A Roadmap for Developing Malawi's National Forest Monitoring System

22th of October 2015, Lilongwe, Malawi

Contents

Acknowledgements

This National Forest Monitoring System roadmap is a result of the contributions of many people, public and private officials and agencies, too numerous to mention.

The Director of Forestry Dr Clement Chilima and his team namely Ms Stella Gama, the UN-REDD Focal Point, Mr Henry Kadzuwa and Mr Custom Nyirenda the Country Counterparts, Mr Mike Chirwa of the Forestry Research Institute of Malawi and fellow researchers who contributed greatly to land monitoring and plot-based forest information pillars.

Key agencies and officials were consulted in order to inform the nature and content of this roadmap. Thanks go to Mr John Mussa Director of Land Resources Conservation and his team namely late Mathews Manda, Getrude Kambauwa and Milha Phiri, Mr Felix Mangani the Surveyor General, the Principal Mapping Officer Alice Gwedeza and the Senior Mapping Officer Mr Gumbi Gumbi from the Department of Surveys who greatly informed the development of this roadmap. Their contribution and support is greatly appreciated. Mention should be made of the Chief Environmental Affairs Officer Mr Ben Yassin in the Environmental Affairs Department who provided valuable information and contribution on GHG inventories. Thanks also go the Director of National Parks and Wildlife Mr Brighton Kunchedwa and his officers Mr Zondiwe Ndlhovu and Mr Alphius Lipiya for providing information which set the department as a key agency. Thanks go to Mr Peterson Ponderani Deputy Director M&E and his colleagues at the Department of Economic Planning and Development.

This roadmap would not be complete without the contribution of civil society, private and community groups. Gratitude is expressed for the contribution of Mr Duncan Mkandawire of the Nyika-Vwaza Association, Mr Blessings Mwale of Total LandCare, Mr Patricio Ndadzela of African Parks and Group Village Headman Nkalo of Machinga District whose Co-Management Block Committee provided useful contribution from the community's perspective. Thanks go to Dr Dennis Kayambazinthu for his valuable contribution to the development of this roadmap especially his insights into the genesis of REDD+ in Malawi and his thoughts on a national forest monitoring system for Malawi. Thanks go to Mr Duncan MacPherson of Kanongo Tobacco Estate and Mr Gay Saunders of Eastern Produce Malawi for providing their insights of a national forest monitoring system from a private sector's perspective.

Last but not least thanks go Mr Ramzy Kanaan Chief of Party of PERFORM Project, Ms Sharon Gomez of GAF AG and Mr John Kerkering of the USFS. Finally gratitude goes to FAO Malawi, Mr George Phiri the FAO Technical Coordinator and administrative staff, for their technical and logistic support ensuring this roadmap comes to fruition. Special gratitude goes to all those who have not been mentioned but their contribution in one or another was so valuable to the development of this roadmap.

This work was funded by the UN-REDD Programme through a targeted support arrangement with the FAO. Thanks go to the authors of this study: Dr Till Neeff, FAO, Mr Bennet Mataya, Mzuzu University, and Mr Henry Kadzuwa, Forestry Department.

Foreword

The development of this National Forestry Monitoring System roadmap, the first of its kind for forest monitoring in Malawi, was part of fulfilling the requirements for the REDD+ Monitoring, Verification and Reporting (MRV) function which the Government of Malawi through the Department of Forestry undertook with support from UN-REDD from April to October 2015. The aim of the roadmap is to provide direction to the Malawi REDD+ Programme for capacity development and more importantly, for serving as a guide or framework of the National Forest Monitoring System.

The roadmap has been developed at an opportune time when Malawi is strategizing on Intended Nationally Determined Contributions that will be presented at the UNFCCC Conference of the Parties to be held in in Paris at the end of this year. The roadmap has been developed as a result of a number of consultations from a wide range of stakeholders such as civil society, non-governmental organizations, government departments, communities, private sector, various reports and literature, UNFCCC and IPCC guidelines and experiences elsewhere.

Validated on 8th October 2015, the roadmap has proposed key steps that need to be followed in order to develop a national forest monitoring system for Malawi. This is part of developing the MRP according to the desired UN REDD trajectory. The roadmap also links well with the Vision and Goals of the Department of Forestry and provides a platform for the Government of Malawi with support from various partners such as the USAID funded PERFORM project, UN-REDD and others to work towards the MRP Readiness Strategy.

It is the department's expectation that this roadmap lays the foundation to enable Malawi monitor forest cover change which is one of the key fundamentals to sustainable management of natural resources, environment protection and food security. The roadmap comes at a time when the country is challenged by increasing deforestation and forestry degradation.

This roadmap has been made possible through tireless and collective efforts that have been carried out by National and International Consultants and Government Counterparts and of course the various stakeholders whose invaluable contributions and efforts provided most needed input and feedback. Great thanks should go to the Government of Malawi and FAO, UNDP and UNEP for the support rendered.

Let us all join hands in 'Arresting Deforestation and forest Degradation and then Restore Our Forests'.

Clement Chilima, PhD, DCM

Director of Forestry

Introduction

About this document

The roadmap for developing Malawi's national forest monitoring system (in short: the NFMS roadmap) provides direction to the Malawi REDD+ Programme (the MRP) for capacity development in the arena of REDD+ tracking. The NFMS roadmap's proposed capacity development trajectory serves as a skeletal framework that details required technical and functional capacities for tracking REDD+ results. The NFMS roadmap is intended to guide strategic decision making at the MRP for years to come.

For the first time, this NFMS roadmap attempts to provide a comprehensive picture of capacity needs for forest monitoring and the NFMS. It also contains a capacity development trajectory taking into account existing capacity gaps, past and ongoing capacity development initiatives and ultimately the remaining capacity gaps that need to be addressed.

This NFMS roadmap is designed to ensure compliance with the minimum requirement for accessing results-based REDD+ funding. The proposed capacity-development trajectory could therefore be extended to be more encompassing and to develop forest monitoring capabilities more comprehensively. Covering minimum requirements is a first step and further developing the NFMS should also be considered subsequently.

The methodology for developing the NFMS roadmap was presented at the launch event for the UN-REDD support to Malawi in late April 2015. Subsequently, it was refined with comments received and informed several months of consultations and discussions in preparation of the NFMS roadmap. The NFMS roadmap was validated with representatives from the key institutions 8 October 2015.

About the Malawi REDD+ Programme

Malawi is a densely populated country in Southern Africa with some remaining forest cover and high deforestation rates. In 2010-2014 population density amounted to approximately 177 persons per square kilometre with an annual growth rate of 3.1%.[1] The primary forest cover in 2015 amounted to 845,000 ha with an annual loss rate of 2.8% during 1990-2015. The area of naturally regenerated forests in 2015 amounted to 1,883,000 ha with an annual loss rate of 0.3% during 1990-2015.[2] About three quarters of Malawi's GHG emissions result from land-use change.[3] Forest-cover change is mainly driven by charcoal production, by firewood for household energy use and by agricultural expansion.[4]

Although Malawi is in an early stage of REDD+ readiness, the Malawi REDD+ Programme has already carried out much work to assess and develop capacities in specific aspects of readiness. The work has led up to the Malawi REDD+ Program Action Plan: 2014-2019 for

[1] The World Bank. 2015. Open data portal.
[2] FAO. 2015. Global Forest Resource Assessment 2015. Desk Reference.
[3] Government of Malawi. 2015. Intended Nationally Determined Contribution.
[4] LTS. 2015. Personal communication about ongoing metadata analysis on drivers of forest change.

the pursuit of REDD+ readiness that was recently submitted to the Government of Malawi's National Climate Change Programme (NCCP) for approval.

The MRP counts with the REDD+ Secretariat that facilitates Malawi's REDD+ readiness process. It is led by Malawi's REDD+ Expert Group (RExG), a body that includes government, civil society, private sector players, and development partners. The RExG works through several technical working groups. The NFMS is within the scope of the Science and Technical Working Group (STWG).

The Malawi REDD+ Readiness Programme (MRRP) has provided much support to the Malawi REDD+ Programme (MRP). Since 2015, the PERFORM project continues providing this support. The MRRP and the PERFORM project are efforts of the Government of Malawi, the United States Agency for International Development (USAID), the United States Forest Service (USFS) and Tetra Tech.

Relation to the Malawi REDD+ Program Action Plan: 2014-2019

A Malawi REDD+ Program Action Plan: 2014-2019 for the pursuit of REDD+ readiness covers all aspects of REDD+ readiness, addressing issues related to the NFMS in its section on REDD+ Tracking (Table 1).

Table 1: Items covered in the Malawi REDD+ Program Action Plan: 2014-2019 and how these are taken up in the NFMS roadmap.

Targets from the Malawi REDD+ Program Action Plan: 2014-2019	Coverage in this NFMS roadmap
Target 4.1 To complete a comprehensive analysis of drivers of deforestation and forest degradation	Reference level setting
Target 4.2 To establish a strong LULC mapping program within the GoM [...]	Land monitoring
Target 4.3 To produce national biomass maps at the same five-year intervals as the LULC maps to complement LULC data and enhance awareness and appreciation of forest condition and degradation	Not currently, might become relevant at a later stage when moving beyond this NFMS roadmap
Target 4.4 To develop a NFMS roadmap by the end of the third quarter of 2016	This document itself
Target 4.5 To develop a NFMS action plan that builds on the NFMS road map currently under development	Possible follow up to this document
Target 4.6 To develop a FI/RI approach for Malawi's REDD+ demonstration sites by November of 2015 and to then begin testing that approach across Malawi's REDD+ demonstration sites soon thereafter	Field-based forest inventory
Target 4.7 To implement a National Forest/Resource Inventory based on lessons learned from the Malawi REDD+ demonstration sites by the end of 2017	Field-based forest inventory
Target 4.8 For the Department of Forestry, the Department of National Parks and Wildlife, the Department of Surveys, and the Environmental Affairs Department to co-develop a work plan to delineate the boundaries of all protected areas in high resolution,	Not currently included or prioritized, might become relevant at a later stage when moving beyond this NFMS roadmap
Target 4.9 To develop a strong data management and sharing program by the end of 2018	Cross-cutting issue relevant regarding all four components of the NFMS

Target 8.1 To develop and observe a memorandum of understanding (MOU) between the DoF and EAD that streamlines operations between the REDD+ and GHG regimes, ensuring sound coordination	National GHG inventory
Not currently included among the targets, although mentioned in several places	Reference level setting

Both the Malawi REDD+ Program Action Plan: 2014-2019 and this NFMS roadmap include the same strategy for developing Malawi's capability to track REDD+ results. While the action plan has a broader scope, this NFMS roadmap focuses on the NFMS exclusively. It also puts much emphasis on the national GHG inventory and reference level setting. The Malawi REDD+ Program Action Plan: 2014-2019 calls for this NFMS roadmap to detail the specific capacity development needs for the NFMS (in target 4.4). It also proposes to develop an NFMS action plan in follow up to implement its recommendations (in target 4.5). Although this may be a good way forward, this NFMS roadmap does not necessarily assume that such an NFMS action plan will be developed. Rather, it attempts to provide the MRP with a coherent framework for developing forest monitoring capacities through the use of national and international resources.

The NFMS and required capacities for REDD+ measurement, reporting and verification

This section provides information on measurement, reporting and verification for REDD+ and the national forest monitoring system. It elaborates on necessary capacities for such systems and how these can be developed. This section is not specific to Malawi and its context.

Measurement, reporting and verification of REDD+ and the NFMS

REDD+ relies on an approach for measurement, reporting and verification (MRV) to track results and ultimately serve as the basis for results-based payments. As per the Cancun decisions and the Warsaw Framework, countries wishing to participate in REDD+ for receiving results-based payments must realize five core elements – and three of those directly relate to MRV (Figure 1).

Figure 1: Five mandatory information streams for countries wishing to participate in REDD+, of which three directly relate to MRV.

The NFMS is a set of data collection efforts undertaken by governments in the context of forest and climate change policy. The NFMS serves both for REDD+ and also for the management of the country's forests more generally. Malawi's NFMS should include four main components: (1) land monitoring, (2) field-based forest inventory, (3) an approach to reference-level setting, and (4) the national GHG inventory (Figure 2).

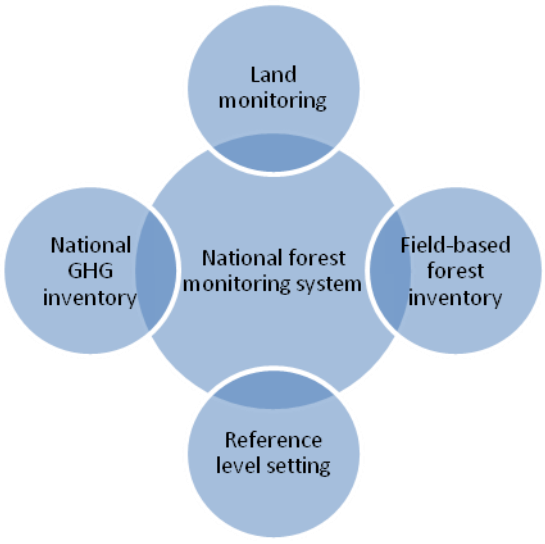

Figure 2: The components of the national forest monitoring system.

Jointly, the components of the NFMS address the MRV requirements for REDD+. Additionally, these components may collect information for purposes unrelated to climate change. Field-based forest inventories deliver information from which emission factors can

be derived and land monitoring delivers core activity data for some, notably deforestation. The combination between data from field inventories and land monitoring provides (historical) emission estimates from forest which are reported to the UNFCCC in the national GHG inventory. A forest reference level is the benchmark for assessing performance of REDD+ implementation. It needs to be consistent with the national GHG inventory, using the same data collected through the NFMS as used in the GHG inventory.[5]

The methodology in compiling this document draws heavily on the above breakdown of the four components of the NFMS. It gives structure to the capacity assessment as well as for institutional role allocation.

Capacities and capacity development

Comprehensive capacity development needs to address technical and functional capacities alike, and extend across the three dimensions of capacity development (Figure 3).

Technical capacity for the NFMS is needed for its four components (land monitoring, field-based forest inventory, the national GHG inventory, and reference-level setting). Technical capacities include the skills of the individuals involved in the components of the NFMS. The availability of appropriate equipment is also relevant. Technical capacity is to be understood to also cover the ability to develop, analyse, and manage data in a sound, scientifically rigorous manner, particularly with a view on the time series that the NFMS requires for reference level setting.

Functional capacity, in turn, includes an array of process-related capacities to operate the NFMS in and between institutions. For example, the NFMS components all come with a set of necessary procedures for data generation, quality checking, documentation, and archiving. The ability to operate complex processes goes beyond the technical skill of individuals involved and also concerns the organisations involved. Moreover, the efforts undertaken to operate an NFMS require a clear backdrop in the mandates of institutions, and ultimately government policy and legal arrangements. Functional capacities also include the ability of individuals to work together across institutional boundaries, for instance, sharing data, which is often challenging, particularly with a view on the national GHG inventory spanning across sectors.

[5] UN-REDD. 2015. The national forest monitoring system.

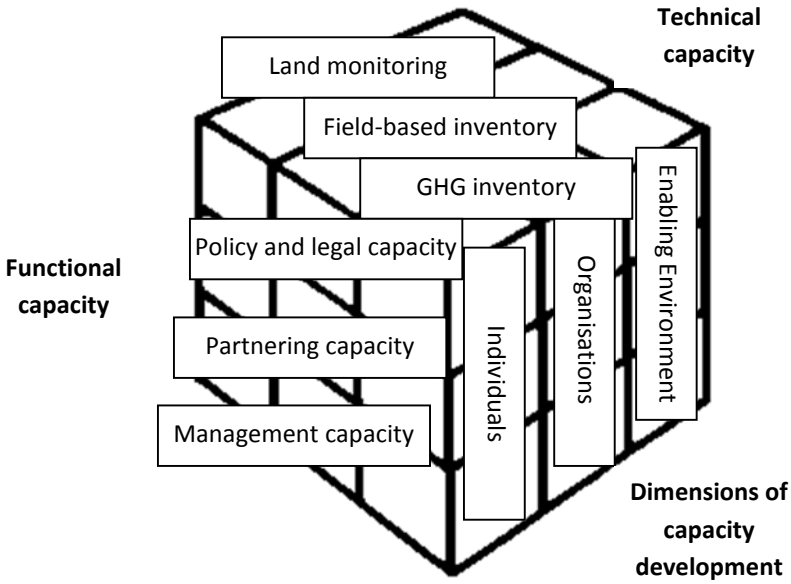

Figure 3: Technical capacities, functional capacities and the dimensions capacity development should address.

Well-designed interventions target three dimensions of capacity development. Individuals receive technical training and organisations are targeted through developing processes and mandates. But both of these entry points can only succeed if there is an enabling environment for capacity development. A culture of cooperation, initiative, and leadership should be fostered internally at each institution, to build a sense of ownership and confidence in Malawi. In the case of the NFMS, awareness raising and lobbying among senior-level decision makers will create such an enabling environment for reform on technical and functional capacities.

The methodology in compiling this NFMS roadmap document draws on the above breakdown of technical and functional capacities. The gap assessment is guided by a distinction of types of capacity and the proposed NFMS roadmap for developing the NFMS takes on board all dimensions of capacity development.

Required capacities for the four components of the NFMS

An assessment of capacity requirements needs to be undertaken for the four NFMS components individually. This assessment should follow the breakdown of technical and functional capacities, as noted. The following summary of required capacities is also encapsulated in the questionnaires that the following section introduce and that the capacity assessment relies on.

The system for ***land monitoring*** is concerned with the collection of data on historical and current land-use / land-cover dynamics. This data typically consists of a time series of past and current land-use / land-cover maps to serve as activity data in the national GHG inventory. At a fundamental level, required technical capacities relate to the availability of critical data and infrastructure, notably remotely sensed imagery and GIS equipment. Beyond these, processes for regular data archiving and accuracy assessments are important functional

capacities. A common limitation to functional capacities is the collaboration between institutions because multiple government agencies are often charged with land management. Introducing a mandatory land-use / land-cover (LULC) classification system and exchanging data between institutions through permanent institutional links are important aspects of institutional arrangements for land monitoring.

A ***field-based forest inventory*** serves to assess the state of vegetation through field measurements. It can be carried out as a multi-purpose national forest inventory in its most complete form. Field-based inventories provide carbon density estimates and therefore important emission factors that can be used together with land monitoring information to estimate emissions from forestry. A strong capacity indicator is whether a national forest inventory has been completed yet in the country. Technical capacities also include whether a network of permanent sample plots is in place and whether this plot system includes only forest land-use / land-cover types or other types, as well. Beyond technical aspects, data handling and archiving is often a challenge, as is the transparency with which inventory results are made publicly available. The most critical functional capacities relate to institutional role allocations (with budgetary provisions) for periodic inventories.

The ***national GHG inventory*** tracks results of REDD+ for comparison against the reference level. It draws on field-based forest information and on land monitoring as emission factors and activity data. In many countries, regular and detailed reporting streams may already be in place in the context of the National Communications to the UNFCCC and their Biennial Update Reports and these are good indicators of existing capacities. For developing national GHG inventories a range of technical capacities are required that are mostly already covered with the technicalities of the field-based forest information and land monitoring. But more generally, it is important that lands are stratified at a high level of detail by land-use / land-cover, climate, soils, and management regime. Such stratification, as with all methodological aspects, needs to be documented transparently and in detail. Concerning functional capacities, quality control procedures in and between institutions are key and should be connected to planning processes for GHG inventory implementation and improvement. Such quality control processes will help several institutions work together and share data for the GHG inventory across institutional boundaries and they should be complemented by clear role assignments.

The ***reference level*** is the benchmark against which REDD+ results will be assessed. It has a consistent approach to assessing REDD+ results. Since it relies on the same data as used in GHG reporting, required capacities for developing a REDD+ reference level are mostly of a technical nature. An obvious capacity indicator is whether a reference level has already been developed and submitted to the UNFCCC or whether development steps have been undertaken, such as the collection of details on national circumstances or the definition of scope and scale for the reference level.

Linkages between the NFMS, the REDD+ strategy, safeguards, and policies and measures

The NFMS is one of the required elements for developing and implementing a REDD+ strategy. As indicated, the NFMS serves to track the performance of REDD+. Beyond this, the NFMS also plays an important role regarding the development of the national REDD+ strategy itself, the collection of information on REDD+ safeguards, and the monitoring and evaluation of policies and measures.

The REDD+ strategy is a policy document laying out how a country aims to address the drivers of deforestation and forest degradation. Typically, it defines targets and objectives for REDD+, a set of REDD+ policies and measures to address the drivers of deforestation and forest degradation, and a description of implementation arrangements. The REDD+ strategy is built upon a sound analysis of the drivers of deforestation to underlie the identification of a set of policies and measures to address them. A well-developed drivers analysis will need to draw on the results of the NFMS for quantitative data on land-use / land-cover and its dynamics. In addition, the establishment of quantitative targets for REDD+ must be informed by data from the NFMS.

The Safeguards Information System is a mandatory information stream on the approaches taken within the implementation of REDD+ that adhere to the six Cancún safeguards. Safeguards information can be collected using quantitative indicators and the NFMS is a sound data source for some of these safeguards; for example, reporting on the requirement that natural forests not be converted to another land-use / land-cover through the implementation of a REDD+ strategy.

In the context of monitoring individual REDD+ policies and measures, the NFMS could generate quantitative information on their impacts on forest cover. It is important to understand that there is no requirement that such policies and measures reflect directly in the REDD+ results as per the wall-to-wall measurements of the NFMS. Policies and measures for REDD+ need to have their schemes for monitoring and evaluation that function independently of the NFMS and the wealth of data collected at a national scale may be a supporting data source.

Methodology

This section provides information on the methodology applied in developing this roadmap for developing Malawi's national forest monitoring system. It includes an overview of activities and methodological tools.

Overview of activities for developing the NFMS roadmap

The methodology for developing this NFMS roadmap proceeded along the lines of six steps (Figure 4). These steps also correspond to sections in the NFMS roadmap document.

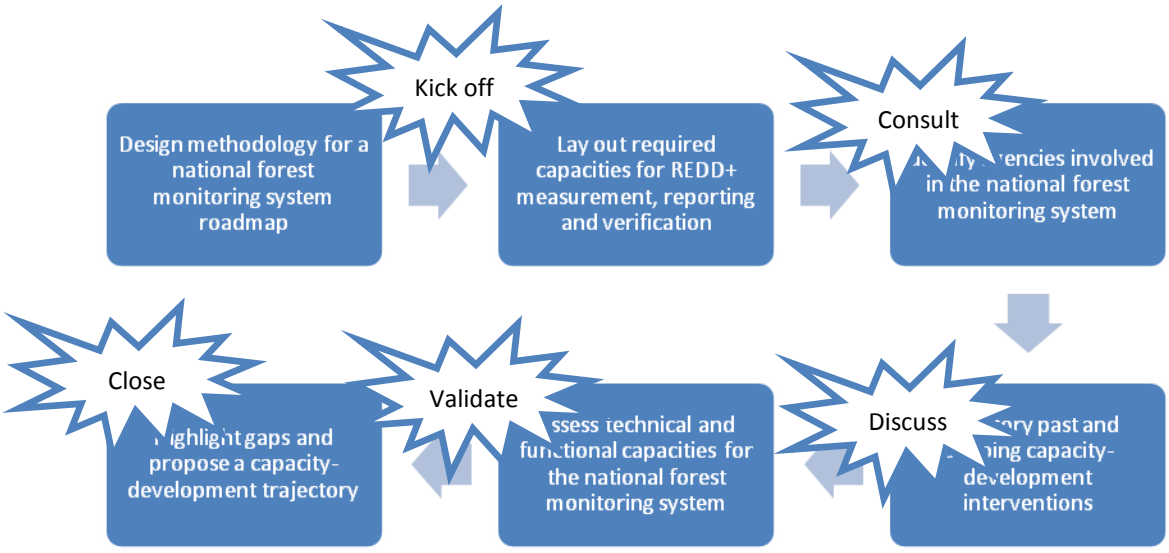

Figure 4: Methodology for developing the NFMS roadmap for developing Malawi's national forest monitoring system.

The following steps were undertaken:

- Work kicked off in April 2015 with the initial design of the methodology to be contained in the inception report.
- An inception working session was carried out on occasion of the Country Needs Assessment / Targeted Support launch event in late April 2015 to familiarise partners with the planned work, its methodology, and its expected results.
- Previous work contributing to assessment or development of capacities for the NFMS was reviewed during May to August 2015.
- Interviews were carried out during May to August 2015 with partners and broader interest groups involved in the national forest monitoring system and REDD+.
- A focus group discussion took place in early July with several principal agencies involved in the NFMS.
- Results were validated at a workshop 8 October 2015.
- Work closed in October 2015, delivering a NFMS roadmap for developing Malawi's national forest monitoring system.

Workshops and focus group discussions

Several events were carried out to collect feedback from principal agencies and key partners. These include an inception working session (see Annex on the summary report of the inception working session), a focus group discussion (see Annex on the summary report from

a focus group discussion) and a validation workshop (see Annex on the summary report from the validation workshop).

The events complemented interviews for data collection, but mainly were used to work on more complex methodological tools: NFMS problem tree and institutional role mapping for the NFMS.

Review of prior work

Prior work conducted for the analysis and assessment of the NFMS components was reviewed in detail. In fact, much of the analysis and the recommendations in this NFMS roadmap were gleaned from such previous work. The most important sources of information that were available are listed in the Annex on literature consulted.

Interviews and questionnaires

The necessary interviews and possible interview partners were discussed at the inception working session (see the Annex on the summary report from the inception working session).

During the interviews, a set of pre-defined questionnaires was applied (see the Annex on the questionnaires used). Using questionnaires ensured collecting complete and comparable sets of information. The questionnaires also served for documenting interview results. Much of the original answers to questionnaires are contained in the following sections.

Agencies involved in the NFMS

This section contains an overview of the agencies involved in the national forest monitoring system. It profiles the key agencies and separates out their respective roles and responsibilities.

Overview of institutional role mapping

A number of agencies are actively involved in the discussions about forest assessment and monitoring. These are the institutions that are expected to play key roles in the NFMS for REDD+. The key agencies for the NFMS include: the Department of Forestry (both headquarters and the Forest Research Institute of Malawi), the Environmental Affairs Department, the Department of Surveys, the Land Resources Conservation Department and the Department of National Parks and Wildlife.

A clear division of roles and responsibilities between agencies is paramount to ensure a well-functioning NFMS. For some of the components, there is a risk of finding gaps and overlaps, but for others there is more clarity (Table 2).

Table 2: Institutional role allocation for the components of the NFMS and related gaps.

Components of the NFMS	What is clear?	What is less clear?
Land monitoring	The DoS coordinates land monitoring for the NFMS and forest monitoring is within the mandate of the DoF and the DNPW.	But, modalities for collaboration need definition, and there are several other agencies that also have related mandates, including the LRCD. Institutional agreements are not in place.
	DoF has a mandate to define forests. (Although a practical forest definition is only just being developed and has not yet been formalized.[6])	But such categories need to work as part of a larger classification system to be agreed with other agencies, including the DoS, the DNPW, and the LRCD.
	The DoF and the DNPW lead the mapping of forest extent and dynamics.	But producing consistent maps requires joint efforts with several other agencies that have advanced infrastructure and processes for data management, including the DoS and the LRCD.
Field-based forest inventory	Assessment and monitoring of forests is within the mandate of the DoF,	But if an effort for field-based data collection was to inventory also non-forest vegetation, agricultural lands and protected areas, collaboration with other

[6] cf. Mills (2015).

	including through field-based forest inventories.	departments such as LRCD and DNPW would be necessary too.
	FRIM coordinates field-based forest inventories, working together with several other agencies.	But there are several other roles to be covered (planning, implementation, quality control, archiving, dissemination). Terms of reference to define roles and collaboration are not yet in place.
GHG inventory	The EAD coordinates the GHG inventory compilation process.	But there is no clarity as to other important roles such as planning, QA/QC, archiving, data provision, dissemination.
	Several technical agencies contribute data to the GHG inventory, including the DoF for aspects related to land.	But these agencies contribute only ad hoc and there are no relevant inter-agency agreements.
Reference level setting	Assessment of forests is within the mandate of the DoF, including also through reference levels.	But not much discussion has yet taken place on reference levels and institutional role allocation.

The above overview of role allocations and gaps shows that there is much scope for improving institutional collaboration. It will be crucial to address these points about institutional role allocation. The below capacity development trajectory addresses these and proposed activities to clarify institutional roles and means of collaboration.

- A Memorandum of Understanding between LRCD, DNPW, DoS and DoF should be developed to define roles on land mapping, GIS and remote sensing for forests.
- Specific terms of reference for FRIM's coordinating role of the field-based forest inventories and institutional agreements to define collaboration should be developed.
- Formal inter-agency agreements should be put in place to define the collaboration of EAD with other agencies for the national GHG inventory, including the DoF.
- A discussion on institutional roles for reference-level setting should also be undertaken.

The Department of Forestry

The Department of Forestry (DoF) was established in 1942. It is headquartered in Lilongwe. The department resides within the Ministry of Natural Resources, Energy and Mining. The DoF has a significant number of staff ranging from frontline staff, technical staff and professional staff totalling 4,996. The DoF budgets for about USD 1,186,000 from the Forest Development and Management Fund (set up in conjunction with the Ministry of Finance to channel a certain proportion of revenues arising from sale of forest produce, fines and

penalties and licences) annually but gets about USD 678,000 from the fund. It also budgets for about USD 847,000 for recurrent expenditures (allocated from central government budget, other than revenue from sale of forest produce, fines and penalties or licences) but receives about USD 229,000 for recurrent expenditures annually on average.

The DoF is guided by the Forestry Act of 1997 (Chapter 63:01). Its purpose is "*to provide guidance, planning, coordination, facilitation and promotion of active participation services for services for sustainable management, development and utilisation of forest resources*."

With the current Malawi National Forestry Policy under review, several new issues are expected to be covered additionally, such as climate-change related issues, GIS and remote sensing, forestry marketing, and licensing. Other than the Forestry Act and the forthcoming National Forestry Policy, other policy documents include Community Based Forest Management, 2003, a supplement to the National Forestry Policy of Malawi; Forest Rules, 2003; the National Forestry Programme, 2001 and the Silvicultural Guide Book, 1977.

According to interviews conducted with DoF staff, the DoF's GIS Unit aims to conduct forest resource assessments and mapping, including carrying out spatial data analysis and interpretation, developing maps, maintaining and consolidating spatial information, and disseminating information on the status of forests to stakeholders. Capacity gaps have, however, been identified for the DoF's GIS Unit to carry out most of these activities (see section on technical and functional capacities within the NFMS).

The Planning Unit is supposed to carry out monitoring and evaluation of forest activities carried out by the department as well as other stakeholders. The unit is also supposed to consolidate forest from the local level into national level data. The unit is also supposed to coordinate planning at regional level especially for plantations and forest reserves. It is also supposed to consolidate the departmental budget for submission to the ministry.

The DoF has plans to establish a Carbon Unit (aka Climate Change Management Section). According to interviews conducted with DoF staff, the unit is supposed to be a platform to provide direction for climate change and carbon management activities in the forestry and land management sector and to coordinate the technical components of related projects. It would mainstream climate change and carbon management activities in the forestry sector's planning, implementation and monitoring processes and promote strategic engagement of key stakeholders. Ongoing momentum is not immediately visible towards the establishment of a Carbon Unit.

The Forestry Research Institute of Malawi (FRIM) is the research arm of the DoF. It was established in 1957. It has ten confirmed professional staff and five additional staff. The FRIM is based in Zomba and has sub-stations in the Central and Northern regions. A strategic document, the National Forestry Research Strategic Plan 2002-2007, expired and a review is planned for the near future. FRIM is generally mandated to undertake endogenously well designed and relevant research programmes, whenever necessary, in collaboration with local or external organizations, to generate usable technologies, or adapt to local conditions exogenous technologies, in order to improve and achieve sustainable management and

utilization of both planted and natural forest and tree resources. Specifically FRIM'S mandate is to provide information and improved tree germplasm and to carry out stakeholder-oriented research on the sustainable management, utilisation and conservation of trees and forests in Malawi.

During the recent past, FRIM has been engaged in leading and coordinating forest inventory related work in Malawi. Such engagement has included a lead role in implementing projects related to forest resource assessment and monitoring. These efforts also included work in collaboration with other key institutions such as the academia and DoF staff. According to interviews conducted with FRIM staff, FRIM has also maintained a database for such project-based data collection efforts. It is, however, not currently clear how effective this database is and whether it adheres to basic principles of data management.[7]

According to a recent recommendation of the RExG, the DoF should contribute to work on ***land monitoring*** within the NFMS.[8] The DoS would coordinate land monitoring and there are options on defining the roles of the DoF and the LRCD, among others. Although details have not yet been defined, the LRCD might take responsibility for general land-use / land-cover mapping, while the DoF contributes forest mapping. A Memorandum of Understanding between LRCD, DoS and DoF should be developed to define roles on land mapping, GIS and remote sensing for forests.

According to a recent recommendation of the RExG, FRIM should lead work on ***field-based forest inventories*** within the NFMS.[9] There are several other roles to be covered (planning, implementation, quality control, archiving, dissemination). It should collaborate with several national institutions, such as Mzuzu University, Lilongwe University of Agriculture and Natural Resources, and the DoF's Planning Unit. Following on this recommendation, specific terms of reference for FRIM's coordinating role of the field-based forest inventories and institutional agreements to define collaboration should be developed.

Regarding the ***national GHG inventory*** and regarding ***reference level setting***, there are not yet advanced discussions regarding DoF's possible role. According to interviews conducted with EAD staff, there seems to be an expectation at the EAD that the DoF contributes the parts related to lands to the national GHG inventory, but there are not yet formal discussions in this direction and the recent National Communications to the UNFCCC do not specifically highlight the DoF's contribution. Similar, there are not yet discussions ongoing regarding institutional role allocation for REDD+ reference-level setting. Formal inter-agency agreements should be put in place to define the collaboration of EAD with other agencies for the national GHG inventory, including the DoF. A discussion on institutional roles for reference-level setting should also be undertaken.

[7] cf. Alegria (2014a).
[8] MRP. 2014. Minutes of the 9th session of the Malawi REDD+ Expert Group, held at Ufulu Gardens on 18th December 2014.
[9] cf. MRP (2014).

The Land Resources Conservation Department

The Land Resources Conservation Department (LRCD) is mandated to promote the conservation of land resources and to conduct land-use planning, including mapping. The Department was established in 1995, having existed previously as the Land Husbandry Unit in the Department of Extension Services. A draft Land Use Act was prepared in 2001 and is yet to be enacted. Its mandate is to ensure sustainable use of land-based resources primarily but not exclusively for agriculture.

The Department resides within under the Ministry of Agriculture and Food Security. Its headquarters are in Lilongwe. The department receives on average about USD 34,000 per year, much less than requests of approximately USD 136,000 per year. It has a staffing of 90 across various grades. The department has a shortfall of staff especially in technical areas.

The LRCD is divided into three technical units, one of which is the Land Resources Surveys and Evaluation Unit. According to the department's policy mandate and departmental profile from 2010, this unit is responsible for generating, analysing, publicising, and disseminating land resources information at national and district levels, including also the production and storage of maps and reports.

As per its mandate the LRCD is a key agency for mapping and monitoring of lands, particularly agricultural alnds. Accordingly, the RExG recently recommended that LRCD also contribute to ***land monitoring*** for the NFMS, under coordination of the DoS and in collaboration with several other agencies, including the DoF.[10] Although details have not yet been defined, the LRCD might take responsibility for general land-use / land-cover mapping, while the DoF and the DNPW contribute forest mapping. A Memorandum of Understanding between LRCD, DoS, DNPW, and DoF should be developed to define roles on land mapping, GIS and remote sensing for forests.

The Department of Surveys

The Department of Surveys (DoS) is mandated to provide surveying and mapping services to the public and private sector in Malawi. It also gives guidance regarding spatial information generation and dissemination to other agencies. The mandate of the DoS work is based on the Land Survey Act, the Registered Land Act, the Adjudication of Titles Act, and the Customary Land Act (chapters 59:03 and 58:01, 58:03 and 59:01, respectively). The DoS has a strategy developed in 2009.

The DoS resides within the Ministry of Lands Housing and Urban Development and is headquartered in Lilongwe. The DoS has 250 staff members and is overseen by the Surveyor General. The budget is not fixed as it depends on the budgets approval. Mostly, funding allocated is far less than actual needs. Underfunding is a challenge for the DoS, as it is with nearly all government agencies.

[10] cf. MRP (2014).

According to a recent recommendation of the RExG, the DoS should be the lead institution for work on ***land monitoring*** within the NFMS.[11] For this, it is expected to coordinate the LRCD and the DoF among other institutions According to interviews conducted, this collaboration does not yet function seamlessly as several agencies, such as LRCD and DoF, produce maps without collaborating or sharing information. The specific terms for collaboration and data sharing are not yet officially agreed. A Memorandum of Understanding between LRCD, DoS and DoF should be developed to define roles on land mapping, GIS and remote sensing for forests.

The Environmental Affairs Department

The mandate of the Environmental Affairs Department (EAD) is to provide cross-sectoral coordination, monitoring, compliance oversight, and facilitate the integration of environmental concerns into sectoral policies, plans, and programs to ensure sustainable development.

The EAD resides within the Ministry of Natural Resources, Energy and Mining. It was established in 1996 with its headquarters in Lilongwe. It has a staff compliment of 98 with 28 District Environmental Officers (one for each district). EAD has for the past three years had an approved budget of about USD 150,000 per year. It also receives negligible funds from environmental impact assessment fees and about USD 20,000 per year from penalities.

The EAD was established by and sources its mandate from the Environment Management Act (1996). Important strategic documents guiding the EAD include also the National Environmental Action Plan (NEAP), 1994 and 2000; the National Environmental Policy, 2004; the National State of Environment and Outlook Report, 2010; the National Adaptation Programmes of Action (NAPA), 2006; the Environmental Impact Assessment Guidelines, 1997; the National Biodiversity Strategy and Action Plan (NBSAP), 2006 and 2014; the National Climate Change Investment Plan, 2013; and the National Strategy for Sustainable Development (NSSD), 2004.

It is also planned that the EAD coordinates the implementation of the National Climate Change Policy (NCCP). The NCCP has been in the drafting stage for several years and its cabinet approval is soon to be expected. Among many other functions, it may provide a framework for formalizing institutional relationships.

Regarding the components of the NFMS, the EAD acts as focal point to the UNFCCC, and it is therefore mandated to coordinate the ***national GHG inventory*** as part of compilation of National Communications to the UNFCCC. According to interviews conducted with EAD staff, the EAD plans to work with a range of partners to implement the national GHG inventory through a set of technical working groups. Specific sets of terms of reference are currently under development. Technical partners to collaborate with EAD may include: the University of Malawi, the Department of Energy Affairs, the Coordination Unit for the Rehabilitation of the Environment, the Ministry of Agriculture, Irrigation and Water Development, the City Councils on Waste Management, and the DoF. For the national GHG

[11] cf. MRP (2014).

inventory in the land sector, relevant for the NFMS, clearly the DoF is EAD's most important partner and its participation in a GHG and Carbon Mitigation Working Group has been specifically recommended.[12] Formal inter-agency agreements should be put in place to define the collaboration of EAD with other agencies for the national GHG inventory, including the DoF.

The Department of National Parks and Wildlife

The Department of National Parks and Wildlife (DNPW) is the public institution mandated to manage national parks and game reserves. The department is headquartered in Lilongwe City. The DNPW is under the Ministry of Natural Resources, Energy and Mining. It came into existence in 1973. It has a total of 732 staff out of which 190 is support staff the rest being technical staff. In the 2015/2016 financial year the Department requested a total of about $2,600,000 from government for its Development Budget to construct electric fences, improve protected area infrastructure, but only got $932,000. It also requested $850,000 for other recurrent transactions but only $353,000 was approved.

The DNPW is mandated through the National Parks and Wildlife Act 1992 revised in 2004 and the Wildlife Policy of 2000 to protect Malawi's wildlife resources and regulate their sustainable use for the benefit of Malawians. Since 2000, the DNPW has been implementing wildlife policy strategies in order to fulfil this mandate. As a government agency the DNPW was established under act of parliament and its functions are guided by the wildlife policy and the wildlife legislation. The DNPW has a strategic plan which is in line with Malawi Growth and Development Strategy (II) of 2011-2016, especially with regards to management of natural resources and the environment.

National parks and game reserves represent, to a large extent, intact forests in the country and are a reservoir of biodiversity. The department manages 5 National Parks, 4 Wildlife Reserves and 3 Nature Sanctuaries covering about 11,000 square kilometres which is 11.1% of the country's total land area. This area is covered in indigenous vegetation which for the purpose of wildlife survival and tourism its growth is closely monitored and protected by relevant DNPW field staff. All fauna and flora are well documented. Any violations regarding the destruction, prohibitive / illegal entry, encroachment, unauthorized collection of forests and forest products in the protected areas leads to arrest and prosecution under the National Parks and Wildlife Act.

The DNPW is only recently engaging in work under the NFMS and REDD+. It is nonetheless an important agency for forest monitoring since it is responsible for a large part of Malawi's forest lands. The DNPW may opt to rely on collaboration with other agencies, including the DoF, for its contribution to the NFMS.

[12] Ministry of Finance and Development Planning. 2011. Capacity Needs Assessment for Climate Change Management Structures in Malawi.

Other important organizations involved in the NFMS

Several other important organizations may also have supporting roles to play in the NFMS. The following are some of these other important organisations.

Government:

- Department of Economic Planning and Development (DEP&D) through the M&E Unit are legally mandated to oversee all monitoring and evaluation activities in the country. The Malawi Growth and Development Strategy II which is coordinated by the department mentions forest cover as one variable to be monitored at national level.
- Ministry of Local Government and Rural Development (MLGRD) is legally mandated to ensure effective decentralisation of key central government functions in liaison with other ministries that support effective management of natural resources. The ministry is instrumental at local government where forest and other activities take place.
- The Department of Meteorology and Climate Change Management's (DMCCM) mandate is to monitor, predict and provide information on weather, climate and climate change that would contribute towards the socio-economic development of the country. Meteorological data collection in Malawi dates way back to the early 1890s when the country became a British Protectorate.
- Department of Disaster Management Affairs (DoDMA) was established through the Disaster Preparedness and Relief Act of 1991. DoDMA is the Government of Malawi's agency responsible for coordinating and directing the implementation of disaster risk management programmes in the country in order to improve and safeguard the quality of life of Malawians, especially those vulnerable to and affected by disasters.
- The Department of Agriculture Research and Technical Services (DARTS) is a technical department in the Ministry of Agriculture and Irrigation and is responsible for conducting research and generating technologies for increased and improved agricultural productivity. Its mandate is to conduct research on all crop and livestock types, with the exception of tobacco, tea, and sugarcane. It is also mandated to offer technical support and advisory services to farmers and stakeholders on soil and leaf tests, certification of seeds, and agricultural imports and exports. Agriculture research in Malawi can be traced back to the establishment of the four main research stations in the 1940s.

Civil society:

- Centre for Environmental and Policy Advocacy (CEPA), is a civil society organisation with interests in environmental policies in the country. They also conduct advocacy on the same. In the MRP CEPA would be key in providing input towards policy and governance that relate to REDD+ activities in Malawi.
- Total LandCare (TLC) has been instrumental in agriculture and natural resources management in the country. One of their activities was a project called KULERA (to nurture) whose overall objective was to secure long-term biodiversity of Malawi's protected areas by transforming impoverished communities on degraded lands around protected areas into prosperous communities on healthy land. They worked on a theme around climate change, communities and biodiversity.
- African Parks is a private wildlife agency working in a public-private partnership with the Department of National Parks and Wildlife and have so far been successful. They have also been involved in REDD+ activities using the voluntary market processes.

- The Coordination Union for the Rehabilitation of Environment (CURE) is an umbrella NGO putting together other NGOs involved in environmental issues in Malawi. Their mission is to enhance effective management of Malawi's environment and natural resources in a participatory and sustainable manner through coordination, communication, capacity building and advocacy. Their goal is to enhance environmental governance for sustainable livelihoods. They would play a crucial role in MRRP and NFMS in particular in issues to do with governance, capacity building and advocacy.
- Leadership for Environment and Development for Southern and Eastern Africa (LEAD SEA) are involved in developing leadership in environmental among young professionals and also in development of capacity for effective management of natural resources.
- Malawi Environment Endowment Trust (MEET) provides grants to communities to protect and manage their natural resources for sustainable livelihoods. They could be used to channel REDD+ finance.
- Mulanje Mountain Conservation Trust (MMCT) is a trust established to manage the biodiversity of the mountain and also initiate participatory livelihoods activities for the benefit of communities surrounding the mountain and beyond.
- Centre for Capacity Development and Management (CDM) are involved in capacity development in natural resources management and in institutions. CDM is active in building capacity in GIS for various stakeholders in the country.
- National universities are key in capacity building, research and advocacy in as far as natural resources are concerned. They would be key in developing skills in RS/GIS, forest inventory , GHG inventory skills among other skills.
- Sustainable Rural Growth and Development Initiative (SRGDI) is an NGO advocating for sustainable environmental management in the country.
- Training Support for Partners (TSP) is a capacity building NGO. They have been involved over the years in capacity building for sustainable natural resources management.
- The National Herbarium and Botanical Gardens (NHBG) are key in conserving biodiversity and ecosystem conservation including conservation of rare, threatened, endangered socio-economically important trees and other plants. Forest conservation is one of the key activities under REDD+.
- The Wildlife and Environmental Society of Malawi (WESM) is the oldest environmental organisation in Malawi. They are involved in various environmental activities including advocacy, awareness and development.
- Private tobacco and tea estates (e.g. Eastern Produce Malawi Limited).

Relevant projects

- PERFORM project (Protecting Ecosystems and Restoring Forests in Malawi) under Restoring the Environment through Prosperity, Livelihoods and Conserving Ecosystems (REPLACE) under the US Presidential Global Climate Change Initiative aims to advance low-emissions growth, climate change resilience and sustainable natural resource management in support of Malawians' quality of life. The practices and lessons learnt in low-emissions growth, climate change resilience and sustainable natural resource management as developed during the lifespan of the project will be key in advancing the REDD+ agenda in Malawi including the NFMS.

Inventory of past and ongoing capacity-development interventions

A range of capacity-development interventions have been implemented during the last years that supported development of the NFMS components (Table 3). Beyond these, a multitude of smaller-scale data collection programmes were implemented that are largely associated with irrelevant project areas or vegetation types. These smaller-scale efforts are not included here.

Table 3: Recent and ongoing capacity-development interventions that supported the development of the NFMS at a national scale.

Name of the initiative	Implementation time	Carried out by who	National Partners	Type of support
Land monitoring				
National Forest Inventory	1991-1993	SatelliteBild / World Bank	DoF	Data collection
FPP	2012	Asia Air Survey / JICA	DoF	Data collection
IALUO	2013	LTS / World Bank	DoF / LRCD	Data collection
AfriCover	2013	FAO	?	Data collection
RCMRD	2013	RCMRD / US-EPA	EAD	Data collection
Global Land Cover Project	2013	USGS	?	Data collection
Shire River Basin Management Programme	?	Worldbank	WRD, DoS and others	System design for MASDAP
Integrated Monitoring in SADC	Ongoing-2015	GIZ	DoF	Strategy design for land monitoring
MRRP	Ongoing-2015	USFS / USAID	DoF	LULC standard design, forest definition
PERFORM	Ongoing	Tetratech / USAID	DoF	LULC standard design, forest definition, develop GIS laboratory
Field-based forest inventory				
National Forest Inventory	1991-1993	SatelliteBild / World Bank	DoF	Data collection
PERFORM	Ongoing	Tetratech / USAID	DoF	Strategy design for forest inventory and technical approach, compile existing data and calculate emission factors
MRRP	2012-2015	USFS / USAID	DoF	Strategy design for forest inventory and technical approach
Integrated Monitoring in SADC	Until 2015	GIZ	DoF	Strategy design for field-based forest inventory
National GHG inventory				

Country Studies Programme	1995	USAID	EAD	Data collection
INC	2001	UNEP	EAD	Data collection
SNC	2010	UNEP	EAD	Data collection
ESA / CD-REDD	2010-2013	CfRN / US-EPA	EAD / DoF	Training
PERFORM	Ongoing	Tetratech / USAID	EAD	Develop technical and functional capacity, build institutional arrangements
TNC	Ongoing	UNEP	EAD	Data collection
Reference-level setting				
IALUO	2013	LTS / World Bank	DoF / LRCD	National circumstances
MRRP	2014-2015	LTS / USFS	DoF	(Qualitative) drivers analysis
PERFORM	Ongoing	Tetratech / USAID	DoF	(Site-level) drivers analysis

A list of land-use / land-cover maps are available for the country from several time periods (Table 5). The maps draw on different land-use / land-cover classification schemes, forest definitions, methodologies and data sources and can therefore not easily be compared. Moreover, the MRP, with support from the Malawi REDD+ Readiness Program (MRRP), recently developed a national land-use / land-cover schema (including a definition of forest) to facilitate the coherency and comparability of future mapping efforts. This schema has not yet been formalized by the Government of Malawi.

A field-based forest inventory was carried out at a national scale in the 1990s by SatelliteBild / World Bank, but the data from this project has been lost. The MRRP conducted several capacity assessments on forest inventory and carbon accounting at the DoF and FRIM. The USAID-funded effort, Protecting Ecosystems and Restoring Forests in Malawi (PERFORM), will soon complete a strategy for a forest inventory and test the proposed approach on select pilot sites.

The CD-REDD project provided technical capacity development to EAD and the DoF on national GHG inventories for agriculture and land management. More recently, the PERFORM project placed an embedded advisor at the EAD to address capacity gaps associated with GHG accounting. The EAD also receives support from the UNEP for development of Malawi's National Communication to the UNFCCC. The EAD is not currently targeting the development of Biennial Update Reports.

The DoF has not yet begun targeted capacity development for the setting of REDD+ reference levels, but several projects have made contributions that are closely related. The MRRP supported a drivers analysis, a fundamental first step towards defining national circumstances for reference levels. The World Bank sponsored the IALUO project that developed land-use / land-cover scenarios for 2030 and 2050, which may be of use for determining national circumstances of REDD+ reference levels.

Overview of technical and functional capacities for the NFMS

This section contains an assessment of technical and functional capacities for the national forest monitoring system. It is broken down by the components of the NFMS and is structured around the results of using predefined questionnaires for capacity assessment. There is also an overview of recurring issues found across the NFMS components.

Recurring issues in capacity assessment for forest monitoring

During the consultations for capacity assessment, a number of recurring issues were identified. These recurring issues provide the context for the more specific assessment of technical and functional capacities using predefined questionnaires. They are also underlying causes of the identified capacity gaps.

Governmental decision making and natural resource management does not always draw on best available data. During consultations, government staff and other stakeholders repeatedly pointed out that political considerations largely drive governmental decision-making, not evidence. For example, this is why the results of an internationally-funded forest inventory never became the basis for the country's forest management, with the data from this effort also lost. When data remain unused, there is risk that data and capacities for data management are lost. Low regard for data is an underlying and broad issue relating to the perceptions and common practices of the country's public servants. (This is a summary of information contained in the problem trees on land monitoring and on the field-based forest inventory.)

Institutional role allocation and modalities for institutional collaboration are often unclear. It is not clear how DoF headquarters and FRIM split roles for field-based forest inventories.[13] It is unclear what the specific contributions of DoF, DoS and LRCD are for land mapping.[14] Data sharing for the national GHG inventory occurs ad hoc, and there is no institutional mandate yet for reference-level setting. The lack of clarity holds up processes, impedes data sharing among government agencies, and results in duplication of work. Although clarifying roles and modalities would come at low costs, reaching decisions would require significant attention from senior-level decision makers. (This is a summary of information contained in the section on overview of institutional role mapping.)

Processes for data definition, data archiving and quality checking need much development. There are gaps with regards to data standards. For example, there is no LULC standard available yet. For example, Malawi has no commonly accepted standard for managing spatial data. Also, there is no effective process in places for archiving data of relevance to the NFMS. For example, the results of the World Bank-sponsored national forest inventory are lost. Lastly, there is also no effective process to ensure that individual data collection efforts comply with quality standards. For example, the past GHG inventories each used their own set of quality standards and definitions. Where there are processes for data archiving and

[13] Kanaan, R. and Farmer, A. and Caldwell, B. 2015. A rapid assessment of REDD+ measurement, reporting and verification (MRV) capabilities and potential in Malawi. Protecting Ecosystems and Restoring Forests in Malawi (PERFORM). Tetratech, USAID.
[14] cf. Miewald (2014).

quality checking available, these are often neglected. For example, the DoS offers a set of quality standards and also an archiving platform for spatial data that other departments do not use routinely. (This is a summary contained in the sub-sections below on land monitoring, the field-based forest inventory and on the GHG inventory.)

Development Partners have invested in data collection and a wealth of data are available. A set of five land-use / land-cover maps with several inventory timepoints are available that would all be useful for forest monitoring (Table 5). A national forest inventory was carried out in the 1990s. Several GHG inventories have been compiled and land-use / land-cover development scenarios have been analysed. Development partners have provided equipment (hardware and software) and technical trainings on forest monitoring, remote sensing, GIS, and GHG inventories. There is not, apparently, a lack of data, funds for data collection and equipment or for technical training. (This is a summary of information contained in the section on inventory of past and ongoing capacity-development interventions.)

Government programmes for forest monitoring are underfunded. The World Bank funded the national forest inventory in the 1990s, the country's several land-use / land-cover maps are known by the acronyms of the respective development partners. UNEP mostly funded the past national GHG inventories, the World Bank and the USAID have funded some work towards reference level setting. The government budget for ongoing data collection is, in contrast, rather limited. Similarly, to date the advancement of REDD+ readiness and the coordination required for that pursuit have relied on embedded international advisors. During consultations, the lack of sustainability in internationally funding the development of databases and technical capacities has been recognized at several occasions. It remains to be seen whether the ongoing REDD+ process can create a push for a nationally-funded government programme for forest monitoring rather than perpetuating reliance on international funding sources. (This is a summary of information contained in the sub-sections on land monitoring and the field-based forest inventory.)

These issues underlie much of the capacity gaps that were identified for the individual NFMS components. While the following sections of this NFMS roadmap propose a list of capacity development interventions to address technical shortcomings of the NFMS, more broadly it emerges that ***strong leadership is needed to improve forest monitoring***. The senior-level management across the several departments involved in the NFMS need to commit resources and their own efforts to forest monitoring.

Developing Malawi's REDD+ programme may be instrumental in garnering such political support. The ***REDD+ strategy could guide forest monitoring and the development of the NFMS***. Although the country's REDD+ programme is at an early phase and has received little national resources much work is underway or planned in the Malawi REDD+ Program Action Plan: 2014-2019 and it already proposes concepts such as 'no-regrets REDD+' and a 'landscape approach to REDD+', which could give direction to developing the NFMS if part of a REDD+ strategy.

Land monitoring

The assessment of capacities for land monitoring draws on past assessment reports, several interviews and focus group discussions. These relied on a pre-defined questionnaire (Table 4) and also led up to building problem trees (see further below).

Table 4: Capacity assessment on land monitoring according to a set of pre-defined indicators. The responses were collected through interviews with representatives from the DoF, FRIM, LRCD, and DoS.

Pre-defined questions	Response
Do available satellite data cover a detailed time series of historical time points?	***Partially***, there are several sets of land-use / land-cover maps available.
Is the geographic information system laboratory well equipped?	***Partially***, the DoF has a well-equipped GIS and remote sensing laboratory, although the internet is slow. The DoS also has a well-equipped laboratory with good internet connection.
Is ground truthing used for accuracy assessment?	***Partially***, ground truthing is done on a project basis but not according to a common approach or using existing reference ground-truthing points.
Are data routinely archived?	***Partially***, this is mostly done ad hoc. The DoS uses MASDAP, as a repository for GIS information, but other departments do not routinely use it. For other kind of data, archiving processes or tools are unavailable.
Is there a functioning data sharing process between institutions involved in land monitoring?	***No***, data sharing is only done ad hoc and there are expectations of funds transfers.
Is an official land classification scheme agreed upon?	***Partially***, this is under discussion.

Several land-use / land-cover maps are available for Malawi. A specific assessment depicted as many as five land-use / land-cover maps that were compiled through initiatives of the following agencies: JICA, FAO, RCMRD, USGS, World Bank.[15] Including further map products, there are many data sources for land monitoring available (Table 5).

Table 5: Overview of land mapping efforts, partly based on earlier work.[16]

Shortname	Inventory timepoints	Classification scheme	Data source	Uncertainty	Government partner
Land Use Survey / ODA	1965-1967	15 categories	aerial photography	unknown	DoA
SatelliteBild / World Bank	1973 1991	28 categories	unknown	unknown	DoF
LTS / World Bank	2010	6 IPCC classes	SPOT 5	unknown	LRCD, DoF
Asia Air Survey / JICA	1990 2000 2010	6 IPCC classes	Multiple	87.6%	DoF

[15] Miewald, T. and Odour, P. 2014. Assessment of land cover mapping in Malawi – existing data and institutional factors. USFWS, RCMRD, USAID.
[16] cf. Miewald (2014).

MAIWD/FAO Land Cover Atlas	1990 2000 2010	Hierarchical LCCS system	TM Landsat	89.2%	LRCD
RCMRD / US-EPA	1990 2000 2010	6 IPCC classes and crown cover percentages	TM Landsat	~80%	EAD
USGS	2013	6 IPCC classes and crown cover percentages	TM Landsat	unknown	Regional initiative
Hansen data	2000 2013	Crown cover	TM Landsat	unknown	Global initiative

It has been recommended to draw on the FAO and RCMRD datasets being the most useful ones for multiple purposes.[17] A detailed time series of map products is available with the FAO and the RCMRD datasets. The time series covers 1990, 2000 and 2010, time frames that would be useful for GHG inventory calculations. There are concerns, however, regarding the level of accuracy in some of these map products.[18] Also, unfortunately, these maps do not all use the same underlying data and definitions and a new base map would still need to be compiled based on these data.[19]

The country does not have an official LULC standard or a forest definition useful for mapping purposes. This is also the reason why the several available land-use / land-cover maps use incompatible legends and agencies use different maps. A technical proposal for such a LULC standard including a forest definition is currently being developed by the MRP.[20] This approach needs testing and the several available datasets might need to be updated to then actually comply with a newly proposed LULC standard.[21] But according to the problem tree analysis, most importantly the political will is missing to adopt the LULC standard and a new forest definition.

Several of the past assessments diagnose a lack of clarity in institutional role allocation with regards to geospatial data collection and management.[22] Different institutions tend to use different and incompatible datasets, public datasets are not shared or only against payment, and data are simply lost because of gaps in assigned responsibility and mandates for data handling and archiving.

There are important shortcomings in terms of technical capacity at the DoF's GIS and remote sensing laboratory. A recent assessment concluded that training was urgently required on

[17] cf. Mills (2015).
[18] GAF. 2015. Personal communication about existing map products.
[19] cf. Mills (2015).
[20] Mills, A. 2015 Report on Validation of Land Use / Land Cover for the Government of Malawi. USFS, USAID.
[21] McGann, M. 2015. Final report on developing a recommended suite of land use / land cover standards for the government of Malawi. USFS, USAID.
[22] cf. Alegria (2014a), Alegria (2014b), Miewald (2014).

fundamentals of GIS and data management.[23] In terms of equipment and infrastructure, the DoF HQ, the DoS and the LRCD already have GIS and remote sensing laboratories, next to gaps in equipment and software, internet connectivity is a limiting factor too. The FRIM would need to have their GIS capability upgraded to effectively participate in land monitoring.

It is also concluded that the DoF HQ's GIS laboratory has an unclear role and no budget; development partners provided most of the geospatial data and the equipment, which is sometimes not even put to use.[24] According to the related problem tree analysis, this may be partly due to only marginal participation of the staff at the GIS and remote sensing laboratories in the past LULC assessments.

Although a wealth of geospatial data were collected during the past decades, much of these data have been lost (Table 3). There is insufficient technical capacity and unclear mandates for data handling, documentation and archiving. Also, there is no central repository of geographic information, although the DoS runs the Malawi Spatial Data Portal (MASDAP), a platform for GIS data.[25] Collaboration with the DoF is not yet seamless. There seem to be expectations of receiving funds transfers in return for data sharing.

According to the problem tree analysis, a lack of leadership underlies much of the capacity shortcomings around collection and management of spatial data. There is a coordination gap between departments and, related to this, a lack of agreed standards (Figure 5).

[23] Alegria, J. and Matthews, B. 2014a. USFS GIS / RS Technical Detail – final report. USFS. USAID.
[24] cf. Kanaan (2015).
[25] Richard, T. 2014. Formulation Assignment for the Development of a Comprehensive Land Profile – Final Report. EC.

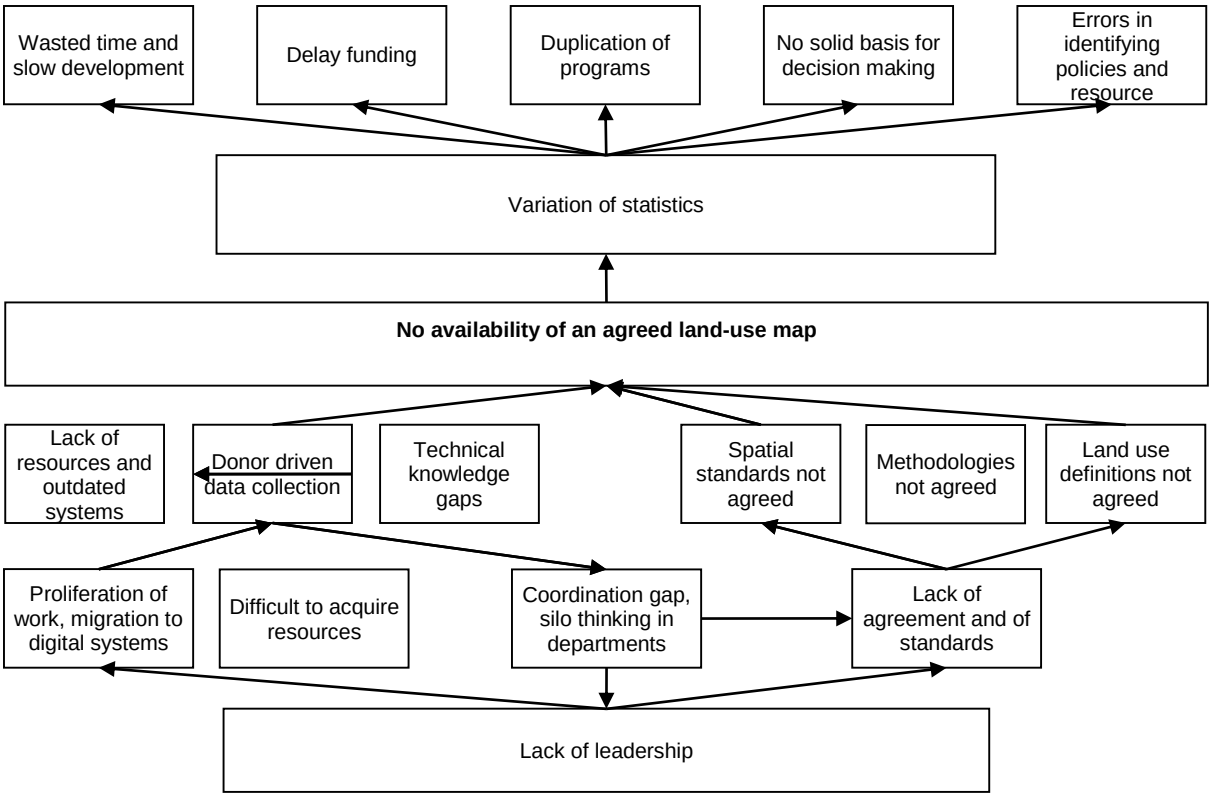

Figure 5: Problem tree analysis for the unavailability of an agreed land-use map in Malawi. This information was collected through a focus group discussion.

In summary, the following capacity-development interventions are required to address capacity gaps in land monitoring:

- Develop a Memorandum of Understanding between LRCD, DoS, DNPW and DoF to define roles on land mapping, GIS and remote sensing for forests
- Continue developing the DoF headquarters and FRIMs remote sensing and GIS laboratories
- Enhance use of MASDAP for data archiving
- Develop a new forest definition
- Develop a LULC standard
- Compile a time series of land-use / land-cover maps based on the LULC standard

Field-based forest inventory

The assessment of capacities for a field-based forest inventory at national scale draws on past assessments, several interviews and focus group discussions. It relies on a pre-defined questionnaire (Table 6). It also includes a problem tree (Figure 6).

Table 6: Capacity assessment on a field-based forest inventory according to a set of pre-defined indicators. The responses were collected through interviews with representatives from the DoF and FRIM.

Pre-defined questions	Response
Has a field-based forest inventory at a national scale been completed yet?	***Partially***, one national-scale data collection effort has been undertaken in the 1990s, and many site-level inventories have also been done.

Is there a network of permanent sample plots that is regularly monitored?	***Partially***, no network of sample permanent plots is available, but the ongoing inventories often have exact locations for temporary plots.
Are non-forest land-use types included?	***Partially***, there are also plot data from grasslands available.
Are there institutional and budgetary provisions for periodic inventories?	***Partially***, there are institutional mandates, but implementation relies on external funding.
Are data routinely archived?	***No***, no functioning data archive for field-based forest inventory available.
Are inventory results widely and transparently available?	***No***, no system for making data publicly available.

A national-scale forest inventory has not been conducted in Malawi since the World Bank invested in 1992, a 23-year time span. Not only are the data lost, a recent assessment concludes that much of the required functions for analysis, database management, field operations, GIS and remote sensing support and quality assessment would need to be built from scratch.[26] There are not currently institutional, budgetary or procedural provisions for a forest inventory. The same assessment also concludes that technical capacity for implementing a field-based forest inventory is likely not to be a bottleneck because the DoF headquarters and FRIM have strong capacities for field work.[27]

Many campaigns have collected field-based forest inventory data at the scale of provinces or even projects during the last years (Table 7). Several assessments conclude that, although a range of data collection efforts have been conducted in Malawi's forests, there is no centralized mechanism available for documenting and archiving data.[28] The data from the last national forest inventory, carried out in 1992, has been lost.

Table 7: Overview of field-based forest inventories at smaller than national scale in Malawi.[29]

Name	Funding Source	Date of data collection or start date	Area covered	Availability
Viphya plantation	Finland	1971-1973	Viphya plantations	Lost
Viphya plantations	FAO	1990-1991	Viphya plantations	Lost
National Forest Inventory	IDA World Bank	1991-1993	Nation-wide	Paper
Dzadalanyama Reserve Inventory	GEF	1994-1995	Dzadalanyama Reserve:	Paper
Miombo inventories	FRP DFID	1996-2000	Chimaliro and Liwonde Forest Reserves	Paper
Bark Harvesting Project	FRP DFID	2005	Phirilongwe Forest Reserve	Electronic
Tree Planting and Management for	Malawi Government	2006-2011	Countrywide	Electronic and paper

[26] Alegria, J. and Matthews, B. 2014b. Proposed national forest inventory approach for Malawi. USFS, USAID.
[27] cf. Alegria 2014b
[28] cf. Alegria (2014a), Alegria (2014b), McGann (2015), Alegria (2015), Miewald (2014).
[29] cf. Alegria (2014b), Alegria (2015).

Carbon Sequestration				
Tree Survey for Right of Way: Malawi-Mozambique Interconnector Powerline	ESCOM	June, 2009	Balaka and Mwanza Districts	Electronic and paper
Avoiding Unplanned Mosaic Deforestation and Degradation in Malawi	USAID - COMPASS II	2009	Mkuwazi and Nyika	Electronic
Inventory of Major Timber Plantations in Malawi	TLC	2010	Major timber plantations - Viphya, Dedza, Zomba, Chongoni-MCFW, Dedza and Donzi-Mvai.	Electronic
Biomass of Faidherbia albida	ICRAF	2010	The northern region	Electronic
Lake Chilwa Basin Climate Change Adaptation Programme	Royal Norwegian Embassy	2010-2014	Lake Chilwa Basin (Machinga, Phalombe and Zomba Districts)	Electronic
Forest Resource Mapping under Forest Preservation Programme (aka JICA map)	Foreign Agency of Japan	2011	Selected seventeen forest reserves across the country	Electronic
LTS Land Cover/change map	The World Bank	2012	Countrywide	Electronic
Land Cover and Land Cover Change 1990-2010	FAO	June 2013	Countrywide	Electronic and paper
US EPA Land Cover, Land Use Map	US EPA	2013	Countrywide	Not applicable
Integrated MRV Project	SADC-GIZ	Sept/October, 2013	Trans boundary between Malawi and Zambia	Not applicable
Distribution and Population Structures of Adansonia digitata	Silva Terra	August, 2013	Countrywide	Not applicable
Dzalanyama Forest Reserve Conservation Project	JICA	To be determined	Dzalanyama Forest Reserve	Not applicable

There is no full clarity on how the DoF and its FRIM would design and implement a national forest inventory.[30] A recent assessment recommended reviewing the institutions' geographical distance, their mandates, the current staff skillsets and to assign roles for field-based forest inventories (as well as for other components of the NFMS).[31] There is, however,

[30] cf. Kanaan (2015).
[31] Alegria, J. and Rhoades, C. 2015 Carbon inventory in Malawi's forests. USFS, USAID.

not yet much consideration for the roles of the DNPW in these efforts. Should a multi-purpose inventory be considered that in its scope goes beyond a forest resource inventory, collaboration with other departments, such as LRCD, would certainly be required and further complicate institutional role allocation.

An agreed and adopted design for a field-based forest inventory is not available. And similarly, there is also no obvious standard regarding plot layout or sampling layout or regarding the objectives and the scope of a forest inventory. A possible design has been proposed on at least one occasion and much field-based data collection has been carried out.[32] But according to the problem tree analysis, DoF staff has not always complete ownership and perceive much of this work as the output of projects only.

The problem tree analysis brought out that decision-making processes do not always rely on evidential data, but are often driven by political considerations (Figure 6). The data from a forest inventory in the 1990s never became basis for the country's natural resource management. And in turn, management also often suffers from unavailability of data.[33] Low regard for data may explain why there is little in the way of ongoing governmental data collection programmes and why internationally funded data are not always put to use (Figure 6).

[32] GAF / DFS. 2014. Development of Integrated Monitoring Systems for REDD+ in the Southern African Development Community (SADC).
[33] cf. Kanaan (2015).

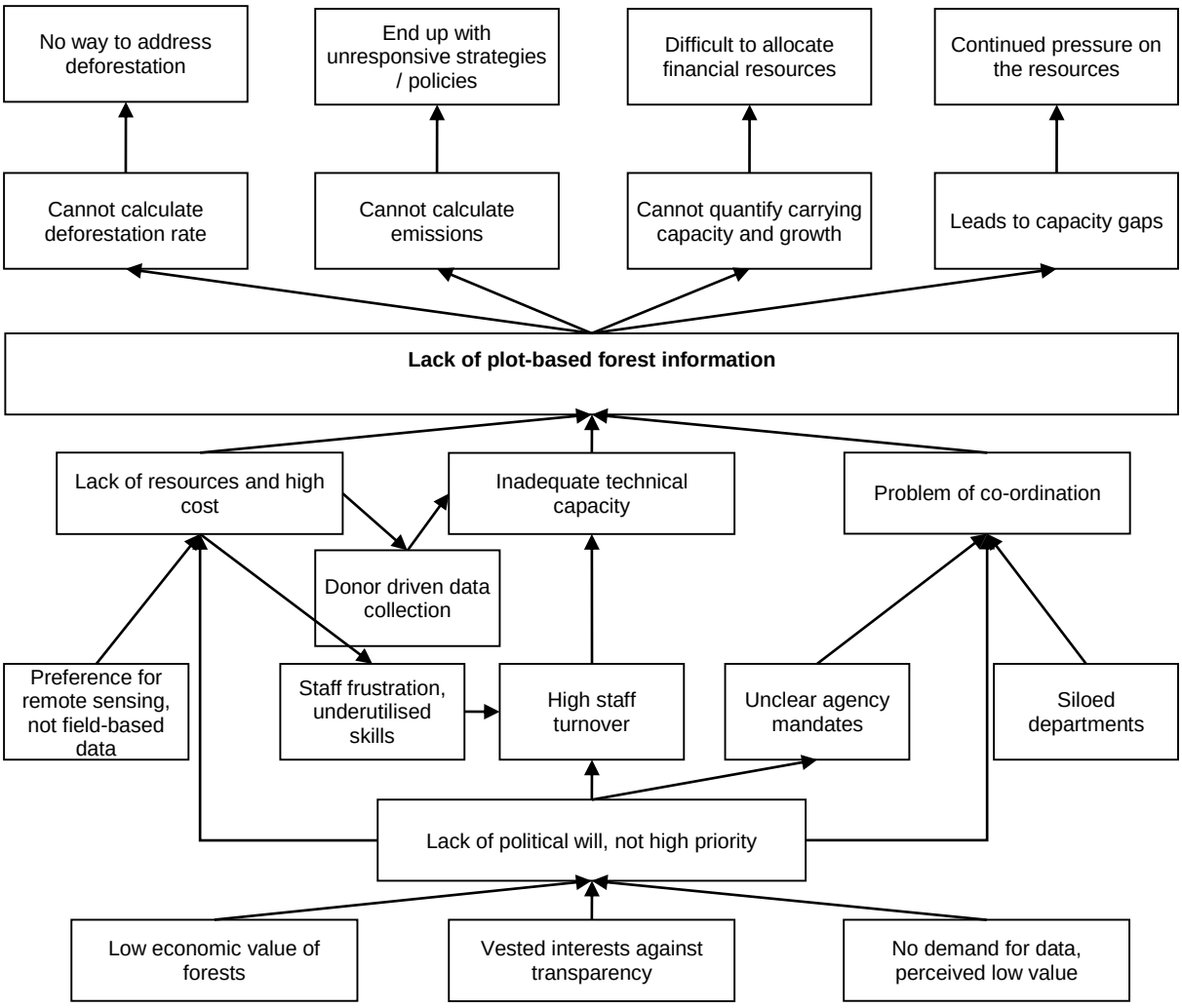

Figure 6: Problem tree analysis for the lack of plot-based forest information in Malawi. This information was collected through a group discussion at the inception workshop.

In summary, the following capacity-development interventions are required to address capacity gaps in field-based forest inventories:

- Define roles of DoF and its several divisions, including FRIM for the field-based forest inventory
- Design a strategy and a field manual for the national forest inventory
- Allocate resources to periodic inventories
- Create a data catalogue and archive of field-based forest inventories
- Collect further field-based forest information to fill gaps in existing data
- Derive emission factor data for the main forest types

National GHG inventory

The assessment of capacities for a national GHG inventory draws on past assessment reports, several interviews and focus group discussions. It relies on a pre-defined questionnaire (Table 8).

Table 8: Capacity assessment on the national GHG inventory according to a set of pre-defined indicators. The responses were collected through interviews with representatives from the DoF, FRIM, and EAD.

Pre-defined questions	Response
Is there regular and detailed reporting on the national GHG inventory to the UNFCCC?	***Partially***, two National Communications with detailed and annual time series have been submitted.
Are lands stratified by land-use sub-categories, climate & soil, by management systems / tree types, and by managed / unmanaged?	***Partially***, at least GHG inventories stratified by land-use subcategories and climate & soil, and managed / unmanaged. There is ongoing work on a LULC standard.
Is the methodology documented transparent and detailed?	***Partially***, for the AFOLU part of one GHG inventory there is a national inventory report available.
Are QA/QC procedures in place and being performed?	***No***, there are no QA/QC procedures effectively being implemented, although setting up procedures has been proposed.
Are an inventory improvement plan and a key category analysis in place and basis for planning?	***Partially***, a key category analysis has been done and an inventory improvement plan is available at least for AFOLU, although both are not acted upon for planning.
Is there a functioning data sharing process between institutions involved in the national GHG inventory?	***No***, data sharing is ad hoc.

The Malawi Government has prepared several GHG inventories, both as part of the regular processes for National Communications and also with support from other capacity development programmes (Table 3). Available GHG inventories cover the years 1990, 1994, 1995-2000, 2010 (Table 9).[34] [35] The country is currently working to develop its Third National Communication, including a GHG inventory (Table 3).

Table 9: Available GHG inventories.

Past GHG inventory efforts	Year	Development partners	GHG inventory years	Guidelines used
Country Studies Programme	1995	US Country Studies Programme	1990	unknown
Initial National Communication	2002	UNEP	1990, 1994	revised 1996 IPCC guidelines
Second National Communication	2011	UNEP	1995-2000	revised 1996 IPCC guidelines

[34] EAD. 2002. Initial National Communication of Malawi.
[35] EAD. 2011. The Second National Communication of the Republic of Malawi to the Conference of the Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC).

ESA / CD-REDD	2014	GIZ / US-EPA / USAID	2010	revised 1996 IPCC guidelines
Third National Communication	forthcoming	UNEP	forthcoming	forthcoming

According to a recent analysis, these inventories have been conducted on ad-hoc basis by short-term consultants without following a given inventory management process.[36] No inventory compilation procedure, no documentation procedure, no data storage nor archiving system are in place. There is no effective process implemented for quality assurance and quality control, although a relevant system has been designed and proposed.[37] Much of these system-related capacities need urgent improvement.

Although it is clear that the EAD coordinates the national GHG inventory compilation, a recent analysis concluded that no arrangements are available to regulate data exchange with other agencies or scientific institutions.[38] For the land management sector alone, data would be required from the LRCD, DoF, and DoS. Drawing up institutional agreements is also hampered by the fact that no unified climate change framework is available to allocate roles and provide basis for formalizing institutional relationships in the form of memoranda of understanding or other mechanisms.[39]

There is a well-developed GHG inventory team available in the land-management sector, mostly at the DoF. There are, however, capacity gaps with regards to technical capacities for GHG inventory compilation. Within EAD, there is however no strong sectoral team for the sector.[40]

An independent review recently assessed the GHG inventory against a range of criteria and diagnosed widespread capacity limitations. [41] A second independent review agreed with this conclusions and identified five main issues: national overreliance on the capacities of a small set of high capacity employees; unstable sources of funding for climate activities; lack of engagement with high level of EAD in GHG inventory system; most technical capacities for GHG accounting are novel to the Inventory System effort within EAD, and are generally lacking; no strong sectoral strengths for GHG accounting.[42] The consultations and analysis from this NFMS roadmap agree with findings of both assessments.

In summary, the following capacity-development interventions are required to address capacity gaps in GHG inventories:

- Formalize institutional relationships for data sharing on the national GHG inventory
- Further develop technical capacity for GHG inventory compilation

[36] Chirwa, M. 2014. National GHG Inventory Report for Malawi. Government of Malawi.
[37] cf. GAF / DFS (2014)
[38] cf. Chirwa (2014).
[39] Winrock, 2015. Institutional Arrangement Options Assessment for Malawi's GHG Inventory System.
[40] cf. Winrock (2015).
[41] Rock, J. 2014. Report of the expert review of the CD-REDD GHG Inventory Report of the FOLU sector of Malawi. CD-REDD.
[42] cf. Winrock (2015).

- Develop functional capacity for GHG inventory compilation
- Calculate GHG emissions from LULUCF and develop submission on REDD+ results

Reference level setting

The assessment of capacities for reference level setting draws on several interviews and focus group discussions, using a pre-defined questionnaire (Table 10).

Table 10: Capacity assessment on reference level setting according to a set of pre-defined indicators. The responses were collected through interviews with representatives from the DoF and FRIM.

Pre-defined questions	Responses
Has a reference level been developed and submitted yet?	***No***, not available yet.
Have national circumstances been analysed?	***Partially***, a drivers analysis is under way and much analysis of historical satellite imagery has been carried out.
Is the scope and scale for the reference level defined?	***No***, not defined yet.
Is the stratification for activity data and emission factors the same as in the national GHG inventory at all levels of stratification of lands?	***Not applicable***, as the stratification is still undefined.

A reference level for REDD+ has not yet been prepared or submitted by Malawi. In fact, only a handful of countries worldwide have gone through this process. But more generally, Malawi has also not yet undertaken work to assess an outlook for the forest sector or to develop forest change projections. Work on REDD+ reference levels would therefore start from scratch.

Although it seems logical that the DoF would be in the lead for developing a REDD+ reference level, no detailed discussion has yet been taken place about institutional role allocation. Also, there are relevant capacities both at DoF HQ and at FRIM and it is not immediately obvious where coordination would be put.

An assessment of the drivers of deforestation and forest degradation is currently underway (Table 3). This drivers assessment is an important step towards defining the national circumstances for a REDD+ reference level. It would also underlie the definition of scope and scale of the reference level.

In summary, the following capacity-development interventions are required to address capacity gaps for reference-level setting:

- Clarify institutional responsibility for reference level setting
- Develop technical capacity on reference levels
- Analyse the national drivers of forest-cover change
- Analyse national circumstances and propose construction methodology for reference level
- Calculate the REDD+ reference level and develop submission

Capacity-development trajectory

This section lays out a capacity development trajectory for the NFMS. The trajectory is a set of activities to be carried out during the coming years in order to build a NFMS that would comply with the requirements for REDD+ as defined by the UNFCCC. The capacity development activities are broken down by the four components of the NFMS.

Overview

This NFMS roadmap lays out a capacity-development trajectory consisting of a set of interventions according to the four components of the NFMS. Some of these interventions are already ongoing and others still need to be tackled going forward. Some required interventions are technical capacity development inputs, but also include the formalization of important national decision making processes (Table 11).

Table 11: Overview of capacity-development interventions required as part of a trajectory towards an effective national forest monitoring system for REDD+.

Required intervention	Type of intervention	Possible lead agency	Indicative cost
Land monitoring			
Develop a Memorandum of Understanding between LRCD, DoS and DoF to define roles on land mapping, GIS and remote sensing for forests	Several meetings to draft and negotiate terms to enable decision making	LRCD, DoS, DoF (within RExG)	None
Continue developing the DoF's remote sensing and GIS laboratories	Technical training, hardware and software, upgrade internet	DoF	Ongoing or planned
Enhance use of MASDAP for data archiving	Workshop on MSADP use to trigger senior-level commitment	LRCD, DoF (individually)	USD 20,000
Develop and formalize a new forest definition	Workshop on the new draft definition to enable approval	DoF	Ongoing or planned
Develop and formalize a LULC standard	Workshop on the new draft LULC standard to enable approval, training for socialization	LRCD	Ongoing or planned
Compile a time series of land-use / land-cover maps based on the LULC standard	Technical input to reclassify existing data and compile base map	LRCD / DoF	USD 50,000
Field-based forest inventory			
Define the roles of DoF's several divisions, including FRIM, for work on the field-based forest inventory	DoF internal decision required on specific roles according to strategy	DoF	none
Design a strategy and a field manual for the national forest inventory	Technical input for strategy, and for the manual, consultation workshops, training	DoF	Ongoing or planned

Allocate resources to periodic inventories	Senior-level commitment required to budget resources	DoF	none
Create a data catalogue and archive of field-based forest inventories	Technical input required to design database, collect and digitize existing data	DoF	USD 100,000
Collect further field-based forest information to fill gaps in existing data	Additional data collection	DoF	USD 100,000
Derive emission factor data for the main forest types	Consultancy to calculate emission factors	DoF	Ongoing or planned
National GHG inventory			
Formalize institutional relationships for data sharing on the national GHG inventory	Senior-level decision required to formalize relationships	EAD	None
Further develop technical capacity for GHG inventory compilation	Training for GHG inventory team in DoF (and other agencies)	EAD, DoF	Ongoing or planned
Develop functional capacity for GHG inventory compilation	Embedded expert at EAD, senior-level commitment to review processes	EAD	Ongoing or planned
Calculate GHG emissions from LULUCF and develop submission on REDD+ results	Consultancy for calculations and training of DoF staff	DoF	USD 60,000
Reference level setting			
Clarify institutional responsibility for reference level setting	Decision required	DoF	None
Develop technical capacity on reference levels	Training for DoF staff	DoF	USD 30,000
Analyse the national drivers of forest-cover change	Consultancy for quantitative drivers analysis	DoF	USD 100,000
Analyse national circumstances and propose construction methodology for reference level	Consultancy on forest reference level	DoF	USD 50,000
Calculate the REDD+ reference level and develop submission	Consultancy for developing submission and training of DoF staff	DoF	USD 60,000

Land monitoring

Required capacity development inputs for land monitoring include the following:

- *Develop a Memorandum of Understanding between LRCD, DoS and DoF to define roles on land mapping, GIS and remote sensing for forests*.[43] Role allocation has been subject of much work.[44] A recent decision of the RExG laid out institutional role allocation. Accordingly, LRCD should take responsibility for general land-use / land-

[43] Sub-target 4.2.A in the Malawi REDD+ Program Action Plan: 2014-2019.
[44] cf. Miewald (2014).

cover mapping, the DoF should contribute forest mapping, DoS should coordinate and provide services for archiving (including through MASDAP) and dissemination of geospatial information, with the DoF acting as steward of forest-related geospatial information.[45] In addition to agreement under the RExG, these roles should also be laid down in a Memorandum of Understanding between the involved agencies. There is a proposal to set up a Malawi Geographic Information Council (MAGIC) and once that becomes operational it may become a good forum for coordination too.

- *Continue developing the DoF's remote sensing and GIS laboratories*. Technical capacity gaps remain regarding basic approaches towards data handling. Technical training on GIS data management, archiving and data documentation should be provided. Also, internet connectivity needs to be upgraded. Most importantly, for the above to be sustainable, the laboratory needs to have a clear institutional embedding and its own budget allocation at the DoF. Such support is required both at the headquarters and at the FRIM and is already ongoing (Table 3).
- *Enhance use of MASDAP for data archiving*.[46] The Malawi Spatial Data Portal (MASDAP) is run by the DoS and designed to function as Malawi's general archive for GIS data. The DoF and other departments do not yet use MASDAP as the standard data repository for spatial data of relevance to the NFMS. Collaboration between DoS and DoF and other departments should be enhanced through clarifying roles and modalities for collaboration. Most importantly, senior management at the DoF and LRCD and other departments would need to commit to using the MASDAP on an ongoing basis as their standard data repository. Such agreements could be part of a Memorandum of Understanding to govern collaboration.
- *Develop a new forest definition*.[47] The current forest definition is not practical for a context of REDD+ because it includes administrative aspects. The definition should be reviewed and a modern definition be chosen that is in line with international best practices, e.g., as through the FAO's forest definition. A technical order may be a good instrument for officialising such a new forest definition for general application by relevant agencies beyond the DoF, and draft text is available from a recent discussion workshop with key agencies.[48] Along with work on the LULC standard, work is also underway towards developing a new forest definition (Table 3).
- *Develop a LULC standard*. [49] The multitude of existing land-use / land-cover maps follow inconsistent methodologies and classification schemes. An important step towards unifying information sources is the development of a land-use / land-cover standard. Such a standard would need to be adopted, e.g., through integration into the geospatial protocol of the Ministry of Lands, Housing and Urban Development.[50] In case a universal agreement is elusive, an agreement between agencies for the scope of natural resource management would already be a significant step forward. And if such an agreement was hard to reach, the development of the forest definition would already be a useful step ahead (see previous recommendation). Work is underway towards developing a LULC standard for Malawi (Table 3).
- *Compile a time series of land-use / land-cover maps based on the LULC standard*.[51] The existing land-use / land-cover data should be reprocessed according to the LULC

[45] cf. MRP (2014).
[46] Target 4.9 in the Malawi REDD+ Program Action Plan: 2014-2019.
[47] Sub-target 4.2.B in the Malawi REDD+ Program Action Plan: 2014-2019.
[48] cf. Mills (2015).
[49] Sub-target 4.2.B in the Malawi REDD+ Program Action Plan: 2014-2019.
[50] cf. McGann (2014).
[51] Sub-target 4.2.C in the Malawi REDD+ Program Action Plan: 2014-2019.

standard.[52] In particular the FAO / RCMRD datasets for 1990, 2000, 2010 show promise for such integration as they largely comply with REDD+ requirements and the IPCC guidance.[53] A time series of land-use / land-cover maps according to the LULC standard will be invaluable input also for work on reference level setting and the national GHG inventory.

Field-based forest inventory

Required capacity development inputs for the field-based forest inventory include the following:

- *Define the roles of DoF's several divisions, including FRIM for work on the field-based forest inventory*. The DoF should develop specific terms of reference for FRIM's coordinating role of the field-based forest inventories, as well as for its other divisions to contribute on other functions, such as design, oversight, data analytics, quality assurance, data archiving, and dissemination of results.
- *Design a strategy and a field manual for the national forest inventory*.[54] A forest inventory would not be implemented solely for REDD+; its objectives and uses should go beyond REDD+ needs if possible. With no high-quality forest inventory data available, there is no regular use of forest inventory information and the possible uses of such data, should it come to exist, would need to be systematically explored. Such a process would also lead to defining the scope of inventories in terms of the vegetation types and even the individual variables to be covered. Although there is some talk of a multi-purpose forest inventory, its feasibility, level of effort and desirability have not yet been systematically analysed. An options analysis comparing the pros, cons and costs of different forest and resource inventories should be carried out. A forest inventory manual would need to be developed that lays out the sampling, plot design, variables to collect, definitions to be applied next to many other details of the approach. Much work has already been carried out at a project level to design such technical details, and this work can be a point of departure for arriving at the DoF's approach to forest inventories.[55] Work is underway towards designing a strategy and the technical approach for the national forest inventory (Table 3).
- *Allocate resources to field-based forest inventories*. A sustainable approach to collecting and managing forest inventory information would rely on DoF core funding, not project-based funding. Sources such as REDD+ may be part of DoF's strategy for financing investments, such as in the collection of field-based forest information. Periodic inventories may be carried out, for example, every 5 years, which would require every year an inventory of the fifth part of Malawi's forests. Senior management at DoF must decide on the long-term allocation of resources to enable building a sustainable approach for collection of field-based forest information. Clarity on resource allocation would then also allow for assigning permanent staff and building their technical capacities.
- *Create a data catalogue and archive of field-based forest inventories*. Several field-based inventories have been carried out in a range of forest areas in Malawi. A systematic data catalogue maintained at DoF HQ or FRIM would be useful as a first step towards using this data for management purposes. The original data should,

[52] cf. McGann (2014).
[53] cf. Mills (2015).
[54] Target 4.6 in the Malawi REDD+ Program Action Plan: 2014-2019.
[55] GAF / DFS. 2014. Development of Integrated Monitoring Systems for REDD+ in the Southern African Development Community (SADC).

where possible, be collected and introduced into a systematic archive. This will allow assessing the coverage and the detailed methodologies of such data. It will also protect against future data losses and reveal the true extent of remaining data gaps. Some support is already secured to create such a data catalogue (Table 3).

- *Collect further field-based forest information to fill gaps in existing data*. Deriving emission factor data for REDD+ will require a set of field-based forest inventory data that covers the country's most important forest types and also other vegetation. Once a data catalogue of existing data is available, gaps can be identified. Additional data would need to be collected to fill gaps.
- *Derive emission factor data for main forest types*. A range of regional forest inventories have been implemented. Above, it is proposed to compile an archive of field-based forest inventories containing useful structural information on forest types in Malawi. It is also proposed to fill gaps in such a data archive by collection of additional field-based information. Based on these efforts, emission factor data for Malawi's forests can be derived and some support has already been secured for this (Table 3).

National GHG inventory

Required capacity development inputs for the national GHG inventory include the following:

- *Formalize institutional relationships for data sharing in the national GHG inventory*.[56] Currently, most data sharing for construction of the national GHG inventory occurs on an ad hoc basis. Institutional roles and relationships should be formalized through Memoranda of Understanding or other mechanisms. A comprehensive National Climate Change Policy (NCCP) may provide a framework for formalizing institutional relationships, although it does not specifically address data sharing. The NCCP has been in the drafting stage for several years and its approval is soon to be expected. Specific support has been secured already to facilitate formalizing institutional relationships (Table 3).
- *Further develop technical capacity for GHG inventory compilation*. Both of Malawi's previous GHG inventories were compiled by consultants external to the EAD and the DoF, and knowledge was not transferred sufficiently for the departments to carry out GHG inventories without assistance. Initial steps towards building technical capacity within the government have already been undertaken. Further technical capacity development and coaching is required both at the EAD and the DoF to bring GHG inventory compilation into the government. An embedded advisor is placed at the EAD to develop technical and functional capacity for GHG inventory compilation (Table 3).
- *Develop functional capacity for GHG inventory compilation*. Beyond technical training, EAD, DoF and also other agencies involved in the national GHG inventory need to build processes for managing the national GHG inventory and its data. Required processes relate to inventory planning, data documentation, quality assurance and quality control, data archiving, inventory improvement, and data dissemination. A starting point for such work may be available with a proposed QA/QC framework for the GHG inventory.[57] An embedded advisor is placed at the EAD to develop technical and functional capacity for GHG inventory compilation (Table 3).

[56] Target 8.1 in the Malawi REDD+ Program Action Plan: 2014-2019.
[57] cf. GAF / DFS (2014).

- *Calculate GHG emissions from land and develop submission on REDD+ results*. Proposed activities for land monitoring and field-based forest inventories will deliver a set of land-use / land-cover maps and a set of corresponding emission factors. With these two ingredients, the GHG inventory calculations for land-use / land-cover change should be performed. The same data will also be basis for calculating REDD+ results and submitting to the UNFCCC as an annex to Malawi's Biennial Update Report.

Reference level setting

Required capacity development inputs for reference-level setting include the following:

- *Clarify institutional responsibility for reference level setting*. Although DoF would seem the likeliest candidate to take on responsibility for developing a reference level, a decision has not yet been reached. A decision also needs to be reached as to whether DoF would carry out this work at its HQ or at the FRIM or whether they can together cover the several functions needed to set reference levels.
- *Develop technical capacity on reference levels*. Currently there are capacity gaps regarding the building of REDD+ reference levels. Selected staff from the relevant agency or sub-agency needs to receive technical training to take on this role.
- *Analyse the national drivers of forest-cover change*.[58] The drivers of land-use / land-cover change provide key input for developing a REDD+ strategy, both regarding the analysis of national circumstances and regarding the identification of REDD+ policies and measures. A drivers study needs to cover both an analysis of the political economy of forest-cover change and also a quantitative analysis to define national circumstances for reference level setting. A (qualitative) drivers study is already underway and some site-level information will also be collected (see Table 3); these efforts could be complemented by a quantitative analysis.
- *Analyse national circumstances and propose construction methodology for reference level*. Work is currently going on that will deliver important ingredients for an analysis of national circumstances. Firstly, several studies recommend compiling a base map of past land-use / land-cover, which would allow for a trend analysis.[59] Secondly, a (qualitative) drivers study is currently being carried out (see Table 3). These elements should be brought together to analyse national circumstances and make recommendations regarding the construction methodology for reference level setting as well as its scope and scale.
- *Calculate the REDD+ reference level and develop submission*. The information collected around the drivers of forest-cover change, the information on national circumstances, the time series of land-use / land-cover maps and its set of emission factors, should all be brought together into the calculation of the REDD+ reference level for submission to the UNFCCC.

Sequence and timeframe

Although highly tentative, a possible sequence and timeframe of capacity development interventions is laid out (Table 12). If there was immediate access to all necessary funding, if there was clarity about the eventual REDD+ strategy and the resulting requirements towards the NFMS, and if there was complete buy-in from senior level decision makers into all

[58] Target 4.1 in the Malawi REDD+ Program Action Plan: 2014-2019.
[59] cf. McGann (2014), Mills (2015)

interventions, then the NFMS capacity could be developed during approximately 2 years. The actual timeframe for developing Malawi's NFMS will need to be defined taking such factors into account and will likely be much slower.

Table 12: Indicative timeframe for developing Malawi's NFMS through the proposed 2-year capacity development trajectory. Each "Q" corresponds to one quarter, i.e., 3 months.

Required intervention	Ongoing	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
Define the roles of the LRCD, the DoS and the DoF for land mapping, GIS and remote sensing for forests		XX	XX						
Continue developing the DoF's remote sensing and GIS laboratory		XX	XX	XX	XX				
Enhance use of MASDAP for data archiving						XX			
Develop and formalize a new forest definition	XX	XX	XX						
Develop and formalize a LULC standard	XX	XX	XX	XX	XX	XX	XX		
Compile a time series of land-use / land-cover maps based on the LULC standard				XX	XX	XX	XX		
Define the roles of DoF's several divisions, including FRIM for work on the field-based forest inventory		XX	XX						
Design a strategy and a field manual for the national forest inventory	XX	XX	XX						
Allocate resources to periodic inventories				XX	XX	XX	XX	XX	XX
Create a data catalogue and archive of field-based forest inventories		XX	XX	XX	XX				
Collect further field-based forest information to fill gaps in existing data				XX	XX	XX	XX		
Derive emission factor data for the main forest types								XX	
Formalize institutional relationships for data sharing on the national GHG inventory		XX	XX						
Further develop technical capacity for GHG inventory compilation	XX	XX	XX	XX	XX	XX	XX		
Develop functional capacity for GHG inventory compilation	XX	XX	XX	XX	XX	XX	XX		
Calculate GHG emissions from LULUCF and develop submission on REDD+ results								XX	XX
Clarify institutional responsibility for reference level setting		XX	XX						
Develop technical capacity on reference levels				XX	XX	XX	XX		
Analyse the national drivers of forest-cover change	XX	XX	XX	XX					
Analyse national circumstances and propose construction methodology for reference level					XX	XX	XX		
Calculate the REDD+ reference level and develop submission								XX	XX

Moving beyond the capacity-development trajectory

There is a range of specific requirements that the NFMS needs to meet to qualify for results-based REDD+. These specific requirements are laid down in a dedicated section above, and

the capacity-development trajectory is designed to cover them. This NFMS roadmap is designed to ensure compliance with the minimum requirement for accessing results-based REDD+ funding.

The proposed capacity-development trajectory could therefore be extended. Although a structured analysis has not been undertaken, the following issues may be entry points for further developing Malawi's forest monitoring capabilities more comprehensively:

- Produce national biomass maps.[60] These could function as emission factors for calculating REDD+ results or the reference level. They could be produced at the same intervals as land-use / land-cover maps.
- Delineate the boundaries of protected areas.[61] Such an effort might be undertaken between the DoF, the DNPW, and the DoS. It would generate an important data layer to support management and also definition of policies and measures to reduce deforestation and forest degradation.
- Carry out a national forest inventory, a multi-purpose inventory or an inventory also non-forest lands.[62] Such comprehensive inventories would generate a wealth of data that could be immensely useful for REDD+, but also for natural resource management more generally. Going beyond a usual forest inventory, a multi-purpose inventory would collect information beyond standard forestry-related indicators. The resulting data would include socio-economic and environmental indicators. Going beyond forests, an inventory could cover also cover non-forest lands. The resulting data would include inventory of grasslands and croplands. A high level of resources would be required for carrying out a national forest inventory and including multi-purpose data or including non-forest land would further augment the required level of effort. There is not currently clarity whether or not such efforts are appropriate or justifiable in the case of Malawi.
- Use the NFMS to collect information on safeguards. Once Malawi moves towards designing a safeguards information system, the NFMS may be a useful data source. Most obviously regarding the conversion of natural forests, but depending on the kind of forest inventory to be carried out, also regarding several other socio-economic and environmental criteria.
- Leverage the NFMS to monitor REDD+ policies and measures. In the context of monitoring individual REDD+ policies and measures, the NFMS could generate quantitative information on their impacts on forest cover that could support the policies' own schemes for monitoring and evaluation.
- Leverage the NFMS to also report on the Malawi Growth and Development Strategy II through the Department of Economic Planning and Development.[63] Leverage the NFMS to also report on the activities laid out in the Intended Nationally-Determined Contribution.[64]
- Provide data for quantifying drivers of deforestation and forest degradation and carbon stock enhancement.[65] A well-developed drivers analysis could draw on the results of the NFMS for quantitative data on land-use / land-cover and its dynamics.

[60] Target 4.3 in the Malawi REDD+ Program Action Plan: 2014-2019.
[61] Target 4.8 in the Malawi REDD+ Program Action Plan: 2014-2019.
[62] Target 4.7 in the Malawi REDD+ Program Action Plan: 2014-2019.
[63] Government of Malawi. 2012. Malawi Growth and Development Strategy II: 2011-2016.
[64] Government of Malawi 2015. Intended Nationally Determined Contribution.
[65] Target 4.1 in the Malawi REDD+ Program Action Plan: 2014-2019.

- Accommodate project-based action in the NFMS. At a project-level actions to reduce deforestation and forest degradation and to enhance carbon stocks are already being undertaken. The MRP has the option to accommodate such project-based action in the approach to REDD+ monitoring and reference level setting. This could be done through a registry of such actions with dedicated accounting procedures.

These and other activities could be undertaken to further develop Malawi's NFMS. They are not immediately necessary for achieving compliance with REDD+ requirements, but may be immensely useful to build an NFMS that underlies effective and balanced forest management, including for REDD+.

Concluding remarks

This NFMS roadmap lays out a capacity development trajectory for developing Malawi's forest monitoring. It pulls together analysis and recommendations from many studies conducted during the last years under guidance of the MRP and its partners.

The roadmap aims to lead towards compliance with requirements for results-based REDD+. Beyond REDD+, sound data can support management of forests. It is hoped that the trajectory laid out here is merely a first step to be followed by much further work required on forest monitoring and moving the capacity-development trajectory.

There are recurring issues that underlie current capacity gaps in forest monitoring and these are often complex and difficult to address through capacity development interventions.

- Governmental decision making and natural resource management does not always draw on best available data.
- Institutional role allocation and modalities for institutional collaboration are often unclear.
- Processes for data definition, data archiving and quality checking need much development.
- Development Partners have invested in data collection and a wealth of data are available, but government programmes for forest monitoring are underfunded.

Strong leadership is needed to improve forest monitoring. The senior-level management across the several departments need to find a common vision to continuously push for data to underlie government decision making, to appropriate fund governmental programmes for data collection, to clarify institutional relationships and enable effective collaboration, and to review and revise processes towards effective and efficient data management. Malawi's REDD+ process could help garner the political buy-in necessary for developing a national forest monitoring system.

Can such strong and visionary leadership be secured, then forest monitoring may make an essential contribution towards "*A Malawi where hills and valleys will be covered with bountiful forest landscapes that deliver a high and sustained quality of life for countless generations. From this abundance, mother Malawi will shed tears of joy that will quench the thirst of her sons and daughters and sustain herds of antelope and schools of chambo*."[66]

[66] MRP vision in the in the Malawi REDD+ Program Action Plan: 2014-2019.

Annex: List of interviews

When	Where	Name of interviewees	Affiliation	NFMS component discussed
30-04-2015	Lilongwe	John Kerkering	USFS	Several
30-04-2015	Lilongwe	Benoit Rivard	LTS	Reference level setting
30-06-2015	Remotely	Sharon Gomez	GIZ	Several
02-06-2015	Rumphi	Duncan Mkandawire	NVA	Land monitoring, Plot-based inventory information
18-06-2015	Lilongwe	Alice Gwedeza	DoS	Land monitoring, Plot-based inventory information
19-06-2015	Lilongwe	Henry Kadzuwa	DoF	Several
19-06-2015	Lilongwe	Milha Phiri	LRCD	Several
19-06-2015	Lilongwe	Blessings Mwale	PERFORM	Land monitoring, Plot-based inventory information
23-06-2015	Lilongwe	Stella Gama	DoF	GHG inventory
25-06-2015	Zomba	Mike Chirwa (other researchers also present)	FRIM	Several
25-06-2015	Zomba	Dennis Kayambazinthu	Consultant	Plot-based inventory information, Reference level setting
25-06-2015	Blantyre	Patricio Ndadzela	APM	Land monitoring,
07-07-2015	Lilongwe	Ben Yassin	EAD	GHG inventory
31-07-2015	Remotely	Alan Mills	PERFORM	Land monitoring
11-08-2015	Lilongwe	Mathews Manda	LRCD	Land monitoring
11-08-2015	Lilongwe	Stavess Msowoya	TCC	Land monitoring
12-08-2015	Mchinji	Duncan MacPherson	Kanongo Estate	Land monitoring

13-08-2015	Machinga	Several committee members	Nkalo Co-Mgt Block	Land monitoring, Plot-based inventory information
14-08-2015	Thyolo	Gary Saunders	Eastern Produce	Land monitoring, Plot-based inventory information
6-10-15	Lilongwe	Alphius Lipiya	DNPW	Land monitoring, Plot based inventory
6-10-15	Lilongwe	Zondiwe Ndhlovu	DNPW	Land monitoring, Plot based inventory
6-10-15	Lilongwe	Peterson Ponderani	EP&D, M&E	Land monitoring
6-10-15	Lilongwe	Jimmy Kawaye	EP&D, M&E	Land monitoring
6-10-15	Lilongwe	Robert Msusku	EP&D, M&E	Land monitoring
6-10-15	Lilongwe	John Mussa	LRCD	Land monitoring
6-10-15	Lilongwe	Getrude Kambauwa	LRCD	Land monitoring
6-10-15	Lilongwe	Milha Phiri	LRCD	Land monitoring
7-10-15	Lilongwe	Felix Mangani	DoS	Land monitoring
7-10-15	Lilongwe	Gumbi Gumbi	DoS	Land Monitoring

Annex: Literature consulted

Much of the analysis and the conclusions in this document are based on earlier work. The following is the set of prior work that was most relevant for the NFMS roadmap:

Alegria, J. and Matthews, B. 2014a. USFS GIS / RS Technical Detail – final report. USFS. USAID.

Alegria, J. and Matthews, B. 2014b. Proposed national forest inventory approach for Malawi. USFS, USAID.

Alegria, J. and Rhoades, C. 2015 Carbon inventory in Malawi's forests. USFS, USAID.

Chirwa, M. 2014. National GHG Inventory Report for Malawi. Government of Malawi.

EAD. 2002. Initial National Communication of Malawi.

EAD. 2011. The Second National Communication of the Republic of Malawi to the Conference of the Parties (COP) of the United Nations Framework Convention on Climate Change (UNFCCC).

FAO. 2015. Global Forest Resource Assessment 2015. Desk Reference.

GAF / DFS. 2014. Development of Integrated Monitoring Systems for REDD+ in the Southern African Development Community (SADC).

Government of Malawi. 2015. Intended Nationally Determined Contribution.

Government of Malawi. 2012. Malawi Growth and Development Strategy II: 2011-2016.

Kanaan, R. and Farmer, A. and Caldwell, B. 2015. A rapid assessment of REDD+ measurement, reporting and verification (MRV) capabilities and potential in Malawi. Protecting Ecosystems and Restoring Forests in Malawi (PERFORM). Tetratech, USAID.

McGann, M. 2015. Final report on developing a recommended suite of land use / land cover standards for the government of Malawi. USFS, USAID.

Miewald, T. and Odour, P. 2014. Assessment of land cover mapping in Malawi – existing data and institutional factors. USFWS, RCMRD, USAID.

Mills, A. 2015 Report on Validation of Land Use / Land Cover for the Government of Malawi. USFS, USAID.

Ministry of Finance and Development Planning. 2011. Capacity Needs Assessment for Climate Change Management Structures in Malawi.

MRP. 2014. Minutes of the 9th session of the Malawi REDD+ Expert Group, held at Ufulu Gardens on 18th December 2014.

Richard, T. 2014. Formulation Assignment for the Development of a Comprehensive Land Profile – Final Report. EC.

Rock, J. 2014. Report of the expert review of the CD-REDD GHG Inventory Report of the FOLU sector of Malawi. CD-REDD.

The World Bank. 2015. Open data portal.

UN-REDD. 2015. The national forest monitoring system.

Annex: Questionnaires used for capacity assessment

Questionnaire on land monitoring

Indicators	'No'	'Partially'	'Yes'
Do available satellite data cover a detailed time series of historical time points?	No fully consistent time series available	Consistent data from two time points across approximately 10 years	Consistent data from at least three time points across approximately 10 years
Is the geographic information system laboratory well equipped?	Ad hoc only	Hardware and software available with slow internet	Fully equipped laboratory with fast internet
Is ground truthing used for accuracy assessment?	Not available	Through ad hoc data collection	Through the plot-based forest inventory that is designed accordingly
Are data routinely archived?	Not available	Decentralized for the NFMS components	Centralized and integrated with regular statistical systems
Is there a functioning data sharing process between institutions involved in land monitoring?	Data sharing ad hoc or data concentrated at the REDD+ management agency	Through Memoranda of Understanding or other agreements	Legally assigned roles for lead and support institutions across several agencies
Is an official land classification scheme agreed?	No official scheme or several inconsistent ones	Under discussion	Official, hierarchical scheme

Questionnaire on plot-based forest information

Indicators	'No'	'Partially'	'Yes'
Has a plot-based forest inventory at a national scale been completed yet?	Not available or with limited coverage only	Once or several times but with incompatible methodologies	Several times with compatible methodologies and at national scale
Is there a network of permanent sample plots that is regularly monitored?	Temporary sample plots with estimated locations	Temporary sample plots with exact locations	Permanent sample plots
Are non-forest land-use types included?	In forest land only	Also in grasslands with varying tree cover	Comprehensive plot-based measurements across all land uses
Are there institutional and budgetary provisions for periodic inventories?	Once off inventory	Institutional mandates and plannings but funding gap or reliant on external funding	Budget allocation and institutional mandates for inventory cycle
Are data routinely archived?	Not available	Decentralized for the NFMS's components	Centralized and integrated with regular statistical systems
Are inventory results widely and transparently available?	Only summary information publicly accessible	Detailed analytical reports publicly accessible	Analytical reports available and web interface

Questionnaire on the national GHG inventory

Indicators	'No'	'Partially'	'Yes'
Is there regular and detailed reporting on the national GHG inventory to the UNFCCC?	No NatComs or INC only	Several NatComs with detailed and annual time series	BUR submitted and including relevant annexes
Are lands stratified by land-use sub-categories, climate & soil, by management systems / tree types, and by managed / unmanaged?	Not available or only land-use subcategories and by managed / unmanaged?	Stratification by land-use subcategories and climate & soil, and managed / unmanaged	Stratification by land-use subcategories, by climate & soil, by management systems / tree types, and by managed / unmanaged
Is the methodology documented transparent and detailed?	Only rudimentary documentation, e.g., within National Communication	Not fully transparent or insufficient detail	Detailed national inventory report available
Are QA/QC procedures in place and being performed?	Not available	QA in place and being performed	QA and QC in place and being performed
Are an inventory improvement plan and a key category analysis in place and basis for planning?	Not in place	Both in place, but not connected or not acted upon for planning	Both in place and linked, and effectively being acted upon
Is there a functioning data sharing process between institutions involved in the national GHG inventory?	Data sharing ad hoc or data concentrated at the REDD+ management agency	Through Memoranda of Understanding or other agreements	Legally assigned roles for lead and support institutions across several agencies

Questionnaire on reference levels

Indicators	'No'	'Partially'	'Yes'
Has a reference level been developed and submitted yet?	Not available or no detailed report available	Reference level for REDD+ developed including detailed report	Reference level for REDD+ developed and submitted
Have national circumstances been analysed?	Not available	Either trend analysis using three time points or drivers analysis	Trend analysis based on three time points and drivers analysis
Is the scope and scale for the reference level defined?	Not available or only defined in terms of activities	Defined in terms of activities, pools and gases	Defined in terms of activities, pools and gases and all exclusions justifiably conservative
Is the stratification for activity data and emission factors the same as in the national GHG inventory at all levels of stratification of lands?	Not available	Mostly same data structure	Same stratification for activity data and emission factors at all levels of stratification

Annex: Summary report from an inception working session

Background

The national forest monitoring system (NFMS) is a set of efforts for data collection, management and analysis, undertaken by governments in the context of forest and climate change policy. Malawi's NFMS includes four main components: land monitoring, field-based forest inventory, an approach to reference-level setting, and national GHG inventory. The Government of Malawi through the Malawi REDD+ Secretariat situated in the Department of Forestry is developing the Malawi REDD+ Programme. One critical elements of the Malawi REDD+ Programme is the established of a National Forest Monitoring System (NFMS). A NFMS roadmap provides the first comprehensive steps towards establishing the design of such NFMS through identifying and describing required capacity development interventions.

REDD+ relies on an approach for measurement, reporting, and verification (MRV) to track results and ultimately serve as the basis for results-based payments. As per the Warsaw Framework, countries wishing to participate in REDD+ need to provide mandatory information streams, three of which directly relate to MRV, the need to set reference levels, the NFMS and the report on REDD+ results. The NFMS is one of the three mandatory information systems directly related to MRV.

A draft inception report was presented in a working session at the launch of UN-REDD support to Malawi. It informs key potential NFMS agencies on what a NFMS is and how the NFMS for Malawi could be developed by undertaking certain key required tasks.

Agencies' inputs into the draft Inception Report:

Proposed structure for NFMS roadmap for Malawi

Potential NFMS agencies present during the working session did not comment on the proposed structure of the Malawi REDD+ Program's NFMS roadmap, but participants did comment on the nature of consultations and compiled a list of agencies likely to be involved in the NFMS. A partial problem tree analysis session was conducted on one of the components of NFMS field-based inventory.

Methodology (tools and process)

Presentations at the working session addressed the scope and objectives of the NFMS roadmap for Malawi's NFMS, background on NFMS for REDD+, and methodologies for developing NFMS roadmap. Each presentation was followed by a short question and answer session. Participants asked for more detail about methodology.

Session outcomes

A question was raised about what the NFMS roadmap was supposed to achieve and what the participants were expected to do during the working session. This question arose during a session aimed at populating a matrix table outlining agencies' roles. The session was curtailed as participants felt agencies' were more or less outlined by the Science and

Technical Working Group of the REDD+ Expert Group. The National Consultant and team members were requested to review documentation of the working group and come up with the list and the expected roles. The team can then conduct consultations and investigate agencies' roles and functions and identify any capacity gaps.

The session also agreed to avail participants the full interview and questionnaire instruments for the inputs.

As part of discussion on field-based inventories the issue of sampling for NFI was discussed. There was the view that the number of permanent sample plots was not adequate for a proper NFI. The issue of scale was also raised as well as determining: what is the adequate number of sample plots? Other participants felt that resources to conduct NFIs may also be limiting.

A view was made that data development is not a problem but how to make use of available data and also the issue of under whose custody the data should be.

On forest definition some participants felt there was no need to labour on this task as apparently Malawi being a SADC member a SADC forest definition was adopted. Other participants, however, felt that such a forest definition was not currently available and an important gap, pointing out that development partners were forced in the recent past to fall back on international definitions, such as the one put forward by the FAO.

On land-use / land-cover maps one participant informed the session that different projects have done work on producing LULC maps. Such projects were undertaken by agencies such as JICA, FAO and RCMRD. It was therefore important to note what contributions are there. The NFMS roadmap should build on these efforts and products. It was therefore important to coordinate this and other activities in Malawi before launch of MRV. Additionally it is important to clearly outline the roles and rules for developing the NFMS. This despite one participant's observation that there is no agreed way to collecting data in Malawi. The NFMS roadmap team should take note of what has happened. The debate on coordination triggered discussion on governance regardless that NFMS is largely scientific and technical. Governance should be accorded the space it deserves in developing the NFMS.

As for the other agencies to be consulted participants the following as additional agencies:

- Department of National Parks and Wildlife
- National Herbarium and Botanical Gardens
- CGIAR
- Nyika-Vwaza Association
- Ongoing programmes of development partners (such as SADC MRV Programme and others)
- Some forest enclaves: groupings such as tobacco estates

Conclusions and next steps

The working session was largely a success despite the initial confusion on the task at hand. There was consensus on what needs to be done next. The participants seemed ready to participate in any they can in supporting the development of the NFMS roadmap.

Specifically the sessions showed that participants are well as aware of reasons why certain processes have not been successful as evidenced from the problem tree analysis on field-based inventories.

The session also revealed that participants are aware of which agencies would be key in implementing the NFMS in Malawi.

Session programme

LAUNCH OF UN REDD SUPPORT TO MALAWI – WORKING SESSION ON THE DEVELOPMENT OF A ROADMAP FOR THE NATIONAL FOREST MONITORING SYSTEM, 30 APRIL 2015, VENUE: CROSSROADS HOTEL, LILONGWE

TIME	ACTIVITY	RESPONSIBLE PERSON
10 mins	Welcome remarks and Introductions by Custom, Scope and Objectives of the roadmap for Malawi's national forest monitoring system (presentation by Henry)	Henry Kadzuwa, Forest Officer/GIS Unit Head, Forestry Department and Custom Nyirenda, Principle Forestry Officer, Forestry Department
15 mins	Background on National Forest Monitoring Systems for REDD+. Generic background from global perspective. Q&A for five minutes after Background	Till Neeff, FAO
30 mins	Presentation of methodology for developing Malawi's roadmap for the national forest monitoring system (20 min + 10 min for questions)	Bennet Mataya, National NFMS Consultant
30 mins	Discussions about the presentations. Questions about: -The Team (workload, duties, capacity building) -Timeline (start/end dates, milestones) -Consultations (who are we consulting? Which institutions? Why?) -Methodology (related to consultations) -Key Institutions (DoF, DoS, LRCD, FRIM, EAD and Academia)	Custom Nyirenda, Principle Forestry Officer, Forestry Department
40 mins	Parallel working groups (1 or 2 depending on needs) on capacity gaps and institutions. Brief summary of the Four Pillars of NFMS (related to capacity gaps in Malawi since we are still developing certain pillars)	Till Neeff, FAO and Bennet Mataya, National NFMS Consultant
15 mins or until end of session	*Coffee Break* Summary and Next Steps	Summary: Henry Kadzuwa, Forest Officer/GIS Unit Head, Forestry Department Custom Nyirenda, Principle Forestry Officer, Forestry Department Next Steps: Bennet Mataya, National NFMS Consultant

List of participants and agencies

Name of participants	Organisation	Contact details
Custom Nyirenda	Department of Forestry	nkhamoza@gmail.com
Bennet Mataya	Mzuzu University	bennet.mataya@gmail.com
Till Neeff	FAO	till@neeff.com
John Kerkering	US Forest Service	john+kerkering@fs.fed.us
Cristel Cheong	Hestian	crischeong@gmail.com
Dennis Kayambazinthu	Forestry Consultant	d_kayamba@hotmail.com
Sharon Gomez	GAF AG/SADC	sharon.gomez@gaf.de
Thomas Haeusler	GAF AG/SADC	thomas.haeusler@gaf.de
Ivy Gondwe	GIS Consultant - CDM	gondweeve@gmail.com
Henry Utila	FRIM	heutila@gmail.com
Clifford Mkanthama	Malawi PERFORM Project	cliffordmkanthama@gmail.com
Eric Mbingwani	FRIM	ericmbingwani@gmail.com
Willie Sagona	FRIM	willsagona@gmail.com
Zacharia Magombo	National Herbarium and Botanical Gardens	zachmagombo@gmail.com
David Chalmers	USAID	dchalmers@usaid.gov
Gumbi Gumbi	Department of Surveys	gumbiwagumbi@gmail.com
Powell Mponela	CIAT- Malawi	p.mponela@cgiar.org
Henry Kadzuwa	Department of Forestry	henharkadzuwa@gmail.com
Christopher Mwambene	CURE	cmwambene@gmail.com
Luke Malembo	PERFORM	luke.malembo@mw.perform.org
Dan Ndalowa	Malawi College of Forestry and Wildlife	nchidani@gmail.com
Yoel Kirschner	US Forest Service/MRRP	malawi.redd.advisor@gmail.com

Annex: Summary report from focus group discussion

National Forest Monitoring System Roadmap Development – Focus Group Discussions

Department of Forestry Conference Room, 7th July, 2015, 2:00 pm – 4:45 pm

Welcome Remarks – Presented by: Stella Gama, REDD+ Focal Point, DoF

Malawi Requested UN-REDD to benefit from a number of programs that support developing counties and our request for Targeted Support was accepted. Under Targeted Support we have a number of components and one is to develop a roadmap to establish a NFMS. The primary objective is to provide direction to the Malawi REDD+ program for a process that will make sure we captivate capacities for the purposes of REDD+ as well as GhG inventories. We expect that the roadmap would identify and prioritize key steps in the design and implementation of a NFMS. This will provide a skeletal framework that we hope to use in the future. This assignment recruited an expert, Bennet Mataya, and is supported by expertise from Till Neeff of FAO and from the department to make sure we have ownership. We also have local government counterparts who are following the assignment on a daily basis, Henry Kadzuwa and Custom Nyirenda.

Rationale for NFMS Roadmap Consultations – Presented by: Henry Kadzuwa, Head of GIS and RS, DoF

Rationale for NFMS

- To provide direction to the Malawi REDD+ Programme for capacity development
- Because NFMS rests on four pillars (land monitoring, plot based forest inventory, Reference-level setting & GHG inventory which are all pre-requisites for the REDD+ to be implemented; the pillars dictate the direction which the REDD+ Programme should take.
- To provide development trajectory that serves as a skeletal framework which lays out required technical & functional capacities and in a way establish if there are any deficiencies in various contexts of capacity and provide means of rectifying them.
- For instance; technical gaps such as data management and utilization- data archiving, data sharing, lack of machinery to support such systems.
- To guide strategic decision making at the Malawi REDD+ Programme during the years to come.
- Giving checks and balances to the Malawi REDD+ Programme to ensure that it embraces all the four pillars in cognizance of the enabling environment and the decision makers that can shape and provide reforms about the Malawi REDD+ Programme.
- To raise awareness and create lobbying for the Malawi REDD+ Programme.

Comments:

B. Mataya – Essentially the NFMS is one of the key requirements through MRV exercises. Without the NFMS pillars we cannot address REDD+ processes.

Y. Kirshner – What we should concentrate on is that the NFMS is a goal for Malawi as a country and is not isolated to the DoF. Within the four pillars, land monitoring is also very important to other departments (Surveys LRCS). The fourth pillar, GHG inventorying, is in the interest of the Department of Environmental Affairs. I really want to emphasis that this is not a DoF priority but a priority throughout the GoM. We want to be inclusive to all ministries and departments.

S. Gama – If we are going to have a complete system we need to address both the quantitative and qualitative data. During the meantime I hope you will appreciate that we have challenges in monitoring our forests and carbon stocks. There are issues of deforestation rates; we have had a number of studies each with a different rate. As a complete package, we expect a lot of it from the NFMS. This should revolutionize the forestry sector.

A. Chibwana – We should keep in mind that one of the principles of Malawi REDD+ is no regrets. It should not just be that the rational for doing this is strictly for REDD+, in terms of no regrets we should look at a NFMS as a system that should always be in place to inform the decision making process throughout the GoM. It's not just for REDD+, if we have a NFMS it will still be quite beneficial to Malawi for all the other benefits it will bring. Once in place even without REDD+ it will bring a benefit to DoF.

H. Kadzuwa – I thought the scope of this is for the National REDD+ program. It is true that we don't have to focus only on REDD+, but the consultants for this assessment are specifically for the REDD+ program.

A. Chibwana – Again one of the philosophies is no regrets, so we can't always just think of REDD+ but instead all of its associated benefits. In the interest of making this attractive to other stakeholders we have to sell it as not just a DoF thing but a landscape approach that will help natural resource management altogether throughout Malawi.

Highlights from the Consultations – Bennet Mataya, National Consultant, Mzuzu University

Technical capacity:

- Not all agencies have GIS laboratories and those that do have no dedicated hardware and software.
- Data mostly centralised and archived but also saved as back up and available on MASDAP.
- NFMS activities at project level undertaken by external agencies as consultants or on short-term contracts with little or no technical capacity by the national agencies.
- Inadequate technical capacity of agencies to address pillars of NFMS (Despite that their mandates may require that)
- Limited coverage of plot-based forest information
- Information generated using different methodologies e.g. SADC MRV project, Japanese Forest Preservation Programme.
- Information/data sharing amongst offices low thus affecting knowledge about REDD+.

- No day to day work in land monitoring other than that linked to projects or if that work has been requested.
- Agencies involved in partial acquisition of satellite data
- Inadequate equipment to support systems such as data storage/decentralization, sharing etc.
- Quite apparent especially in government institutions.
- A national systematic review of work done by projects not done
- Important so as to compare indicators that have been developed by the against standards set by government.
- FAO and IPCC classifications being used but no agreed land cover classification
- Analysis of land use changes done by FAO (2013) study on forest and agriculture land.
- 'Silvicultural zones' missing in land classification process.
- Project based REDD+ initiatives are commercially oriented to fill revenue gaps and generate revenue for communities.
- Malawi has hardly started work on reference levels.
- Not many countries have completed reference levels.
- Data on GHG provided by agencies to EAD.
- However GHG inventories not standalone but part of National Communications.
- PERFORM to support national inventory system for GHG as technical capacity currently available hence reliance on consultants.
- Key category analysis yet to be conducted to determine efficiencies and establish which sectors are key in GHG emissions.
- NFMS pillars not fully understood and will require thorough understanding and skills to implement them (echoed by Dr Kayambazinthu).

Functional Capacity:

- No agency addressing all pillars of the NFMS but pillar(s) that are addressed are those that have linkages to mandates of those agencies.
- Government agencies mostly involved in NFMS; non-government agencies including CBOs working at project level.
- Some overlaps by agencies in NFMS related functions.
- Dedicated officers assigned to carry out NFMS related functions with 'minimal skills and capacities'.

Key informant: Dr Dennis Kayambazinthu, former Director of Forestry

- REDD+ is so complicated than VCS projects hence analyse each and every aspect of NFMS.
- Extend consultations to forest areas managed by the private sector and areas managed by local communities e.g. Co-management Blocks, Village Forest Areas; meet Village Natural Resources Management Committee etc. since Government will NOT implement projects but others e.g. CBOs, NGOs, Private Sector will.
- However if REDD+ projects are situated in the community monitoring has to be done by the community.

Challenges:

- Different levels of capacity/knowledge in REDD+ concept/initiatives affecting contribution in the interviews/discussions

- Most studies/activities on NFMS pillars were project-based and a number of them phased- out without leaving data/information with the relevant institutions. {Publications (i) made without acknowledging locals (ii) not available at key institutions}.

Next Activities:

- Focus Group Discussions on 7 July centered on NFMS to fill in gaps missed during consultations and solicit clarifications, to detail and consolidate institutional profiles, and to conduct problem tree analysis around reference levels and GHG inventories (land monitoring and plot-based forest information problem trees done).
- Further consultations with selected private sector agencies and selected local governance institutions including NHBG, Department of National Parks and Wildlife, Daulos Maumbeta etc.

Comments:

Y. Kirschner – You mentioned the issue of hardware/software in terms of capacity at the institutions that you looked into. I was wondering if human resources came up not only in terms of capacity but the number of people available to work. There is an issue of training and education and we have to look at the next 5 year horizon when some are retiring and a new crop of students are coming in, will they know anything about GIS/RS?

B. Mataya – Your right, the issue was mainly in terms of numbers.

M. Chirwa - We have a separate questioner that was about institutional profiling.

B. Mataya – The recommendations as of now are preliminary. In the institutional profile we ask agencies to give us the number of staff they have. We are talking to people we know who say something. The link between the college of forestry is one of the biggest links as of now.

M. Chirwa – I hear the Malawi College of Forestry and Wildlife is aligned with Bunda College; we can take advantage of that.

T. Neeff – I've seen similar pictures in other countries. In terms of how Malawi compares to others it is quite typical. There are a few things that are unique but overall these things that Bennett has discovered really resonate with my expectations. If there is a reoccurring gap, those kinds of things you find across the board in other countries. The work we are trying to do is relevant, and shows that we are going in the right direction. You ask people why it is difficult to carry out a NFMS. What I want to do later in the next section is talk to you about the why. Why do we have these gaps and what do they lead up to.

B. Mwale – Your observation that you go to different agencies and there is some level of capacities, but maybe as a way forward we should be looking at how we harness that capacity. How can we take advantage that different agencies have some capacity? You also mentioned the issue of harmonizing indicators. As part of the action plan aren't we talking about the need for an M and E framework? Otherwise when you see these projects with different indicators it means as a nation we are moving in different directions. You mentioned

GhG, PERFORM has yet to finalize a GhG gap analysis. Again it's not just the environmental affairs department; it has to do with all the related sectors. There is a need for coordination and a harmonized M and E framework that all agencies need to be aligned to.

A. Gwedeza – If you look at LULC you see at least 4 different standards due to lack of coordination. The capacity is there but the coordination is not

B. Mataya – We didn't use the word of lack of something. You look at the synergies of departments; it's not the lack of something its poor coordination.

H. Kadzuwa – In most of the forums that I've attended I've been asked about where we are in terms of LULC standards.

A. Gwedeza – Unfortunately as a department we haven't received any feedback from consultants. I suggest that we need to have a forum for all who are involved in LULC standards.

S. Gama – The DoF is planning on further consultations, we need everybody to be aware of what REDD+ has produced. We will be consulting the Department of Land Resources Conservation as well as other stakeholders depending on the discussions Dr. Chilima will have.

H. Utila – Do you have an ideal GIS lab during consultations

H. Kadzuwa – The institution with the best GIS lab is the Department of Surveys.

A. Gwedeza – We have good mapping hardware as well printers and software for processing data sets. Also we have a lab for training as well has scanners.

H. Kadzuwa– To add you need facilities to support data storage and data archiving as well as consistent internet connectivity. Surveys also has an index to easily access data.

T. Neeff – That is a highly relevant question, because you first need to understand where you want to go in order to understand the gaps.

D. Chonongera – In your consultations did you have specific offices that had data and weren't sharing with others, and what is the way forward?

B. Mataya – Among the offices, there is good information in personal computers but in the end you have to make a request to a particular individual to see that data.

H. Kadzuwa - with respect to MASDAP you find out that if you want project data you can't find it on MASDAP, you have to go to the surveys department and many times you have to buy or be mandated to have the data set.

B. Mataya – In the future when this is done, there are always in house rules. Even within the DoF, with the information that we are keeping, it's not that anyone can walk in and attain it. We should allow free access as much as possible but there will always be limitations.

A. Gwedeza– We are encouraging to share the meta data and not necessarily the entire data. There is a lot of duplication; we want to encourage donors and other organizations that collect data to directly upload it to MASDAP.

Recap of Questionnaires – Presented By: Till Neeff, Climate Change Expert, FAO

Does available satellite data cover a detailed time series of historical time points?

Y. Kirschner – Partial, we're somewhere between no and partially because we have 4 maps created since 2012.

S. Makungwa – Some studies have been conducted, the classical studies, but they have been project based.

T. Neeff – The question says satellite data so the answer could actually be yes

Is the geographic information system laboratory well equipped?

D. Chonongera – Lack of internet is the biggest issue

Is ground truthing used for accuracy assessment?

M. Chirwa – It is partially, it is usually project based so it is ad hoc.

Are data routinely archived?

A Gwedeza – Done by specific institutions so it's decentralized.

S. Makungwa – It is being done through MASDAP so it is yes, it is centralized.

Is there a functional data sharing process between institutions involved in land monitoring?

A. Gwedeza – Any data can be attained through MASDAP.

Is an official land classification scheme agreed?

M. Chirwa – This is under discussion

T. Neeff – Overall the picture isn't bad, most countries answer no to the majority of these questions.

Next Steps – Presented By: Bennet Mataya, National Consultant, Mzuzu University

In terms of the far future, we will worry about this after the workshop. What I have reported is simply the highlights, but now we will analyze the data and start drafting the report to prepare for the validation workshop sometime in September. Throughout July we will visit communities, estates, as well as other departments such as national parks and the national

herbarium. For the near future we will be conducting consultations to prepare for the drafting of the report.

Comments:

Y. Kirschner – We will address the Department of Surveys concerns about LULUC standards, it is very important that we continue to talk and continue to cooperate.

A. Gwedeza – We also want to coordinate standards so we will discuss and see the way forward.

H. Utila – I want to know how the NFMS captures factors like deforestation and degradation.

T. Neeff – Regarding the definition, that is an open issue that comes up immediately. The drivers are outside the scope of this study but are done by a different consultant. We might have to reconsider our recommendations once that study is made available.

S. Gama – The drivers study is funded by USFS and the preliminary findings should be circulated.

Y. Kirschner – Phase one will be done by RExG 12 so we can present then.

B. Mwale – From PERFORM I think there are going to be linkages between what we are going to doing. We have a key component of assessing the GhG inventory and how we will measure it. This is good information and I think the most interesting findings for us are what the capacity gaps are. This is really useful related work and I think it will complement the efforts of PERFORM.

S. Gama – The team has made commendable progress of the roadmap and we look forward to the actual outcome of the roadmap and how it will guide the future work of the forestry sector as well as stakeholders in land use.

Attendance

Name	Title	Agency/Department	Email
Henry Kadzuwa	GIS and RS Head	Department of Forestry	hkadzuwa@yahoo.co.uk
Dickson Chonongera	Land Resources Conservation Officer	Department of Land Resources Conservation	dchonongera@yahoo.com
Yoel Kirschner	REDD+ Advisor	Malawi REDD+ Readiness Program	malawi.redd.advisor@gmail.com
Alinafe Chibwana	REDD+ Associate	Malawi REDD+ Readiness Program	achibwana@live
Alice Gwedeza	Principal Mapping Officer	Department of Surveys	alicejgwedeza@gmail.com

Henry Utila	Assistant Director	FRIM	heutila@gmail.com
Gloria Nkhoswe	Technical Assistant - Biodiversity	Department of Forestry	nkhoswegloria@yahoo.com
Stella Gama	REDD+ Focal Point	Department of Forestry	stellafunsani@gmail.com
Blessings Mwale	Deputy Chief	PERFORM	blessings.mwale@gmail.com
Moses Njiwawo	Assistant Forestry Officer	Department of Forestry	mnjiwawo@yahoo.com
Lucas Elenitsky	REDD+ Volunteer	US Peace Corps	lelenitskyk@gmail.com
Mike Chirwa	Senior Research Officer	FRIM	chirwamike@gmail.com
Till Neeff	Climate Change Expert	FAO	till.neeff@fao.org
Steve Makungwa	Law emissions development specialsist	PERFORM	smakungwa@gmail.com
Bennet Mataya	Senior Lecturer	Mzuzu Department of Forestry	bennet.mataya@gmail.com

Annex: Summary report from validation workshop

NATIONAL FOREST MONITORING SYSTEM ROADMAP DEVELOPMENT
VALIDATION WORKSHOP REPORT

Introduction

The National Forest Monitoring System (NFMS) roadmap validation workshop was held on 8th October 2015 at the Pacific Hotel, Lilongwe, Malawi. The aim of workshop was to enable participants officially accept the roadmap after presentation of the draft roadmap report. Participants were drawn from various agencies that will be part in developing the NFMS as well as implementing activities that will generate data for the system.

Workshop remarks

Mrs Stella Gama, the UN-REDD Focal Point in Malawi provided a background to the Malawi REDD+ Programme. She reiterated that Malawi is currently in the Readiness Phase whose outcome will be the development of the Malawi REDD+ Readiness Strategy. In 2015 and onwards funds amounting to $300,000 from UN-REDD would be available mostly to carry out various analytical works including the development of the NFMS. Hence all the agencies gathered for the validation workshop had a stake in the NFMS.

Ms Florence Rochelle, the FAO Country Representative noted that a majority of forests in Malawi have disappeared. 25 years ago there were a lot of forests in the country. She said it is time to 'Think Outside the Box' and that forestry, agriculture and energy sectors need to work together. The NFMS roadmap should be looking at these issues to address the forestry situation in Malawi.

Director of Forestry, Dr Clement Chilima, observed that the forestry in the country is facing a lot of challenges including severe deforestation and forest degradation. The country is losing forest cover. Quantifying the loss is a daunting task as methodologies differ. There is need for robust and systematic methodologies to estimate GHG emissions and removals. There is therefore need for a transparent NFMS result-based methodology to minimise uncertainty. The NFMS will be important in monitoring REDD+ outcomes. It will also be important for planning and management. He called for further support of the REDD+ processes. The forest sector needs to be transformed. Deforestation and forest degradation needs to be addressed and forests restored.

Presentation and comments on the draft NFMS roadmap

The presentation of the draft NFMS was made in three parts namely: Background and methodology, Institutional role allocations and perceived gaps and conclusions and recommendations by the Country Counterpart, National Consultant and International Consultant respectively. At the end of each presentation quick reactions were sought from the participants followed by final reactions from the participants. A scoring exercise of the recommendations per NFMS pillar was conducted and the results debated. Several comments and clarifications were made as follows:

Dr Clement Chilima: Why is there a need for collaboration between DoF and FRIM when these are but one agency? DoF/FRIM institutional relationship? No! But intra-departmental relationship is important but no need for MOU.

Response: Working modalities for NFMS and NFI by DoF and FRIM will be worked out in-house and hence no need for an MOU.

George Phiri: Are there models for MOUs/Agreements in Malawi?

Response (Ted Kamoto): There are some MOUs that have been developed to build inter-agency relationships.

Christopher Mwambene: Why have CSOs and Private Sector not been involved?

Response: Some CSOs and private sector involved as sample agencies such Nyika-Vwaza Association, Total LandCare and Kanongo Tobacco Estate on roadmap development. More CSOs and private sector to be involved in the actual NFMS.

Christopher Mwambene: Most of the work done by external assistance. There is need for sustainability to sustain the effort. However not all GHG inventory work has been done by external consultants and external funding. Some CSOs and the Malawi Bureau of Standards have done work on GHG inventory.

Response: This is noted.

Henry Kadzuwa: Reports that have been submitted show lack of capacity e.g. the persistent use of default values.

Ramzy Kanaan: Since GHG inventories are carried as part of preparing National Communications, Government should be managing the data. As for National Forest Inventory the roles and responsibilities should be internal. There is no advantage to inventory non-forest resources.

Response: This is noted. This will have to be discussed further in the near future.

Till Neeff: Work on drivers of deforestation and forest degradation has been done by LTS but it has largely been qualitative. For the purposes of the NFMS quantitative information will need to be collected.

Christopher Mwambene: Why is leadership an issue?

Response: There is a feeling that the DoF has now leadership it needs to steer it forward. Not saying current leadership is not wrong.

Jessica Troell: Some of the recommendations have legal implications.

Response: This is noted. Those recommendations should be identified.

Clement Chilima: There is 'unfair' distribution of votes across the pillars and recommendations e.g. on collection of data. Certain actions need to start before others (*need*

to identify which ones). Outputs have scored HIGHER than the PROCESS which should been the other way round.

Response: This is noted. To be worked out in-house by DoF.

Ted Kamoto: Equally 'shocked' with allocation of votes e.g. forest inventory has received low votes Misalignment of prioritisation of pillars and recommendations especially reference level setting and GHG inventory indicates that these are new areas that need for technical capacity. Previous efforts such the Tree Planting for Carbon Sequestration Project collapsed due to this lack of technical capacity.

Response: Agreed with the observation. Future similar projects should draw on well-grounded technical capacity for concerned technical staff.

Till Neeff: Why has institutional relationships NOT received more votes? This is critical.

Response (George Phiri): Institutions working in SILOs (isolation). We should be advocating to break down these silos. Strong leadership should build the relationships as there are a lot of activities happening outside forests.

Response (Ramzy Kanaan): Institutional arrangements being made for GHG inventories. EAD has had a meeting and letters have gone out on this (to develop some of protocol) however it should ne noted that this is not a typical practice in Malawi.

Till Neeff: There is a major gap in the archiving system in the country. Data from more 25 years ago has been lost thus why MASDAP is being put forward as a solution for this gap.

Gumbi Gumbi: There is need for better catalogue of data to be done and then the data posted on MASDAP.

Ramzy Kanaan: However people will always ask 'What is in it for them' (what do they gain) for example by collecting data for GHG inventories.

Mike Chirwa: However in terms of technical capacity it is important to derive (calculate) activity data and emission factors as these form the basis for anything else that follows.

Closing remarks

The FAO Technical Specialist for Climate Smart Agriculture, Dr George Phiri called for the implementation of the NFMS roadmap in order to save the forests in Malawi. FAO will continue to support the process. The Director of Forestry, Dr Clement Chilima thanked FAO for supporting the validation workshop. The report was very enlightening to everybody. He also thanked Mr Ramzy Kanaan, Chief of Part for PERFORM Project and the NGOs present at the validation workshop. He reiterated that the DoF is very serious and that all activities will be well coordinated. The Ministry of Natural Resources, Energy and Mining wants deforestation and forest degradation to be arrested and reversed. Monitoring of forests will be key to this process. There will therefore be need to convince higher authorities that this will be achieved. There is need to know how much deforestation and forest degradation is

happening and what impact interventions are having. There is need for results for whatever is being supported. The DoF is eagerly waiting for the report and looks forward to its adoption.

Prioritisation of recommendations

Land monitoring		Forest inventory		Reference levels		GHG inventory	
Develop MOU between LRCD, DoS, DPNW, DoF to define roles	2	Define roles of within DoF and FRIM	1	Clarify institutional responsibility	2	Foramalise institutional relationships	3
Develop DoF and FRIM GIS and Remote Sensing laboratories	2	Design a strategy	4	Develop technical capacity	5	Develop technical capacity	8
Enhance use of MASDAP	0	Allocate resources	3	Analyse drivers of deforestation	2	Develop functional capacity	1
Formalise new forest definition	3	Create data catalogue and archive	1	Analyse national circumstances	1	Calculate GHG emissions from land use	0
Formalise new LULC standard	1	Collect data to fill gaps	2	Calculate and submit REDD^{+} reference level	8	-	-
Compile maps based on LULC standard	2	Derive emission factors	5	-	-	-	-
Pillar total	10	Pillar total	16	Pillar total	18	Pillar total	12

Participants

Name	Designation	Department
Mike Chirwa	Senior Forestry Research Officer	Department of Forestry, Forestry Research Institute of Malawi
Eric Mbingwani	Forestry Research Officer	Department of Forestry, Forestry Research Institute of Malawi
Henry Kadzuwa	Forestry Officer	Department of Forestry
Clement Chilima	Director of Forestry	Department of Forestry
George Phiri	Technical Coordinator	FAO
Christopher Mwambene	Executive Director	Coordination Union for the Rehabilitation of the Environment
Stella Gama	REDD+ Focal Point	Department of Forestry
Gumbi Gumbi	Senior Land Information Systems Officer	Department of Surveys
Zondiwe Ndlhovu	Senior Research and Development Officer	Department of Parks and Wildlife
Stavess Msowoya	Reafforestation Officer	Tobacco Control Commission
Jessica Troell	Environmental Lawyer	Environmental Law Institute
Ramzy Kanaan	Chief of Party	PERFORM Project
Chika Takanushi	GIS Specialist	Department of Forestry
Till Neeff	UNREDD	FAO
Ted Kamoto	Assistant Director of Forestry	Department of Forestry
Gloria Nkhoswe	Biodiversity Officer	Department of Forestry
Hanna Kasongo Siame	Environmental Officer	Environmental Affairs Department
Harold Chisale	Lecturer	Lilongwe University of Agriculture
Peter Mkandawire	Lecturer	Lilongwe University of Agriculture
Nyuma Mughogho	Deputy Director of Forestry	Department of Forestry

UN-REDD PROGRAMME

Food and Agriculture Organization of the United Nations

UNDP Empowered lives. Resilient nations.

UNEP

22th of October 2015, Lilongwe, Malawi