- Sub-TA – several GVA
- Group Village Headman (GVH) – several villages
- Village Headman (VH) - 2-4 clans
- Clan – 2-3 families with a clan leader
- Family with siblings

Bibliography:

http://www.masdap.mw/maps/213/view (map of TA boundaries)

http://zachimalawi.blogspot.co.ke/2010/12/rites-of-passage-among-ngoni-of-malawi.html#uds-search-results

(http://zachimalawi.blogspot.co.ke/)

Annex 10: Enabling framework: policies, laws, and regulations

Many policies, laws, and regulations in Malawi are pertinent for forest landscape restoration implementation. These policies and regulations on land, forests, and other natural resources have informed the Forest Landscape Restoration National Strategy and Action Plan (FLR-NSAP), and analysis of associated institutional and policy challenges will assist improved coordination across sectors and policy frameworks. Key policies, laws, and regulations are listed below to highlight areas for harmonization and cross-sectoral support to identify strategies for FLR implementation at scale.

The overall goal of Malawi's National Forest Policy (2016) is the conservation, establishment, protection and management of trees and forests to achieve sustainable development. The Policy has nine strategic objectives to promote cross-sectoral integration of activities to increase forest cover, sustainably manage existing forests, and reduce deforestation and degradation. The policy has strong linkages with other sectoral policies including MGDS II, the National Environmental Policy (2006), National Land Policy (2002), National Decentralization Policy (1998), Water Policy (2005), National Parks and Wildlife Policy (2000), Energy Policy (2003), and National Land Resources Management Policy and Strategy (2000). FLR outcomes are closely aligned with Forest Policy priority areas, in particular on community based forest management; indigenous forests, forest reserves, and ecosystem management; and biomass energy development. There is specific alignment in the following areas:

- Community Based Forest Management: to conserve and develop forest resources for the economic and environmental benefits;
    - Supporting communities to access carbon finance through engagement into REDD+, CDM and Biodiversity conservation, PES activities.

- Indigenous Forests, Forest Reserves and Ecosystem Management: to conserve biologically rich ecosystems, protection of water catchments, control of soil erosion, provision of forest products, eco-tourism development and aesthetic values;
    - Promoting an increased forest cover and reduction of carbon loss through appropriate incentives for sustainable management like Payment for ecosystems management in Public Private Partnerships (PPPs) in the development of primary and secondary forest industries.
    - Promoting and maintaining the resilience of ecosystem functions to climate change and biodiversity loss.
    - Promoting the development and management of a National Forest Monitoring System (NFMS) that supports Malawi REDD+ strategy.
- Biomass Energy Development: to promote the growing of trees in order to achieve sustainable self- sufficiency of firewood, charcoal and forest products and services.
    - Promoting indigenous woodland regeneration and the establishment of woodlots and homestead planting specifically for firewood.
    - Promoting the development and use of alternative sources of energy for cooking for rural and urban areas.

Malawi's **National Climate Change Management Policy (2016)** seeks to enhance community resilience to climate change through sustainable development. A number of focal areas within the Policy are relevant to FLR, including its focus on preventing degradation, reducing vulnerability to climate change impacts through improved social, economic and ecological resilience, and conserving and enhancing biodiversity (Government of Malawi, 2016). The policy also advocates for interventions from a mitigation perspective, including enhancing carbon sinks through re-afforestation and sustainable utilization of forest resources as well as capacity building and education, awareness programmes to enhance societies' capacity for building ecosystem resilience systems and community. The policy is consistent to the Article 2 of UNFCCC and adaptation potential of FLR interventions to "allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner" (UNFCCC, 2017).

Malawi's **National Climate Change Policy (2015)** formulates the set of principles, strategies and institutional frameworks for effective management of Climate Change. The issues include capacity building; education, training and public awareness; the Clean Development Mechanism; Reduction of Emissions from Deforestation and Forest Degradation (REDD+); adaptation and mitigation across multiple sectors (including Agriculture, Energy, Industrial processes, Waste management, Forestry, Water resources, and Wildlife) (Government of Malawi, 2015). The policy advocates for the integration of climate change strategies and proposed action plans into sectoral policies and programs. The following strategies are pertinent for FLR implementation:

- **Agriculture:** Promote adaptation in such a manner as to enhance incorporation of agro-forestry, land use planning and soil and water conservation in order to attain food security, livelihoods and natural resource resilience; Prevent land degradation and deforestation, and address the issues of bush fires); Increase of above ground carbon storage through promotion of agro forestry; Promote adaptation in such a manner as to enhance incorporation of agro-forestry, land use planning and soil and water conservation in order to attain food security, livelihoods and natural resource resilience.

- **Forestry:** Improve the livelihoods of local communities through the sustainable provision of forest goods and services and development of forest-based enterprises; Reduce dependence on fuel wood by promoting alternatives that would substantially shift the majority of Malawians up the energy ladder; Implementation of legislation aimed at decelerating deforestation and curbing bush fires; Promotion of vegetation and tree cover through relevant sectoral policies; Promotion of REDD+ as a strategy for mitigation, to ensure continuous forest cover for carbon storage, maintenance of biodiversity, protection of watersheds, and prevention of soil erosion (in support of REDD+ strategy and existing forestry legislations); Enforce policy/legislation and improve infrastructure for arresting deforestation and bushfires;
- **Biodiversity:** Conserve, rehabilitate and restore ecosystems as a means to provide resilience to climate change impacts; promote awareness on conservation strategies for managing biodiversity in anticipation of a changing climate.
- **Energy:** Encouraging afforestation activities and non-extractive livelihoods from forests, which will also improve catchments for hydropower generation; Promotion of energy saving technologies and practices to decrease pressure on the forest reserves for provision of firewood and improve health through reduced indoor air pollution;
- **Fisheries:** Promote protection of water resources and good catchment management to allow ecosystems services such as water retention improvement in soils and regulating flow in rivers as they affect fisheries sector; promote a harmonized and ecosystems approach in stream-bank restoration (Government of Malawi, 2016).

The **Environmental Policy (2004)** goal is the promotion of sustainable social and economic development through the sound management of the environment and natural resources (Government of Malawi, 2004). The following references in the policy are relevant to FLR:

- Section 2.2.3. Facilitate the restoration, maintenance and enhancement of the ecosystems and ecological processes essential for the functioning of the biosphere and prudent use of renewable resources (Government of Malawi, 2004).

The **Environmental Management Act (1996)** is managed by the Ministry of Natural Resources, Energy and Mining for the protection and management of the environment and the conservation and sustainable utilization of natural resources. The following references in the Act are particularly relevant to FLR implementation:

- Part II, section 3, (2)b: facilitating the restoration, maintenance and enhancement of the ecological systems and ecological processes essential for the function of the biosphere, and the preservation of biological diversity;
- Part IV, Section 33, (2) a: take such measures as are necessary for the restoration of any land degraded by reason of the activities of the person against whom the environmental protection order is made including the replacement of soil, the replanting of trees and other flora, and the restoration, as far as may be possible, of unique geological, physiographical, ecological or historical features of the land and of waste disposal sites (Environmental Management Act, 1996).

The **Malawi Climate Change Learning Strategy (2013)**, was developed by the Ministry of Environment and Climate Change Management. The purpose is to have knowledge-driven climate change resilient population by 2030, pursuing a low carbon emission development path. In this regards it aims to strengthen human resources and skills development for the advancement of green, low emission and climate resilient development. It is relevant to FLR as it focuses on mitigation and adaptation as well as resilience to climate change. It can be used as useful mechanism to disseminate knowledge on FLR.

National Climate Change Investment Plan (2013) focuses on the four key priority areas to promote climate change management in Malawi: adaptation; mitigation; climate change research, technology development and transfer; and capacity building (Ministry of Environment and Climate Change Management, 2013). Investment in adaptation is relevant to FLR specifically as it focuses on integrated watershed management, enhancing disaster risk management, enhancing resilient though agriculture production as well as investment in mitigation which focuses on the Enhance Reduction of Emissions from Deforestation and Forest Degradation (REDD+) (Ministry of Environment and Climate Change Management, 2013).

Malawi's National Adaptation Programme of Action (NAPA) (2006) draws analysis on the impacts of climate change in agriculture, water, fisheries, forestry, energy, wildlife and gender (Ministry of Mines, 2006). Loss of soil fertility, land degradation and forest fires are recognized as major threats to forestry sector as well as the rapid environmental degradation as a result of agricultural expansion, inadequate knowledge and skills in the productive use and management of land and natural resources (Ministry of Mines, 2006). The NAPA outlines several interventions that target women in the agricultural sector and in particularly vulnerable situations, to gain access to water and energy sources and to microfinance to diversify earning potential (Ministry of Mines, 2006).

Some of the key finding from the report on **Sector Policies Response to Climate Change in Malawi (2011)** can be considered to be adopted for the National FLR Strategy and Action Plan (Government of Malawi, 2011). The report indicates that there are many instruments, policies, laws and programs related to climate change but are sector specific. For example, there are clear differences being drawn between climate change adaptation and Disaster Risk Reduction but can benefit from combined policies. The report also states that some policies are broadly outlined and lack of coordination results in duplication of efforts. According to the report, without considering the cross-links the policies offer very limited scope for

addressing the complexity of climate change policy goals. One of the recommendations of the report is *an integrated policy that recognizes the multiple dimensions and cross-cutting nature of climate change should be formulated by harmonizing all policies and programs and bridging all the gaps and integrated policy should articulate new policy instruments combining all instruments which may work better in practice than reliance on a single instrument* (Government of Malawi, 2011).

Similarly, the **National Biodiversity Strategy and Action Plan II (2015)** recognizes the conflicting and overlapping policy frameworks and legislation, and recommends an integrated approach to forest, biodiversity, land and water management. NBSAP II recognizes key issues and constraints affecting the biodiversity, of which conservation of natural ecosystems and species, restoration of degraded ecosystems are highly important to FLR implementation. It also refers that the value of ecosystem services and biodiversity is poorly understood. Cross-sectoral integration can enhance the protection, conservation and restoration of biodiversity. NBSAP II lists the actions related to targets for biodiversity management by planning to *increase the areas of forests under protection, improving the quality of protected forest habitats through ecological restoration and enhancing nature management methods used in commercially utilized forests* (Government of Malawi, 2015). Specifically, under Strategic Goal D: Enhance the Benefits to all from Biodiversity and Ecosystem Services,

- *Target 15: By 2020,* ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15% of degraded ecosystems, thereby contributing to climate change mitigation and adaptation and to combating desertification.

National reports are prepared on measures taken to implement the Convention and the effectiveness of these measures. Malawi submitted its Fifth National Report to the CBD in 2014. However, the report does not include specific measures on gender inclusion or gender mainstreaming in biological diversity but can be strengthened within gender responsive FLR strategy on Biodiversity (Government of Malawi, 2015).

The **Land Act (1965)** classifies three type of lands (customary land held/used by community under customary law, private land held/owned by freehold title, lease, or under **Registered Land Act (1967)**, and public (government) land that include national parks, conservation, and historical areas) and recognizes three types of land tenure - freehold (private land), leasehold (private, public and customary), and customary tenure (customary land) (USAID Malawi). **Customary Land (Development) Act (1967**) forms the principles for conversion of customary land for agricultural development and deciding disputes over customary land (USAID Malawi). The **National Land Policy (2002**) revised the legal framework governing land rights and its goal *is to ensure tenure security and equitable access to land, to facilitate the attainment of social harmony and broad based social and economic development through optimum and ecologically balanced use of land and land based resources*. It also promotes community participation and public outreach to ensure environmentally sustainable land use practices. The National Land Policy (2002) has number of provisions that are relevant to FLR implementation, specifically,

- *Section F, 2* - The Government supports community participation in the management and the right to a share of the revenue derived from public land established on land managed by a Traditional Authority. This includes land reserved for national parks, forest reserves and protected areas.
- *Section 6.5.1. (d)* Rural land use plans will involve multi-disciplinary teams of experts in spatial planning, soil management, crop and animal husbandry, forestry and others and should provide a basis for guiding extension services including land management techniques.
- *Section 7.6.4 (b)* Land areas reserved for communal use, such as areas for forestation, communal grazing land, block or cooperative farming, and other areas set aside for village or communal projects will be respected. The community will be given the authority to protect these areas against encroachment.
- *Section 9.4. (b)* The government will introduce buffer zones in areas where agriculture conflicts with forestry or grazing land. Where possible, multiple land uses such and agro-forestry will be encouraged
- *Section 9.4.1. (d)* Environmentally friendly and sound human activities will be encouraged to preserve wildlife habitat, forest cover for the headwaters of rivers and water catchments areas.
- *Section 9.5.1 (a)* Local/village communities should be encouraged to manage forest products locally and be watchdogs to protect community forests and woodlands. (b) Community and village development organizations should be encouraged to practice agro-forestry. Cutting of trees on steep slopes, hilly areas and watershed areas should be prohibited unless it is done under strict control and guided by selective pruning for sustainable management.
- *Section 9.6.1* Steps will be taken to exploit alternative sources of energy to provide and diversify energy sources and minimize the depletion of forests and woodlands for urban and commercial use. Programs to involve Communities in safeguarding forest reserves, conservation areas and national parks and to share the revenue derived from them, will be encouraged and supported.
- *Section 9.7.1.* Forestation programs should encourage the use of trees that will improve soil fertility as well as the amount of fodder available for livestock (Government of Malawi, 2002).

The policy highlights the need to increase women's access to land and states, "more often than not, the rights of women, children and the disabled are denied on the basis of customs and traditions that are no longer relevant, or they are totally disregarded due to prejudice and lack of effective representation. This being so and in view of the effects of increasing land pressure due to population as well as the devastating effects of HIV/AIDS pandemic, a clear policy on gender access and the rights of children and the disabled should always be considered in policy planning and implementation strategies" (13).

Currently the **Land Bill (2015)** is being drafted and will include the new categories of land. In 2016, the recently passed Customary Land Act (2016) replaces the **Customary Land (Development) Act (1967)** and aims to address the challenges on tenure security and empowering locals, especially women to hold the land title (UN-REDD Programme, 2016). The development of regulations and guidelines under the act will be of particular relevance to FLR and agencies responsible for restoration should be actively involved in the formulation process. The **National Land Resources Management Policy and Strategy (2000**) promotes tree planting, natural regeneration and conservation of forests for the sustainable land-use and management (Government of Malawi, 2016).

The **National Agriculture Policy (2016)** is 5 year guide for developing agricultural policies and strategies focusing on sustainable agriculture production, irrigation, strengthening marketing systems, increasing engagement in profitable off-farm and non-agricultural livelihoods, and improving food security and nutrition (Government of Malawi, 2016). The NAP recognizes forestry and agricultural technologies including agroforestry as a vital economic activity in the agricultural sector and advocates for agricultural technology practices to improve soil fertility, reduce soil erosion, and enhance resilience to climate change. The policy also recognizes needs to strengthen cross-sectoral linkages sectors to ensure resilient socio-economic growth and development (Government of Malawi, 2016). For FLR implementation, the following strategies are particular interest for Department of Forestry:

- **Policy Statement 3.1.4:** Promote investments in climate-smart agriculture and sustainable land and water management, including integrated soil fertility management and conservation and utilisation of Malawi's rich agrobiodiversity (Government of Malawi, 2016).
  - Promote introduction of nitrogen-fixing plants, such as legumes, and agricultural technologies and systems in crop farming systems.
  - Designate protected land areas, forests, and water shores for conservation.
  - Designate in situ conservation sites for crop wild relatives in protected areas

The Policy ties to larger development goals encompassed by other strategies, including the MGDS II and the National Gender Policy. Youth and women's employment in agriculture is an important consideration, and the NAP seeks to promote access to, ownership and control of productive resources, including land, water, and farm inputs, for women and youth; promote agricultural education and technical training for women and youth; support agribusiness entrepreneurship among women and youth; facilitate access to finance for women and youth in agriculture; and promote participation of women and youth in agro-processing, value addition and agricultural exports (Ministry of Agriculture, 2012). In addition, the **Agriculture Sector Gender, HIV and AIDS Strategy 2012-2017** recognizes the important intersections of gender and HIV/AIDS in the agricultural sector toward goals of food security and inclusive growth (Ministry of Agriculture, 2012).

The **Malawi Growth and Development Strategy II (2011-2016)** is designed to reduce poverty through sustainable economic growth and development (Government of Malawi, 2011-2016). Natural Resource and Environmental Management is one of the nine key priority areas and aims to enhance sustainable management of forest resources and their contribution to the national economy (Government of Malawi, 2011-2016). Numerous strategies and activities outlined in MGDS II are relevant to FLR implementation, including strategies to reduce land degradation, promote soil and water conservation techniques, improve coordination of environment and natural resource programmes, strengthen education and public awareness programmes on environment and natural resources management, and improve forestry extension services, research, and information management among other areas. (See Annex 5 for a detailed overview of MGDS II activities relevant to FLR.) The Strategy recognizes many areas that should be considered cross-cutting issues in all sectors of the economy, including gender and climate change.

With the third Malawi Growth and Development Strategy (MGDS) III (2016-2020) under development, this assessment offers recommendations to facilitate integration of FLR interventions.

The MGDS is a guiding principle for achieving **Malawi's Food Security Policy (2006)** strategies. The policy goal is to improve food security and increase agricultural growth and diversity in ways that is environmentally friendly. The policy advocates conservation and sustainable utilization of natural resources and the environment to achieve sustainable development. The strategies that are particularly relevant to FLR are:

- Enforce the regulation that requires tobacco estates to allocate a proportion of their land for afforestation;
- Develop appropriate technology and extension methods aimed at improving and maintaining soil fertility;
- Encourage sustainable utilization of wetlands for agricultural use (Government of Malawi, 2006).

Additionally, **Malawi's Food Security Action Plan (2008)** assists to link Food Security Policy with National Nutritional Policy and compliments Agriculture Development Programme. Some of the activities proposed for implementation that are relevant to FLR are:

- Activity 4.4.3 (ii) Preservation and conservation of the catchment area of the irrigation systems for instance through afforestation and construction of soil conservation structures.
- Activity 4.5.3.1 Facilitate the formation of community conservation committees to rehabilitate degraded areas at community level; build the capacity of farmers to carryout conservation activities including: physical soil conservation, agro-forestry farming technologies, vetiver grass planting, protection of stream-banks, steep slopes, watershed areas, swaps, and dambos.
- Activity 4.5.3.2 Promote disperse systematic tree planting (planting trees with crops at a wide spacing to improve soil fertility (*Faidherbia albida* (Msangu), *Acacia polycarnia* (Mthethe) and *A. galpinii* (nkunkhu)); promote regeneration of natural trees; promote agro-forestry farming technologies.
- Activity 4.5.3.3 Soil and water conservation means the protection, maintenance, rehabilitation, restoration, and enhancement of soil resources and includes the management and sustainable use of soil resources.
- Activity 4.6.3.2 Develop productive local forestry activities e.g. fuel wood, timber, and fruit tree production.

The **National Water Policy (2005)** guides the sustainable management and utilization of water resources in order to provide sufficient quantity and quality water for the country and for the enhancement of the country's natural ecosystems (Government of Malawi, 2005). The policy recognizes that water resources can be highly impacted due to deforestation and environmental degradation. The policy is linked to National Forestry Policy as it promotes forestry sector participation in water resources, catchment protection, conservation and management (Government of Malawi, 2016). The **National Water Resources Act (2013)** provides a mechanism for coordination, allocation and delegation of responsibilities among stakeholders for the protection and management of water resources.

Vision 2020 states that Malawi by 2020 *will be secure, democratically mature, environmentally sustainable, self-reliant… technologically driven middle-income economy. Although environmental sustainability are linked to overall achievement of Malawi's Vision 2020, the goals set forward for the Natural Resource And Environmental Management Act are vital for promoting and advocating FLR implementation –such as ensuring well conserved and managed land; zero percent deforestation; availability of adequate and clean water resources; restored and well conserved biodiversity and ecosystems; low population growth; preventing air and noise pollution from becoming serious problems; contributing to global efforts to managing climate change and other global environmental issues; incorporating environmental considerations at all stages, and enhancing the participation of the public in the planning and implementation of natural resource and environmental programmes* (Government of Malawi, Vision 2020).

Malawi **Food Insecurity Response Action Plan (2016-2017)** is developed by the government of Malawi to respond the food assistance needs and food insecurity thought the humanitarian clusters categorized as food security, nutrition, agriculture, health, education, water and sanitation clusters as a key intervention strategies. The resilience building activities are recognized in Food Insecurity Response Action Plan (FIRP), which can be strengthen by FLR implementation if it is further integrated in the plan. For example, planting of trees, creation backyard gardens, construction of fuel efficient stoves are listed as resilience activities and has been one of the food security cluster's response plan (Government of Malawi, 2016-2017). Education cluster under the plan also is engaging youth in planting fruit trees around schools and communities. Agriculture cluster prioritizes flood mitigation strategies in areas expose to cyclic hydrologic shocks and good soil and water management practices.

National Strategy for Sustainable Development (2004) focuses on the key priority areas for environmental management, social and economic development to assist sustainable economic growth and poverty alleviation (Government of Malawi, 2004). Overall goal of the strategy is to conserve and enhance biological diversity, prevent degradation and manage environment sustainably. Some of the action plans relevant to FLR are:

- Agriculture: scaling up of proven technologies to arrest land degradation and improved soil fertility, water management and use practices;
- Supporting implementation for National Forestry Programme;
- Biodiversity: to reverse the loss of biodiversity and restore biodiversity in degraded areas; carry out afforestation using indigenous trees; establish woodlots, botanic gardens, plant museums, conservation sanctuaries, etc. (Government of Malawi, 2004).

Malawi **National Disaster Risk Management Policy (DRM) (2015)** priority area 4 promotion and adoption of resilience-enhancing interventions falls into FLR objectives (Government of Malawi, 2015). The policy recognizes the linkages with other policies and strategies such as National Forestry Policy, Environmental Policy, Food Security Policy and National Forestry Act and calls for mainstreaming DRM policies cross sectors.

The **Comprehensive African Agricultural Development Programme** (CAADP) is agriculture-led development framework of Africa that aligns development objectives cross sectors under the New Partnership for Africa's Development (NEPAD) (NEPAD, 2017). CAADP's thematic priorities fall into FLR objectives under sustainable land management and reliable water control systems, including soil fertility management and sustainable use of agriculture water.

The **Energy Regulation Act (2004)** does not specifically mention forestry but the effects of deforestation and degradation on lake and river for power generation as well as dependence on biomass energy are the areas where the policy integration and institutional support for FLR implementation can be enhanced.

The **Mines and Minerals Act (1981)** and **Mines and Minerals Policy (2013)** requires the mining entities to protect the natural resources on the land and that the minerals are explored sustainably. The Act is planned to be replaced by the **Draft Mines and Minerals Act (2015)** (UN-REDD Programme, 2016).

Malawi submitted an **Intended Nationally Determined Contribution (INDC)** for the 2015 Agreement at the 21st UNFCCC Conference of Parties (COP) in response to decisions adopted at the 19th and 20th sessions of the COP (Republic of Malawi, 2015). Malawi is committed to pursuing policies and measures that slow and eventually reverse GHG emissions from deforestation and forest degradation, and increase removals through afforestation. Malawi's INDC refers to *promoting agroforestry systems in targeted locations as source of biomass and soil carbon sequestration, and the planting of nitrogen-fixing plants to reduce fertilizer usage; as well as potentially reduced and zero tillage*; as such a large number of related targets and action plans are relevant for FLR (Republic of Malawi, 2015). Malawi's INDC includes gender as a major cross-cutting issue to be mainstreamed in all sectors to enhance gender inclusiveness, specifically in the adaptation measures outlined in the INDC. (See Annex 6 for a more detailed overview of INDC targets and actions relevant to FLR.)

The **National Action Programme (NAP)** is the main implementing instrument of the United Nations Convention to Combat Desertification (UNCCD). Malawi ratified the Convention in 1996 and submitted a NAP in 2001 (Republic of Malawi, 2001). The NAP highlights the need for adaptation efforts that are cost-effective and can generate returns over the medium and long-term. Restoration interventions including agroforestry and farmer-managed natural regeneration are low-cost and have been shown to deliver significant benefits for climate resilience. Recognizing women's contribution to food security and important role in the agricultural sector and acknowledging the challenges women face in accessing agricultural loans and land titles, Malawi's NAP also calls for approaches to ensure women's participation in training and capacity building programmes focused on food security (Republic of Malawi, 2001). This will reinforce efforts to engage women as central actors in, and beneficiaries of, restoration interventions and particularly those related to agricultural technologies.

The Malawi **Gender Policy (2012-2017)** was written to promote gender equality and women's empowerment by reducing gender inequalities and facilitating sustainable social and economic development (Republic of Malawi, 2001). The policy includes the following themes: gender, literacy, education and training, agriculture, food security and nutrition and natural resources and environmental management (Republic of Malawi, 2011). The Policy provides strategies for each theme and its objectives seek to address the interests of gender groups in macro and sectoral policies and programmes; promote equal opportunities in employment for women and men; foster peace, harmony and respect for human dignity; ensure equal access to education and training for women and men; and coordinate the implementation of the policy (Republic of Malawi, 2011).. Although not formally adopted yet, this draft policy provides important information for the public sector by outlining key areas of concern.

The Gender Equality Bill (2012) of Malawi recognizes that gender considerations are a vital piece of the overall national development agenda (Republic of Malawi, 2012). The Bill contains key issues to furthering gender equality on the national level—in conjunction with international agreements like CEDAW, SADC, the AU Women's Protocol and the BDPFA—including prohibiting discrimination based on sex, harmful cultural practices and sexual harassment; enhancing women's participation in public life and decision-making positions; furthering equal access to education and trainings; and enabling access to sexual and reproductive health services and education (Republic of Malawi, 2012). This Bill is an important mechanism for realizing the gender equality in FLR strategy and action plan, as it provides a legal mechanism and outlines areas where discrimination of people based on gender is prohibited (Republic of Malawi, 2012).

Lastly, the Ecosystem Based Adaptation for Food Security Assembly (EBAFOSA) national framework and action plan presents a useful framework to improve coordination of efforts to implement restoration. EBAFOSA is the first pan-African policy framework and brings together stakeholders in government, the private sector, academia, NGOs, and CSOs to scale up ecosystem-based adaptation driven agriculture. The Government of Malawi has launched its participation and could leverage this platform to assist policy coordination and scaling efforts.

Annex 11: Community-level financing for restoration in Malawi

Results of information from District Development Planning Officers.
Robert Wild, Technical Coordinator, People and Landscape Programme IUCN ESARO.
17 September, 2016

Summary: District Development Planning Officers (DDP)[12] or their representatives from 17[13] out of 28 districts answered a brief questionnaire on community-level financing for restoration. The results showed that communities can save and borrow, but that especially borrowing options are limited, and mostly come from Village Savings and Loans Associations (VSLA)[14]. While these are critical financial institutions at community, the loan sizes are typically small. Wage labour or piecework, commonly known as '*ganyu*' in Malawi, along with natural resources exploitation (predominantly unsustainable charcoal-making and fishing) are key ways to access cash for emergencies. Community savings groups (e.g. VSLA), borrowing from relatives and friends as well as money lenders are also used. In terms of access to financial services, solidarity groups (e.g. VSLA), traditional rotating savings groups (e.g. Chilemba or Chiperegani), and money lenders are the commonest financial institutions at the community level and there is no access to formal banks and very little to cooperatives. *Ganyu* is a particularly important source of cash at the village level, a fact backed up by other studies (Whiteside, 2000).

According to the District Development Planning officers there is generally an absence of financial institutions that directly support restoration at the village and district level. Respondents made recommendations as to how financial institutions could be supported to promote restoration and these included:

- The strengthening and linking of existing institutions (especially Village Natural Resources and Catchment Management Committees) for financial mediation for restoration;
- Introduce new financial mechanisms including a revolving fund at the village level;
- Provide incentives for restoration through the empowered of local financial institutions but to avoid dependence and build sustainability into restoration process;
- Carry out advocacy, awareness and publicity campaigns not only at the village level but also within the financial institutions;
- Support financial institutions with capacity building, knowledge, skills and the provision of start-up capital.

Preliminary recommendations based on results, field visits and workshop discussions:

- **Build restoration-focused financial infrastructure at district and community level:** Currently there is no effective financial mechanisms at the village or the district level for restoration.
- **Focus the government public works programme (cash-for-work) scheme at restoration activities especially watershed management:** A very significant proportion of households depend on *ganyu* for household income. This comes from employment by other households in the community (mainly assistance with agricultural production), but also cash for work programmes. These programmes (especially the World Bank funded MASAF[15] and its Public Works Programme), provide significant inputs into village level action that could be more strongly directed towards restoration actions at the village level.
- Build on the Village and Savings Associations to incentivize restoration. The Village Savings and Loans Associations (VSLA) are the most widespread and most effective of community-level financial interventions. These most commonly deliver a double bottom line delivering financial and social benefits to members. To align these with the Sustainable Development Goals (especially Goal 15) would entail adding environmental sustainability objectives. Methods to do this have been identified (Wild et al., 2008). A recent model has been developed and evaluated in Uganda to do this. It is called the Community Environmental Conservation Fund (CECF) and it incentivizes and strengthens community level ecosystem management (IUCN, 2013; Kakuru and 2016). The model has been built

12 Several DDP mentioned that they were new to their districts (less than 1 year) and their depth of knowledge was limited. This needs to be taken into account in interpreting the results. A process of repatriating this information and verifying would be appropriate.

13 Mulange, Balaka, Chipita, Mchinji, Kasungu, Mwonza, Ntchisi, Neno, Zomba, Nsanje, Drowa, Karonga, Likema, Nkhotakota, Chiradzulu, Thyoio

14 Village Savings and Loans Associations (VSLA) are a CARE International community-finance model that was developed in Niger and that over the last 20 years has revolutionized rural access to finance in Africa. It is now expanded to 150,000 groups in 26 African countries, serving nearly 3.8 million members. It has developed financial literacy and savings capacity in many communities and about seventy five percent of VSLA beneficiaries are women. http://www.care.org/work/economic-development/microfinance

15 The Public Works Programme (PWP) component of the Malawi Social Action Fund - MASAF is a safety net scheme targeting poor households and communities supporting a programme of labour intensive construction activities to build infrastructure. The works will generate significant employment at the minimum wage to provide safe targeting for those who have no alternative income earning opportunities.

upon VSLA principles, is showing significant promise and could be piloted in Malawi. It is a performance-based revolving fund that represents a 'co-investment' (CES) in ecosystem services, rather than a payment for ecosystem services (PES) scheme. Unlike the VSLA groups that typically are associations of 20-30 households, the CECF operates at the community level and is open to anyone. It incentivizes a community ecosystem governance to achieve restoration, resilience and sustainable management, it also allows for the promotion of income generating activities at the household level, as well as providing an additional safety net. Thus is links and harmonizes collective environmental and social benefits, household benefit and enterprise. Once established it should remain a long-term asset to a community and can be seen as restoration infrastructure.

Detailed responses

1a. Are most households in the district able to save money?

No 24%
Yes 71%

1b. If yes how?

Mostly through VSLA.

2a. Are most households in the district able to borrow money?

No 18%
Yes 76%

2b. If yes how?

Most mention was made of VSLA but other mechanisms listed were also mentioned.

3. In case of household emergencies, food purchase, health issues or paying school fees how to most household find cash resources?

a. Borrow from friend or relative 53%
b. Exploit natural resources (e.g. make charcoal, fishing) 76%
c. Wage labour /piece work (ganyu) 76%
d. Money lender 24%
e. Community or group savings 65%
f. Other 6%

4. Which is the most commonly used?

a. Borrow from friend or relative 0%
b. Exploit natural resources (e.g. make charcoal, fishing) 47%
c. Wage labour /piece work (ganyu) 53%
d. Money lender 0%
e. Community or group savings 18%
f. Other 0%

5. What proportion of households in the district depend on paid wage labour (ganyu) for a sizable portion of their income?

a. Less than 20% 18%
b. 20-50% 29%
c. More than 50% 41%

6. What are the main financial institutions as the village level?

a. Formal banks 0%
b. Cooperatives 6%
c. Solidarity groups (e.g. CARE International village savings and loans associations (VSLA) 71%
d. Traditional rotating savings groups (e.g. Chilemba or Chiperegani) 53%
e. Money lenders 35%
f. Others? 0%

7. Are there any financial institutions at the village level focused on soil, land or forest restoration?

No 65%
Yes 18%
VSLA, COMSIP and a beekeepers association mentioned

8. Are there any financial institutions at the district level focused on soil, land or forest restoration?

No 71%
Yes 18%

Lending institutions, forest sector, VSLA and COMSIP (Community Savings and Investment Programme – a cooperative) were mentioned.

9. What are your recommendations for supporting local financial institutions to provide incentives village level restoration?

Strengthen existing institutions for financial mediation:

- They should provide loans to VNRCs for forest-based enterprises;
- Strengthen VNRC to focus on financial matters at village level by focusing on restoration
- To include them in the catchment management committees in the district;
- To bring financial institutions together so work as a thematic group;

Introduce new financial mechanisms:

- Introduction of a revolving fund at the village level;
- Provide soft loans;
- Established agri-based banks;

Incentives:

- It can be a good idea to empower local financial institutions to provide incentives;
- The incentives will help the villages to sustain restoration processes;
- Incentives for local people should be in kind and not cash as cash incentive have proved to encourage laziness and dependence syndrome;

Advocacy, awareness and publicity:

- Need to raise the awareness of existing financial institutions to consider village level restoration;
- Provide advocacy campaigns;

Capacity building:

- Financial institutions need to be supported in many ways, especially capacity building as this will be sustainable;
- Capacity building, knowledge and skills, start-up capital;

Improved natural resources management:

- They can promote natural regeneration of forests, they can provide alternative forms of energy to the poor;
- Form village level forests under the leadership of the Chief;

References:

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Annex 12: Methodology for the economic and financial analysis

Beginning in June 2016, the USAID funded Protecting Ecosystems and Restoring Forests in Malawi project (PERFORM), led by the Malawi Department of Forestry, working in partnership with the International Union for the Conservation of Nature (IUCN) and the World Resources Institute (WRI), led a stakeholder-centered process to assess the opportunities to scale up forest landscape restoration in Malawi). Through the partnership, stakeholders from communities, NGOs, and government came together at 12 regional workshops held between April and November of 2016 to discuss what they hoped to achieve through the restoration process. Approximately 30 – 50 officials from the economic planning department, land resource, environmental affairs, crops directorate, department of forestry, and NGOs participated in each workshop.

During the workshops stakeholders worked together to create a short list of the most relevant and feasible restoration activities for agriculture land and forestland. Stakeholders described restoration activities in general terms since each broad activity could potentially describe dozens of more specific activities. For example, specific activities would be defined by the type of tree species that would be used, what their planting density would be and which crops would be used in agroforestry. While it would be very difficult and outside of the scope of a national level assessment to consider the management trade-offs of each specific restoration activity that may be adopted in Malawi, it is still useful to analyze the opportunities of the general activities.

In order to do this, the assessment team used The parameters for the cost benefit analysis were created through a Delphi process with stakeholders to create activity budgets that described the management practices and inputs that would be needed to implement each restoration activity from the perspective of smallholders. The Delphi process is useful in situations where resource managers have to make difficult decisions that affect large areas of land and when decisions have to be made in a short amount of time and with data that are missing or unsuitable for empirical modeling (MacMillan and Marshall 2005).

Restoration Activity	Change in Crop Yields ($t\ ha^{-1}\ yr^{-1}$)	Change in Timber Yields ($ha^{-1}\ yr^{-1}$)	Change in Carbon ($t\ ha^{-1}$)	Change in Erosion ($t\ ha^{-1}\ yr^{-1}$)
Conservation Agriculture	1	N/A	0	0.37
Intensive Agroforestry	1	20 head loads	69	0.54
Farmer Managed Natural Regeneration	1	10 head loads	15	0.37
Community Plantations and Private Woodlots	N/A	1500 poles; 100 head loads	15	0.39
Natural Forest Management	N/A	1000 trees; 100,000 MWk NTFPS	69	0.27

The Delphi process attempts to overcome the lack of data in a timely manner by achieving a consensus between experts over the 'true' values of restoration activity parameters and assumptions in an iterative process. In the first iteration, experts filled out activity budgets for each degraded land use and restoration activity. The information that experts contributed contained details about the material inputs, labor requirements, timber and crop yields, and market prices of outputs for each degraded land use and activity. Once the initial budgets were complete, the experts reconvened at a validation workshop to revise the budgets by challenging the assumptions and information.

The result of the process were activity budgets that reflected the best currently available knowledge on the costs and benefits of the proposed restoration activities. Experts included employees from government ministries, including the Malawi Department of Forestry, the Ministry of Agriculture and Food Security and others helped to characterize the current land use management practices to establish baselines against which to assess the opportunities to scale up targeted restoration practices.

Annex 13: Economic and financial analysis

Source: Malawi NFLRA Task Force

Data on the expected benefits of each degraded land use and restoration activity were taken from a number of sources. Maize is the predominant staple food crop in Malawi and occupies 80% of the land area under cultivation so degraded conventional agriculture was defined as a conventional maize agricultural system that has been continuously cultivated for a period of several years (Ngwira, Aune, and Mkwinda 2011; MMNREE 2010). During the workshops, stakeholders reported the average annual maize yield of such a system would be approximately 1.5 tons per hectare. Previous work has reported that conservation agriculture, intensive agroforestry, and farmer managed natural regeneration can boost maize yields by between 50-250% (Omanya G, Pasternak, D. 2005; Akinnifesim, Makumba, and Kwesiga 2006; Beedy et al. 2012). The estimates in this report assumed maize yields under the three agricultural restoration activities would increase by a modest 60% in order to be as conservative as possible. Maize prices were also reported by stakeholders and the group consensus was that an average price of 225 MWK per kg of maize was an appropriate average. Timber yields and timber prices were also reported by stakeholders during the workshops. Depending on the activity, stakeholders reported timber yields and prices in terms of trees, poles, or head-loads. Detailed information about the timber yields and prices are shown in the activity budgets located in the Appendix.

Carbon sequestration and sediment retention were estimated with the InVEST model (Natural Capital Project 2016). The InVEST Carbon Storage and Sequestration model estimates the current amount of carbon stored on the country's landscape using a land use/land cover (LULC) map. The model accounts for the amount of carbon stored in four carbon pools (aboveground living biomass, belowground living biomass, soil, and dead organic matter) based the LULC maps. There were 44 unique land use/land covers represented in Malawi's LULC map.

Carbon sequestration values were estimated by modeling the amount of carbon currently stored by different land uses in Malawi. Carbon sequestration was valued assuming a price of 5040 MWK ($7 USD) per ton of CO2 equivalent, which is 3.67 times larger than a ton of carbon. The carbon stored by both degraded and restored land uses were estimated by finding land uses in the LULC map that corresponded with the degraded and restored land uses (See Appendix). The carbon stored on degraded conventional agricultural land and land under conservation agriculture was assumed to be equal to the carbon stored by rainfed herbaceous crops on plots less than 2 hectares in LULC map. The carbon stored by land under agroforestry was set equal to the carbon stored by rainfed herbaceous crops grown on less than 2 hectares under broadleaved deciduous trees with at least 60% of the canopy closed. The carbon stored by land under FMNR was set equal to the carbon stored by rainfed herbaceous crops grown on less than 2 hectares under woodlands with an herbaceous layer. The carbon stored by degraded forestland was set equal to the carbon stored by broadleaved deciduous trees with rainfed herbaceous crops on plots less than 2 hectares. The carbon storage of pine plantations was set equal to forest plantation land uses, while the carbon storage value of natural forest management was set equal to the carbon storage value of broadleaved deciduous trees with 70% of the canopy closed.

The objective of the InVEST sediment delivery model is to map overland sediment generation and delivery to a stream. In the context of a national restoration program, such information can be used to identify priority restoration areas in a specific catchment. The InVEST Sediment Retention model estimates the capacity of a land parcel to retain sediment by using information on geomorphology, climate, vegetative coverage and management practices. A land parcel's estimated soil loss and sediment transport informs the service step of the InVEST Sediment Retention model, which produces outputs in terms of avoided sedimentation. Like the carbon sequestration values, the sediment retention values for both degraded and restored land uses were estimated by first, modeling the amount of sediment currently exported by different land uses in Malawi and then finding land uses in the LULC map that corresponded with the degraded and restored land uses. The sediment retention estimates followed the same land uses from the LULC map as the carbon storage estimates.

The benefits of avoided sedimentation was valued using an avoided cost approach. According to the Ministry of Finance and Development Planning, offsite sedimentation costs hydropower producers in the Middle Shire catchment approximately 1.4 billion MWK, annually (Malawi Ministry of Finance and Development Planning 2011). Remote sensing indicated that sediment primarily came from 689,300 hectares of farmland in the immediate area and suggested each hectare produced approximately 20 tons of erosion each year. In total, the farmland exported approximately 13.8 million tons of erosion into the watershed each year. Dividing the total damages by the total amount of erosion shows that each ton of erosion creates approximately 520 MWK in damages. Therefore, each ton of sediment that is retained saves water users 520 MWK.

Costs

Restoration requires raw materials, such as tree seedlings, fencing, and fertilizer, although activities like FMNR require far fewer inputs. Additionally, restoration requires labor to prepare the sites, raise and transport tree seedlings, and take care of other activities including forest extension and support services. The total cost of these inputs depends on how degraded a site is and how difficult it will be to restore. Additionally, costs vary according to geography, the objectives and contexts of specific restoration activities, and the types of restoration methods that are used (Suhkdev 2008).

Smallholders incur costs both directly through the physical process of restoring degraded land and also indirectly through foregone production and participating in negotiating and planning processes. These direct and indirect costs can be placed into one of three categories:

1. Implementation costs: Implementation costs represent investments in land, labor, and materials and include any expense directly related to the establishment and operation of a restoration project.
2. Transaction costs: Transaction costs represent the cost for landowners and implementing agencies to identify viable land to restore and negotiate over terms that ensure restoration meets both local and national priorities. Additionally, they may include the cost required for smallholders to receive information and training on a new restoration activity.
3. Opportunities costs: Opportunities costs represent the tangible goods and services that were foregone to make restoration possible. Often, opportunities costs are represented by the Net Present Value (NPV) of degraded land uses. In cases where land is extremely degraded, the opportunities cost of restoration may be zero because the degraded land no longer has a productive value. Assuming that opportunities costs are positive provides a conservative basis for estimating the potential benefits of restoration.

The analysis considered both the implementation and opportunities costs of each restoration transition. Implementation costs were estimated with activity budgets that are discussed below. Opportunities costs were estimated by using the activity budgets to estimate the value of degraded land uses that would be replaced by the restoration activities. As discussed in the 'Smallholder' section of this report, transaction costs, such as those required for smallholders to receive information and training on a new restoration activity, can act as barriers to the adoption of restoration activities. However, without specific details on how smallholders will access this knowledge and training and who will provide it, it is not possible to estimate the size of the transaction costs.

First Year Financial Costs & Financial Gap

The financial costs in the activity budgets are analyzed to estimate the first-year financial cost for each activity in the first year. The first-year financial costs can be thought of as the minimum capital investment that is necessary to successfully manage the restoration activity. It represents investments in equipment such as saws, shovels, seedlings, and other necessary implements. In many cases smallholders may already have the tools and inputs that are required. For example, according to the Malawi Agricultural and Livestock Census of 2006/7, 99% of households own a hoe, 55% own a sprayer, 54% own a panga knife and only 3% own a sprayer. As a result, the financial cost estimates reported here reflect upper bounds. It is also an important metric for understanding how much additional financial capital smallholders may need access to in order to adopt the restoration activities. If a woman or a man smallholder cannot make the proper investments in inputs and equipment it will be difficult or impossible for them to capture the potential benefits of restoration activities and other, low-input, restoration activities may be more appropriate.

This is also an important metric because Malawian households may not have the financial capital to make the necessary investments out of their own pockets and more importantly, they may also be unable to borrow the money because they lack access to credit markets (MNSO 2010). As of 2010, less than 15 percent of all households in Malawi had some interaction with the credit market and only 1.2 percent of households successfully obtained an agricultural loan. Additionally, gender information from Malawi shows that female-headed households face more constraints to accessing credit than male headed households. Large financial gaps will suggest that additional sources of funding will need to be secured and distributed to smallholders as part of a larger scaling-up effort.

NPV Decision Metric

Smallholders are concerned with the timing of the benefits and costs of different land use activities. Some restoration activities require smallholders to invest financial and human resources up front and wait fairly long periods – some times as long as 20 years – to reap significant benefits as is the case for plantation forestry In order to account for the timing of the benefits and costs of different activities, the benefits and costs of each activity are discounted. Discounting effectively defines benefits and costs in the future as less valuable than benefits and costs that occur today. The discount rate acts as the weight which describes how much the value of future benefits and costs are discounted compared to the present.

Once the benefits and costs of an activity have been discounted, they can be treated equally regardless of when they are received in time. That is, a discounted stream of future costs and benefits can be described as present values because they represent the amount of money that someone would be willing to pay in the present to obtain a benefit (avoid a cost) in the future.

Cost benefit analysis helps inform these decisions by producing information that describes how efficient different restoration transitions are in terms of their resource use. Decision makers can determine if an activity is capable of producing benefits in excess of its costs by discounting and summing the flow of present and future benefits and costs and then subtracting the sum of discounted costs from the sum of discounted benefits. In other words, is the sum of the discounted flow of benefits greater than the sum of the discounted flow of costs? The NPV concept formalizes this logic and allows discounted flows of benefits and costs to be compared on equal terms across alternative projects.

The NPV of each restoration transition calculates the additional benefits and costs that would be created by restoring degraded land. The NPV of each restoration transition is calculated by using activity budgets to calculate the NPV of each degraded land use and restoration activity separately. Next, the NPV of the degraded land use is subtracted from the NPV of each restoration activity. For example, to calculate the NPV of the transition from degraded conventional agriculture to intensive agroforestry, the NPVs of degraded conventional agriculture and agroforestry would be calculated first. Then, the NPV of degraded conventional agriculture would be subtracted from the NPV of intensive agroforestry. If the NPV of the restoration transition is greater than zero it suggests that restoring the degraded landscape is a worthwhile endeavor.

Assuming all of the benefits and costs have been accounted for, a NPV less than zero would suggest that restoring the degraded land use will generate fewer benefits than costs. When benefits, such as key ecosystem services like water quality improvements, are omitted from the NPV calculation, the NPV may understate the true benefit of the restoration transition. The NPV of each restoration transition is calculated following:

〖NPV〗_RT=〖NPV〗_R-〖NPV〗_D [1]

Where 〖NPV〗_RT is the net present value of the restoration transition, 〖NPV〗_R is the net present value of the restoration activity, and 〖NPV〗_D is the net present value of the degraded land use.

The net present value of each restoration activity and degraded land use is calculated following:

〖NPV〗_i= ∑_(t=0)^T▒δ^t (B_(i,t)-C_(i,t)) [2]

Where B_(i,t) is the annual benefit received from the degraded land use or restoration activity i. C_(i,t) is the annual cost associated with degraded land use or restoration activity i, and is the discount factor. The NPV for all activities is calculated over a twenty-year time horizon with a 10% discount rate. Sensitivity analysis is carried out with discount rates of 5 to 25%.

The decision rule for the NPV concept is straightforward. If the net present value of the restoration transition (〖NPV〗_RT) is positive it suggests that it makes economic sense to restore the land. However, the analysis does not account for everything, and other factors also need to be considered. In the case where multiple restoration transitions are being evaluated for the same unit of land the transition with the largest NPV should be selected. If the NPV is negative and a full accounting of the benefits has been done it suggests the benefits of the transition are less than the costs and the land should not be restored because the resources that are required could be invested elsewhere with a larger impact.

Activity Budgets for Degraded Land Uses and Restoration Activities

Data for the activity budgets were taken from a number of sources. During the regional workshops stakeholders reported the material inputs, equipment, labor, and outputs that would be part of general degraded land uses and restoration activities through a Delphi process discussed above. This information was summarized in an activity budget, which displayed all of the information about each activity in one place. This information was then used to quantify the costs and financial benefits of each activity so that the costs of continuing with business-as-usual and the benefits of restoring degraded land could be quantified. The data presented in the activity budgets are based on stakeholder's consensus over values and can therefore be considered as approximate averages. Stakeholders validated the final versions of the activity budgets during a fifth workshop held in Lilongwe in November, 2016. The budgets for conservation degraded conventional agriculture with maize is presented in Table XX, but the remaining budgets , agroforestry, farmer managed natural regeneration, degraded woodland with light agriculture, natural forest management, community woodlots and plantations are presented below.

Table A2. Restoration activity

Activity budget for conservation of degraded conventional agriculture with maize

Item	Unit	Unit Price MK	Quantity per hectare	Total MK	Time Interval
Material Inputs					
Seeds	Kg	400	25	10,000	Annually
Organic Fertiliser	Kg	12,500	2	25,000	Annually
Urea	Bag	23,000	4	92,000	Annually
Pesticides	Kg	12,700	1	12,700	Annually
Equipment					
Hoe / shovel	unit	1,400	1	1,400	Every 3rd year
Labour					
Mulching	day	700	10	7,000	Anually
Planting	day	700	10	7,000	Anually
Spraying (Round-up)	day	400	7	4900	Anually
Land preparation /ploughing	day	700	21	14,700	Annually
Fertilizer application	day	700	10	7,000	Annually
Hand weeding	day	700	10	7,000	Annually
Top dressing	day	700	3	2,100	Annually
Harvesting	day	1,200	5	6,000	Annually
Transport Costs					
Oxcart	trip	4,000	3	12,000	Annually
Revenue					
Crop	**Unit**	**Price per Kg**	**Kg**	**Total MK**	**Timing**
Maize		225	4,500	1,012,500	Annually

Source: Malawi NFLRA Task Force

Item	Unit	Unit Price (MWK)	Quantity per hectare	Total MK	Frequency
Material Inputs					
Seeds	Kg	400	25	10,000	Annually
Urea	Bag	23,000	4	92,000	Annually
Equipment					
Hoe / shovel	unit	1,400	1	1,400	Every 3rd year
Labour					
Land preparation	day	700	21	14,700	Annually
Planting	day	700	10	7,000	Anually
Fertilizer application	day	700	10	7,000	Annually
Weeding	day	700	15	10,500	Annually
Spraying	day	700	2	1,400	Annually
Irrigating	day			0	Annually
Harvesting	day	1,200	5	6,000	Annually
Transport Costs					
Oxcart	trip	4,000	3	12,000	Annually
Revenue					
Crop	**Unit**	**Unit Price**	**Kg**	**Total MK**	**Timing**
Maize	Kg	225	1,500	337,500	Annually

Table A2 shows the cost and revenue structure for conservation of degraded conventional agriculture with maize in Malawi. Agriculture in Malawi is a low-input activity that uses no mechanization and relies on very few inputs. The financial costs of agricultural systems are very low because only basic materials like a hoe and shovel are required. Labor and farm inputs, like Urea, are the most costly farming inputs. Conservation of degraded conventional agriculture uses approximately 400 kg of seed, 4 bags of inorganic fertilizer and requires approximately 7663 days of labor. The system produces maize yields of 2.251.5 tons or equivalently 41,500 kg, on average, and this generates an average annual revenue of 1,012337,500 MWK per year.

Limitations

This study has several important limitations that need to be discussed before the results are presented. To begin with, the study relies on data from a Delphi process instead of using empirical cost and benefit estimates from the field. While this may not cause any loss of accuracy in theory, it does increase the potential for bias in the estimates. Additionally, the estimates contained in this report do not include a full accounting of restoration's benefits. Many of the benefits that restoration creates are public ecosystem system services like water infiltration, flood control, enhanced stream flow, improved water quality, habitat for wildlife, climate regulation, disaster risk-reduction, and many others. These benefits were not assessed because they can be difficult to quantify in settings were extensive data is not available, as was the case in Malawi. As a result, the benefits of each restoration transition are likely under-estimated and should be seen as lower-bound estimates. A more complete accounting of restoration benefits would increase the net present values of each restoration transition.

Additionally, the results reflect estimates of average impacts, but in reality, the net benefits of each restoration activity are distributed around the average. This means that some smallholders will achieve benefits in excess of the averages reported here and others will achieve benefits below the averages. This uncertainty introduces an element of risk into smallholder decision-making that may act as a deterrent to adoption (Verdone and Seidl 2016). This risk has been mitigated to some extent by conducting sensitivity analysis to changes in crop yield assumptions and changes in the discount rate, but other risks to changes in climactic variables, market prices, and other related factors remain.

Table A3. Restoration activity budget for 1-hectare of intensive agricultural technologies

Item	Unit	Unit Price MK	Quantity per hectare	Total MK	Time Interval
Labour					
Nursery set up and operation	day	700	10	7,000	Once
Land preparation	day	600	12	7,200	Annually
Digging	hole	60	1,500	90,000	Once
Planting	day	700	6	4,200	Annually
Weeding	day	700	10	7,000	Annually
Watering	day	700	12	8,400	Once per week for 3 months
Fertiliser application	day	700	12	8,400	Annually
Pruning	day	700	18	12,600	3 times per year after year 3
Material Inputs					
Seedlings	Seedling	100	1,500	150,000	Once
Artificial fertilisers	Kg	500	200	100,000	Annually
Pesticides	Kg	3,500	2	7,000	Annually
Crop seeds	Kg	3,000	10	30,000	Annually
Harvesting					
Crop harvest	day	700	24	16,800	Annually
Fuel wood harvest	day	700	6	4,200	After year 3
Equipment					
Hoe/Shovel	unit	1,400	1	1,400	Once
Panga	unit	1,200	1	1,200	Once
Pruning Scissor	unit	1,800	1	1,800	Once
Planting trowels	unit	500	1	500	Once
Wheel Barrow	Unit	12,000	1	12,000	Once
Transport Costs					
Oxcart hire for firewood	trip	4,000	3	12,000	Every 3 years
Revenues					
Crop	**Unit**	**Price**	**Quantity**	**Total MK**	
Maize	Kg	225	2,500	562,500	Annually
Fuelwood	Headload	200	100	20,000	Annually After Year 5

Source: Malawi NFLRA Task Force

Table A3 shows the cost and revenue structure for agricultural technologies in Malawi. Unlike other agriculture in Malawi, agricultural technologies require a fair amount of inputs during the establishment phase in the first year. A nursery has to be established to produce the tree seedlings that will be planted alongside crops like maize. The seedlings also have to be transported to the fields and the fields themselves have to be prepared to receive the seedlings. Equipment like hoes, shovels, *panga* knives, pruning scissors and wheel barrows also have to be purchased during the first year in order to properly manage the activity. Managing an agricultural technology system requires 110 days of labor during the first year and 73 days of labor thereafter. The activity produces maize yields of 2.5 tons or equivalently 2,500 kg, on average, and this generates an average annual revenue of 562,500 MWK per year. The activity also produces fuelwood from the agroforestry trees, which can be consumed by the household or sold at market for a price of 200 MWK per headload.

Table A4. Restoration activity budget 1-hectare of farmer managed natural regeneration (FMNR)

Item	Unit	Unit Price MK	Quantity per hectare	Total MK	Time Interval
Material Inputs					
Seeds	Kg	400	25	10,000	Annually
Urea	Bag	23,000	4	92,000	Annually
Labour					
Planting	day	700	10	7,000	Once
Weeding	day	700	15	10,500	Annually
Harvesting crops	day	1,200	5	6,000	Annually
Pruning	tree	80	60	4,800	Annually
Harvesting					
Tree felling & logging	tree	300	60	18,000	Year 12
Equipment					
Hoe	Unit	1,400	1	1,400	Once
Panga knife	Unit	1,000	1	1,000	Once
Pruning Scissor/saw	unit	1,200	1	1,200	Once
Axe	Unit	1,200	1	1,200	Once
Rip saw	Unit	3,000	1	3,000	Once
Transport Costs					
Oxcart	trip	4,000	3	12,000	Annually
Revenues					
Item	**Unit**	**Price**	**Yield/ha**	**Total MK**	**Time Interval**
Maize		225	2,500	562,500	Annually
Fuelwood	Headload	200	2	400	Annually after year 5

Source: Malawi NFLRA Task Force

Table A4 shows the cost and revenue structure for farmer managed natural regeneration (FMNR) in Malawi. FMNR, like conventional agriculture, is a low input activity. Desirable tree species, like *Faidherbia albida*, are allowed to natural regenerate on agricultural plots in order to fix soil nitrogen, which is a limiting nutrient for most plants. Like conventional agriculture, the only financial expenses that smallholders face on an annual basis are the costs of seeds and Urea. In the first year tools and equipment to manage the trees must also be purchased. Managing an FMNR system requires 82 days of labor each year. The activity produces maize yields of 2.5 tons or equivalently 2,500 kg, on average, and this generates an average annual revenue of 562,500 MWK per year. The activity also produces 2 headloads of fuelwood from the trees, which can be consumed by the household or sold at market for a price of 200 MWK per headload.

Table A5. Activity budget for 1-hectare of degraded woodlands with light agriculture

Item	Unit	Unit Price MK	Quantity per hectare	Total MK	Time Interval
Material Inputs					
Seeds	Kg	1,250	10	12,500	Annually
Equipment					
Hoe / shovel	unit	1,400	1	1,400	One time
Panga knife	unit	1,200	1	1,200	One time
Labour (Working Day)					
Land preparation /ploughing		700	21	14,700	Annually
Planting	day	700	10	7,000	Annually
Harvesting	day	700	5	3,500	Annually
Oxcart	trip	4,000	3	12,000	Annually
Revenues					
Crop	**Unit**	**Price per kg**	**Kg**	**Total MK**	**Time Interval**
Maize		225	1,000	225,000	Annually

Source: Malawi NFLRA Task Force

Table A5 shows the cost and revenue structure for degraded woodlands with light agriculture in Malawi. The activity is assumed to occur in areas like forest reserves and other woodland areas that are prone to encroachment. As a result, the activity is very low intensity and low input since the operating assumption is that the smallholders who participate in this activity are doing so without secure land tenure. Managing an FMNR system requires 36 days of labor each year. The activity produces maize yields of 0.5 tons or equivalently 1,000 kg, on average, and this generates an average annual revenue of 225,000 MWK per year.

Table A6. Restoration activity budget for 1-hectare of natural forest management

Item	Unit	Unit Price MK	Quantity per hectare	Total MK	Time Interval
Labour					
Fire protection (est. of a fire line)	km	600	10	6,000	Annually
Cleaning the fire line	km	600	10	6,000	Annually
Patrolling	year	216,000	4	864,000	Annually
Harvesting					
Tree felling & logging	tree	300	500	150,000	Year 15
Monitoring allowances		2,500	20	50,000	Annually
Equipment					
Watering can	unit	1,800	1	1,800	Once
Hoe	Unit	1,400	1	1,400	Once
Thinning Saw/bow saw	Unit	1,000	1	1,000	Once
Pruning Scissor/saw	unit	1,200	1	1,200	Once
Axe	Unit	1,200	1	1,200	Once
Rip saw	Unit	3,000	1	3,000	Once
Ropes	Unit	1,800	50	90,000	Once
Wheel barrow	unit	12,000	1	12,000	Once
Revenues					
Tree Specie	**Unit**	**Price per bag**	**Yield/ha**	**Total MK**	**Time Interval**
Mixed species	m^3	2,500	1,000	2,500,000	After year 15
NTFPs	unit			100,000	Annually

Source: Malawi NFLRA Task Force

Table A6 shows the cost and revenue structure for a hectare of natural forest management in Malawi. Natural forest management is both a labor and resource intensive activity. The threat of encroachment on natural forest areas must be managed with regular patrols that require 864,000 MWK of time to be invested each year. In addition, cash allowances of 2,500 MWK per patroller – 50,000 MWK total - must be paid each year as well. Fire lines must be established and cleared to protect the forest area from fires and tools such as ropes and *panga* knives have to be purchased so the forest can be properly managed. The community who manages the forest area can receive 100,000 MWK of non-timber forest products per hectare each year and after 15 years, 2,500,000 MWK of timber can be extracted.

Table A7. Restoration activity budget for 1-hectare of community plantations and private woodlots

Item	Unit	Unit Price MK	Quantity per hectare	Total MK	Time Interval
Labour					
Nursery Set up operation	day	700	20	14,000	Once
Digging	hole	80	1,200	96,000	Once
Planting	seedling	30	1,200	36,000	Once
Watering	day	1,200	24	28,800	Once
Pruning	tree	100	1,200	120,000	Every 5 years
Thinning	tree	150	200	30,000	Year 7
Fire protection (est. of a fire line)	M^2	700	10	7,000	Once
Cleaning the fire line	Day (8hrs)	700	10	7,000	Every 2 years
Inputs					
Seedlings	unit	100	1,200	120,000	Once
Artificial fertilisers	Kg	350	10	3,500	Year 15
Pesticides	Kg	3,500	1	3,500	Every 5 years
Harvesting					
Fuel (diesel)	Litres	776	70	54,341	Year 20
Equipment					
Watering can	unit	1,800	1	1,800	Once
Hoe	Unit	1,400	1	1,400	Once
Panga knife	Unit	1,000	1	1,000	Once
Axe	Unit	1,200	1	1,200	Once
Ropes	Unit	1,800	50	90,000	Once
Wheel barrow	unit	20,000	1	20,000	Once
Transport Costs					
Truck hire (5 Tonne track)	Trip	20,000	2	40,000	Year 20
Truck Loading	Truck	10,000	1	10,000	Year 20
Oxcart (1 tonne load)	trip	4,000	2	8,000	Every 5 years
Revenues					
Tree Specie	**Unit**	**Price**	**Yield/ha**	**Total MK**	**Time Interval**
Poles	Tree	30,000	1,750	52,500,000	Year 20
Fuelwood	Tree	2,500	100	25,000	Year 7 to Year 14

Source: Malawi NFLRA Task Force

Table A7 shows the cost and revenue structure for a hectare of community plantations and private woodlots in Malawi. Community plantations and private woodlots are both a labor and resource intensive activity. The activity requires a fair amount of inputs during the establishment phase in the first year. A nursery has to be established to produce the tree seedlings that will be planted. The seedlings also have to be transported to the fields and the land has to be prepared to receive the seedlings. Equipment like hoes, shovels, *panga* knives, pruning scissors and wheel barrows also have to be purchased during the first year in order to properly manage the activity. Fire lines must be established and cleared to protect the woodlot from fires. Managing a community plantation or private woodlot system requires 115 days of labor during the first year and 45 days of labor thereafter. The activity produces fuelwood between the 7th and 14th years' worth 25,000 MWK per year. After 20 years the trees can be harvest for poles at a price of 30,000 MWK per tree. At a stocking density of 1,750 trees per hectare this generates a revenue of 52,500,000 MWK.

Table A8. Carbon sequestration values for land uses in Malawi

Land Use Land Cover Description	Above Ground Carbon	Below Ground Carbon	Soil Carbon	Dead Carbon	Total Carbon
RAINFED HERBACEOUS CROP(s) Small (< 2ha)	3.3	0.9	123.3	0.1	127.6
RAINFED HERBACEOUS CROP(s) Large to Medium Field(s) (> 2ha)	3.3	0.9	123.3	0.1	127.6
RAINFED HERBACEOUS CROP(s) - Small Field(s) (< 2ha) with a layer of Sparse Trees	3.3	0.9	123.3	0.1	127.6
RAINFED SHRUB CROP(s) Small Field(s) (< 2ha)	3.3	0.9	123.3	0.1	127.6
RAINFED HERBACEOUS CROP(s) Small (< 2ha)/Broadleaved Deciduous Trees, Closed > (70-60)%	57.95	14.225	121.675	2.8	196.65
RAINFED HERBACEOUS CROP(s) Small (< 2ha)/Woodland Open General (15-65%) with Herbaceous Layer	16.6	5.4	118.65	1.475	142.125
RAINFED HERBACEOUS CROP(s) Small (< 2ha)/Tree and Shrub Savanna	9.625	2.95	121.525	0.825	134.925
RAINFED HERBACEOUS CROP(s) Small (< 2ha)/Shrubland Closed to Open (Thicket) (100-15%)	18.2	5.625	118.675	2.475	144.975
RAINFED HERBACEOUS CROP(s) Small (< 2ha)/Built up Urban Non-Urban	2.475	0.675	120	0.075	123.225
RAINFED HERBACEOUS CROP(s) - Small Field(s) (< 2ha) with a layer of Sparse Trees/Built up Urban Non-Urban	2.475	0.675	120	0.075	123.225
RAINFED HERBACEOUS CROP(s) - Small Field(s) (< 2ha) with a layer of Sparse Trees/TREE ORCHARD	24.825	6.15	120.8	1.175	152.95
Broadleaved Deciduous Trees, Closed > (70-60)%	221.9	54.2	116.8	10.9	403.8
Forest Plantation	221.9	54.2	116.8	10.9	403.8
Broadleaved Deciduous Trees, Closed > (70-60)%/RAINFED HERBACEOUS CROP(s) Small (<2ha)	167.25	40.875	118.425	8.2	334.75
Woodland Open General (15-65%) with Herbaceous Layer	56.5	18.9	104.7	5.6	185.7
Woodland Open General (15-65%) with Herbaceous Layer/RAINFED HERBACEOUS CROP(s) Small (<2ha)	43.2	14.4	109.35	4.225	171.175
TREE ORCHARD	89.4	21.9	113.3	4.4	229
TEA PLANTATION	35.1	9.3	115.5	1.2	161.1
SUGAR CANE - Irrigated Herbaceous Crop(s) Large to Medium Field(s) (> 2ha)	46.3	12.4	161.9	1.6	222.2
RICE FIELDS - Small Sized Field(s) Of Graminoid Crops On Waterlogged Soil (< 2ha)	3	0.8	107.9	0.1	111.8

Source: InVEST carbon sequestration model. Documentation available at: http://data.naturalcapitalproject.org/nightly-build/invest-users-guide/html/carbonstorage.html

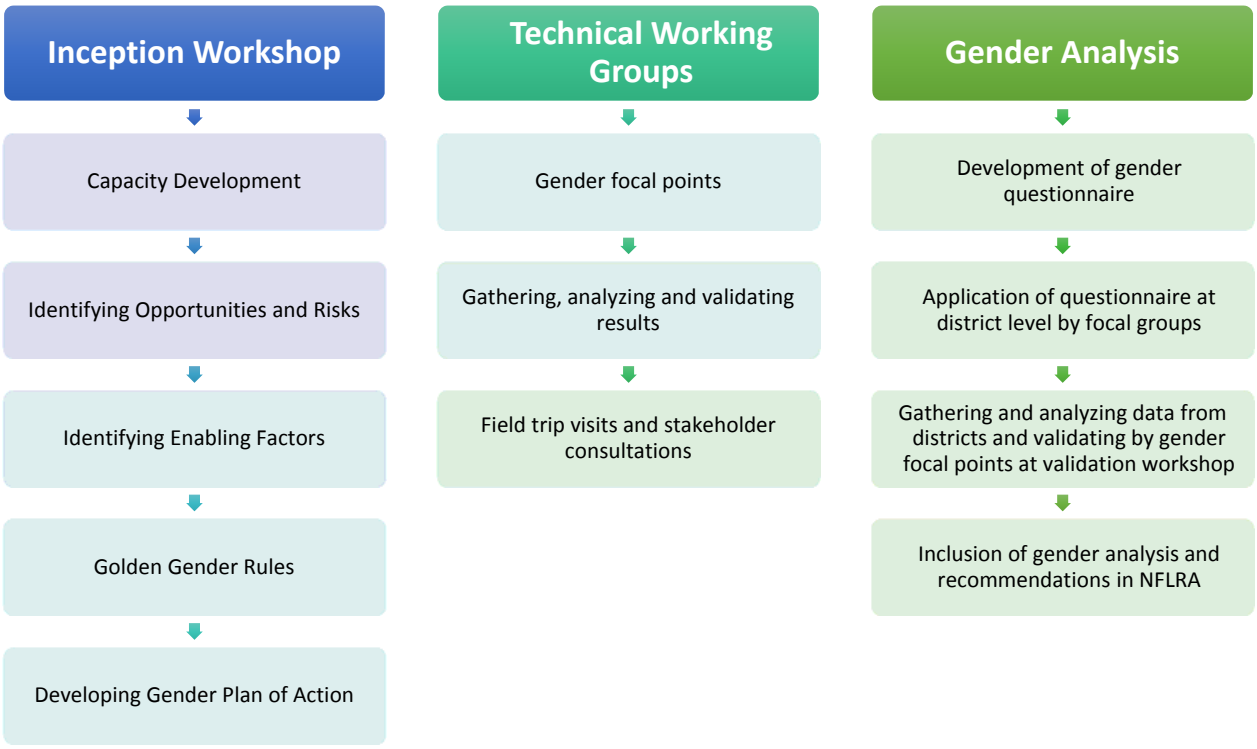
Annex 14: Gender-responsive NFLRA

A gender working group was organized including the representatives from the Ministry of Gender, Children, Disability and Social Welfare (MoGCCD), the Department of Forestry, and IUCN gender specialists to facilitate gender responsive national assessment process. Two gender focal points were assigned to each of the three working groups (stocktaking and mapping, economics and finance, and policies and institutions) to ensure that gender issues were taken into consideration in each working groups' analysis. Through a series of workshops, the working groups generated a Gender Plan of Action (Annex 16) to provide guidance on gender-responsive NFLRA.

The gender working group conducted the gender analysis using the Gender Responsive FLR Analysis Framework[16]. This framework was adapted to design a questionnaire (Annex 15) relevant to FLR in the context of Malawi. Following the design of the questionnaire, gender specialists generated the data from the 14 districts, providing an information on specific gender issues in the context of FLR-relevant sectors at the sub-national level (example is provided in Annex 17). The additional information was complemented with the secondary data. The data was organized in tables by district and sub-categories such as demographics; livelihoods; natural resources access, use and control; women's empowerment and decision making; and practices. This data then was analyzed and shared at the validation workshop and covered the following topics:

- Socio-cultural norms and practices of local communities in the district area in terms of gender division of labor, rights and responsibilities, access to information and services, access to and control over economic and financial resources and services, with focus on gender and ethnicity;
- Gender based livelihoods patterns of local communities, including such aspects as access to land, water, sanitation, education, health, and forest, disaggregated by sex, with a focus on women, and poor female-headed households (FHHs); and
- Use and control over the resources and services and the role of women and men in the management of community and household natural resources.

Gender- responsive National Forest Landscape Restoration Assessment (NFLRA)



Furthermore, the gender working group identified the key policies and institutions related to gender that are important for the implementation of FLR in Malawi and made recommendations to include gender considerations in National Strategy and Action Plan.

16 Complete framework available at www.genderandenvironment.org to be adapted to specific context and programme for analysis.

Annex 15: Gender questionnaire

Gender Analysis: the following questions will assist to develop appropriate data for gender analysis. Some tables have been included after the question to help organize the possible answers wherever applicable.

Data collection: sex disaggregated (e.g., household/community/district-level data)

At a socio-demographic level

1. How many people comprise live at the district and what is the illiteracy rate, level of education, poverty rate, labor stats by sex and age?
2. What types of family structures exist, and are most prevalent, within the communities? (Women as household heads, size of families, nuclear families, etc.)
3. What are the migration and immigration patterns in the area and how does migration affect the use of natural resources by women? How does it affect men? How does it affect other members of the household (girls, boys, and elderly people)?
4. How do population growth and density affect the use, access, control and distribution of resources?

At a health level

1. What basic community or districts services are provided and in what condition (water, electricity, sewage and garbage disposal)?
2. What is the nutritional condition of the population? (any stats on stunting, waste)
3. Is traditional medicine practiced? What type? What is the dependency on natural medicines form the forests?
4. Which are the health problems caused by environmental effects?

At a natural resource and productive levels

1. What are the different types of land tenure in the district?
   - To which land do women have access to or control of?
   - Who holds title deed to the land? (men only, women only, both)
   - Are there any cultural restrictions for women to own land?
2. Which resources are available to men? Which resources are available to women?
   - Bodies of water, estuaries, lagoons, rivers, mangroves, land, water, housing, small species, seeds, trees, forest
   - Capital, credit, savings (e.g., in the event that credit facilities are available for the activities undertaken by men and women, do women have access to credit services?)
   - Labor (women, men, youth, elderly)
   - Production tools
   - Infrastructure
   - Permits and concessions
   - Raw materials for work
   - Transportation
   - Time
3. What are the main activities women and men do for their livelihoods in the district?

Activity (this are possible examples)	Women	men	Both of them
Farming (which crops)			
irrigated agriculture (which crops)			
Business (what type)			
Fisherman			
Firewood collection for sale			
Employment			
Livestock keeping			
Selling (which type of products, any products from the forest)			
Weaving baskets			
Brick making			
Bee keeping			

4. What are the roles and responsibilities of women and men for the activities related to natural resources?

	Time of the year for doing the activity											
Activity	J	F	M	A	M	J	J	A	S	O	N	D
Agriculture (annual crops)												
Soil preparation-clear land												
Ridges and Planting												
Fertilizer application												
Harvesting												
Others.												
Fishing												
Collecting fish												
Selling fish												
Other.												
Livestock (type)												
Animal feed												
Others.												
Forest												
collecting firewood (which tree species)												
collect timber and poles for construction (which species)												
Produce charcoal (which species)												
Collecting mushrooms												
Collecting Grass												
Medicinal plants (type and use)												
Other												

Men M, women W, children C, Permanent P, seasonal S, Intensive I (to be included in the boxes under time).

5. What are the main crops grown by women and men and what is the main use?

Crops grown	**women**	**use**	**Men**	**use**

6. Do women and men own trees in the communities?

7. What type of tree and use women and men do of the trees they own?

Name of tree	**Use and benefit**	**Own by women**	**Own by men**

8. Who exerts control over the resources (men, women)?
   - Who owns the production-related tools?
   - Who owns the processing-related equipment or tools?
   - Who owns the storage equipment?
   - Who owns the commercialization-related equipment (transportation)?
9. Who decides whether or not a resource may be used?

10. What are the main practices or activities to improve agriculture, forest, food security, water and firewood that women and men do and what are the benefit in terms of increase women participation, reduction women load work (collecting firewood, water, taking care of sick people), increase women and youth income, food insecurity reduction, and building women and youth capacity and empowerment?

11. What is the role of women and men in the value chains of forestry, agricultural technologies, and NTFP?

Practices/activity	Women	Men	Both of them	Benefits
Agricultural technologies (CA, FMNR, AF)				
Community forests and woodlots				
Forest management				
Soil and water conservation (e.g., check dams, gully protection, terracing, contour bunds, infiltration trenches, ridges)				
Water resources management				

12. What are the main needs, interests and concerns of women as well as men in relation to areas to restore?
13. What are the women and men environmental perceptions about the condition of the resources, contamination and degradation of the landscape?
14. How climate change affects women and men from the target group in different ways, including their ability to recover from climate change impacts, and any opportunities that climate change might provide for greater gender equality and women's empowerment?

At a social participation, political-institutional level

1. What are the programs or initiatives and from which institution and organizations in the district that promote women empowerment, women access to productive resources such as technical assistance, funds capacity building or development of leadership?
2. How are male and female stakeholders involved in the decision-making, planning and management of natural resource at the community level?
3. What type of organizations exist (traditional, clans, formal and informal associations and organizations), and how are they comprised (by sex, age, etc.)?
4. In which organizations or groups of stakeholders are women involved and how?
5. How women and men are currently represented in governance processes in the landscape? Who are responsible for decision-making?
6. Is there any gender specific policy and legislation that should be taken into account at the national or local level?

Annex 16: Malawi NFLRA gender plan of action

This document was produced in collaboration with the IUCN, Department of Forestry of Malawi and gender specialists from the Ministry of Gender, Children, Disability and Social Welfare (MoGCCD) and working groups.

STOCKTAKING AND MAPPING	
AREA OF INTERVENTION	GENDER CONSIDERATION IN RELATED ACTIONS
Stocktaking	Identify success stories of women in landscapes: agricultural technologies, nurseries, forestry management, etc. from literature, interviews, project documentation
	Make sure the criteria for selecting successful FLR experiences are gender responsive
	Identify gender-responsive objectives for restoration taking into account national policies on youth and gender, forestry, SGDs
Data collection	Collect and analyse sex- and age-disaggregated data, as well as data on use, access and control
	Conduct a gender analysis using the Gender Responsive Analysis Framework[17] as a guide
Assessment criteria	Take into consideration women's resource use and needs after the criteria are decided. For example: Resilience (species maps for trees and non-timber fruit trees, multipurpose trees that women use) Biodiversity and adaptation (with reference to increasing the resilience of women and men) Soil organic matter (to ensure production and food security) Diversification of products (for food security, firewood and income generation) Drought (food security, firewood and water)
	Take into consideration the use of NTFPs and fruit trees by women when restoration intervention selection takes place
Consultation and validation	Organise gender-responsive validation and inception workshops
	Organise a separate validation workshop for women and youth
Monitoring	Develop gender indicators to monitor the impact of FLR on well-being of men, women and youth

17 Accessible at http://genderandenvironment.org/resource/gender-responsive-roamflr-analysis-framework/

ECONOMICS, FINANCE AND FOOD SECURITY	
AREA OF INTERVENTION	GENDER CONSIDERATION IN RELATED ACTIONS
Social, economic and environmental data collection/ analysis	Identify impacts and benefits for men, women and youth during data analysis
	Ensure that while analysing the cost of FLR interventions (e.g., labour) the unpaid or unequal pay for women's labour is taken into account
	Thematic working group ensuring the analysis and data collection are gender responsive; gender expert group to validate whether these has been addressed. Are there any gaps?
Food security	Measure the access and control of resources by women, men and youth
Demographics	Collect sex-disaggregated data for households and communities. Check National Statistics Office; if data not available at national level, use women's working groups/extension workers within the ministry for at least half of districts.
Capacity building	Train extension workers on gender and FLR (for collecting data from women's working groups but also for training farmers, especially illiterate communities)
Validations	Ensure participation and leadership of women's groups to represent the interests of their peers and validate gender-responsive outputs (e.g., engage expert personnel with a background in social science to validate results relevant to gender and youth)
Final results	Review and validate by gender experts to ensure the suggestions from the stakeholder validation have been integrated and address gender and youth
POLICY AND INSTITUTION	
AREA OF INTERVENTION	GENDER CONSIDERATION IN RELATED ACTIONS
Ongoing programs, strategies and investment	Draw lessons learned from gender mainstreaming in programmes, strategies and investments
	Incorporate success stories on gender mainstreaming into FLR programmes, strategies and investments that will be implemented
	Draw lessons learned from youth integration in programmes, strategies and investments
	Incorporate success stories on youth integration into FLR programmes, strategies and investments that will be implemented
Enabling conditions and barriers	Assess the enabling conditions and barriers in relation to gender and youth participation (take into consideration the gender golden rules and enabling factors developed by Malawi gender specialists)
Policy analysis Full technical ROAM assessment report	Lobby for the integration of gender into various policies
	Review technical report to ensure information on gender is included in each section
	Present the gender strategy for action plan

Annex 17: Information on on-farm activities in Mzimba district

This table shows information collected on on-farm activities, as well as the time of year during which the activity takes place and who participates in the activities. This information was gathered from a gender focal group in Mzimba district.

Data based on district level questionnaires, farm activities, the period of the year during which the activity takes place and participating personnel.

Activity	Time of the year for doing the activity											
	J	F	M	A	M	J	J	A	S	O	N	D
Agriculture (annual crops)												
Soil preparation-clear land						women		Women + children				
Ridges and Planting								Women + children				
Fertilizer application	Women + children											
Harvesting			Women + children									
Others.(Processing and Storage)					Women							
Fishing												
Collecting fish *(get the most in the highlighted)from the lake and Kazuni river	Men											
Selling fish	Women and men											
processing	Women											
Livestock												
Animal feed	Mainly done by boys											
Forest												
collecting firewood (which tree species) Eucalyptus, michenga, lisunguti, nsumbuti, chimpakasa, mtwana, chitimbwe and uwauwa	Women											
collect timber and poles for construction (which species) Mbawa, mlombwa, ntangatanga, nsambafumu, mtumbu, mkwelanyani and eucalyptus	Men											

Produce charcoal (which species) Indigenous spp	Mostly men and women help when the husband tells her
Collecting mushrooms	Women
Honey production species Muwula, mango, munyozi, guaba and chiyombo	Women + men
Collecting Grass	Women
Medicinal plants (type and use) Chitime (stomachache), mkwale, mtumbu, naphini, mlobwa, ntondooko, kangande, and chalilima (increase blood)	Both women and men

Annex 18: Methodology for spatial multi criteria analysis of forest landscape restoration

The purpose of this multi-criteria analysis (MCA) is to use objective and empirical spatial data to define aggregated features of a landscape that could be of interest for restoration practitioners at varied geographic and administrative scales. The process uses a series of spatial proxies related to landscape restoration and stacks these proxies within a map to identify where they overlap. Proxies are specific collections of available spatial data that form the components of themes such as degradation and different restoration scenarios and are used to both gauge the baselines and potential for restoration activity.

In landscape restoration the use of MCA helps in the agreement with stakeholders on which spatial proxies respond to their objectives. The analysis then uses the spatial overlay of the proxies to help identify and prioritize areas for restoration that may meet the objectives. The overlay of specific objectives in a MCA, can help to diversify and maximize the benefits derived from interventions, by prioritizing those areas.

In the multi-criteria analysis, independent spatial data are aggregated to visualize their overlap, which can be used as an indication of priority. Based on the input of stakeholders, available spatial data, and scientific literature, a series of relevant biophysical and socioeconomic information were analysed in a geographic information system (GIS).

Within each multi-criteria map, proxies are analysed for their contribution to degradation, or their potential to achieve the specific objectives for landscape restoration. This may include decisions on how the proxy is quantified (e.g. including only the most extreme poor areas or how slope may be categorized). This is termed “parametrization”, and refers to the necessary categorical exclusion of some attributes of spatial data layers so that the analysis can focus on the attributes that are of interest.

The parameters of each of these data layers were classified based on their contribution to landscape degradation, food security, resilience, and biological diversity. A description of how each of these layers was classified can be found in the Criteria included in the MCA section below.

When the proxies have been analysed and parameterized through expert analysis or by comparing with similar parameters in peer-reviewed scientific literature, they become criteria for multi-criteria analysis. MCA can subsequently demonstrate which areas or districts contain the most overlapping criteria of functional degradation, as well as the most opportunities for addressing food security, resilience, and biodiversity – demonstrating how restoration has the potential for multiple benefits.

MCA will also set baselines that will enable monitoring of individual proxies of interest to measure the future biophysical and socio-economic success of landscape restoration in Malawi. MCA is adaptable to changing needs as proxies and criteria can be added or removed based on changing stakeholder preferences and/or new spatial data availability.

Importantly, the overlay of proxies allows for the identification of technical specifications that are needed in a given location to address the present input criteria (e.g. slope+sedimentation+forest cover loss+food insecurity versus forest cover loss+high population pressure). This is critical information for cost-benefit analysis, and for designing technical packages for the FLR interventions.

Criteria included in the MCA

Fire can have a significant impact on people and ecosystems, especially in cases where neither are adapted to dealing with fire. These data represent burnt areas between 2000-2012 and the input data for the MCA included all areas that have been affected by fire during this period.

Slope: While not necessarily a measurement of degradation, areas of high slope have greater potential for degradation and represent a reasonable proxy within a multi-criteria analysis. Additionally, the degree of slope will also inform what types of FLR interventions are preferred or possible. Slopes greater than 16.5º were selected because they represent the initial extreme category under the classification scheme following “strong slopes” (8.5º-16.5º)

Erosion: analysis includes areas of severe or moderate erosion as categorically defined by the Malawi National Spatial Data Center Department of Surveys soil data. The most severe erosion in this layer was only found on 10,000 hectares of land surface. Through stakeholder workshops and surveys, along with the goals of the restoration plan, it was clear that erosion affects many people in Malawi and is a large factor of landscape degradation. For this reason the parameters were widened to include “moderate” erosion as well, which has a much broader spatial footprint.

Evapotranspiration is an important measure of the ability of an area to support agricultural crops. Each crop species has a reference value range for typical evapotranspiration levels that are required for a crop to grow. In this case 400mm as the minimum reference evapotranspiration average for rain-fed maize in Malawi was appropriate. Areas of low evapotranspiration in Malawi are indicative of agricultural hardship and represent a proxy for an aspect of landscape degradation. Evapotranspiration was calculated using the Water Yield model from the Integrated Valuation of Ecosystem Services Tool (InVEST) in partnership with the Natural Capital Project.

Soil Fertility: areas of low or very low soil fertility as defined by categorical attributes of Malawi soil data defined by the Malawi National Spatial Data Center Department of Surveys. Identified as areas with “low” or “very low” cation exchange capacity - a proxy for soil fertility.

Sediment Export: Calculated through a partnership between IUCN and the Natural Capital Project, sediment export refers to the metric tons of soil that are deposited from the land into streams for each 90m x 90m pixel. This criteria is a proxy for the degraded state of the land that results in topsoil erosion into stream networks.

Canopy cover loss: Areas that experienced canopy cover loss between 2000 and 2014. While not a specific measurement of deforestation, canopy cover loss presents a reliable estimation of the loss of canopy. However, the data cannot distinguish among deforestation and timber harvest.

High population density: generally speaking, areas of high human population are inherently more degraded than areas with lower human populations. This criteria includes areas where the human population exceeds 500 people per km2, a common threshold for the distinction between rural and urban areas.

High Poverty: Areas greater than 90% poverty represent areas of both extreme risk and extreme opportunities. Restoration interventions in these areas have the potential to drastically improve the lives of people living in poverty. 90% was chosen as the threshold for analysis to provide a reasonable limit to parameters. The majority of Malawi land area is classified at >80% poverty and >90% appeared as a reasonable parameter to identify priority.

Poor Market Access: A lack of accessible markets reflects that people are both increasingly dependent on ecosystem services and have less opportunities to generate market-based income sources. Land tenure also tends to be less secure further from markets which can contribute to greater degradation. 40 minutes represents near the maximum time that can be reasonably allotted for a one-way trip to market each day based on stakeholder consultations.

Female Gender Balance: Successful restoration interventions that occur in areas that have a high female population will have a statistically better chance of providing benefits to women and girls. This data layer uses Malawi Census 2014 enumeration areas to calculate the proportion of women for each census enumeration area. Areas where the female proportion of the population was above one standard deviation from the mean female national proportion were selected and included as a layer in the MCA.

Lack of Access to Non-imber Forest Products has implications for all three scenarios (food security, resilience, and biodiversity). Sustainable access to non-timber forest products can have tremendous benefits for community nutrition and economies - including access to fuelwood and charcoal which are the primary energy sources for most of Malawi. Therefore, the lack of available access to fuel, food, and fibers provided by non-timber forest products represents a concern that can be addressed through landscape restoration.

Rain-fed Cropland: Most of the people of Malawi depend upon rainfed cropland for their food and the spatial locations of rainfed cropland are important in determining the location of interventions that can address both food security and resilience.

Low Crop Yields: There are many factors that contribute to low crop yields. However, what is clear is that with an annual population growth rate over 3% and high levels of degradation, wherever low crop yields are present there is cause for concern. These data were selected and digitized from the Malawi Census (2014) based on the top ⅓ districts with the lowest crop yields, standardized by available agricultural area.

Fewest Quantity of Livestock: Access to livestock is not only an indicator of socio-economic status, but it represents a sustainable level of food security. These data were selected and digitized from the Malawi Census (2014) based on the quantity of livestock per household in each district. The top ⅓ of districts with the fewest quantity of livestock per household were used as an input criteria.

Most Days of Food Insecurity: While there are areas within Malawi that have categorically higher levels of food insecurity due to international reporting on food insecurity, this analysis uses the metric reported in the 2014 Malawi Census on "number of food insecure days per year. The top ⅓ of districts with the most days of food insecurity per year were included in the MCA.

Drought has implications for both resilience and food security but was included in the resilience MCA. Droughts occur naturally, but their intensity and severity are becoming increasingly less predictable due to landscape degradation and climate change. Drought severely affects the ability of people to cope with other environmental changes and is an important component of measuring the potential to address resilience through landscape restoration. This analysis included areas that have recently experienced drought.

Riverine Flooding is a significant hazard for people in or around floodplains. Additionally, with the increased unpredictability of rain duration and intensity that results from shifting climates, mapping areas of observed riverine flooding are important in identifying areas where people are at risk. As such, areas of riverine flooding were included in MCA analysis.

Water Yield is a measurement of the volume of water that leaves a certain area (in this case a 90m raster cell). Lower water yield values indicate that water is retained in these areas, potentially contributing to groundwater recharge and indicative of reduced runoff. Often these areas are valuable agricultural land. The values for water yield in the resilience MCA are between 316-579 mm/ha/year which omit areas that have little or no water yield (i.e. wetlands) and include areas where water yield is below the national mean. Restoration of these areas should be important for resilience.

High Temperature Trend: Increasing temperature intensifies resource use and drought and stresses crops, livestock, and ecosystems. Restoration, especially forest restoration, can have dramatic positive effects on ambient temperature. Between 1960 and 2006, mean annual temperature in Malawi has increased by 0.9°C (an average rate of 0.21°C per decade), increasing total hot days and nights in all seasons by 30.5 days World Bank, 2017). Mean annual temperature in Malawi is projected to increase by 1.1 to 3.0°C, and 1.5to 5.0°C by the 2060s and 2090s respectively (USAID, 2017). The projections indicate substantial increases in the frequency of hot days and nights.

Low Precipitation Trend: Reduced rainfall has many similarities with increases in temperature, but has serious implications for agro-ecological systems and the ability of these systems to respond to shocks. Reduced precipitation over time stresses ecosystems and can lead to desertification when combined with deforestation and degradation. Although the historical data doesn't reveal long-term consistent decreases in rainfall, Malawi has recently experienced water stress (precipitation makes up over 90 % of total water availability in country) due to a decrease in annual runoff and increase in evaporation (World Bank, 2017; USAID, 2013). During El Niño years, rainfall deficits have been common, which has direct impact at household and community level as demand for water increases by 55 % during dry seasons (World Bank, 2017).

Tree Cover: Over 50% of the species on the planet inhabit forest ecosystems. Tree cover also provides each of the four types of ecosystem services (provisioning, regulating, supporting, and cultural) to people and to the landscapes that depend on them. Areas of high tree cover (>40%) are indicative of areas that still support species and the production of these essential services.

Protected Areas form one of the only verifiable and available land tenure layers and are critical in maintaining landscape function and natural heritage. They are included in the biodiversity MCA.

Critical Ecoregions are a globally accepted assessment of threatened species assemblages (Olsen et al. 2001). In many areas throughout the world these areas are under severe pressures from agricultural expansion and other unsustainable industrious activities. Two such terrestrial ecoregions are contained within Malawi and Lake Malawi is one of the largest and most important freshwater ecoregions in the world due to its high levels of endemism.

Key Biodiversity Areas are sites that contribute significantly to the global persistence of biodiversity according to globally standardized criteria developed by IUCN and the Key Biodiversity Areas Partnership.

Selection of proxy criteria and parameters

The Stocktaking and Mapping Working Group assembled a large amount of spatial data. The intervention analysis used a selection of these data to determine the potential areas for each of the five intervention types. The data selection process for the multi-criteria analysis is similar and it defined which data were useful for identifying the most severely degraded areas, as well as the data that would explain the components of the three landscape restoration goals in this chapter.

Input criteria for each of the four scenarios in table A8 were determined by the spatial data collected by the Stocktaking and Mapping Working Group, and relevant global, national and district-level data. While the input criteria explained below do not form the totality of possible input criteria for each scenario, they do represent a reasonable approximation of a significant number of proxies, and are useful for analyzing priority areas for landscape restoration.

In each case, an effort was made to use national-level spatial data. Where national level data were not available, relevant global data were used instead. Preference in the analysis was given to high-resolution raster data, but in some cases, socio-economic data from district-level analysis was relevant and was also included.

Table A9: Input Criteria for Degradation, Food security, Resilience, Biodiversity

CRITERIA			
DEGRADATION	**FOOD SECURITY**	**RESILIENCE**	**BIODIVERSITY**
Steep slope	**Female Gender Balance**	**Drought**	**Key Biodiversity Areas outside Protected areas**
Erosion	**Poor Market Access**	**Flooding**	**Protected Areas outside Key Biodiversity areas**
Low Evapotranspiration	**Low Crop Yields**	**Water Yield**	**High Tree Cover**
Low soil fertility	**Rainfed Cropland**	**Temperature Trend**	**Endangered Ecoregions**
Sediment Export	**Lack of Access to Non-Timber Forest Products**	**Precipitation Trend**	
Canopy cover loss	**Fewest Quantity of Livestock**	**Rainfed cropland**	
High population density	**Most Days of Food Insecurity**	**NTFP**	
High poverty			
Fire / fire risk			

Table A10: Input Criteria for Functional Degradation

Degradation Criteria	Source	Parameters
Steep Slopes	30 meters Digital Elevation Model (DEM) from Shuttle Radar Topography Mission (SRTM). This data-set was derived through mosaicking of individual SRTM tiles for a particular country and clipping the mosaicked tiles using the country boundary extent. http://servirportal.rcmrd.org/layers/servir%3Amalawi_srtm30meters	Slope >16.5º (very strong slopes)
Erosion	Malawi National Spatial Data Center. Department of Surveys MASDAP: http://www.masdap.mw/layers/geonode:mw_soils	Severe and Moderate Erosion
Low Evapotranspiration	InVEST ecosystem service model. IUCN and Natural Capital Project	<400mm
Low soil fertility	Malawi National Spatial Data Center. Department of Surveys MASDAP: http://www.masdap.mw/layers/geonode:mw_soils	Cation Exchange Capacity <10 meg/100g
Sediment Export	InVEST ecosystem service model. IUCN and Natural Capital Project	Areas with sediment export to streams
Canopy cover loss	Hansen et al./ UMD 2000-2014, 30m https://earthenginepartners.appspot.com/science-2013-global-forest/download_v1.2.html	Areas of canopy loss
High population density	Landscan population 2015, 1km	Areas >500 people per km2
High poverty	These data have been developed by RCMRD and Malawi Department of Disaster Management Affairs (DoDMA). SERVIR is a joint USAID-NASA project. Regional Center for Mapping of Resources for Development (RCMRD), Malawi Department of Disaster Management Affairs (DoDMA 2015),SERVIR Eastern and Southern Africa. Malawi Hazards and Vulnerability Atlas. August 2015 http://geoportal.rcmrd.org/layers/servir%3Amalawi_national_poverty_levels#more	Areas with >90% of people affected by poverty
Fire / fire risk	These data have been developed by RCMRD and Malawi Department of Disaster Management Affairs (DoDMA). http://geoportal.rcmrd.org/layers/servir%3Amalawi_national_forest_fires#more Based on: MODIS Fire products (burnt area) available from http://wamis.meraka.org.za/products/fire-frequency-map The mapped variable is the number of events from 2000-2012.	All fire events 2000-2012

Table A11: Input Criteria for Food security

FOOD SECURITY	Data Source	Parameters
Female Gender Balance	Malawi National Spatial Data Center. Department of Surveys Malawi National Statistical Office. MASDAP http://www.masdap.mw/layers/geonode:eas_bnd#more	Enumeration areas where the proportion of women exceeds more than 1 standard deviation from the mean national female proportion (mean = 0.51, Mean +1sd = 0.54)
Poor Market Access	RCMRD and Malawi Department of Disaster Management Affairs (DoDMA). http://geoportal.rcmrd.org/layers/servir%3Amalawi_national_market_accessibility_time#more	This data has been developed by RCMRD and Malawi Department of Disaster Management Affairs (DoDMA). SERVIR is a joint USAID-NASA project. Regional Center for Mapping of Resources for Development (RCMRD), Malawi Department of Disaster Management Affairs (DoDMA 2015),SERVIR Eastern and Southern Africa. Areas >40 minutes travel time
Low Crop Yields	Welfare Monitoring Survey 2014, Malawi National Statistical Office. Table 9.9.2:Average number of livestock in households, by districts, http://www.nsomalawi.mw/index.php?option=com_content&view=article&id=220:welfare-monitoring-survey-wms-2014&catid=5:report	Bottom ⅓ of districts for mean of average crop yield for all planted crops.
Rainfed Cropland	Global Food Security Support Analysis Data (GFSAD) Crop Mask 2010 Global 1 km V001. USGS https://lpdaac.usgs.gov/sites/default/files/public/product_documentation/gfsad1k_user_guide.pdf	Rainfed Cropland
Lack of Access to Non-Timber Forest Products	Hansen, M.C., Potapov, P.V., Moore, R., Hancher, M., Turubanova, S.A., Tyukavina, A., Thau, D., Stehman, S.V., Goetz, S.J., Loveland, T.R., Kommareddy, A., Egorov, A., Chini, L., Justice, C.O., and Townshend, J.R.G., 2013, High-Resolution Global Maps of 21st-Century Forest Cover Change: Science, v. 342, no. 6160, p. 850-853, at http://www.sciencemag.org/content/342/6160/850.abstract. 40% threshold recommended by FAO Forest Resources Assessment 2000 and Sasaki, Nophea, and Francis E. Putz. "Critical need for new definitions of "forest" and "forest degradation" in global climate change agreements." *Conservation Letters* 2.5 (2009): 226-232	Areas outside a 1km buffer from areas of >40% tree canopy cover.
Fewest Quantity of Livestock	Welfare Monitoring Survey 2014, Malawi National Statistical Office. Table 9.9.2:Average number of livestock in households, by districts, http://www.nsomalawi.mw/index.php?option=com_content&view=article&id=220:welfare-monitoring-survey-wms-2014&catid=5:report	Bottom ⅓ of districts for the average number of livestock per household (cattle, goats, sheep, poultry) - normalized by the number of households per district.
Most Days of Food Insecurity	Welfare Monitoring Survey 2014, Malawi National Statistical Office. Table 9.5: Proportion of households who could not afford to eat their normal food by number of times they failed in the past 7 days prior to the survey http://www.nsomalawi.mw/index.php?option=com_content&view=article&id=220:welfare-monitoring-survey-wms-2014&catid=5:report	Top ⅓ of districts that experienced the most "food insecure" days per year.

Table A12: Input Criteria for Resilience

Resilience	Data Source	Parameters
Drought	RCMRD and Malawi Department of Disaster Management Affairs (DoDMA). SERVIR is a joint USAID-NASA project. Regional Center for Mapping of Resources for Development (RCMRD), Malawi Department of Disaster Management Affairs (DoDMA 2015),SERVIR Eastern and Southern Africa. Malawi Hazards and Vulnerability Atlas. August 2015 http://geoportal.rcmrd.org/layers/servir%3Amalawi_national_drought_physical_exposure	non-zero values
Flooding	RCMRD and Malawi Department of Disaster Management Affairs (DoDMA). SERVIR is a joint USAID-NASA project. Regional Center for Mapping of Resources for Development (RCMRD), Malawi Department of Disaster Management Affairs (DoDMA 2015),SERVIR Eastern and Southern Africa. Malawi Hazards and Vulnerability Atlas. August 2015 http://geoportal.rcmrd.org/layers/servir%3Amalawi_national_riverine_flood	non-zero values
Water Yield	IUCN and Natural Capital Project Ecosystem Service analysis Malawi 2016 (unpublished)	Water yield between 316-579 mm/ha/year
Rainfed Cropland	Global Food Security Support Analysis Data (GFSAD) Crop Mask 2010 Global 1 km V001. USGS https://lpdaac.usgs.gov/sites/default/files/public/product_documentation/gfsad1k_user_guide.pdf	Rainfed Cropland
Access to Non-Timber Forest Products	Hansen, M.C., Potapov, P.V., Moore, R., Hancher, M., Turubanova, S.A., Tyukavina, A., Thau, D., Stehman, S.V., Goetz, S.J., Loveland, T.R., Kommareddy, A., Egorov, A., Chini, L., Justice, C.O., and Townshend, J.R.G., 2013, High-Resolution Global Maps of 21st-Century Forest Cover Change: Science, v. 342, no. 6160, p. 850-853, at http://www.sciencemag.org/content/342/6160/850.abstract. 40% threshold recommended by FAO Forest Resources Assessment 2000 and Sasaki, Nophea, and Francis E. Putz. "Critical need for new definitions of "forest" and "forest degradation" in global climate change agreements." *Conservation Letters* 2.5 (2009): 226-232	Areas within a 1km buffer from areas of >40% tree canopy cover.
Temperature Trend	RCMRD and Malawi Department of Disaster Management Affairs (DoDMA). SERVIR is a joint USAID-NASA project. Regional Center for Mapping of Resources for Development (RCMRD), Malawi Department of Disaster Management Affairs (DoDMA 2015),SERVIR Eastern and Southern Africa. Malawi Hazards and Vulnerability Atlas. August 2015 http://geoportal.rcmrd.org/layers/servir%3Amalawi_national_temperature_trend	Top 25% of temperature increase
Precipitation Trend	RCMRD and Malawi Department of Disaster Management Affairs (DoDMA). SERVIR is a joint USAID-NASA project. Regional Center for Mapping of Resources for Development (RCMRD), Malawi Department of Disaster Management Affairs (DoDMA 2015),SERVIR Eastern and Southern Africa. Malawi Hazards and Vulnerability Atlas. August 2015 http://geoportal.rcmrd.org/layers/servir%3Amalawi_national_precipitation_trend	Top 25% of precipitation decrease

Annex 19: Interventions and potential impacts on livelihoods

Summary of the proposed FLR interventions and potential impact on livelihoods, and is pertinent to all four dimensions of food security, in which various components are qualitative, whilst some aspects are quantifiable as seen in Table 7.

Proposed Interventions	Improved food security/livelihoods
Agricultural technologies (Agroforestry Farmer Managed Natural Regeneration (FMNR) Conservation Agriculture)	The sufficient quantities of safe and nutritious food is available; increased economic means to access food either own production or purchase; enhanced utilization of food; stabilizing productivity of landscapes by – Increase in crop yields – Nutrition intake from fruit trees; Food from fruit trees – Income from stabilized labor force in agriculture – Income from NTFP (self-employment in gathering and sale of NTFP) – Wage employment in forestry and forest-based enterprises – Diversified Livelihoods and Nutrition – Stabilizing the productivity of landscape (resilience) – Increase water availability – Nitrogen fixation from leguminous trees – Preserve Biodiversity (nutrient cycling, pollination, pest control
Woodlots/ Village forest areas	Increased economic means to access food either own production or purchase; enhanced utilization of food by – Increase energy source (Woodfuel) – Wild foods (wild plant roots, leaves, fruits, nuts), medicine – Materials for construction (as well as soils/mud for home construction, leaves and other plant for roofing) – Commercial products such as charcoal, honey and timber – Reduction of the hours used by women and girls for fetching firewood for domestic purposes.
Watershed management (tree planting and regeneration along waterways) (e.g., check dams, gully protection, terracing, contour bunds, infiltration trenches, ridges)	Enhanced cooking and preparation of food though available water resources by – Increase quality and quantity of the water – Help control soil erosion and protect cropland, pastoral land, and forest land – Help prevent flooding – Reduction of water related diseases such as Diarrhea – Reduction of the hour used by women and girls for fetching water for domestic purposes.
Natural forest management Wood saving stoves/biogas (cook stoves)	Sustainability of ecosystem services and food productions systems – Decrease biomass usage/reducing forest loss/stopping deforestation and degradation/enhancing ecosystem services upon which production systems rely.
Soil & Water conservation	The sufficient quantities of safe and nutritious food is available; increased economic means to access food either own production or purchase; stabilizing productivity of landscapes by – Increase resilience of the landscape to climate change