



The current state of Eastern Africa's forests

Editors: Esther Mwangi, Paolo Cerutti and Robert Nasi

Technical report to the Joint Research Centre of the European Commission regarding the service contract to support establishment of an Eastern Africa forest observatory prototype (covering Kenya, Mozambique, Tanzania and Uganda)

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ACRONYMS

AFRI 100	African Forest Landscape Restoration Initiative
CBFM	Community based forest management
CBO	Community Based Organization
CFA	Community Forest Association
CFM	Collaborative Forest Management
CFR	Central Forest Reserve
CLA	Community Land Alliance
CRM	Collaborative Resource Management
CSO	Civil Society Organization
CSR	Corporate Social Responsibility
DFO	District Forest Officer
DFS	District Forestry Services
DINAF	National Directorate of Forests
DNFT	National Directorate of Forests and Wildlife
EIA	Environmental Investigation Agency
FSSD	Forest Sector Support Department
GOK	Government of Kenya
GOM	Government of Mozambique
GDP	Gross Domestic Product
JFM	Joint Forest Management
KEFRI	Kenya Forest Research Institute
KFS	Kenya Forest Service
KNBS	Kenya National Bureau Statistics
LFR	Local Forest Reserve
LULC	Land Use Land Cover
MITADER	Ministry of Lands, Environment and Rural Development
MENR	Ministry of Environment and Natural Resources

MEWNR	Ministry of Environment, Water and Natural Resources
MFW	Ministry of Forestry and Wildlife
MNRT	Ministry of Natural Resources and Tourism
MRV	Monitoring, reporting and verification
MWE	Ministry of Water and Environment
NFMS	National Forest Monitoring System
NBS	National Biomass Study
NDP	National Development Plan
NEMA	National Environment Management Authority
NFA	National Forestry Authority
NGO	Non-Governmental Organization
NTFP	Non-Timber Forest Product
NWFP	Non-Wood Forest Product
PFM	Participatory Forest Management
REDD+	Reducing Emissions from Deforestation and Forest Degradation
SADC	Southern Africa Development Community
SDAE	District Service of Economic Activity
TFS	Tanzania Forest Services Agency
THF	Tropical High Forest
UBOS	Uganda Bureau of Statistics
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UN REDD	United Nations REDD Programme
URT	United Republic of Tanzania
UWA	Uganda Wildlife Authority
VAT	Value Added Tax
WCA	Wildlife Conservation Area
WWF	World Wide Fund for Nature

EXECUTIVE SUMMARY

Introduction and rationale

This report outlines, describes and analyzes the status of forests and REDD+ implementation in Eastern Africa, synthesizing and presenting information so it can be easily understood by policy makers and practitioners making forestry and REDD+ related decisions.

Demand for reliable national and regional forestry data is high. The East African Legislative Assembly, which passed a regional Forestry Bill in late 2015, indicated that data on regional forest cover change and drivers is scarce, constraining design of a regional approach to policies and practices for sustainable forest management and use. Regional forest conversion rates are high and rising, ranging from 97% in Rwanda, 37% in Tanzania, and 27% in Uganda in 1990–2005. These rates have sustained or increased beyond 2005; Uganda seeing an annual rate of 4.14%. All countries are signatories to the Paris Agreement, which calls for conservation and enhancement of forests and adoption of policy approaches and incentives that reduce emissions from deforestation and forest degradation. The implementation of REDD+ further increases demand for reliable data to prove whether forest conservation programs are reducing carbon emissions. Scarcity or lack of data has been a barrier for many developing countries yet to establish baselines to measure forest changes; many have not yet developed a coherent framework and actions for monitoring carbon emissions and UNFCCC reporting.

The region has recently taken steps to design country-level forest monitoring and information systems. This process has involved periodically gathering data critical for forest resource monitoring, like forest biomass, land cover changes, timber harvesting and areas of degradation. Such initiatives are defined more by dissimilarities than by compatibility. While Kenya, Uganda and Tanzania have established monitoring systems, the scale, frequency and type of data gathered varies. Tanzania's National Forestry Resources Monitoring and Assessment (NAFORMA), the most comprehensive on-the-ground data collection system in the region, gathers socio-economic data that includes disturbance data and local community forest use, as well as the biomass inventories and satellite data gathered by all countries. Ugandan monitoring has focused on establishing biomass stocks but includes volume of timber harvested in different forest types, sawn timber, firewood and poles; it makes extensive use of satellite data to estimate change. In addition to satellite and biomass inventories, Kenya's forest monitoring system includes participatory monitoring. Kenya and Tanzania are at different stages in designing and implementing carbon monitoring, reporting and verification (MRV) systems. Kenya has recently developed and is now establishing a system for land emissions estimation (SLEEK); this gathers forestry, meteorological, crop and land-use data and has processes and structures for data generation, sharing and reporting. Tanzania's newly-established National Carbon Monitoring Center (NCMC) will provide technical services on MRV for REDD+, and host and manage the national carbon database. Although the region has forest monitoring initiatives, these are diverse and lack compatibility; data type and scale vary. Likewise, carbon monitoring is at a nascent stage, with systems developing in divergent ways.

Against this background, several needs emerge for regional forest monitoring: a) better, regular and more systematic information on forest trends and threats, providing data for national and regional reporting and to support decision making; b) mechanisms for data exchange and harmonization, and strengthening current monitoring system capacity. Reviewing existing monitoring systems, practices and processes will assist stakeholders to explore avenues for country-level support to meet various goals (e.g. REDD+ MRV, evidence-based policy making, data quality, coordination and harmonization); it will also support region-

level policy initiatives aimed at cross-border integration of forest and natural resources management. Equally, this report provides information that can support monitoring of national obligations with regional content and relevance like REDD+ and the African Forest Landscape Restoration Initiative (AFRI 100).

The report comprises of six chapters grouped into three sections. The first section provides background to forest management in Eastern Africa; the second presents trends and trajectories of regional forest cover change; while the third presents conclusions for policy makers and practitioners.

Key findings

Forest use and management

Eastern African forests are diverse and include transboundary forest ecosystems, such as miombo woodlands, mangroves and coastal forests that stretch from south-eastern Somalia to Tanzania and Mozambique. Forest contribute significantly to local and national economies as well as to the livelihoods of rural and especially forest-adjacent, mostly poor, communities. Current estimates indicate forestry contributes an average 3% to Gross Domestic Product (GDP) regionally, although this doesn't take into account the contribution of ecosystem services (regulatory and recreation) and informally-traded Non Timber Forest Products (NTFPs). Significant forest-adjacent community household income is derived from forest resources, increasingly so when households are poor, making forests an economic and financial safety net, and a buffer against climatic shocks like droughts. Formally and informally, the forestry sector employs up to one million people in countries like Uganda. It also contributes to economic sectors such as energy (forest-derived wood fuel supplying over 70% of energy demand), agriculture and tourism. Stakeholders come from forestry, environment, agriculture and energy sectors, and include ministries, implementing agencies, research institutions, forest users (domestic, industrial and commercial), local and central governments, non governmental organisations (NGOs), civil society organisations (CSOs) and private sector.

Forest laws and institutions

Across the region forestry is governed by policies, laws and regulations derived from the sector and environmental, agriculture and energy sectors. Legislation has similar objectives: integrating conservation-development approaches that aim for sustainable forest management and conservation for public well-being. Forest legislation includes provisions for decentralization of forest management to ensure local community and authorities are involved in public forests (managed by central or local governments), community forests and private forests. Communities co-manage public forests through participatory initiatives, as seen in Kenya and Tanzania. Uganda has two types of community-based forestry (CBF) in public forests: collaborative forest management (CFM) in Central Forest Reserves (CFRs) and collaborative resource management (CRM) in Wildlife Conservation Areas (WCAs). Other forms of CBF in Uganda are private and community forests. Although in Mozambique communities do not own land, they are granted rights to use and benefit from land and resources (such as water, minerals and forests) for subsistence purposes. Community members are also entitled to 20% of any fees or tax paid by concessionaires and license holders for the exploitation of local forest resources.

Environmental ministries are the lead central government institutions overseeing forestry, working in collaboration with agriculture and wildlife ministries. Various institutions implement forest management mandates, such as the Kenya Forest Service (KFS) and Kenya Wildlife Service (KWS); the Ugandan National Forestry Authority (NFA) and Uganda Wildlife Authority (UWA); the Tanzania Forest Services Agency (TFS) and Tanzania National Parks Authority (TANAPA); and the National Directorate of Forests (DINAF) and National Administration of Conserved Areas (ANAC) in Mozambique. Forest management is decentralized to local government (or county-level government in Kenya) with district authorities managing local government forests and supervising private and community forests. In Uganda a specialized institution manages local-level forests, the District Forestry Services (DFS).

Main constraints to forest law implementation include inadequate financial, technical and human capacity, insufficient stakeholder coordination, weak conflict resolution and grievance mechanisms, and conflicting policies between sectors that favor forest conversion. Corruption, political interference and elite capture also hinder implementation.

Status of REDD+ in Eastern Africa

No country has yet finalized all elements required in the REDD+ readiness phase, the major constraint being inadequate funding. Other potential constraints to REDD+ implementation include initial lack of consideration for indigenous rights and insufficient stakeholder consultation on the importance and aims of REDD+.

Progress on the development and implementation of REDD+ has varied. All countries bar Kenya have a national REDD+ strategy, while Tanzania and Mozambique also have national action plans, and Mozambique and Uganda are now negotiating funds for REDD+'s investment phase. No country has a fully operational National Forest Monitoring System (NFMS) and all are at different stages in designing and implementing this. Progress towards other key elements, such as benefit sharing and grievance mechanisms, and country-relevant forest governance improvements, also varies. No country has a clear scheme for benefit sharing although efforts to develop them are underway. Only Kenya has started to integrate REDD+ provisions into key legislation, although this has not yet been finalized.

Forest monitoring in Eastern Africa

The region's forest resources are periodically monitored through biomass monitoring and Land Use Land Cover (LULC) or forest cover mapping. Harvesting and trade in forest products are also monitored, however, forest monitoring systems and initiatives vary in data type, scale and frequency of collection.

Monitoring approaches were adopted to establish a long-term harmonized methodology for national monitoring of forest resources and ensure sustainable forest management; recently all countries' approaches have been aligned with REDD+ objectives. Nevertheless, carbon emissions monitoring is still initiating, with only Kenya and Tanzania having designed and now establishing systems (SLEEK and NCMC) while others are still in the design phase. These systems are developing in divergent ways. Uganda is further advanced in developing forest monitoring approaches for different forest types and purposes, and has produced more comprehensive LULC data, including forest cover change for various forest types and tenure regimes.

Major challenges to forest monitoring include inadequate financial, technical and human resources, and a lack of harmonized standards and methodologies for national monitoring. The countries use different

methodologies at different times, complicating comparison of forest cover changes. Other challenges are specific to field data collection, with collectors encountering remote sample or validation points, difficult and insecure terrains, sometime uncooperative communities and dangerous wild animals. In spite of the challenges, good practices in forest monitoring practices were identified. Monitoring has involved multi-stakeholder processes with multiple collaborators in assessment design and implementation. Socio-economic data collection also provides insights into factors underlying forest cover changes.

Forest cover change: trends, drivers and policy responses

Trends show a general decline in forest cover. Annual deforestation rates are high, ranging from 0.3-4% in Uganda, 0.97% in Tanzania, 0.85% in Mozambique and 0.05% in 1990-2010 in Kenya. Deforestation is highest in forestlands with weak management and tenure security, such as open access land in Tanzania and communal lands in Kenya. In Uganda, however, deforestation is highest in private land forests, with less deforestation occurring in government-managed public forests.

Many of the region's restoration efforts respond to REDD+, the Bonn Challenge and AFRI100 while others relate to national policy initiatives such as Uganda's National Development Plan which promotes commercial forests. Degradation is more widely spread and varied than deforestation, though undeveloped assessment methodologies have resulted in a gap in degradation monitoring. Drivers of forest cover change and degradation are regionally similar, with main direct drivers being agricultural expansion, unsustainable harvesting of wood products and poles, infrastructure development and wildfires. The greatest external drivers are from agricultural and energy sectors, while internal drivers are logging, firewood collection and charcoal production.

In response to rapidly-declining forest cover, the four countries have embarked on sector reforms, including reviewing and enacting new legislation. Kenya has included county-level government in forest management and initiated a chain of custody system to verify and report on forest product origin. With reforestation as a national development priority, Mozambique's newly-formed Ministry of Lands, Environment and Rural Development (MITADER) initiated a participatory audit of forest concessions, suspended new exploration requests, banned log exports, updated forest policies and regulations, and started an ambitious forest protection, conservation and sustainable management project called *Floresta em Pé* (Siteo et al. 2012).

Various regional initiatives attempt to address illegal forest product trade and ensure sustainable transboundary forest resource management, including the Southern Africa Development Community (SADC) Forest Protocol (2002), the East African Community (EAC) Protocol on Environment and Natural Resources (2005), EAC Forest Management and Protection Bill, EAC Transboundary Ecosystems Management Bill and the EAC Regional Strategy to Combat Poaching and Illegal Trade in Wildlife and Forest Products. Other policy strategies include bilateral agreements on monitoring timber trade and The Zanzibar Declaration on Illegal Timber Trading and Forest Products, a multilateral agreement presenting an opportunity to strengthen efforts to build relations with the SADC and EAC member states, to improve management of forests and forest product trade.



Photo: Douglas Shell/CIFOR

CHAPTER 1. FOREST USE AND MANAGEMENT IN EASTERN AFRICA: AN OVERVIEW

LAURA MUKHWANA, ESTHER MWANGI, PAOLO CERUTTI, ALFRED GICHU, JOHN DIISI,
NURDIN CHAMUYA AND JOAQUIM MACUACUA

1.1 Introduction

This report consolidates forestry sector information across Eastern Africa, responding to the need for increased regional coordination in resource use and decision making. Trade of charcoal and timber spills across national boundaries, climate change effects transcend borders, even certain forest resources are transboundary. Eastern African countries are designing laws and policies to govern cross-border assets and interactions, through legislation like the Zanzibar Declaration to curb illegal transborder timber flows and the East African Communities' forest bill.

This report therefore aims to support regional decision making by policy makers and practitioners, through providing current reliable information. The report forms part of a project to develop an Eastern Africa forest observatory prototype, details of which can be found here: apps.rcmr.org/ofesa

This first chapter gives an overview of regional forest types, describing distribution, cover and contribution to national economies. It highlights pressures on forests and describes relevant value chains, highlights main stakeholders and their interests, before concluding with key gaps requiring attention.

1.2 Forest cover types in Eastern Africa

Eastern Africa has a variety of unique and biologically diverse forests, some transboundary, such as miombo woodlands spanning Tanzania and Mozambique, Eastern Arc Mountain Range forests spanning Kenya and Tanzania, Mount Elgon's forests crossing Kenya and Uganda, and mangroves and coastal forests stretching from south-east Somalia to Mozambique (Timberlake et al. 2011), whilst Guinea-Congolian rainforest remnants are still found in eastern Uganda (Mabira forest) and western Kenya (Kakemega forest) (Kweka et al. 2015; MENR 2016). Forest covers 55%, 43%, 12.4 % and 6.99% of total land area in Tanzania, Mozambique, Uganda and Kenya respectively (GOM 2018, 2007; MENR 2016; MNRT 2015; MWE 2017b, 2018).

Kenya's has four forest cover types: western rainforest (western plateau/Guinea-Congolian rainforest), afro-montane undifferentiated, dryland and coastal forests (MENR 2016), as well as plantation and farm forests. Montane forests (1.14 million ha), and mangroves and bushlands (2.13 million ha) are dominant. Western Kenya's Kakamega and Nandi Hills rainforests are representative of Guinea-Congolian rainforests stretching from the Congo Basin to the West African coast. Bamboo and mixed indigenous afro-montane forests are found on Kenya's major 'water towers' - Mount Nyiro, Mount Elgon, Mount Kenya, Mount Kulal, Mount Marsabit, Mau Forest Complex, Cherangani Hills, the Aberdares and the Mathews range. Coastal forests consist of mangroves and coastal natural forests, while dryland forests can be found in the Taita Hills, northern Kenya's hills and eastern and north-eastern regions; these occur in low-lying sandy alluvial soils and are both riverine forests in floodplains and along rivers and tributaries, and dry savannah forests.

Uganda's forests consist of Tropical High Forests (THFs), woodlands and plantations (broad-leaved and coniferous) (MWE 2016a, 2016b; MWE 2017a, 2017b); woodlands are the predominant forest cover type. Well-stocked THFs once covered Uganda's central regions and mountainous areas; now these are restricted to national parks (e.g. Bwindi Impenetrable, Kibale, Mount Rwenzori and Mgahinga) and some Central Forest Reserves (CFRs) in western Uganda (Budongo, Katsyoha-Kitoma, Bugoma and Kalinzu-Maramagambo) (MWE 2016a, 2016b; MWE 2017a, 2017b). Low-stocked THFs are found on Lake Victoria's islands and shores, while savannah bushlands and woodlands cover drier regions in northern, central and western Uganda.

Mainland Tanzania's dominant forest ecosystems are acacia savanna and miombo woodlands; the Guinea-Congolian, Montane/Eastern Arc low land and coastal forests are also present (Kweka et al. 2015). Soft and hard wood plantations are located in the Southern Highlands, and the northern region's montane forests (Kweka et al. 2015). The Eastern Arc mountain forests are found on Taita Hills, north and south Pare mountains, north and south Nguru mountains, east and west Usambara mountains, Ukaguru, Udzungwas, Malumbwe Hills, Mahenge and the Uvidundwa mountains. Other types of montane ecosystems are found on Mount Kilimanjaro, Mount Meru, Ngorongoro in northern Tanzania, and Marang forests (WWF 2001); these form part of the Eastern Africa montane forests running from southern Sudan to northern Tanzania passing through Kenya and Uganda (WWF 2001). Most Tanzanian forest is in the southern regions of Lindi, Katavi, Ruvuma and Mbeya, where forest constitutes over 70% of total land area. Zanzibar's forests - bush and tall trees in coral rag areas (81%), mangroves (15%) and forest

plantations (4%) - cover approximately 40% of total land area (106,458 ha and form part of Eastern Africa's coastal forest ecosystem (URT 2016).

Mozambique's forest cover is comprised of woodlands and forests (Marzoli 2007). Woodlands are thickets, woodlands and forests under shifting cultivation while the main forest ecosystems are miombo (60%), dry deciduous (15%) and mopane forests (11%) (JICA 2013). Provinces with the largest forest cover are Cabo Delgado (4.8 million ha), Zambezia (5.1 million ha) and Niassa (9.4 million ha) (Marzoli 2007). Other forest ecosystems include coastal forests, afro-montane forests and coastal dry forests in southern, central and northern Mozambique respectively (World Bank 2017).

1.3 Forest values

Forests contribute significantly to socio-economic development, boosting local and national economies through forest products sales, food and energy, employment, and ecosystem services supporting livelihoods and energy, agriculture, wildlife and tourism sectors. Current estimates on forests' contribution to national economies vary, depending on indicators. Kenya's National Bureau of Standards (2016) estimates 0.7% annually, while UNEP (2012) estimates 3-3.6% annually (equivalent to USD 365 million) (MENR 2016). Revenues collected by forest management institutions like Kenya Forest Service (KFS) are mostly derived from production royalties on public forest derived products, charges levied on annual licenses' applications and special use licenses (Mbugua 2003). Charges are also levied from non-wood forest product harvesting and services such as cultivation and grazing, harvesting of stone/sand products and taxes and licenses. Timber import in Kenya also raises revenues through import fees per consignment and forest produce movement permits (Cheboiwo et al. 2015).

Forestry's contribution to Uganda's national economy is equally uncertain. The Uganda Bureau of Statistics (UBOS) states forestry contributed 3-3.5% annually between 2000-2013 (MWE, 2016b); MWE (2001) and Bush et al. (2004) estimate it as twice that (6%); while the National Environment Management Authority (NEMA) placed it at 8.7% in 2011 (MWE 2016b). Recent estimates in Uganda's Forest Investment Plan (2017) indicate that the sector contributes 5.7% to GDP. Of Uganda's sawn wood consumption, valued at UGX 101 billion (USD 42 million), about UGX 23 billion (USD 9.8 million) is lost annually through uncollected fees and taxes owing to illegal timber trading (WWF 2012). Forests product revenues are collected at district level from licenses, taxes and fees charged on timber. Timber harvested on private and community lands is taxed at 30% (WWF 2012), however, total revenue is unreported centrally so unknown. Imported timber is subject to 6% withholding tax, 10% duty tax and 18% Value Added Tax (VAT). Almost half imported timber volume goes underdeclared to avoid taxes. WWF (2012) indicate about USD 1 million in revenue is lost annually through under-declaration of volumes and undervaluing of timber. Revenues are also generated through export of forest products such as plywood, laminate and veneer (MWE 2016b); export values between 2008-2012 totaled USD 35,643,000, excluding *Prunus Africana* bark exports.

Forestry's contribution to Tanzania's GDP is estimated to be 3% (Abidoye et al. 2015). Revenues derived from forestry increased from USD 4.18 million in 2003/04 to USD 31.08 million in 2009/10 (Kweka et al. 2015). Milledge et al. (2007) notes this trend may not be sustained as most revenue (70%) is derived from plantations without reinvestment. Logging has failed to generate expected revenue levels due to large volumes of illegal and unrecorded timber harvesting and trade, resulting in losses of USD 58 million annually. Forestry contributes an estimated 2% to Mozambique's economy (MITADER 2016); about USD

330.3 million or 2.8% of GDP in 2011 (World Bank 2017), however revenue losses from illegal logging for export was USD 146 million in 2007-2012 (MITADER 2016). The volume of illegal logging for export has increased rapidly with an estimated 93% of all commercial logging illegal in 2013 (EIA 2014 as cited in MITADER 2016), representing an increase from 81% during 2007-2012.

Discussion on forests' economic value is severely undermined by underestimation; forest ecosystem services and goods are excluded, and contributions to other sectors are not captured by national accounting systems and grossly undervalued by standard economic indicators like GDP. KNBS (2016) estimates exclude contribution of ecosystem services, household energy and NTFPs - mostly traded in informal markets and used for subsistence. Estimates of Mozambique's forestry contributions do not account for subsistence use of forests and forest products, informal forest-based activities and unreported activities like illegal timber trade (MITADER 2016). Uganda's Bureau of Statistics (UBOS) estimates do not consider contributions to employment, household incomes, livelihoods, energy provision, ecosystem services such as carbon sequestration, soil and water conservation, biodiversity protection and water provision; ecosystem contributions to Tanzania's economy are also not fully accounted for (UNEP 2002).

Bush et al. (2004) report Ugandan forests' total economic value is UGX 593.4 billion, UGX 222 billion of which is the value of ecosystem services like soil and water management, carbon sequestration and future use of biodiversity. A cost-benefit analysis of deforestation in Tanzania shows, at present market values, net economic losses to Tanzania's economy from deforestation in 2013-2033 will be TSH 273 billion (USD 171 billion). Undervaluation of full economic contributions of forest ecosystem services and goods has resulted in unsustainable use, degradation and loss. This has disproportionately impacted marginal groups such as the poor, women and indigenous people who highly depend on them (MA 2005; Abidoye et al. 2015).

Forests contribute significantly to rural community livelihoods, especially forest-adjacent marginal groups, by providing food and energy, being economic safety nets, and buffering against climatic shocks (Bush et al. 2004; MENR 2016; SADC 2002). In Uganda, forest-adjacent people are among the country's poorest, and depend on forests for food and financial security especially during prolonged dry seasons and droughts. An estimated 87% of livelihoods for Tanzania's rural poor is supported by forest resources (Bush et al 2004; Milledge et al. 2007). World Bank (2017) reports extremely poor regions of Mozambique have many households deriving income from forestry and agricultural activities. MENR (2016) noted forests and trees provide livelihoods in areas of Kenya with high poverty levels and youth unemployment. Sustainable forest management is thus vital to poverty alleviation, which the Southern Africa Development Community (SADC) Forest protocol and East African Community (EAC) Forest Management and Protection Bill acknowledge (EAC 2015; SADC 2002), however forest-dependent communities are frequently politically weak (MENR 2016) and their reliance on ecosystem services is rarely measured, thus overlooked in national statistics and poverty assessments, leading to inappropriate policies which don't consider environment's role in poverty reduction (MA 2005).

The forest sector employs significant numbers in all countries. In Kenya, although indirect employment is unclear, direct forest product industry employment is estimated at 823,539 (MENR 2016). In 2001, forestry in Uganda employed 1 million people, 100,000 of them formally (Bush et al. 2004). The charcoal industry employs over 20,000 people full-time in production, and thousands more in transportation, distribution and marketing (MWE 2016b). Approximately 22,000 people are directly employed in Mozambique's forestry sector. Non-Timber Forest Products (NTFPs) are key in rural community

livelihoods, contributing to incomes, food and medicine. In Kenya, NTFPs generate around KSH 3.2 billion annually while others, such as *Bixa Orellana*, *Acacia Senegal*, Arabic gum, and resins such as myrrh, hagar and frankincense, are exported (MENR 2016). Bush et al. 2004 estimate that, for Uganda's forest-adjacent families, forests contribute 11-27% to total cash income. Charcoal production also significantly contributes to Uganda's rural population's cash income, contributing an estimated USD 20 million in 2008 (MWE 2016b), whilst in Mozambique, miombo woodlands contribute an estimated 19% of total household cash income in Gorongosa, Sofala, and 40% of non-cash or subsistence income (World Bank 2017).

Forests contribute significantly to agriculture, livestock and wildlife, tourism, industry, water, energy sectors and infrastructure, construction, real estate and cottage forest-based enterprises (MENR 2016). Forests' nutrient cycling and erosion prevention environmental functions support agriculture. Most of Kenya's water supply comes from its 'water towers' (forested mountains such as Mau Complex, Mount Kenya, Aberdares, Mount Elgon and Cherangani Hills), providing an estimated 15,800 million m³ of water annually through lakes and rivers (UNEP 2012). However, water tower deforestation threatens their ability to provide water; reported forest losses of approximately 50,000 ha in 2000-2010 led to a 62 million m³ annual decline in water availability (UNEP 2012). Tanzania's Eastern Arc mountain forests are also critical water catchments, from which rivers like Ruaha, Kilombero, Ruvu and Zigi originate.

Forest-derived wood fuel is the region's primary energy source, meeting over 90% of Ugandan's energy needs (MWE 2017b; UNEP 2002), 70% in Mozambique (World Bank 2017) and over 92% in Tanzania, with 95% of Uganda's energy coming from biomass.

Forest ecosystems also provide crucial habitats for wildlife and are rich in biodiversity including endemic, threatened and endangered species such as the mountain gorilla; these are also income-generating tourist attractions. In Uganda an estimated 61% of tourism income is derived from forested national parks (MWE 2017a). Forests also offer tourist activities including camping and picnic sites, sport tourism, canopy walks and nature trails (MENR 2016). This presents opportunities for communities and private sector to benefit, currently unexploited except in Kenya which has increasing numbers of private and community tourism projects (MENR 2016).

1.4 Main trends, pressures and drivers of deforestation and forest degradation in Eastern Africa

Deforestation rates are highest in Tanzania. Kweka et al. (2015) notes that Tanzanian deforestation rates are among the largest globally and if they continue or increase, all forest will be lost within 50-80 years. Mainland Tanzania saw average losses of 403,000 ha/year. Latest URT estimates (2016) indicate that 580,000 ha/year were lost between 2002-2013 in mainland Tanzania and 7,100 ha/year between 2002-2014 in Zanzibar. Uganda lost almost half its forest cover between 1990-2015, going from 24% to 12.4% of total land area, with deforestation rates highest in private lands and lowest in wildlife estates or conservation areas managed by the Uganda Wildlife Authority (MWE 2018). Privately-owned woodlands, low and high stocked THFs have experienced biggest cover losses at 79%, 80% and 88% respectively between 1990-2015 (MWE 2016b). 46% of Central Forest Reserve (CFR) woodlands were lost in the same period, the largest area loss among all forest cover types. LULC analysis revealed Kenya's deforestation rate was 0.05% in 1990-2000 (KFS 2013). Although forest declined by 0.199% from 1990 to 2000, it has

been increasing at a rate of 0.109% annually due to improved afforestation efforts (KFS 2013). Mozambique's annual deforestation rate in 1990-2000 was 0.58% (220,000 ha/year) - an estimated 2.7% loss of forest cover (World Bank, 2017). Deforestation rates are increasing with Zambezia province losing 310,000 ha annually between 1990-2013 – an annual loss of 0.61% - peaking at 0.86% between 2010-2013 (World Bank 2017).

The greatest deforestation drivers come primarily from agricultural and energy sectors. Drivers are closely linked: logging opens previously intact forest to wood fuel extraction, production and eventual cultivation, leaving forests more vulnerable to fire invasion, tree fall and drought, which can further degrade it (Kweka et al. 2015). Activities like mining open forests to other exploiters through access road and trail construction. Some activities act as direct and indirect drivers; urbanization directly causes deforestation through forest clearance and urban infrastructure, indirectly increasing demand for wood fuel and food, thus agricultural expansion into forests.

Although the region has different forest types, deforestation and degradation drivers are similar: agricultural expansion into forestlands for subsistence and commercial agriculture; unsustainable harvesting of wood products, like wood fuel, poles and timber, including illegal harvesting and trading; wildfires lead to burning of extensive areas of woodlands and forests; and infrastructure development. Other direct drivers include overgrazing, wildlife and livestock damage to trees affecting forest regeneration, mining, industrial development and human settlement. Direct drivers interact with underlying factors to indirectly drive degradation and loss of forests. Regional underlying factors are institutional weaknesses and poor forestry sector governance, population growth and urbanization. Poverty is linked to deforestation and degradation as poor communities are highly forest dependent for their livelihoods, either for subsistence or small-scale trading. Some drivers are country-specific, such as the impact of refugees and Internally Displaced Persons (IDPs) and the discovery of underground natural resources in Mozambique and Uganda. Greater detail on forest cover change and drivers is found in Chapter 5.

1.5 Forestry sector stakeholders

Key stakeholders in forest use, monitoring and management are government, forest users (communities, industries and institutions), producers, research and training institutions, NGOs and CSOs.

Central government

Central government ensures sustainable management of forest resources for the welfare of citizens, with this role being carried out by ministries of natural resource and environment-related sectors, with specific departments, divisions and semi-autonomous agencies focused on forestry implementation. Ministries supervise agencies reporting to them and provide oversight and coordination through formulating and developing appropriate laws, policies, strategies and sector guidelines in consultation with other stakeholders, as well as monitoring and evaluation.

Local and county governments

Local or county governments are responsible for sustainable forestry management at district or county level. In Uganda, District Forestry Services (DFS) manage Local Forest Reserves (LFRs) and advise District Councils, private forest owners and community land alliances on forestry-related matters. In Tanzania,

local governments manage local government reserves, and regulate use and harvesting of forest products from unreserved lands (Kweka et al. 2015). Under Kenya's devolved system, county governments have adopted certain central government natural resource management responsibilities; they manage forests and game reserves formerly managed by local authorities and provide farm forestry extension services. County assemblies may enact legislation and county governments participate in formulating national policies and frameworks to coordinate the sector (GOK 2016). Mozambique's forests are managed at provincial and district level; the Provincial Forestry Services (SPF) supervises provincial activities and facilitates forest concessions below 20,000 ha; the District Service for Economic Activity (SDAE) has forestry unit enforcing legislation at district level, including arresting illegal loggers, putting up police control points to check logging licenses, and inspecting planted areas to check seedling numbers and species.

Forest users

Forests are used for consumption, income or to source inputs to production processes. Rural populations access forests for agriculture and rely on wood fuel to meet energy needs, as do urban households. Their role in decisions and planning depends on the management regime and mechanisms for community participation. In Kenya, communities co-manage forests with the KFS and are granted use rights and management responsibilities such as assisting with enforcement and protection. In Uganda, diverse community-based forestry (CBF) structures are found (MWE 2016a), depending on the land tenure under which the forest falls; community participation in planning and decision making depends on this structure. In Tanzania, community inclusion in forest management occurs through Participatory Forest Management (PFM) where communities oversee land and forest resource management in village forest reserves and central government reserves (Kweka et al. 2015). Local governments oversee management of forests on unreserved lands through regulating forest product harvesting via permits and fees, but communities decide how to manage forests and often practice agriculture within them. In Mozambique, all land and resources are state-owned therefore communities only have rights to use and improve land they have occupied. Communities can delimit land, resolve conflicts and manage natural resources through formal requests to the state, and are entitled to 20% of license fees; funds which can be used for community development projects.

Institutional and industrial users

Other major users are hotels and enterprises using wood fuel for production processes. Wood fuel demand has promoted over-exploitation of forests: Crystalline Salt and Pwani Oil, companies in Kenya's coastal region, consume an estimated 20 tons of firewood every 1-3 days (MFW 2013). Construction companies also consume significant amounts of timber and wood products to construct settlements and infrastructure for new and growing urban centers, however some hotels participate in tree planting activities. Other users include telecommunication and power distribution companies which require treated poles.

Research institutions and training institutions

Specialized government research institutions, universities and colleges undertake research and training of forestry professionals. Research institutions' interest is based on mandates to research and disseminate results on forest and forest resources.

Producers

Commercial tree growers, wood-based industries, wood fuel producers, forest concessionaires and loggers all provide processed and unprocessed forest products to meet domestic and international market demand.

NGOs and CSOs

NGOs and CSOs focus on conservation, promotion of sustainable forest management and livelihood improvements for forest-adjacent and/or dependent communities. They fund and implement forest development and conservation projects and programs; advocacy for conservation and good sector governance; community capacity building around alternative livelihood sources to promote forest conservation; and supporting local government. They also participate in formulating forestry laws, policies and plans; the Network for Civil Society Organizations in Environment and Natural Resources (ENR-CSO) in Uganda participates in the annual Joint Sector Review (JSR), and CSO Kenya Forest Working Group (KFWG) acts as a forest monitoring watchdog and undertakes policy advocacy, campaigns against forest destruction and community capacity building (KFWG 2016).

1.6 Conclusion

This chapter shows the diversity of regional forest cover, from high altitude afro-montane forests to coastal mangrove forests, miombo and dry woodlands to equatorial forests. Most forests are under intense pressure with deforestation rates some of the highest in the region, driven by agricultural expansion, unsustainable harvesting and infrastructure development. Underlying drivers are weak legal and policy frameworks, implementation bottlenecks, insecure tenure rights, and population and urban growth. Although inadequately quantified, Eastern Africa's forests provide critical goods and services to communities, enterprises, and other economic sectors and some of the region's poorest communities live adjacent to forests. The lack of quantification of forests' economic value and contribution to national and regional economies is a major information gap; crucial for budgetary allocation to the sector and its prioritization. This need for quantification provides clear transnational focus and opportunity for cross-country learning on approaches and applications. Transboundary forests, with their diverse forest types and institutional settings, can be used to pilot cross-country approaches.

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CHAPTER 2. FOREST LAWS AND INSTITUTIONS

PHILIPPE KARPE

2.1 Introduction

Forests are of great importance to Eastern Africans. Yet despite forestry contributing 1% in monetary terms and 13% in non-monetary terms to GDP¹ in Kenya, forest cover decreased from 60% to 2% between the 1940s and 1990s². Inappropriate legal frameworks and corruption have been blamed and to combat this, all four countries have begun forestry reforms, facilitated and catalyzed by the REDD+ program. Legal rules share fundamental similarities, seeking participation of local populations and authorities in forest management, and aiming to ensure attainment of legal objectives, however differences exist; texts have diverse levels of precision and statutes differ in depth, pointing to the likelihood of laws responding to specific historical events. Better knowledge of comparative law can help the region find an alternative response to historical constraints. As such, this chapter presents a general overview of forest law content and implementation in the four countries.

¹ Legal Report. Forest Governance, REDD+ and Sustainable Development in Kenya. Kenya REDD+, Analytical Series - Issue #3, September 2013 - Annex i. Ministry of Environment, Water and Natural Resources, UN-REDD p. 9.

² *ibid.* p. 9

2.2 Forest law content

Eastern African forestry is subject to diverse legal texts, programs and policies. Here we focus on the content of each country's basic legal texts: Kenya's Forest Conservation and Management Act 2016; Uganda's National Forest and Tree Planting Act 2003; Mozambique's Forest and Wildlife Act 1999; and Tanzania's Forest Act 2002. The chapter describes principal rules impacting forestry (2.2.1) and the main policies, reports and organizations (2.2.2).

2.2.1 Principal rules impacting forestry

General objectives

General forestry objectives are similar; all four legal frameworks integrate a conservation-development approach aiming to improve local well-being and call for public participation in forest management and conservation. Tanzania is most specific in how public participation will come into being, outlining intentions to facilitate active participation of citizens in the sustainable planning, management, use and conservation of forest resources "through the development of individual and community rights, whether derived from customary law or under this Act, to use and manage forest resources", and delegation of forest management responsibilities to the lowest possible level of local management.

All laws mention sustainable development. Kenya's Forest Conservation and Management Act (2016) focuses on sustainable forest management and conservation and "rational use" for socio-economic development and the benefit of local people, as well as equitable benefit sharing. Tanzanian forestry law intends to enhance forestry's contribution to the country's sustainable development. Ugandan forest law demonstrates a clear two-pronged approach, focusing on both forest protection and production, highlighting sustainable use and enhancement of forests' productive capacity; this involves tree planting; consolidating forest produce trade law, and establishing a National Forestry Authority.

Integration and collaboration is also a regional theme. Uganda aims to create an "integrated sector" to facilitate sustainable increases in economic, social and environmental benefits", whilst Mozambique's Law No. 10/99 on Forest and Wildlife Act (1999) states its need for "an integrated management framework, for the economic and social development of the country" (Article 2). Tanzania also states its aim "to promote coordination and cooperation between the forest sector and other agencies and bodies in the public and private sectors"³. Uganda, Tanzania and Mozambique all mention the need to conserve forests for both present and future generations; only Kenya fails to mention this. Kenya's Act also differs in some other specifics, highlighting its aim to maintain tree cover of at least 10% and to protect and enhance intellectual property in, and indigenous knowledge of, biodiversity and the genetic resources of the communities.

Guiding principles

Despite some specificities, guiding principles all highlight participation, devolution and decentralization. Kenya and Mozambican forest laws provide clear guiding principles, with Mozambique's being most developed. Uganda and Tanzania have no explicit guiding principles; these can instead be inferred from their general objectives: sustainability, people's participation, participative management, coordination and cooperation, devolution and decentralization for Tanzania; and integration, sustainability, public participation and information, and decentralization for Uganda. Uganda has changed its development

³ Part II, Article 3

strategy from a ‘poverty-reduction strategy’ to an ‘enterprise approach’. Its National Development Plan (2010-2015) categorizes forestry as a primary growth sector with prospects for national budget and private sector investment, emphasizing “sustainable development through preservation of natural resources such as forests”⁴. Kenya uses its Constitutional values and governance principles as guidelines for environmental sustainability: these call for devolution, democracy and participation; equity; integrity; transparency and accountability; defining, recognizing, protecting and enforcing human rights; access to information; objectivity and impartiality in decision-making; and avoidance of corrupt practices⁵. Specific guiding principles include: “good governance; public participation; intra-government cooperation; and protection of indigenous knowledge and intellectual property rights of forests resources”⁶.

Both Mozambique and Kenya highlight the importance of international cooperation and knowledge, Mozambique mentioning “international co-operation: harmonization of solutions regarding the protection, conservation and management of forest and wildlife resources with other countries and international organizations”, and Kenya highlighting “international best practices in management and conservation of forests”⁷. Mozambique’s Forest and Wildlife Act of 1999 highlights broad inclusion of community, private sector and general public in both social and economic development and biodiversity preservation and conservation. Responsibility is also a key principle; it asks for impact evaluation studies “to guarantee sustainability” and outlines a responsibility principle aimed at anyone causing damages to forests and wildlife.

Forest categories

Although their definitions differ slightly, forest laws in all countries except Mozambique recognize three main forest categories - public, community and private forests. In Mozambique natural forests are state property; the emphasis instead is on management objectives.

Kenyan forests are classified as public, community or private⁸; public forests including national parks⁹. Kenya’s KFS-registered community forests are on land lawfully transferred to a specific community; declared by parliament to be community land; lawfully held, managed or used by specific communities as community forests; and ancestral lands and lands traditionally occupied by hunter-gatherer communities¹⁰. Kenya’s owner-registered¹¹ private forests are on freehold or leasehold tenure land and can be owned for commercial or non-commercial purposes¹². Ugandan forests are classified as central forest reserves, local forest reserves, community forests, private forests, or forest forming part of a wildlife conservation area under the Uganda Wildlife State 1996¹³. Tanzania recognizes national and local authority forest reserves, village forests and private forests¹⁴. Village forests include village land forest

⁴ Uganda R-PP (May 2011) REDD Readiness Preparation Proposal for Uganda submitted to the Forest Carbon Partnership Fund May 2011. p. 30.

⁵ *ibid.* p. 27.

⁶ Part I, Article 4

⁷ Part I, Article 4

⁸ Part IV, Article 30, § 1

⁹ Part IV, Article 30, § 2

¹⁰ Part IV, Article 30, § 3

¹¹ Part IV, Article 33, § 1

¹² Part IV, Article 30, § 4

¹³ Part II, Article 4

¹⁴ Part II, Article 4

reserves; community forest reserves created from village forests; and village council-managed forests on village land¹⁵. Private forests include village land forests under customary right of occupancy; and village land forests leased or occupied by the forest manager¹⁶. In contrast, Mozambique’s state-owned natural forest and wildlife resources are classified according to potential, location and use, resulting in conservation forests in protection zones, ‘high forestry potential’ productive forests, and ‘low forestry potential’ multiple use forests, both located outside protection zones¹⁷. Forest within zones of historical and cultural use and value may be used according to local “customary practices”¹⁸.

Local participation in forest management

All forestry laws facilitate local participation in forest management, and express sincere state will to establish this in a real and effective way.

Kenya’s Forest Conservation and Management Act of 2016 details how registered community forest associations may apply to participate in public forest conservation and management¹⁹. If granted permission, associations have significant responsibilities to protect, conserve and manage forests according to management agreements and plans; formulate and implement sustainable forest programs; protect sacred groves and protected trees; assist relevant authorities in firefighting and combatting illegal harvesting of forest products; inform them of any activity or change impacting biodiversity; and assist with “any other act that is necessary for the efficient conservation and management of the forest”.²⁰

Tanzania’s Forest Act of 2002 transferred forest resource ownership and management responsibilities to local communities through Participatory Forest Management (PFM), which aims to improve rural livelihoods, conserve and regenerate forest resources and promote good governance through two implementation approaches: Community Based Forest Management (CBFM) which establishes a Village Natural Resources Committee (VNRC) for forests on village or private land, and Joint Forest Management (JFM)²¹ for state-owned forests on reserved land, in which management responsibilities and returns are divided between state and forest-adjacent communities. Joint management agreements are established between village councils and forest-connected community groups, or private forest managers and forest-adjacent community groups living off the forest²².

In Mozambique, to ensure “local communities participate in the exploitation of forest and benefits”²³ community representatives become members of local resource management councils²⁴, and may be also state-empowered to manage forests²⁵. Any forestry concession must involve a hearing or renegotiation

¹⁵ Part II, Article 4, c

¹⁶ Part II, Article 4, d

¹⁷ Article 5, Law No. 10/99, Forest and Wildlife Act 1999

¹⁸ Article 13, § 2

¹⁹ Part V, Article 48, § 2

²⁰ Part V, Article 49, § 1

²¹ Readiness Preparation Proposal for Tanzania. October 2010. p.24.

²² Part III, Article 16, § 1

²³ Article 31, § 3

²⁴ Article 31, § 1

²⁵ Article 33

with local communities²⁶ and forest exploitation must safeguard free access to local communities, including subsistence use rights²⁷.

In Uganda, community forest can only be declared so after community consultation²⁸. A management plan prepared “in consultation with the local community”²⁹ must detail local community involvement in resource management³⁰. Ugandan community forests are specifically protected from construction or re-opening of roads except forestry purposes³¹ and state technical support is offered to maximize forestry revenues (which belong to the community for sustainable management of the community forest and community welfare³²).

Kenyan community forest user rights are significant and include: harvesting of medicinal herbs, grass, timber or fuel wood forest produce for community-based industries; grazing; ecotourism and recreational activities; scientific and education activities; plantation establishment through non-resident cultivation; specific forestry operation contracts; and development of community wood and non-wood forest-based industries”³³. This differs from Uganda, where community members may only cut and take wood and bamboo for personal domestic use, and not forest produce. Tanzania’s community group user rights include exercising existing rights to enter, occupy, use and harvest forest produce³⁴ however CBFM and JFM approaches differ in terms of forest ownership and cost/benefit flows. Mozambique’s productive and multiple use forests may be exploited by communities under a management plan³⁵ and with a renewable 50-year forestry concession contract “for the purpose of supplying the processing or fuel industry”.

Local authority participation

Local public authority participation in forest management is facilitated by law in each country. Kenya’s Forest Conservation and Management Act of 2016 expressly engenders collaborative forest management between state and county-level authorities. County government implements national forest management and conservation policies, manages all public land forests, promotes county-level afforestation, advises and assists in community and private forest management, and may enter into joint management agreements for the management of these³⁶. County government may pass legislation to carry out these duties³⁷ and can request support from the Kenya Forest Service³⁸. Ugandan local government authorities can be responsible for a local forest reserve and must be consulted by state-level authorities before a central forest reserve is declared³⁹, as well as holding forests “in trust for the people” and protecting forest reserves. In Mozambique, the municipal assembly approves municipality-level environmental plans and

²⁶ Article 17, § 2

²⁷ Article 18

²⁸ Part II, Article 17, § 1, (a)

²⁹ Part II, Article 28, § 1

³⁰ Part II, Article 28, § 2

³¹ Part III, Article 32, § 1

³² Part II, Article 19, § 1

³³ Part V, Article 49, § 2

³⁴ Part V, Article 47

³⁵ Article 16, § 1

³⁶ Part II, Article 21, § 1

³⁷ Part II, Article 21, § 2

³⁸ Part II, Article 21, § 3

³⁹ Part II, Article 6, § 1 (a)

ecological zoning; incentive programs for environmental protection or restoration; programs for afforestation, planting and conservation of shade trees; local natural resource management programs; and definition and establishment of protected areas⁴⁰, whilst national-level authorities in Tanzania must use their “best endeavors” to ensure that local (district, urban, or village) government authorities and associations (including village councils and forest reserve management committees) “are consulted and kept informed about the management of forests”⁴¹.

Forest protection

The Kenyan Forestry Service Board establishes forest conservation areas which can be sub-divided into ecosystems⁴²; each area has a committee with three representatives nominated by relevant community forest associations, forestry industries and conservation CSOs⁴³; the committee makes recommendations to the Board and local authorities on conservation and forest utilization and identifies and recommends areas for public forests⁴⁴. Forest protection in Uganda is assured through environmental impact assessments for any activity with “significant impact” on a forest⁴⁵. In Mozambique, protection zones are established to represent national natural heritage, biodiversity conservation and fragile ecosystems or animal or plant species⁴⁶, including national parks, national reserves and zones of historical and culture use and value⁴⁷. These areas must be managed according to a plan prepared with local community participation⁴⁸. Tanzanian forests may be protected by ministerial decision after consultation with those considered “to be knowledgeable on environmental issues”⁴⁹. With this protection, forest cannot be felled, cut, loped, damaged or removed, nor its produce taken or sold⁵⁰.

2.2.2 Main forest policies, reports and organizations

To enforce the law, public authorities must prepare forest policies and report on their execution (2.2.2.1). Forest law also establishes certain public forestry organizations (2.2.2.2).

Forest policies and reports

Kenya’s Constitution aims “to achieve and maintain a tree cover of at least 10%” - “the minimum recommended [land area] for ecological sustainability”⁵¹. A national forest policy and a public strategy⁵² for sustainable forestry is produced every five years in consultation with county governments and relevant stakeholders⁵³ and reported on annually⁵⁴. The Ugandan National Forest Plan is prepared as “the framework for the implementation of the forestry policy and programs by government and stakeholders

⁴⁰ Article 46, Lei de Bases Das Autarquias, Lei n° 2/97 de 28 de Maio

⁴¹ Part II, Article 8, § 1 and 7

⁴² Part II, Article 20, § 1

⁴³ Part II, Article 20, § 4 d

⁴⁴ Part II, Article 20, § 3

⁴⁵ Part III, Article 38, National Forest and Tree Planting Act of 2003

⁴⁶ Article 10, § 1

⁴⁷ Article 10, § 2

⁴⁸ Article 10, § 5

⁴⁹ Part VII, Article 65, § 1

⁵⁰ Part VII, Article 65, § 4

⁵¹ Legal Report. Forest Governance, REDD+ and Sustainable Development in Kenya. Op.cit. p. 26.

⁵² Part I, Article 6, § 2

⁵³ Part I, Article 5

⁵⁴ Part I, Article 6, § 4, a

in the forest sector”⁵⁵, taking into account forestry stakeholder and forest-dependent people⁵⁶. Mozambique prepares and implements its National Program for Environmental Management (PNGA)⁵⁷, a multisector short and medium-term program aimed at sustainable socio-economic development. To resolve Mozambique’s environmental challenges, the PNGA aims to establish a national environmental policy; better equipped institutions; legal, economic and financial instruments to deal with natural resource use and environmental management; and promotion of education, community awareness, training, and research activities⁵⁸. In Tanzania, the National Forestry Advisory Committee provides an implementation report in the Ministry’s annual performance report⁵⁹.

Public forestry organizations

To complement existing organizations in Kenya, new forestry authorities have been established: the Kenyan Forestry Service (KFS); the Forest Conservation and Management Trust Fund; Kenya Forestry College for forestry-related education and training; and Kenya Forestry Research Institute. KFS focuses on public forest conservation, protection and management, including preparation and implementation of public forest management plans, and assisting community and private forests in this task. It also reviews applications for forest resource/management licenses or permits, and benefit sharing arrangements. It assists county governments to build capacity, makes recommendations on public forests, approves credit facilities and technical training for community-based forest industries and incentives for sustainable use of forest products⁶⁰. The Kenya Forestry College develops certificate to diploma-level training programs in forest management and use and provides trained professionals to support forestry apprenticeship and vocational training, including in communities, private forests and industries⁶¹. The Kenya Forestry Research Institute prepares country-wide forestry research and development strategies, conducts forestry training courses, disseminates findings to support forestry development, participates in the development and monitoring of national forest standards, and regularly reports to the Cabinet Secretary on forestry research and development⁶².

In Uganda, the National Forestry Authority (NFA)⁶³ was established in 2003 to develop and manage all central forest reserves. It prepares their management plans and reports, recommends areas for central forest reserve status, promotes local participation in reserve management, controls and monitors mining, industrial and tourism development in reserves, promotes local community participation in reserve management. It also cooperates and coordinates with the National Environment Management Authority and other lead agencies, establishes procedures for sustainable use of Uganda’s forest resources, undertakes or commissions research into forest conservation, development and use, and trains officials in forest development and sustainable management⁶⁴. The NFA can also support, monitor, coordinate and report on local governments’ forest reserve management, including providing training and technical

⁵⁵ Part VII, Article 49, § 1

⁵⁶ Part VII, Article 49, § 2

⁵⁷ Article 5, § 1

⁵⁸ <http://documents.worldbank.org/curated/en/213921468775180470/Mozambique-National-Environmental-Management-Plan>; viewed 16 November 2017

⁵⁹ Part II, Article 10, § 6

⁶⁰ Part II, Article 8

⁶¹ Part II, Article 17, § 2 and 3

⁶² Part II, Article 22, § 3

⁶³ Part VIII, Article 52, § 1

⁶⁴ Part VIII, Article 54, § 1

support relating to forestry advisory services and management plans for community or private forests or local forest reserves⁶⁵. The NFA may establish Forestry Committees, as community voices regarding conservation and use of central forest reserves, to assist local communities to benefit from the reserves and advise the NFA on implementation of its functions⁶⁶.

In Mozambique, the Council of Ministers is responsible for guaranteeing forest and wildlife inspection to monitor the conservation, use and management of forest and wildlife resources⁶⁷; forest law states that all citizens, especially local resource management councils and license holders, should collaborate in the surveillance necessary to protect forest and wildlife, reporting all infractions to the nearest authorities⁶⁸. National Council for Sustainable Development, CONDES⁶⁹ was established by the Environmental Law as a consultative organization and forum for public opinion on environmental issues⁷⁰, to guarantee effective coordination and “integration of the environmental management principles and activities in the Nation’s development process”. CONDES acts upon relevant legislation and policies, makes recommendations to relevant ministers, and serves as a forum to resolve institutional differences related to natural resource use and management⁷¹. Several annual sessions focus on provincial-level environmental issues and are extended to district administrators and heads of administrative posts.⁷².

In Tanzania a National Forestry Advisory Committee⁷³ and the Tanzania Forest Fund were established⁷⁴. The Committee advises on forest policy, forest concession issuance and forest reserve declarations⁷⁵, whilst the Fund promotes awareness of the importance of forests, funding community forestry development and research, and assists Tanzania to benefit from international initiatives and funds⁷⁶. The Tanzania Forest Services Agency, established by the Executive Agency Act⁷⁷, establishes and manages national natural forests and forest plantations, enforces forest rules and collects forestry revenue.

2.3 Forest law implementation

Despite positive results, all four countries encounter similar difficulties connected to poor governance (3.1) and have been discussing and actioning some remedies (3.2).

2.3.1 Primary difficulties

Poor governance and institutional weaknesses impact deforestation and forest degradation⁷⁸ in Kenya. Poor inter-sectoral coordination hinders the tackling of cross-cutting environmental and conservation issues, and a sector-specific approach to conservation and development has exacerbated inter-sectoral

⁶⁵ Part VIII, Article 54, § 2

⁶⁶ Part VIII, Article 64, § 1

⁶⁷ Chapter VII, Article 37, § 1

⁶⁸ Chapter VII, Article 37, § 2

⁶⁹ Article 5, § 2

⁷⁰ Article 5, § 3

⁷¹ Article 6, § 1

⁷² REDD Readiness Preparation Proposal for Mozambique. Working Draft Version 5 December 2010 p. 21.

⁷³ Part II, Article 10, § 1

⁷⁴ Part X, Article 79, § 1

⁷⁵ Part II, Article 10, § 4

⁷⁶ Part X, Financial provisions and establishment of a Fund, Article 80

⁷⁷ Cap. 245 Revised Edition 2009

⁷⁸ Revised REDD Readiness Preparation Proposal for Kenya. October 2010. p. 40.

incoherence and conflicts. Certain policies and legislations (e.g. the Agriculture Act) focus on economic development and favor clearance of natural habitats without consideration of environmental issues, resulting in forest clearance for tourism facilities, roads and agricultural projects⁷⁹.

In Uganda, natural resource conflict resolution and grievance management systems are inadequate⁸⁰, including provisions for stakeholder participation in planning and management. Forest law does not sufficiently control private forest timber harvesting; although commercial timber harvesting from large areas is subject to district authorization, no formal proof of land ownership is required, opening the door to abuses and conflicts. Forest owners outside protected areas aren't required to seek authorization for harvesting trees or clearing land for agriculture; this has been exploited by some district officials to register pit-sawyers who have harvested and cleared timber from local and central forest reserves. Over-regulation of timber markets also tends to create avenues for corruption and bribery⁸¹. Many areas need clarification, including enforcement and compliance to laws on sustainable forest and resource management and stakeholder participation, as well as carbon rights and benefit sharing⁸².

Mozambique has socially progressive and environmentally sound legal instruments⁸³, but lacks coordination between authority levels regarding natural resource management⁸⁴. Some legal frameworks, like annual issuing of Simple Licenses, do not favor sustainable management; extending to five years and management plans could address this. Updating logging concessionaire stumpage fees and wildlife hunting fees could be considered⁸⁵ for more sustainable forest management, however law enforcement remains a stumbling block. Field officers are insufficient in numbers (1 officer per 50,000 km²), with limited transportation. National law enforcement personnel are few, including those checking management plan implementation. Of 179 concessions, only 108 fulfilled legal requirements, however most concessionaires implement planned management interventions⁸⁶. Current legislation does not incentivize forest conservation, rather rewards deforestation and degradation due to poor policy implementation and vested interests⁸⁷. As in Kenya, uncoordinated sectoral policies and laws promote land use conflicts between production forests, conservation areas and mining, or agriculture land and advancing urban areas, in part because of discrepancies between land potential and land allocation. The Policy and Law of Territorial Planning (2007, 2009) provides an opportunity to organize land use according to potential but is currently failing. The Conservation Policy (2009) promotes biodiversity conservation and tourism in the protected area network, however most protected areas have settlements within or around; consultation and zoning has been used to mitigate biodiversity impacts while meeting population needs, but this has led to resettlement (see Limpopo National Park)⁸⁸. As well as acknowledging customary rights to land and subsistence harvesting without license requirements, government can allocate forest use rights to both communities and investors. For commercial use, resource inventories, design management plans and processing facilities must be in place. Communities tend to be excluded from commercial activities due to

⁷⁹ Legal Report. Forest Governance, REDD+ and Sustainable Development in Kenya. Op.cit. p. 61.

⁸⁰ REDD Readiness Preparation Proposal for Uganda. May 2011. p. 49.

⁸¹ *ibid* p. 69.

⁸² *ibid* p. 75.

⁸³ REDD Readiness Preparation Proposal for Mozambique. Op.cit. p. 84.

⁸⁴ *ibid*, p. 81.

⁸⁵ *ibid*, p. 80.

⁸⁶ *ibid*, p. 86.

⁸⁷ *ibid*, p. 42.

⁸⁸ *ibid*, p. 79.

capacity and resource deficits, and private investors can acquire land use rights, including on community lands, after negotiating with communities⁸⁹.

In Tanzania, key issues include corruption, elite capture of revenues and marginalization of minorities regarding forest resource access, low accountability, lack of transparency, low participation and weak law enforcement. Sustainable forest management is not fully realized due to poor local to national-level governance. Ministries and institutions are not linking to local governments, regional administration and central levels. Local village government requires significant planning and financial management capacity development, and current capacity to protect and manage reserves and provide advisory services, is also weak. Recruitment and proper deployment of professionally competent, adequately compensated staff is much needed, as are adequate facilities⁹⁰.

To date, participatory forest management (PFM) has been heavily donor-dependent and this dependency casts doubt upon its sustainability. In Tanzania's southern highlands, it is estimated that potential forestry revenue has been reduced by 80% due to monitoring neglect⁹¹. Challenges include inadequate institutional financial and human resources, particularly at District Council level where most natural forests are found, however sustainable forestry management is only feasible through empowering communities, NGOs and CSOs to become legitimate forest owners and managers and clarifying land use and forest resource tenure rights. Operational concession guidelines would encourage sustainable private sector investment in forestry, and District Councils could be more efficiently engaged in district-wide forest management through development and approval of forest management plans for natural forests and woodlands. The Joint Forest Management (JFM) mechanism requires clarity on benefit-sharing mechanisms and limitations on income generation potential must be addressed⁹². Other issues to address include ineffective control of log export bans and corrupt forest product trader practices⁹³.

2.3.2 Suggested, adopted and applied solutions

All four countries have developed contextually-adapted solutions to effectively implement their forest objectives. In Kenya, proposals to address forest management weaknesses have been undertaken through REDD+⁹⁴. A revised National Environmental Policy draft recognizes and seeks to address a lack of coherence between environmentally-related laws and policies. An inter-ministerial committee is proposed to bring together forest-related sectors, expanding KFS's mandate to manage all forest types to reduce overlaps⁹⁵. In Uganda, a comprehensive conflict and grievance management strategy has been developed, setting up measures for detecting, predicting, preventing emergence or minimizing escalation of conflicts, and establishing a neutral multi-stakeholder conflict resolution mechanism⁹⁶.

To tackle limited law enforcement capacity in Mozambique, training and equipping law enforcement officers and ministry technical officers has been proposed. To improve forest harvest monitoring and

⁸⁹ *ibid*, p. 80.

⁹⁰ REDD Readiness Preparation Proposal for Tanzania. *Op.cit.* p. 20

⁹¹ Bongers F, Tennigkeit T, 2010. *Op.cit.* p. 101-102.

⁹² Bongers F, Tennigkeit T, 2010. *Op.cit.* p. 103.

⁹³ REDD Readiness Plan Idea Note (R-PIN). Tanzania. Revised February, 2009. p. 12.

⁹⁴ Legal Report. Forest Governance, REDD+ and Sustainable Development in Kenya. *Op.cit.* p. 62.

⁹⁵ Legal Report. Forest Governance, REDD+ and Sustainable Development in Kenya. *Op.cit.* p. 62.

⁹⁶ REDD Readiness Preparation Proposal for Uganda. May 2011. *Op.cit.* p. 165-166.

environmental management for large-scale investments, an annual report on current harvesting, concessions and license practices and processing is recommended, as well as national and provincial reports on land allocation, use, markets and revenue⁹⁷. Participatory law enforcement could be strengthened by identifying actors, needs, training, and community scout reward systems. An enabling environment for independent forest monitoring institutions is essential. Wider application of existing benefit sharing mechanisms (e.g. 20% community benefit and land tax revenue allocation to district authorities), to mining, energy and other industries needs to be explored⁹⁸. To improve coordination, the National Council for Sustainable Development (CONDES), the consultative body for environmental and social safeguards for cross-sector investments, was created.

In Tanzania, inadequate cross-sector policy coordination contributes to deforestation and degradation. As such, the forest policy has been revised to take into consideration changes and emerging issues like climate change⁹⁹. Insecure land tenure has also impacted deforestation. More than 50% of Tanzania is, in reality, open access due to unclear ownership and absent tenure security and formal user rights, leaving forests under pressure from conversion to competing land uses like shifting cultivation, livestock grazing, settlements and industrial developments and recurrent forest fires. Current cross-sectoral efforts aim to provide property rights to communities and private sector to conserve and manage forests and trees on general lands¹⁰⁰. New cost-benefit sharing mechanisms are being finalized by Forestry and Beekeeping Division (FBD) to encourage local participation in forest management. Management agreement processes for JFM villages should also be simplified, to avoid unnecessary bureaucracy¹⁰¹.

2.4 Conclusion

As a driver of national and regional economic development forests are important in Eastern Africa and a regional concern. All four countries have a tradition of crafting and implementing rules; all have forest laws that share basic fundamental principles and objectives. All are cognizant of the need to balance forest conservation with human well-being and importantly have devolved authority and governance to lower, sub-national levels including communities. Likewise, all four countries view cross-sectoral coordination and collaboration as critical for the sustainable management of forests. The structure and distribution of tenure rights and management authority is similar in Kenya, Uganda and Tanzania where different tenure categories exist, from community-owned forests through co-management to government and private forests. In Mozambique however, all forests are state-owned and forest classifications are functional rather than institutional. Management structure is similar across the region comprising decentralized and deconcentrated government organizations as well as community organizations at the most local level. However, only Tanzania champions the subsidiarity principle by law.

Most laws were promulgated in the late 1990s to early 2000s, except for Kenya's which was promulgated in 2005. Deforestation and degradation were also concentrated in the decades following the adoption of these relatively progressive rules. The countries are only now starting to revise their forestry laws to integrate new developments, with Kenya having adopted a new law in 2016. Implementation of these

⁹⁷ Readiness Preparation Proposal for Mozambique. Op.cit. p. 97.

⁹⁸ Readiness Preparation Proposal for Mozambique. Op.cit. p. 95-96.

⁹⁹ Readiness Preparation Proposal for Tanzania. Op.cit. p. 21.

¹⁰⁰ Ibid. p. 20.

¹⁰¹ Readiness Preparation Proposal for Tanzania. 12 October 2010. Annexes. p. 39.

laws is hampered by well-known barriers such as cross-sectoral conflicts and competition, incomplete regulation of forest product harvesting and trade, insufficient capacity to monitor and enforce laws and regulations and continued conflict and competition over resource rights among communities and between communities and mandated authorities. Despite this, laws are mostly sound and cover the most crucial bases for supporting the sustainable use and management of forests. Some of them have been reviewed or are in the process of review to capture the changes of the past 15 years. There is need for cross-fertilization of experiences and ideas during these review processes; the Eastern Africa Forest Observatory can provide a common framework and pathway for discussion and debate.

2.5 Annex 1. Comparison of key forest law elements across Eastern Africa

Key elements	Kenya	Uganda	Mozambique	Tanzania
Forest law	Forest Conservation and Management Act, 2016	National Forest and Tree Planting Act, 2003	Law No. 10/99 on Forest and Wildlife Act, 1999	Forest Act, 2002
Objectives	“[To] provide for the development and sustainable management, including conservation and rational utilization of all forest resources for the socio-economic development of the country and for connected purposes”	“[To] provide for the conservation, sustainable management and development of forests for the benefit of the people of Uganda; to provide for the declaration of forest reserves for purposes of protection and production of forests and forest produce; to provide for the sustainable use of forest resources and the enhancement of the productive capacity of forests; to provide for the promotion of tree planting; to consolidate the law relating to the forest sector and trade in forest produce; to establish a National Forestry Authority”	“The economic, social, cultural and scientific importance of forest and wildlife resources to the Mozambican society justifies the establishment of adequate legislation capable of promoting sustainable utilization of these resources. The legislation also encourages initiatives that will guarantee the protection and conservation of forest and wildlife resources for improvement of the Mozambican citizens’ quality of life”	“[To] provide for the management of forests”
Guiding principles	(a) good governance (b) public participation and community involvement in the management of forests (c) consultation and co-operation between the national and county governments (d) values and principles of public service (e) protection of indigenous knowledge and intellectual property rights of forests resources (f) international best practices in management and conservation of forests		a) indigenous forest and wildlife resources in the national territory are state property b) equilibrium c) prevention and prudence d) objective responsibility e) respect for local communities and local government organizations f) private sector participation g) research and development studies h) formal and informal environmental education i) international co-operation	
Defined forest areas	<ul style="list-style-type: none"> Public forests Community forests Private forests 	<ul style="list-style-type: none"> Central forest reserves Local forest reserves Community forests Private forests Forest in wildlife conservation area under the Uganda Wildlife State 1996 	<ul style="list-style-type: none"> Conservation forests Productive forests Multiple use forests 	<ul style="list-style-type: none"> National forest reserves Local authority forest reserves Village forests Private forests
National forest law enforcement institutions	<ul style="list-style-type: none"> Kenya Forest Service Forest Conservation and Management Trust Fund Kenya Forestry College Kenya Forestry Research Institute 	<ul style="list-style-type: none"> National Forestry Authority 	National Council for Sustainable Development	<ul style="list-style-type: none"> National Forestry Advisory Committee Tanzania Forest Fund Tanzania Forest Services Agency



CHAPTER 3. PRESENT STATUS OF REDD+

PHILIPPE KARPE

3.1 Introduction

Despite their importance, total forest cover across Eastern Africa is decreasing. In 2008, annual deforestation was 0.3% in Kenya (GOK 2010) and 0.58% in Mozambique (GOM 2008), Tanzania saw 91,200 ha deforested annually (URT 2008), and overall Ugandan deforestation was approximately 58% (GOU 2008). As well as mitigating and contributing to global efforts against climate change, REDD+ is considered to have potential to manage what forest remains whilst increasing forest cover and all four countries are REDD+ participants. Each country is at a different REDD+ stage and none yet implements it fully. Kenya has been particularly slow implementing REDD+ preparedness activities; as such, information on certain subject matters in the country does not exist or is not up-to-date. The above deforestation rates provide a starting point for REDD+ planning. Data has since been improved through REDD+ participation, especially regarding forest cover change and deforestation rates which have improved through Forest Reference Emission Level and/or Forest Reference Level (FREL/FRL) assessments and National Forest Monitoring Systems (NFMS).

This chapter is divided into four parts, focusing on general REDD+ context, the status of each REDD+ pillar, enabling activities and constraints in each country.

3.2 General context

3.2.1 Current REDD+ status

Each country is at a different stage in the preparation and implementation of REDD+; budget and technical capacity, political will and commitment all influence this. Although REDD+ projects are underway, like the Kasigau Corridor REDD+ project in Kenya, the Yaeda Valley REDD+ project in Northern Tanzania and the Ongo Community Forest REDD+ pilot project in Uganda, and investments have taken place, no country is yet ready to receive potential result-based payments. Mozambique, Uganda and Tanzania all have national REDD+ strategies in place, yet only Uganda has submitted its FREL to UNFCCC. No country yet has a fully operational Safeguards Information System (SIS), and all four countries are still designing national forest monitoring systems. Uganda and Mozambique are currently negotiating funds from the Forest Investment Program (FIP) (MITADER 2016; MWE 2017) and Bio-Carbon Funds (through the Emissions Reduction (ER) program).

3.2.2 REDD+ objectives

The countries have similar REDD+ objectives. Some are more general: both Tanzania and Mozambique highlight conservation objectives; Kenya and Uganda aim to contribute to climate change mitigation efforts, Kenya additionally mentioning climate adaptation efforts, whilst Mozambique aims to reduce emissions from deforestation and forest degradation.

Some objectives are more specific: Kenya and Mozambique specifically detail their aims to increase forest cover by at least 10% (Kenya) and to increase forest carbon stocks by 36 Mt CO₂/year by 2030 (Mozambique) (GOM 2008); Uganda highlights its aim to improve livelihoods of local, indigenous and forest-dependent communities; Kenya highlights support for government efforts to design policies and measures to protect and improve remaining forest resources; Tanzania highlights conservation and/or enhancements of unique biodiversity values and forest ecosystems and corresponding benefits, equitable sharing, and adoption of a low carbon development pathway; whilst Mozambique aims to restore a society that values its natural capital and recognizes the contribution of environmental services to the social, economic and environmental well-being of current and future generations at local, national and global levels.

3.2.3 Institutional arrangements

Each country has unique institutional arrangements covering the four Cancun Agreement¹⁰² pillars and different phases of REDD+ implementation.

¹⁰² The 11 December agreements in Cancun, Mexico, at the 2010 United Nations Climate Change Conference, represent key steps forward “in capturing plans to reduce greenhouse gas emissions and to help developing nations protect themselves from climate impacts and build their own sustainable futures” <http://unfccc.int/cancun/> (viewed 26 November 2017).

Kenya's Ministry of Environment and Natural Resources (MENR) which coordinates environmental management including forests, hosts the UNFCCC Focal Point and a Climate Change Directorate which coordinates national activities and reports to UNFCCC. A Steering Committee provides policy guidance, implements REDD+ activities, and coordinates inter/intra-sectoral REDD+ activities nationally, whilst a Technical Working Group provides technical advice, and a Coordinating Office coordinates readiness activities and REDD+ task forces.

The Ugandan Ministry of Water and Environment (MWE) leads REDD+ coordination and implementation. The National Climate Change Advisory Committee (NCCAC) coordinates REDD+ at policy level and acts as the REDD+ Steering Committee; the Forestry Sector Support Department (FSSD) under MWE serves as the National Focal Point and REDD+ Secretariat, undertaking management and technical coordination; whilst three task forces and a national technical committee provide support (MWE 2017b).

Tanzania's National Climate Change Steering Committee (NCCSC) and National Climate Change Technical Committee (NCCTC) oversee and guide climate change activity implementation (URT 2010). NCCSC has Permanent Secretaries (PS) from 13 ministries, society, organizations and the private sector. Technical issues are handled by the NCCTC (URT 2010).

In Mozambique, a technical unit (UT-REDD+) was formed in 2016 under the Ministry of Lands, Environment and Lands (MITADER), itself formed in 2015. CONDES is chaired by the minister in charge of MITADER and the Prime Minister.

3.3 Progress against REDD+ pillars

The Cancun Agreements state developing countries must produce i) a national strategy or action plan; ii) a national forest reference emission level and/or forest reference level; iii) a robust and transparent national forest monitoring system (NFMS) for REDD+ activities; and iv) a safeguards information system. Below we summarize the status of each pillar in each country.

3.3.1 National REDD+ strategy/action plan

Kenya still lacks a national strategy and action plan, however recent studies¹⁰³ will inform this and an investment plan. Stakeholder consultations now require intensification to ensure information is up-to-date. Uganda's national strategy (draft version) was launched during COP23 in Bonn and a World Bank Forest Investment Program (FIP) investment plan devised (MWE 2017a) to cover partial implementation. Tanzania has developed its strategy, and a comprehensive action plan outlining how to avoid harm to livelihoods and biodiversity (URT 2017). Mozambique's draft strategy (MITADER 2016a) and action plan for 2016-2030 (MITADER 2016c) are available and being used to develop implementation activities, as well as a FIP proposition and an emissions reduction program.

3.3.2 National forest monitoring systems (NFMS)

Kenya's NFMS is under construction with partner technical support. An accuracy assessment of existing land cover change, roadmap for establishing forest reference levels and the NFMS, and proposal for institutional MRV arrangements have been finalized (FAO & KFS 2017). The roadmap, which details

¹⁰³ On drivers and underlying causes of forest cover change, Kenya's charcoal value chain, forest governance, REDD+ and sustainable development, integrating REDD+ provisions into key legislation and guidelines for stakeholder engagement and free, prior and informed consent (FPIC)

available data, process and methodology, tasks, system design timeline, national forest inventory, GHG inventory and monitoring system, and budget for system operationalization, is currently being used as the basis for NFMS activities.

Uganda's monitoring system is under improvement. Forest/vegetation maps have been updated with 2000-2015 changes, and a national forest inventory was launched to reinforce the quality of emissions factor data. Uganda has progressed its NFMS by improving: monitoring function, through capacity building to increase forest inventory and mapping expertise; the satellite land monitoring system, through completing key data sets and ground-truthing for 1990, 2000, 2005, 2010 and 2015; the national forestry inventory, by providing tools and equipment to strengthen National Forestry Authority (NFA) capacity to conduct field inventories, develop inventory protocols and deploy an automated system for data collection/analysis¹⁰⁴; and completing a targeted biomass inventory to develop the FREL. A NFMS web interface is planned though still under construction. Tanzania has defined and documented a monitoring approach and strengthened capacity in system design and implementation. Tanzania's national forest inventory has been finalized and its NFMS, though under improvement, is now publicly available via a web portal (<http://tz-nfms.org/portal/>). No up-to-date information is yet available for Mozambique.

3.3.3 Forest reference level/forest reference emission levels

By 2017 only Uganda and Tanzania had submitted their FRELs to UNFCCC. National validation of Kenya's FREL was completed in November 2017; Kenya will submit this in 2018. Uganda, Tanzania and Kenya (MWE 2017b; URT 2016) take a historical average approach on their CO₂ emissions to produce national-level data for their FRELs; Uganda's FREL is based on 2000-2015 data, whilst Tanzania uses data from 2002-2013 for mainland Tanzania and 2004-2012 for Zanzibar. Whilst Tanzania and Kenya's FREL covers deforestation, Uganda's scope covers deforestation, forest degradation, sustainable management of forests and conservation. Tanzania focuses on CO₂ produced from above-ground biomass, below-ground biomass and dead wood whilst Uganda currently focuses on above and below ground biomass but plans to include deadwood in their revised FREL submission. No up-to-date information is available for Kenya.

3.3.4 Safeguards information system

No country yet has an established and operational safeguards information system (SIS), and although Uganda and Kenya have system development plans, Mozambique and Tanzania do not¹⁰⁵.

3.4 Enabling activities

Others design elements for national REDD+ systems include benefit-sharing and grievance mechanisms, and governance improvements around forest protection and management. Progress differs due to each country's unique needs. As yet, no country has clear benefit-sharing mechanisms enabling them to receive result-based payments. Kenya has begun analysis and modelling for development of a future system. Tanzania plans to establish a REDD+ Fund but how to establish and manage this is unclear as yet. Although project-level modalities appear to be clear for Kenya, Tanzania and Uganda, national benefit-sharing mechanisms require further in-depth analysis regarding carbon rights and land tenure rights. Kenya has

¹⁰⁴ See Uganda REDD+ readiness process: Mid-term progress report and request for additional funding Uganda REDD+ readiness process: <https://www.forestcarbonpartnership.org/sites/fcp/files/2016/May/Uganda%20MTR%20Presentation.pdf>

¹⁰⁵ See: <http://www.unredd.net/announcements-and-news/2592-safeguards-country-resource-hub.html> (viewed 26 November 2017)

started to integrate some REDD+ provisions into key legislation, but this process is not yet finalized and requires continuous national-level lobbying.

3.5 Constraints

No country has completed all four REDD+ requirements - a fundamental challenge in accessing international result-based payments. The main constraint hindering REDD+ design and implementation is funding availability. No country has national budget available for this, which has been mainly funded by international and bilateral funding agencies to date. National governments must mobilize funds to support REDD+ activities in the field urgently; if not they risk losing public trust in REDD+ or local-level REDD+ projects developing independent systems which disregard national processes. Indigenous rights could also become a constraint if FPIC has not been duly completed previously; as indigenous people are mostly located in forested areas within Uganda, Kenya and Tanzania, indigenous rights are of critical importance, particularly at national level. Likewise, communication around REDD+ aims and processes must continue to ensure stakeholder involvement isn't weakened.

3.6 Conclusion

REDD+ is progressing in all four countries albeit unevenly. FRELs have only been submitted in two countries, one country does not have a forest monitoring system in place and none have benefit sharing and grievance mechanisms in place. However, there is keen political interest in REDD+ as a pathway for addressing deforestation drivers at national and regional level. A major constraint to REDD+ is community tenure rights: clarity and security of rights is central to incentivizing sustainable use and management while providing a basis for assigning benefits. The establishment of a regional forest observatory will have positive impacts on the speed at which progress continues by allowing countries to share knowledge, skills and resources.

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Photo: Patrick Sheperd/CIFOR

CHAPTER 4. FOREST MONITORING IN EASTERN AFRICA

LAURA MUKHWANA, ESTHER MWANGI, PAOLO CERUTTI, FORTUNATE MUYAMBI,
ALFRED GICHU, JOHN DIISI, NURDIN CHAMUYA AND JOAQUIM MACUACUA

4.1 Introduction

Forest monitoring systems are central to evidence-based decision making within the sector. They not only generate data at a given scale and scope, they are also responsible for the reliability, repeatability and frequency of data that underpins effective and timely decision making.

This chapter presents methodologies for estimating forest/tree cover and biomass and carbon monitoring at different scales, as well as processes, structures and mechanisms. Such mapping allows for compatibility and comparability assessments, and exploration of necessary adjustments for regional decision-making and approaches to REDD+ reporting, regional timber trade, forest restoration and community forestry. The first section summarizes the region’s main approaches to monitoring; the second compares these on parameters such as biomass estimation approaches, land use/land cover assessments, forest definitions, types and scales of forest inventories, variables collected, and sample and plot designs. Advantages and disadvantages are highlighted and discussed. The latter sections highlight forest monitoring obstacles and good practices to help mitigate these.

4.2 Main forest monitoring approaches in the region

All countries periodically monitor their forest resources through forest cover change mapping, biomass inventories and monitoring trade in timber, wood fuel and NTFPs. With the exception of Kenya, all countries use an integrated approach to forest monitoring, combining LULC mapping and biomass stock monitoring, however Ugandan LULC mapping has been separate to biomass inventories since 2009, due to insufficient funding to support a national inventory.

Ugandan forest monitoring programs include LULC mapping which monitors reforestation and deforestation of plantation and natural forests. Uganda maps degradation and monitors timber and non-timber forest product trade, focusing on volume (in m³) of licensed timber harvests from plantation and tropical high forests (THF), volume of timber from NFA sawmills, number of utility poles and construction poles, and volume (stacked m³) of firewood sold. Kenya's forest monitoring programs include participatory community forest management, forest fire management and biomass inventories, and multi-stakeholder forest mapping initiatives. Insufficient resources mean Kenya's last nationwide forest inventory was conducted in the early 1990s, when the Kenya National Forest Master Plan was being prepared; this included inventories and forest cover mapping. Tanzania's National Forestry Resources Monitoring and Assessment (NAFORMA) is one of the region's most comprehensive field data collection systems, with data on disturbance and local community forest use, as well as LULC mapping and biomass inventories. Aspects of NAFORMA's socio-economic data collection have been adapted for Kenya's planned National Forest Resources Assessment (NFRA) methodology. The Tanzania Forest Services Agency (TFS) also monitors forest resource use, including forest product harvesting, protection and consumption. Mozambique's monitoring programs include biomass inventories, forest resource mapping and wildfire monitoring. Numbers of licensed timber, charcoal and firewood operators, quantity of wood processed in forest product industries, timber exports, district collected taxes, restoration efforts and forest law enforcement are all monitored. DINAF also tracks forest concessions nationally and records licenses granted provincially, and monitors forest concession approvals, simple licenses issued and volumes of harvested timber and species to ensure the allowable cut isn't exceeded. Forest plantations are also monitored to check numbers and species of seedlings planted (JICA 2013). A participatory audit of forest concessionaires and industries began in 2016. To monitor illegal logging, DINAF works with the District Service for Economic Activity (SDAE) and police; unlicensed loggers are arrested at checkpoints. DINAF also shares monthly fire occurrence bulletins with relevant ministries.

4.3 Biomass monitoring

Table 1 illustrates the history of the region's biomass monitoring initiatives which began in the 1970s.

Table 1: History of biomass monitoring in Kenya, Tanzania, Uganda and Mozambique

Country	Biomass monitoring activities
Kenya	<ul style="list-style-type: none"> • 1990-1994: Kenya Indigenous Forests Conservation (KICFON) project monitors 15 indigenous forests. • 1991-1994: Kenya Forestry Master Plan (KFMP) conducts forest inventories; current national estimates of mean volumes and forest area based on this data. • 1997: Mount Elgon forest mapping and inventory. • 2001: Indigenous tree inventory and vegetation survey in Mount Elgon Reserve, and indigenous forest inventory in Arabuko Sokoke Forest Reserve. • 2005: Tree inventory and vegetation survey in Mukogodo; tree resource inventory in South Nandi Forest Reserve; Kakamega forest mapping under Biota project. • 2009-2012: National plantation forest inventory; all plantation forests characterized by species, age and management type. • 2012: Mau Forest Block inventory.
Tanzania	<ul style="list-style-type: none"> • 1971-1973: Reconnaissance forest inventory of indigenous forests in Kilimanjaro, Tanga, Kilombero, Mtwara and Tabora blocks. An industrial inventory was later conducted in 1975 and 1980. • 1996: Reconnaissance forest inventories in Singida, Dodoma and Arusha. • 1999: Study on status of NTFPs. • 2005: FBD reconnaissance forest inventory in 11 districts across the Northern, Southern, Eastern and Western zones. • 2011: Mangrove forest inventory conducted by Tanzania Forest Services (TFS). • 2013: State plantations inventory initiated in 2013; expanded to selected production forests in 2014 under 'Big Results Now' (BRN).
Uganda	<ul style="list-style-type: none"> • 1989-2009: National Biomass Studies (NBS) project. • 2000 to date: Exploratory inventory of Tropical High Forests (THFs). • 1999-2015: Permanent sampling plot monitoring in natural and plantation forests. • 2011: Carbon assessment in Semiliki and Kibale national parks.
Mozambique	<ul style="list-style-type: none"> • 1980: National forest inventory. • 1994: National forest inventory. • 2005-2007: National forestry inventory.

Uganda's National Biomass Studies (NBS) project in 1980s developed standard biomass monitoring procedures still in use today. Other countries have developed standard procedures for biomass monitoring more recently, Kenya developing these in 2013 through its Improving Capacity for Forest Resource Assessment (IC-FRA) project, Tanzania in 2009 through NAFORMA, and Mozambique developing national forestry inventory guidelines in 2016. Kenya's last comprehensive national forest inventory was completed in 1994. Designs of subsequent inventories differed, but in 2013-2015 the Improving Capacity for Forest Resources Assessment (IC-FRA) project developed collection manuals since adopted as standard and used in a pilot national inventory. Addressing inadequate forest resource knowledge and insufficient institutional capacity, NAFORMA, implemented in 2009-2014 with FAO technical support, was mainland Tanzania's first ground-based forestry inventory. Mozambique's first nationwide field inventory, the Integrated Assessment of Mozambican Forests (AIFM), was carried out between 2005-2007 by the National Directorate of Lands and Forests (DNLF) under a private sector-ministry consortium (Marzoli 2007). Previous inventories were based on mapping activities with limited fieldwork (Marzoli 2007); AIFM combined LULC mapping and forest inventory collection with national and sub-national studies. Studies focused on wildlife distribution and evaluation of NTFPs nationally, with socio-economic studies on forest

condition, wildlife and NTFPs, and sub-national studies assessing wildlife and community forestry. Outputs included a land cover map, a National Forest Inventory, and information systems and maps of forest types and potential. Mozambique's fourth National Forest Inventory (NFI) was carried out in 2015-2017 to determine volumes of timber, commercial forest products and available commercial species, conditions, and estimated carbon content. This focused on natural and semi-natural forest ecosystems, with outputs including LULC maps, a NFMS and sustainable forest policy, an information platform for monitoring REDD+, and Mozambique's FREL.

4.4 Comparison of monitoring approaches

Examining inventory type and scale, variables, sample design and integration of quality control/assurance, biomass monitoring approaches reveal similarities and differences (see Table 2).

Monitoring methodologies: Uganda's National Biomass Studies (NBS), Tanzania's National Forest Resources Monitoring and Assessment (NAFORMA) and Mozambique's National Forest Inventory (NFI) 2015-2017 all combine forest inventory and LULC mapping.

Collected data type and variables: As well as biophysical data, Tanzania's NAFORMA and Kenya's planned National Forest Resources Assessment (NFRA) collect socio-economic data on forest resource use and management. The first phase of Uganda's NBS and Mozambique's AIFM also collected socio-economic data though Uganda's socio-economic survey collected wood fuel consumption and wood fuel transportation data, whereas Mozambique evaluated national wildlife distribution and NTFPs and assessed wildlife and community forestry locally. Tanzania and Kenya's approaches were similar in biophysical survey design and collected variables; however, Kenya also collected data on litter, debris, bamboo and climbers, and included observations on erosion, grazing, water catchment importance, and forest, woodland and cropland biodiversity. The two approaches were also comprehensive in collected variable scope, compared with Uganda and Mozambique; Tanzania's NAFORMA methodology involved collecting measurements from trees with a DBH of at least 10 cm (MNRT 2015). Due to the small sample size of NAFORMA's socio-economic survey, results could not be projected nationally and many forest use and extraction activities may have been underreported (MNRT 2015). This survey was conducted by local forest guards, which may have discouraged locals from disclosing information on illegal forest use.

Purpose: All approaches aimed to establish a long-term harmonized methodology for sustainable management and have since been adopted as the standard for forest inventory and LULC mapping. Standardized procedures have now been developed; biophysical and socio-economic survey manuals produced for Tanzania's NAFORMA, a forest inventory field manual to guide biophysical and socio-economic data collection in Kenya's National Forest Resources Assessment (NFRA), and guidelines developed to assist Mozambique with their National Forest Inventory (NFI).

Scale of inventories: Both Kenya and Tanzania adopted national-level biomass inventory methodologies; however, Mozambique and Uganda carried out biomass inventories at diverse scales. Mozambique undertook a national inventory plus two more intensive provincial inventories; Uganda's more sophisticated approach saw biomass inventories with different purposes, scales and ecosystems.

Sampling approach: Tanzania, Uganda and Kenya use a double sampling approach. All countries stratified for cluster and sample plot selection, though strata numbers and criteria vary. Tanzania stratified into 18

based on predicted growth stock, slope and accessibility; Uganda stratified on agroecological zones and population density; Kenya used county boundaries and agro-ecological zones to stratify into four; whilst Mozambique stratified into five forest types, with sampling intensities based on these.

Quality Assurance/ Quality Control mechanisms: only Tanzania issued elaborate quality control and assurance guidelines for field inventory collection, having two quality assurance teams and a field manager.

Table 2: Comparison of biomass monitoring approaches

	Uganda	Tanzania	Kenya	Mozambique
<p>Type and scale of inventory</p> <p>Purpose</p>	<p>Four types of biomass estimation methods</p> <ul style="list-style-type: none"> • National Biomass studies (NBS): comprehensive national, regional and district-level studies focused on land cover, biomass density, protected area status, standing stock, growth and dynamics. Project outputs have been used for planning and licensing private forest timber harvesting. Focus on private land to provide up-to-date data on the state of biomass resources. Combination of forest inventory collection and LULC mapping. • Stock assessments: Exploratory Inventory & Integrated Stock Survey & Management Inventory (ISSMI) - conducted in Central Forest Reserves (CFRs) every ten years to generate information on forest stocks available for harvesting. • Permanent Sample Plots (PSPs): research plots for monitoring growth rates, biomass dynamics and yields in Central Forest Reserve natural (Tropical High Forests) and plantation forests. Revisited every five years depending on funding. • Special purpose inventories: biodiversity inventories, baseline surveys, carbon assessments and research studies on Tropical High Forests (THFs), carried out on a needs basis. 	<p>National Forest Resources Monitoring & Assessment (NAFORMA) - national scale</p> <p>Purpose: develop baseline information on forest tree resources; assist TFS to set up specialized structure; establish long-term, policy-relevant, holistic and integrated monitoring system for forested ecosystems to address domestic information needs and international reporting requirements</p> <p>Approach: combines forest inventory and LULC mapping</p>	<p>National Forest Resource Assessment (NFRA) – planned</p> <p>Purpose: provide harmonized information about Kenya’s forest resources</p>	<p>Inventory at national and provincial scale</p> <p>National Forest Inventory (NFI) 2015-2017</p> <p>Purpose: establish a National Forest Monitoring System (NFMS) to support decision making through scientific evidence and developing a national sustainable forest policy</p>
<p>Sample design</p>	<p>NBS: systematic sampling approach; sample plots located at 5 km x 10 km grid intersections with 3 sample plots at each intersection.</p>	<p>Double sampling for stratification: 1st phase: grid of clusters overlaid at 5 km x 5 km on mainland map divided into 18 strata.</p>	<p>Double stratified systematic cluster sampling: 1st phase: 2 km x 2 km cluster grids over all strata.</p>	<p>4 km x 4 km grid overlaid on country imagery/map from which clusters selected using stratified random sampling.</p>

	Sampling intensity varied based on population density and agroecological zones. 3:2:1 sampling intensity was adopted across priority zones: 1 (high population), 2 (medium population) and 3 (low population).	2nd phase: samples systematically chosen from previous phase samples but at different sampling intensities.	2nd phase: 1 st phase clusters stratified into 2 nd phase strata based on number of forest sample plots in a cluster.	Stratified into 7 strata based on 2016 LULC map classification system. Sampling intensity determined by estimated total volume per stratum.
Variables, tree measurements, observations and other data collected	<p>Variables collected: species name, DBH, tree height, crown width and bole height.</p> <p>Observations: crown cover assessment of all LULC or crop, stocking density levels, percentage of bush coverage; regeneration (in PSPs only).</p>	<p>Tree measurements: DBH greater than or equal to 1 cm; dead wood measurements min. width 10 cm diameter – 1 m length, within 10 m plot radius; length and diameter (top and bottom); degree of decay; stump measurements: stump diameter, height, estimated time of cutting.</p> <p>Variables collected: species, health, DBH, height, stump diameter, bole height, soil sample (for PSPs only).</p> <p>Additional variables for bamboo species: species, no. of stems and average diameter; shrub measurements (coverage, species and mean height of shrub/bushes); regeneration (no. of seedlings and species).</p> <p>Plot description data: location, vegetation type, land use and ownership, slope, canopy coverage, measuring time, non-wood forest product, human impact, damage (factors and severity), plot center photographs taken.</p> <p>Socio-economic and governance data: forest use and management.</p>	<p>Variables collected: tree variables (species and code name, DBH, tree and bole height, stump diameter and height, land use, vegetation type, soil, forest products and services, shrubs, regeneration (no. of tree seedlings and saplings), litter and debris, dead wood, stumps and bamboos, climbers, shrubs (coverage and mean height), soil measurements.</p> <p>Observations: erosion, grazing, importance as a water catchment and biodiversity.</p> <p>Socio economic variables: agricultural cropping system, water, pests, energy source, livestock, local perceptions on land use changes, main products and services derived, land use related problems, cluster location.</p>	<p>Tree measurements: all trees with DBH > 10 measured.</p> <p>Variables collected: species (local/botanical names), DBH, total height, commercial height.</p> <p>Observations: regeneration, tree quality, health status, wildlife occurrence.</p> <p>Socio economic data: use of NTFPs.</p>
Quality Assurance/ Quality Control		NAFORMA Quality Handbook guided through various control measurements. Field managers to ensure data collection methodologies followed.		

4.5 Mapping initiatives and LULC mapping

Land cover and/or vegetation mapping initiatives have been undertaken for decades, by various actors and at different scales. The introduction of REDD+ has started to influence these mapping initiatives; Annex 2 contains a summary across the four countries.

Kenya's first comprehensive LULC maps were produced in 1983-1993. Between 2011 and 2013, mapping capacity was developed, before Land Use, Land Change and Forestry (LULCF) mapping was conducted for historical change trend analysis (1990, 2000 and 2010) using medium and high-resolution imagery. Detailed mapping, forest cover change modelling and forest inventory surveys to estimate above ground biomass were also completed for ecosystems of interest. Kenya's first comprehensive nationwide land cover map was coordinated through the SLEEK Land Cover Change Mapping (LCC) program (2015-2016), which produced land cover maps from 2014 to 1990. The program had a rigorous quality control and assurance processes including stakeholder consultations; land cover classification and process manuals were developed and program maps have been adopted as national data and are being used for REDD+.

Ugandan LULC mapping began in the early 2000s with a 1990 LULC map. Ugandan LULC maps have now been produced for 1990, 2000, 2005, 2010 and 2015. The latter three years were produced in 2015/16 for the estimation of the Forest Emissions Reference Level (FREL); reforestation and deforestation were examined in natural and plantation forests. LULC mapping was initially every five years but is now every two years as forestry is a key National Development Plan indicator requiring annual reporting to monitor the targeted forest cover increases from 14% in 2012/13 to 18% in 2019/20.

Mozambique forest cover and inventory maps have been produced since 1980. The third national forest map, generated from Landsat 5 imagery, marked the first digital map. The fourth national map was produced through the 2015-2017 forest assessment exercise; this also generated two provincial LULC maps (Cabo Delgado and Gaza).

Tanzania Forest Service Agency (TFS) led production of the 2010 mainland Tanzania LULC map, based on satellite imagery interpretation and ground validation (MNRT 2015). In 2016 forest change maps were developed for mainland Tanzania (2002-2013) and Zanzibar (2004-2012) in a process to estimate Tanzania's Forest Reference Emissions Level (FREL).

4.6 Comparison of mapping initiatives

Similarities and differences exist when comparing forest definition, classification systems, classification method and quality assurance and quality control (QAQC) within mapping initiatives. Table 3 provides a regional comparison summary.

4.6.1 Forest definition

Definitions of forest as used by Uganda and Mozambique are most similar; both require a minimum of 1 ha in area, and at least 30% crown or canopy cover. Their minimum tree height requirement differs, with Kenya requiring 4 m and Mozambique requiring 3 m. Kenya and Tanzania each require a minimum of 0.5 ha in area, but their requirements differ for canopy or crown cover and height of tree species: at least 10% and 3 m in Tanzania, and at least 15% and 2 m in Kenya.

4.6.2 LULC classification system

All four countries use international standards for land cover classification systems. Uganda uses the FAO Land Cover Classification System (LCCS), translated for consistency and to enable comparison into the National Biomass Classification used in previous land cover maps. Mozambique's 2007 AIFM map used LCCS and the Mozambican Agro-ecological zoning (2010-2014) remained consistent with AIFM national classifications, however the 2015-2017 NFI LULC mapping was based on 2006 IPCC Tier 3 classifications. As such, Kenyan and current Mozambican classification systems are similar, both based on the 2006 IPCC guidelines, although Kenya has a different number of LULC classes. Tanzania's classification is based on a 1995 map by Hunting Technical Services Ltd modified to fit within the FAO Global Forest Resources Assessment definitions of four global land cover classes: forest, woodlands, bushlands and grasslands.

4.6.3 Classification methods

Kenya, Uganda and Tanzania use Random Forests (RF™) to digitally classify satellite imagery in LULC mapping; this classifier has greater accuracy, deals better with outliers, is better for time series monitoring, is consistent across different operators and has good feasibility at national scale.

4.6.4 Quality Control/Quality Assurance (QC/QA)

All countries have accuracy and validation mechanisms for LULC maps and are using similar validation methods including ground truthing or high/medium resolution satellite imagery (Google Earth, Landsat, Aster etc.). Tanzania's NAFORMA also used sample plot photographs in the validation process.

Kenya's SLEEK LCC quality control and assurance procedures stand out; quality control was undertaken by a quality assurance team after each mapping stage. Final accuracy was assessed through ground referencing/truthing and independent point interpretation using Google Earth and Landsat imagery. Quality assurance was completed by an external expert group followed by other members of the Land Cover Element Working Group, specifically Kenya Forest Service (KFS) and Kenya Agricultural and Livestock Research Organization (KALRO). A stakeholder validation workshop was also held, before final validation by Surveys of Kenya (SOK), Kenya's map producing organization; although this final stage is not yet complete.

Table 3. Comparing LULC mapping across Eastern Africa

	Uganda	Tanzania	Kenya	Mozambique
Forest definition	Minimum area of 1 ha, minimum crown cover of 30%, and comprising of trees able to attain a height of 4 m and above.	At least 0.5 ha, with minimum tree crown cover of 10% or with existing tree species (planted or natural) able to attain more than 10% crown cover, and with trees with potential or having reached a minimum height of 3 m at maturity.	Land spanning more than 0.5 ha with trees higher than 2 m and canopy cover of over 15% or trees able to reach this threshold. This includes natural and planted plantation forests in state and private land.	At least 1 ha, with canopy cover of at least 30%, and with trees with potential to reach a height of 3 m at maturity, temporarily cleared forest areas and areas where the continuity of land use would exceed the thresholds of the definition of forest, or trees capable of reaching these limits.
LULC classification system	FAO Land Cover Classification System (LCCS) with legend translated into National Biomass Classification (NBC) for comparison with existing LULC maps.	Classification system based 1995 map by Hunting Technical Services Ltd (HTSL) modified to fit FAO GFRA definitions of the four Global Land Cover Classes.	Classification based on local definitions of land cover and 2006 IPCC guideline requirements, and national need for information and mapping system simplicity.	2016 LULC map classification system based on 2006 IPCC guidelines, AIFM national classifications, 2010-2014 Zoneamiento Agroecológico de Moçambique (ZAEN), and 2015-2016 provincial forest inventories in Gaza and Cabo Delgado.
Classification	<p>Automated segmentation and supervised classification (Random Forests Classifier)</p> <p>Validation (quality control):</p> <ul style="list-style-type: none"> • Visual validation of results previous maps as back drop • Low intensity ground-truthing 	<p>Digital image interpretation: supervised classification using Random Forest Classifier (RFC)</p> <p>Visual image interpretation: to extract agriculture related LULC classes using ArcGIS and ArcView</p> <p>Validation (quality control):</p> <ul style="list-style-type: none"> • Field observation using GPS and cameras • Forest inventory photographs • Google Earth images <p>Final processing: cleaning, reprojection, mosaicking and cartography</p>	<p>Digital image interpretation: Supervision classification through Random Forests Classifier (RFC) on single year image mosaics</p> <p>Multi temporal classification of single year land cover types using conditional probability network (CPN), a mathematical model to produce multi-year land cover maps and land cover change products</p> <p>Validation (quality control):</p> <ul style="list-style-type: none"> • Quality control review after each step • Accuracy assessment: Ground referencing and Independent Point Interpretation • Quality assurance by external expert group and through stakeholder input workshop • Validation by Surveys of Kenya (SOK) 	<p>Digital processing techniques: Image enhancement (combination of bands and false color composition)</p> <p>Validation (quality control):</p> <ul style="list-style-type: none"> • Ground truthing - Manica and Maputo provincial maps) • Visual interpretation of high resolution images (ASTER), satellite images (LANDSAT 5, LANDSAT 7, LANDSAT mosaic MrSID and MODIS) and auxiliary information (aerial photographs, maps and reports)

4.7 Carbon monitoring

Carbon monitoring is still at a nascent stage in the region; Kenya and Tanzania have developed carbon MRV systems while Uganda and Mozambique are at design and development stage.

Kenya's SLEEK program is at an advanced stage of development and consists of: a) FLINT (Full Lands Integration Tool) which combines weather data and land cover maps with biological growth models which capture emissions and removal of carbon from trees, crops and soils to estimate land sector emissions over time; and b) an online reporting tool where all FLINT data, results and outputs can be visualized and queried. KFS is designing Kenya's National Forest Monitoring System (NFMS), with a prototype expected by June 2018. Most data will come from SLEEK but NFMS will have a broader scope including the national GHG inventory, data for international reporting and support for forestry sector planning and decision making. Tanzania has completed the REDD+ readiness phase and will next focus on developing its NFMS, designing and implementing the MRV system through the National Carbon Monitoring Centre (NCCM). Launched in 2016, the NCCM led preparation of the FRELs, and is now providing technical services on REDD+ MRV. The national carbon database is now established and consists of: a) an activity database, with remote sensing data used in LULC change analysis; and b) an emissions factor database and forest and species allometric models.

Uganda's NFA will host MRV and the still-under-development NFMS; the latter will link with all existing forest information systems. Mozambique has three monitoring initiatives. DINAF and JICA are co-establishing a Sustainable Forest Resource Information Platform for REDD+ monitoring, fully operational in 2018. Outputs of the DINAF-JICA project also include Forest Reference Emissions Levels (FRELs) and MRV baselines, biomass and carbon estimate preparation, and guidelines on monitoring and inventory studies and biomass and carbon estimation models, as well as a platform management manual. Under this program inventories and LULC mapping took place in two provinces, with results used in the 2016-2017 National Forest Inventory. A biomass survey was conducted to develop allometric equations for estimating Above Ground Biomass (AGB) and Below Ground Biomass (BGB) for mopane trees. Likewise, UT-REDD+ is operationalizing Mozambique's MRV system, along with its NFMS, with methodologies being developed for monitoring safeguards.

4.8 Forest monitoring challenges

Outlined challenges are derived from examples highlighted by institutions via interviews, monitoring reports and a needs assessment.

Difficult and insecure terrains

Data collection teams must walk long distances to access remote areas; Tanzanian field teams walked 21-65km to access clusters (MNRT 2015). Some areas are impenetrable (closed thickets, wide rivers and steep terrain) or insecure due to wild animals, and communities or individuals can pose challenges, denying access. As such, not all clusters can be accessed. Tanzania's NAFORMA established 3,240 clusters with 32,660 sample plots, but 3,219 clusters with 30,773 plots were sampled in reality (MNRT 2015).

Equipment failure and illness

At times, equipment failed during field work. The NAFORMA inventory required photographs of each accessed plot, but only 63% of plot photographs were taken, due to flat batteries, camera failure, human error and even camera loss (MNRT 2015). Other field-related challenges included illness among NARFORMA data collection field teams, affecting both their productivity and progress.

Data management

The entry, processing, storage and management of forest monitoring field data is challenging due to constantly changing software and technologies which render previous software obsolete; Uganda used dBase software for data entry and analysis in their 2005-2009 National Biomass Study, however, software is now obsolete and few staff know how to operate it (NFA 2009). The filing naming system is also inadequate, plot data files being duplicated or stored in different places, as plot visits increased (NFA 2009).

Inadequate financial resources

The region's institutions lack adequate funding to systematically monitor forest resources. Most major inventory activities are funded by bilateral donors: Tanzania's NAFORMA was co-funded by the Finnish government; Mozambique's AIFM funded by the Italian Development Corporation; Uganda's 2008 NBS was funded by NORAD and has not been conducted since. Likewise, DINAF's lack of funding affects systematic monitoring like biomass assessments and forest cover map updates in Mozambique. Their ICFRA project was only possible through Finnish funding; though manuals were produced as part of this, no national forest resource assessment has been possible due to insufficient funds. As inadequate financial resources limit the frequency and scope of data collection exercises, data gaps appear. Limited finance also restricts the use of some data types, like high-resolution satellite imagery which could improve LULC mapping results and assist to monitor forest degradation (which has been challenging) and forest and/or land cover change. At present, institutions rely on medium to coarse resolution satellite imagery, making it difficult to acquire comprehensive scenes during the rainy season due to extensive cloud cover.

Human capacity

Forest monitoring institutions equally face inadequate human resources, both in technical expertise and numbers. Workforces are limited by budgetary constraints and government hiring restrictions. With changing technologies, the institutions find it hard to cope with new software, methodologies and technologies in LULC mapping, forest change detection and monitoring, forest degradation mapping, forest inventory collection, the use of open source remote sensing, and GIS data and scripting languages like R and Python.

Technical infrastructure

Technical infrastructure requirements (equipment, tools, software and reliable, fast internet connection) are a major issue for most forestry institutions. This is aggravated by insufficient funding, which hinders institutional ability to replace old equipment and software and/or adopt modern ones. In a 2017 needs assessment, countries highlighted their needs. Uganda's NFA lacks a comprehensive system with combined database for inventory and LULC statistical data, and lacks sufficient computing, storage and

back-up capacity to handle new data like high-resolution Sentinel 2 and Landsat 8 imagery. Mozambique's DINAF has appropriate hardware and software for data storage and processing, but weak internet prevents acquisition of free satellite imagery. Kenya's KFS has an information center and GIS and remote sensing lab with hardware, servers and software for data processing, but lacks fast and reliable internet and resources to procure software and update licenses for commercial remote sensing and GIS software, and needs improvements in data storage and back-up infrastructure. Tanzania's Forest Services Agency (TFS) requires advanced software for remote sensing and GIS, and a forest database and information sharing service.

4.9 Good practices

Good practices identified from forest monitoring approaches across the region are:

Multi-stakeholder processes: in Tanzania, Kenya and Mozambique multiple forestry stakeholders have collaborated in design, development and implementation of national forest assessment programs.

Socio-economic data: Tanzania and Kenya's planned NFRA collect socio-economic data on the use and governance of forest resources.

Linkages: Uganda and Mozambique's NFMSs avoid duplication by linking to existing information systems and databases.

4.10 Conclusion

Though forest monitoring approaches in Eastern African countries appear more different than similar, certain fundamental similarities can provide foundations for joint efforts responding to regional policy and decision-making needs. All countries combine forest inventories with LULC mapping and are striving to collect both biophysical and socio-economic data. Yet while collected biophysical data is consistent across countries, socio-economic data varies, highlighting a need for closer cross-border coordination to determine what socio-economic data would assist with regional reporting for obligations such as REDD+ and AFR100. Indicators capturing deforestation drivers, including governance and forest tenure dimensions, need to be carefully considered.

All countries have standardized monitoring guidance documented in manuals, for example NAFORMA's comprehensive field manual on biophysical and socio-economic data collection, and elaborate approach to quality assurance and control. The countries also tend to value learning from each other; Kenya's planned National Forest Resources Assessment (NFRA) has drawn heavily from the experiences and practices of Tanzania's NAFORMA.

Approaches, however, differ in critical ways. Biomass assessment sampling designs vary, as do forest criteria and definitions which see alignment only in Uganda and Mozambique. Although all use international standards for land cover classification systems, these also vary with Uganda using FAO's Land Cover Classification System (LCCS), Kenya and Mozambique using IPCC guidelines, and Tanzania using FAO's Global Forest Resources Assessment (GFRA). Compatibility across definitions and classification systems is necessary; countries need to jointly propose any potential adjustments to ensure national data can be used in regional assessments and decisions. Though monitoring systems are designed in response

to country-specific needs, they are increasingly evolving to be both national in scale and responsive to international imperatives.

Monitoring continues to be challenged by inadequate financial and human resources and difficult, often insecure, terrains, with results like Kenya conducting its last national forest inventory more than 20 years ago. Good practices like broad-scale collaboration in design and implementation tend to compensate for these shortfalls. There is increased interest in linking socio-economic data to biophysical data however, with the exception of Mozambique, most monitoring systems are yet to meaningfully integrate participatory approaches to involve community members and civil society.

Overall, the region's monitoring systems are dynamic and evolving to fit multiple purposes nationally and internationally. However, there is practical need to ensure systems also respond to sub-regional and regional policy problems, which are increasing with greater social, economic and political integration.

4.11 References

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4.12 Annex 2: Forest and LULC initiatives in the region

Country	Year	Type of map	Satellite imagery used	Legend	Coverage	Scale	Year of publication/ publisher
Tanzania	1981	Topography and vegetation type			Usambara and Pare mountains	1:2,000,000	
	1908	Land cover map		Biome type classification system with 13 land cover classes	Whole of Tanzania	1:6,000,000	German colonial administration
	1923	Generalized vegetation map		Biome type classification system with 20 different land cover classes	Africa (1st continental map)	1:10,000,000	
	1949	Vegetation map		Biome type classification system with 16 different land cover classes	Whole of Tanzania (Tanganyika territory)	1:2,000,000	
	1984	Woody biomass map		Five vegetation classes: forest, woodland, bushland, grassland and thicket each further subdivided for Tanzania into a number of levels	Southern Africa Development Community (SADC) region		
	1995	LULC map		Six vegetation classes: forest, woodland, bushland, grassland, cultivation and others, divided into sub classes	Whole of Tanzania	1:250,000	Hunting Technical Services Ltd (HTSL)
	1995	Africover land cover map			Africa	1:1,000,000	FAO
Uganda	1990	LULC map	SPOT I and II	Main stratum 13 LULC classes, plus substrata (biomass stocking, bush type, wetness)	Whole of Uganda		2002, Forest Department, Ministry of Water Lands and Environment
	2000	LULC map	Landsat (best pixel composite for 1999-2001)	Main stratum 13 LULC classes	Whole of Uganda		2015
	2005	LULC map	Landsat 7	Main stratum 13 LULC classes, plus substrata (biomass stocking, bush type, wetness)	Whole of Uganda		2008, National Forestry Authority
	2010	LULC map	Landsat 5	Main stratum 13 LULC classes, plus substrata (biomass stocking, bush type, wetness)	Whole of Uganda		2015
	2015	LULC map	Landsat 8	Main stratum 13 LULC classes	Whole of Uganda		2016
Kenya	1990-	LULUCF map	Landsat and	IPCC classification system of six	Whole of Kenya		2013, Ministry of

	2000		ALOS AVNIR2	land cover categories: <i>Forestland, Cropland, Grassland, Wetland, Settlement and Other lands.</i>			Forestry and Wildlife
	2010	LULUCF map			Mau forest complex		2013, Ministry of Forestry and Wildlife
	2013	Forest cover change mapping for selected ecosystems			Mau forest complex, Mount Elgon, Mount Marsabit, the Aberdares and Taita hills		
Mozambique	1967	Vegetation map of flora in Zambeziaca area, providing comprehensive descriptive accounts of native and naturalized flowering plants and ferns			Zambia, Malawi, Mozambique, Zimbabwe, Botswana and the Caprivi strip		
	1980	Forest cover map	Landsat				
	1994	Forest cover map	Landsat				
	2004-2005	Land cover map through the 'Integrated Assessment of Mozambican Forests' (AIFM) project	Landsat 5				
	2015-2016	LULC map			Cabo Delgado and Gaza provinces		

NB: Gaps due to information not being available for all countries



CHAPTER 5. FOREST COVER CHANGE: TRENDS, DRIVERS AND POLICY IMPLICATIONS

LAURA MUKHWANA, ESTHER MWANGI, FORTUNATE MUYAMBI, PAOLO CERUTTI, ALFRED GICHU, NURDIN CHAMUYA, JOHN DIISI AND JOAQUIM MACUACUA

This chapter presents information on different forest cover types in Eastern Africa, their distribution and influencing factors. It focuses on the dynamic processes and drivers, both natural and human-induced, that affect forest cover. The chapter also provides an analysis of recent changes in forest cover, providing an indication of deforestation rates, whilst also assessing current drivers and their relative importance.

5.1 Forest cover types and distribution

Forest area

Forest area varies among the countries. Mainland Tanzania has the largest forest area, estimated at at 48.1 million ha or 55% of total land area, with approximately 40% (106,458 ha) of Zanzibar island forested (MNRT 2015; URT 2016). This is followed by Mozambique which 34. 4 million ha equivalent to 43% of its

total land area (GOM 2018) while Kenya and Uganda have least forest, covering an estimated 6.99% (4,136,446,5 million ha) and 12.4% (2.5 million ha) of total land respectively (MENR 2016; MFW 2013; MWE 2018) Forested land in Mozambique, Tanzania and Uganda is comprised of forests and woodlands. For example, in mainland Tanzania, an estimated 44.7 million ha (92%) of forested land is woodland (MNRT 2015).

Forest cover types

Forest classifications and descriptions vary; the most common parameters used are canopy cover, tree type, natural or planted, and forest ecosystem type. Peltorinne (2004) classified Kenyan forests on geographic formations: riverine forests, high mountains and high ranges, southern hill forests, coastal, northern mountains forests and western plateau forests. Classified by woody vegetation type, Kenya has indigenous closed canopy forests, mangroves, open woodlands, plantations, bushlands (MFW 2013); whilst SLEEK's LCC program focuses on canopy cover: dense forests (>65% canopy), moderate forests (40-65% canopy) and open forest (15-40% canopy) (FAO and KFS 2017). White (1983) classifies eco-regions, producing five major types (MENR 2016): 1) Guinea-Congolian (western) rainforest of which Kenya's Nandi and Kakamega forest reserves are representative; 2) Afro-montane forests in the water towers, subdivided into bamboo and mixed indigenous natural forests; 3) coastal natural forests (like Arabuko-Sokoke, Tana, coral rag and the Kayas) and mangrove forests, with coastal forests considered the last refuges of an ancient forest mass stretching from southern Somalia to northern Mozambique in a narrow coastal strip; 4) riverine and dry forests - found in low-lying sandy alluvial soils in Taita Hills, northern Kenya's hills and dry areas of Machakos and Kitui, with dry savanna forests found in Laikipia, Baringo, and Samburu, Marsabit and Samburu; 5) large-scale planted forests, commercial plantations and on-farm forests.

Table 4: Kenyan forest cover, types and areas.

Forest type	Forest sub-types	Approximate area (ha)	% of total forest area
Guinea-Congolian rain forest/Western plateau	Natural forest (mixed indigenous)	144,615	3.5
Afro-montane forest	Natural forest (mixed indigenous)	1,359,860	32.9
	Bamboo	85,693	2.1
Coastal forest	Natural forest (mixed indigenous trees)	295,871	7.2
	Mangroves	48,522	1.2
Dryland forests	Natural forest (mixed indigenous trees)	1,875,316	45.4
	Riverine forests	135,231	3.3
Stocked forest plantations/planted forests	Indigenous and exotic trees	186,716	4.5

Source: KFS 2013, based on 2013 forest cover mapping using 2010 satellite imagery adapted from MENR 2016

Mozambique's forested land is both forest and wooded lands (thickets, woodlands and forests under shifting cultivation) (Marzoli 2007), with miombo (60%), dry deciduous (15%) and mopane forests (11%) dominating (JICA 2013). Siteo et al. (2012) found the predominant miombo forest covered nearly two thirds of the region north of Rio Limpopo, whilst mopane forests dominate the semi-arid hinterlands and

undifferentiated forests on the central region’s coast. Other forest types are coastal forests, coastal dry forests and afro-montane forests in southern, northern and central Mozambique respectively and Africa’s second largest mangrove forest cover is also found Mozambique (World Bank 2017). Marzoli (2007) classified Mozambique’s forests based on use, resulting in production or productive (26.9 million ha or 67%), conservation and protection (4 million ha or 11%) forests. Production forests are of high timber value generally located outside conservation areas, although more than 9 million ha are found within them (World Bank 2017). Conservation forests are located within forest reserves, national parks and Coutadas de Caça. All forests in wetlands, including mangroves, inaccessible or rugged terrain are conservation forests. Conservation areas make up more than 25% of the country and are either under sustainable use or strict management (World Bank 2017). A detailed summary of Mozambique’s forest cover is found in Table 5.

Table 5: Mozambique forest cover (based on 2004-2005 forest cover map)

Province	Total area [km ²]	Closed forest (in km)	Open forest (in km)	Agric. w/trees (in km)	Shifting cultivation (in km)
Manica	62,200	16,021.6	18,538.8	4,075.5	11784,3
Maputo	26,964	2,986.6	5,164.2		
Cabo Degaldo	76,820	32,953.2	14,582.0	4,312.6	6633,5
Gaza	77,040	16,959.8	20,749.4	18,309.5	1847,9
Nampula		18,280.4	8,630.1	3,752.5	5074,8
Niassa	127,760	57,865.1	363415.3	6403.6	3,430.9
Sofala	68,712	8,538.3	19,958.5	7,791.3	9,373.2
Tete	100,088	19,659.1	22,407.7	18,798.0	5,428.6
Inhambane	67,260	10,999.4	12,057.3	16,466.5	8,566.3
Zambesia	101,284	43,011.4	5,467.1	8,089.1	15,369.5
Total		227,274.8	163,900.3	87,998.6	67,509.0

Tanzania’s main forest cover types are woodlands - miombo woodlands and acacia savannas (Kweka et al. 2015). Other types are humid montane, lowland, plantation and coastal forests including mangroves (MNRT 2015 and URT 2016). Humid montane forests are in the north, while soft and hardwood plantation forests are mainly in the Southern highlands (Kweka et al. 2015). Forests can be categorized by function into: production forests (70%), multiple use (24%) and biodiversity conservation (6%) (Kweka et al. 2015). Tanzania’s most forested regions are Katavi, Lindi, Mbeya and Ruvuma, where over 70% of land is forested. Zanzibar’s forest cover is mainly bush and tall trees in coral rag areas (81%), mangroves (15%) and forest plantations (4%) (URT 2016), with mainly exotic plantation species - eucalyptus, cypress, teak and pine (Kweka et al. 2015).

Table 6: Tanzanian forest and woodland distribution by region

Veg Type	Eastern	Southern	S. Highlands	Central	Lake	Western	Northern
Humid montane (ha)	274,823	70,169	175,622	38,544	194,815	24,023	418,916
Lowland (ha)	681,772	610,118	65,340	2,802	16,924	240,331	91,141
Mangrove (ha)	153,423	37,899	-	132	-	68	2,081
Plantation (ha)	16,180	3,095	558,227	2,559	85,427	10,533	44,605
Closed woodland (> 40%)	1,822,100	1,847,086	838,212	763,517	537,505	1,869,029	363,751
Open woodland (10-40%)	5,045,878	8,140,873	8,707,824	2,945,331	2,843,421	4,896,585	3,517,603
TOTAL	7,994,176	10,709,239	10,345,226	3,752,886	3,678,091	7,040,570	4,438,097

Source: adapted from Kweka et al. 2015

Main Ugandan forest types are: natural, consisting of well-stocked and low-stocked Tropical High Forests (THFs); woodlands; eucalyptus and pine plantation forests (MWE 2017a). THFs originally covered mountainous areas and the central region between Lake Albert and Lake Victoria, but they are now mostly found in National Parks and Central Forest Reserves (CFRs) (MWE 2017b). Low-stocked THFs are on Lake Victoria's shores and islands, whilst drier northern, central and western regions have savannah woodlands and bushlands.

5.2 Forest tenure systems

The region has communal, government (central, county and local) and private forest tenure systems. Tenure systems differ in rights according to country context: Uganda has four types of community-based forestry: collaborative forest management (CFM) in central forest reserves (CFM), collaborative resource management (CRM) in wildlife conservation areas, community and private forests, where communities negotiate user rights with minimal management responsibility, except for private forests where they hold all management and user rights. In Kenya, 'community forest' refer to public forests co-managed by the KFS and Community Forests Associations (CFAs) - both have management and user rights; in Tanzania 'community forest' means community-managed state-owned forest land. Some tenure systems do not exist in Mozambique, as all land is state-owned.

Most of Tanzanian forests are communal; 45.7% of Tanzanian forests and woodlands are village-owned, 34.5% are central government-owned while 6.5% are local government-owned (MNRT 2015); whilst Mozambique's state-owned forests grant communities and the private sector user rights through land use rights certificates, simple licenses and forest concessions. In Uganda, between 1990-2005, most forests were private, however over-exploitation of private forests and their subsequent rapid decline resulted in more public and fewer private forests. Ugandan public forests are protected as Central Forest Reserves (11,123 km²), Local Forest Reserves (50 km²) or wildlife estates, which are comprised of 11,231 km² national parks, 7,910 km² wildlife reserves, 713 km² wildlife sanctuaries and 3,174 km² community wildlife areas (MWE 2017b).

5.3 Forest cover trends

Comparing forest cover changes is challenging due to different forest classifications in maps, data gaps and conflicting information due to differing sources, methodologies and definitions. Regional trend analysis reveals general forest cover decline except for in Kenya. Tanzania's deforestation rate

(0.97%/year) is among one of the largest global annual net losses of forest cover, resulting in total loss of forest cover within 50-80 years if it continues or increases (Kweka et al. 2015). Forest degradation assessment methodologies are not well developed, so few studies have been conducted in Eastern Africa, although degradation is more widely spread and varied than deforestation, and often a precursor to deforestation (MWE 2016a).

Several restoration efforts are attempting to counter this deforestation and forest degradation; some in response to the Bonn Challenge and AFRI100. Ugandan government prioritized restoration in its National Forest Plan, Vision 2040 and National Development Plans, with a target to restore forest cover to 24% of land area. This saw the Ugandan government pledge to restore 2.5million ha forest by 2020 as part of the Bonn Challenge’s target of 250 million ha. Other restoration activities include the Sawlog Production Grant Scheme (SPGS I-III) and the Farm Income Enhancement and Forestry Conservation (FIEFOC) Project. SPGS I and II resulted in 47,177 ha private sector plantation forests between 2004-2015 (MWE 2016b, 2016a), whilst FIEFOC Project 1 (2006-2012) increased forest cover by an estimated 31,000 ha along Uganda’s cattle corridor through tree planting (AFDB 2015). Mozambique’s government aims to increase commercial plantations from 60,000 ha to 1 million ha by 2030, and reduce the rate deforestation by 40% from 0.85% in 2016 to 0.5% by 2030 thus protecting 3.7 million ha forest (MITADER 2016; World Bank 2017).

Kenya

Kenya experienced an annual deforestation rate of 0.119% in 1990-2000 followed by an annual afforestation rate of 0.109% in 2000-2010 giving an overall deforestation rate of 0.05% in 1990-2010 (KFS 2013). LULC trends are shown below (Table 7).

Table 7: Trends in analysis in land use change in Kenya

LU/Year	Area in % of Total Area of Kenya						Total
	Forest	Cropland	Grassland	Settlements	Wetland	Other	
1990	7.89	15.64	72.19	0.10	2.49	1.70	100.00
2000	5.90	16.32	72.43	0.15	2.54	2.66	100.00
2010	6.99	16.88	70.95	0.21	3.20	1.76	100.00

Source: adapted from KFS 2013

Mozambique

Mozambique’s is losing forest at a rate of 0.58% annually (220,000 ha) (JICA 2013), with the Forest Resource Assessment (FRA) study citing losses of 2.7% between 1990-2010 (FAO 2010 as cited in JICA 2013), and mangroves decreasing from 408,000 ha to 357,000 ha between 1972 and 2004. Deforestation is increasing rapidly, from annual losses of 67 ha between 1972-1990, to 217 ha between 1990-2004 (Marzoli 2007). Annual deforestation rates have increased from 0.58% in 2007 to 0.85% in 2015 and provinces like Zambezia see even greater deforestation rates than national rates, increasing from 0.61% in 1990-2013 to 0.86% in 2010-2013 (World Bank 2017). The threat of commercial agriculture is ever present and, if badly planned, its promotion could reduce forest cover significantly (World Bank 2017).

Table 8: Mozambique forest area change (1990-2010)

Category	1990	2000	2005	2010
Forest	43,378	41,188	40,079	39,022
(%)	54.3	51.5	50.1	48.8
Other wooded land	15,146	14,856	14,711	14,566
Other land	20,114	22,594	23,848	25,050
Inland water bodies	1300	1300	1300	1300
TOTAL	79,938	79,938	79,938	79,938

Source: adapted from JICA 2013

Table 9: Estimates of deforestation rates in Mozambique by province (1990-2002)

Province	Forest/woody vegetation estimate for 1990 ('000 ha)	Forest/woody vegetation estimate for 2002 ('000 ha)	Annual change of forest/woody vegetation ('000 ha)	Annual forest area change	Annual deforestation rate
Maputo	1,280	1,078	17	16	1.67
Nampula	3,958	3,509	37	33	1.18
Manica	4,340	4,005	28	23	0.75
Zambezia	5,819	5,356	39	31	0.71
Tete	7,376	7,025	29	27	0.64
Sofala	4,430	4,161	22	20	0.63
Cabo Delgado	5,322	4,989	28	25	0.54
Ihambane	4,585	4,424	13	11	0.52
Gaza	5,182	5,027	13	13	0.33
Niassa	9,635	9,379	21	21	0.22
Total	51,926	48,952	248	219	0.58

Source: adapted from Siteo et al. 2012

Few forest degradation studies have been completed in Mozambique; though studies were imprecise and small-scale, they estimate high degradation rates, as can be seen in Table 10.

Table 10: Estimates of forest degradation in Mozambique's regions

Author	Rate of degradation	Study focus	Study location	Methodology	Comment
Argola (2004)	1.4% per year (1991-1999)	Land use and forest cover change	Beira Corridor districts (Dondo, Nhamatanda, Gondolo, Manica)	Interpretation of satellite images and field observation	The Beira Corridor is one of the areas with the greatest rate of change. The period studied was the end of civil war
Jansen et al. (2006)	0.81% per year (1990-2004)	Land use and forest cover change	Manica province	Interpretation of satellite images and field observation	Conversion mostly dense and open forests to agriculture-forest and forest-agriculture mosaics
Ryan et al. (2011)	67% (0.15 TgC in three years) of loss caused by forest degradation	Deforestation and forest degradation	1,160 km ² of Gorongosa and Nhamatanda districts	Interpretation of ALOS PALSER satellite imagery	Presented method has potential to monitor forest cover change and degradation

Source: adapted from Siteo et al. 2012

Tanzania

Tanzania's average deforestation rate between 1990-2010 was estimated to be 403,000 ha annually (Kweka et al. 2015); rates in the 2010 Global Forest Resource Assessment (FRA) and NAFORMA match this. FRA 2010 reports annual average forest losses of 403,350 ha (0.97%) between 1990-2010; NAFORMA puts this at 403,870 ha between 1984-1995 and 372,816 ha between 1995-2010 (Table 11) (JICA 2013 and MNRT 2015). Forest change detection in mainland Tanzania and Zanzibar (undertaken as part of FREL development) reported an annual mainland deforestation rate of 582,427.27 ha between 2002-2013 with Zanzibar losing 7,092.99 ha/year between 2004-2012 (URT 2016); these FREL-derived annual deforestation rates also correspond to NAFORMA's estimates (URT 2016). Forest cover change is seen in Figure 1.

Table 11: Land cover change in Tanzania (1990-2010)

FRA 2010 category/year	Area (in 1,000 ha)			
	1990	2000	2005	2010
Forest	41,495	37,462	35,445	33,428
Other wooded land	18,183	14,901	13,260	11,619
Other land	28,902	36,217	39,875	43,533
Inland water bodies	6,150	6,150	6,150	6,150
Total	94,730	94,730	94,730	94,730

Source: adapted from JICA (2013)

Table 12: Annual rate of change in Tanzania's forests, woodlands and other land

Year	Forest (ha)	Other wooded land (ha)	Other land (ha)
1984-1995	-403,870	-328,643	732,513
1995-2010	-372,816	-248,871	621,687

Source: MNRT 2015

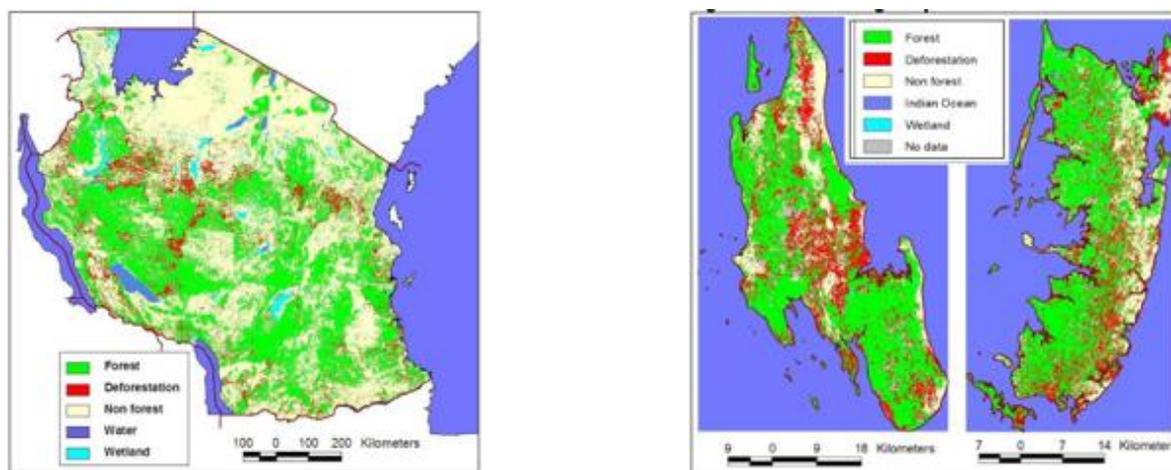


Figure 1: Forest change maps for mainland Tanzania (left), Unguja island (middle) and Pemba island (right)

Source: adapted from URT 2016

Uganda

Almost half Uganda’s forest cover was lost since 1990, with deforestation rates generally increasing before reducing over the last decade; this resulted in forest cover reducing from 24% to 12.4% of total land area between 1990-2015 equivalent to about 2.5 million ha (MWE 2018). Woodlands are the dominant forest type, making up 64% of the forest area, THF for 20% and plantations for 16% (MWE 2018).

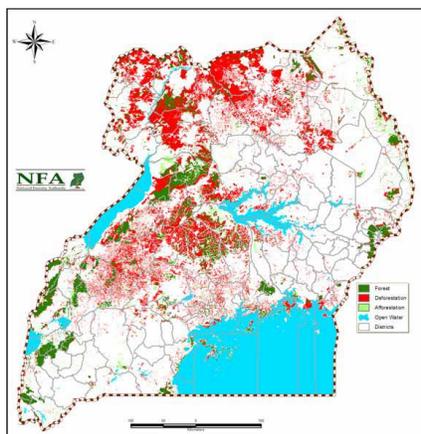


Figure 2: Ugandan deforestation 1990–2000

Source: adapted from MWE 2016a

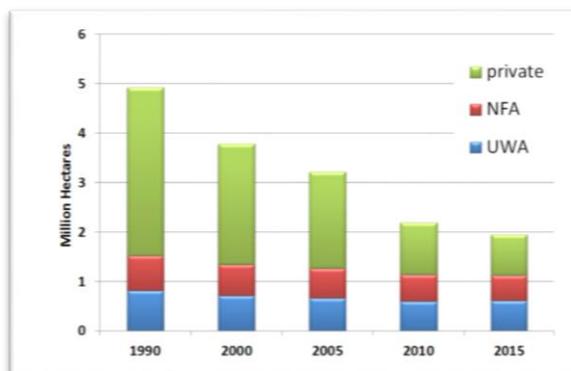


Figure 3: Ugandan forest cover change by management regime

Source: Adapted from MWE 2016a

Figure 2 shows how deforestation was generally concentrated in northern and western regions. Most occurred in private natural forests of which nearly half were cleared between 1990-2015 (MWE 2016b). MWE (2018) reports highest annual deforestation rates on private and communal lands while the lowest rates are found in national parks and wildlife reserves. Deforestation has mostly affected woodlands and low-stocked THFs; over half of woodlands have been lost since 1990 (MWE 2016b) whilst plantation forests have increased. Deforestation in government-managed protected areas was significantly lower compared to that in private forests. Central Forest Reserves, co-managed with communities (MWE 2016b), experienced more illegal harvesting and encroachment deforestation, with 46% of CFR woodland lost, whilst 20% of UWA-managed THFs grew in area (MWE 2016b). Private and protected land forest cover changes are indicated in Table 13.

Table 13: Trends in Ugandan forest cover on private land and protected areas in percentages

Year	Forests on private land (%)	Forests in protected areas (%)
1990	68	32
2000	64	36
2005	61	39
2010	46	54
2015	38	62

Source: MWE 2016a

5.4 Drivers of deforestation and forest degradation in Eastern Africa

The main direct drivers are agricultural expansion for subsistence and commercial farming; unsustainable harvesting of timber, firewood, charcoal and poles; infrastructure development; and wildfires. Other direct drivers include overgrazing, livestock and wildlife damage, mining, oil exploration, industrial development and human settlements; although inadequate information is available on their impacts (MWE 2017). Major indirect drivers of deforestation and forest degradation include population growth and urbanization, poverty, poor governance resulting from poor enforcement of forest laws, policies and regulations and institutional failures. Others include insecurity and/or the impact of civil unrest and conflicts.

Analysis of regional deforestation and degradation drivers shows:

- 1) Agriculture and energy sectors are the most significant external drivers, with internal drivers including logging, firewood collection and charcoal production; 65% of Mozambique's deforestation is attributed to agricultural expansion, mainly shifting cultivation resulting in uncontrolled fires (World Bank 2017) Unsustainable commercial timber exploration and wood extraction for biomass energy accounts for estimated 15% while urban expansion and infrastructure development account for 12% (World Bank 2017). Kenya's REDD+ readiness proposal (2010) states main drivers as agricultural expansion; wood fuel production, logging and forest grazing; and past governance and institutional failures (MFW 2013). Kweka et al. (2015) report Tanzania's main drivers as smallholder farming, charcoal production and commercial logging, however Makundi (2001) reports 70% of Tanzanian forest cover change is due to wood fuel production, particularly charcoal (Kweka et al. 2015).
- 2) Drivers are closely linked and interact to cause forest loss and degradation. Logging makes forests vulnerable to degradation through tree fall, fires, drought and by opening them to activities like wood fuel extraction, production and cultivation (Kweka et al. 2015).
- 3) Drivers like urbanization have direct and indirect impacts: directly through forest clearance for urban centers and related infrastructure; and indirectly through increased wood fuel demand and agricultural expansion to meet growing demand for food.

Drivers vary with ecosystem type, region and forest tenure regime. Within Uganda's Central Forest Reserves the main drivers are illegal charcoal production and firewood collection whereas outside the reserves, drivers are settlements, ranching and agricultural expansion (MWE 2016b). Table 14 and 15 show driver distribution across Tanzania and Kenya.

Table 14: Deforestation and forest degradation drivers in Tanzania's main ecosystem types and region

Ecosystem type	Region	Main driver(s)
Acacia savanna	Shinyanga, Singida	Farming (sown crops, cash crops, subsistence food production), firewood
Coastal forest	Lindi, Mtwara, Pwani	Logging, charcoal
Eastern Arc/montane forest	Iringa, Morogoro, Tanga	Fire
Eastern Arc/montane forest	Iringa, Morogoro, Tanga	Illegal logging
Guinea-Congo	Kagera, Mwanza	Farming (sown crops, cash crops, subsistence food production), charcoal
Miombo woodland	Manyara, Morogoro, Tabora	Charcoal
Miombo woodland	Iringa, Morogoro, Tabora	Agriculture (livestock and plantations)

Source: Adapted from Kweka et al. 2015

Table 15: Summary of drivers across Kenya (based on sub-national consultations)

Region	Forest types	Direct drivers	Indirect drivers
Coast	Mangroves Coastal forests Dry woodlands Montane Plantations	Wood extraction Poles Charcoal production Firewood Timber Agricultural expansion Subsistence agriculture Commercial agriculture – sugar/biofuels Infrastructure - tourism establishments Grazing and browsing Wildlife damage – elephants in Kwale Mining – minor but growing at coast	Industrial demand for fuelwood – salt, soap, vegetable oil industries High costs of electricity for industry and LPG for domestic use Urban over-dependence on charcoal Rural poverty Absence of industrial plantations
Ewaso North	Dry (<i>Acacia-Commiphora</i>) Woodlands Dry Evergreen - Montane	Wood extraction Charcoal production Firewood Timber and poles (cedar) Grazing and browsing Livestock Wildlife – elephants Fires - wildfires	Increase in charcoal prices Growing demand for charcoal Urban population increases Vast area – weak institutional presence Lack of cheaper alternatives
Mau	Montane Industrial plantation	Agricultural expansion Permanent subsistence Permanent commercial agriculture - tea, wheat Wood extraction Domestic fuelwood and charcoal Commercial timber (poles and timber)	Governance – deliberate excisions of gazetted forest land Population pressure Demand for timber and fencing posts
North Rift	Montane Dry woodlands Industrial plantation	Agricultural expansion Permanent subsistence agriculture Permanent commercial agriculture Wood extraction Timber – illegal logging Firewood and charcoal	Low rates of regeneration of clear-cut plantations Population pressure Rural poverty
Nyanza		Agricultural expansion Permanent subsistence Permanent commercial - sugar, tobacco Wood extraction Firewood and charcoal Fish smoking Poles for construction and fencing	Low rates of regeneration of clear-cut plantations Inadequate institutional presence Population pressure
Western		Agricultural expansion Permanent subsistence Permanent commercial - sugar, tobacco Wood extraction Firewood and charcoal Poles for construction and fencing	Low rates of regeneration of clear-cut plantations Population pressure Rural poverty

Source: MFW 2013

5.4.1 Direct drivers

Agricultural expansion

Agriculture contributes an estimated 20-30% to GDP regionally (Kweka et al. 2015), with the agriculture, forestry and fishing sector collectively contributing 30% of Kenyan GDP in 2015 (KNBS 2016) and Uganda's agricultural sector contributing about 26% of its GDP in 2015. Most Eastern Africans depend on agriculture for their livelihoods, particularly the rural poor (Kweka et al. 2015; NFA 2009). Agricultural land continues to increase with poverty, population growth, migration and policy initiatives promoting agricultural expansion for food security: 2008 saw over 300,000 illegal settlements in Uganda's Central Forest Reserves, whilst its agricultural land increased from 8,400,789 to 8,847,591 ha between 1990-2005 with expansion of small-scale and/or subsistence agriculture into wetlands, grasslands and forests. Similarly, in Mozambique, sesame seed production increased dramatically, bypassing traditional cash crops like cotton and tobacco; yet sesame is not planted on the same land for two consecutive seasons, new land is cleared to grow it.

Deforestation due to large-scale commercial agriculture is widespread. In Kenya, it was responsible for most deforestation in the late 1980s and 1990s, when commercial agriculture promotion led the Mau Complex being cleared for large-scale tea and wheat cultivation and Kenya's western and Nyanza regions saw agricultural expansion from Mumias Sugar Company and Sony Sugar (MFW 2013). Although large-scale agriculture is not as widespread in Uganda, it increasingly threatens forests; over 7,000 ha of natural forest on Bugala and Kalangala islands was signed over by government for oil palm plantations.

The region's governments are attempting to minimize agricultural impacts: Kenya's Agriculture Act of 2009 and Farm Forestry Rules require 10% of farmland be set aside for tree growing (MFW 2013), whilst Uganda's Agriculture Sector Development and Investment Plan (2010/11-2014/15) aims at promoting soil and water conservation, restoring productive natural resources to increase food security, and supporting farmers with climate change adaptation and resilience (MWE 2013).

Unsustainable wood harvesting

Wood is extracted from forests for fuel (firewood and charcoal), timber and construction poles for domestic, commercial and industrial purposes. Regional wood harvesting is happening at unsustainable rates, with countries extracting above their annual allowable cuts (AAC) leading to depletion of forest resources. Tanzanians consume 62.3 million m³ of wood annually, exceeding their AAC by 19.5 million m³ (MNRT 2015), whilst Kenya, Uganda and Tanzania face wood product supply deficits and shortages due to high demand from increasing population, urbanization, industrialization and economic growth, compounded by rapid forest cover loss. Kenya's supply deficit is about 10.3-12 million m³ and expected to triple by 2020 (Gatsby Charitable Fund 2014 and MEWNR 2013; as cited in MENR 2016). As domestic sources can only sustainably supply 70% of demand, the deficit is met through imports and unsustainable harvesting.

Wood fuel

Regionally, forest-derived wood fuel is the main household energy source, with 70-90% of Eastern Africans dependent on it due to low purchasing power and high gas and electricity costs. Over 70% and 92% of wood fuel is forest-derived in Mozambique and Tanzania respectively (UNEP 2002; World Bank 2017). More than 80% of Kenya's energy supply is met by wood fuel (MENR 2016) and biomass provides an

estimated 94-95% of energy in Uganda (MEMD 2016; MWE 2016b); 90-92% of this is wood fuel (80% firewood and 10% charcoal) while the rest is crop residue (MEMD 2016; MWE 2016b).

Respectively, Mozambique and Tanzania consume 14.8 million tons and 1,658,000 million tons of charcoal annually, whilst Uganda consumes 16-18 million tons of firewood and 400,000 tons of charcoal (Kweka et al. 2015; MEMD 2015; World Bank 2017). Urban areas mostly use charcoal - 85% of Tanzania's urban population use it for households and SMEs, with cities like Dar es Salaam consuming 500,000 tons annually (Kweka et al. 2015); this trend is echoed in Uganda where Kampala is responsible for three quarters of Uganda's annual charcoal consumption – an estimated 300,000 tons of 400,000 tons (MEMD 2015). Some countries export charcoal: Tanzania exports to the Arabian Peninsula despite this being illegal; South Sudan is a key consumer of Ugandan charcoal. Urban firewood consumption is also substantial, as firewood is the main energy source for businesses and institutions like hotels, lime production, fish smoking, schools, hospitals, prisons and barracks, bakeries, tobacco curing and brick-making.

Wood fuel consumption is expected to rise with population growth, urbanization and fossil fuel alternative price increases. Likewise, low stove and fireplace efficiency and inefficient charcoal production techniques increase demand (MWE 2016b; Siteo et al. 2012); in a 2007 survey only 20% of Ugandan households used fuel-saving technologies. Hosier et al. (1993) projected that for every 1% increase in urbanization there will be a corresponding 14% increase in Tanzanian charcoal consumption (Kweka et al. 2015).

As consumption increases, deficits are expected, with Uganda and Kenya already experiencing these. An estimated 73% of Ugandan districts have seen deficits of accessible woody biomass for wood fuel since 2002, aggravated by population growth (MWE 2013). Firewood scarcity in northern and eastern districts has doubled the distance walked by women and children from 0.73 km in 2000 to 1.5 km in 2007 (MWE 2016b). Kenya's Ministry of Environment, Water and Natural Resources (MEWNR) projects potential supply is insufficient to meet firewood and charcoal demand both now and in 2031/32 (MENR 2016).

Charcoal production is most detrimental. It results in 4-6 times more wood consumption than firewood collection (Kweka et al. 2015) and leads to forest degradation through over-exploitation of specific species, like Tanzania and Mozambique's slow-growing miombo hardwoods (Kweka et al. 2015); Mozambique's mopane woodland species, and Ugandan species like *Combretum* spp., *Acacia* spp, *Albizia* spp, *Terminalia* spp, *Azelia africana*, and *Piliostigma thonningii*, and even highly valuable fruit trees like mango, jack fruit and shea nut. Kenya's MFW (2013) reports charcoal-related degradation in the Mount Kenya region, whilst in Uganda charcoal-related deforestation and degradation is widespread in the northern savannah woodlands and cattle corridors which supply charcoal to nearby urban centers, Kenya, South Sudan and Rwanda (MWE 2016b). Depletion of private and community-owned lands where charcoal wood traditionally comes from, and subsequent high prices, is fueling illegal harvesting from reserves. In Uganda, commercial firewood extraction for urban households and SME industries is also causing deforestation and forest degradation.

In response to threats posed by wood fuel consumption and increasing demand, policy initiatives have been instigated, such as Tanzania planting firewood plantations and increasing charcoal production efficiency. The effects of such initiatives are limited however, as weak law enforcement and inadequate trade regulation capacity continue to result in illegal charcoal production. Kenya's Forest Service enacted the Charcoal Rules of 2009 to regulate industry and legal trade, forming associations for charcoal producers and transporters (MFW 2013), whilst The Energy Policy (Sessional Paper No. 4 of 2004) and the Energy Act of 2006 call for renewable energy and Kenya's National Forestry Conservation and

Management Act of 2016 allows for verification and reporting on forest product origin. Uganda's energy policy (2002) aims to develop and promote solar and biogas.

Logging

Logging activities (both commercial and artisanal) have increased recently due to high timber demand for construction, furniture making and other purposes. Commercial logging in Mozambique has increased and is concentrated in Sofala, Zambezia and Cabo Delgado provinces (Siteo et al. 2012). Two regimes govern commercial logging in Mozambique, simple licenses for small timber operators, and forest concessions for larger companies (Siteo et al. 2012). Tanzanian logging is concentrated in the south where valuable timber species are still found and infrastructure development has increased access to forests (Kweka et al. 2015). Ugandan logging occurs in private and communal forests and central forest reserves (WWF 2012). Kenya's ban on public forest logging in the 1990s resulted in timber being from private farms, with increasing prices fueling illegal timber trade from natural forests.

Whilst Mozambique and Tanzania export timber to Asian countries, Kenya and Uganda experience timber supply deficits and import from Democratic Republic of Congo (DRC) and South Sudan (WWF 2012). Although Uganda established an estimated 40,000 ha of plantations between 2004-2010, these will only begin to supply from 2025, thus Uganda will continue to experience supply shortages and rising timber prices (WWF 2012).

Illegal logging accounts for most the region's traded timber. Though exact volume is difficult to assess, Contreras-Hermosilla et al. (2007) estimates it accounts for 40%, but more recent estimates put this at 50–80%, resulting in huge losses to local and national government revenues. Illegal logging is widespread in Mozambique's major timber-producing provinces, and Robiero (2011) suggests 50-70% of total logged timber is illegal. Recently, illegal logging for export has surged; an Environmental Investigation Agency (EIA) study in 2014 indicated 93% of commercial logging in 2013 was illegal, a rise from 81% in 2007-2012 (MITADER 2016). Unreported exports resulted in losses of USD 146 million potential government revenues, and tax revenue losses of USD 540 million between 2003-2013, with impacts on local communities, entitled to 20% of taxes (MITADER 2016; World Bank 2017). In Tanzania, illegal logging is similarly rampant: corrupt forest officers surpass logging license quotas, allow exporting after bans and accept bribes. The extent of illegal logging is yet unquantified (URT 2012a as cited in Kweka et al. 2015), however fraudulent legalization of illegally-logged timber resulted in China importing 4-10 times more timber in 2002-2005 than Tanzania officially exported. Likewise, in Uganda, WWF (2012) estimates up to 80% of the timber market is illegal, with significant impacts on Central Forest Reserves (CFRs).

Even when legal, the region's timber harvesting is at unsustainable levels; MNRT (2015) reported 2012 timber harvests exceeded sustainable growth by 19.5 million m³. According to Mozambique's Ministry of Finance in 2010, weak simple license enforcement means harvested timber volumes can double that taken via forest concessions (Siteo et al. 2012). In Uganda, chainsaw milling is still common, despite its illegality since 2004, whilst pit sawing is common in Mozambique, Tanzania and in Uganda where pit sawyers supply over 90% of sawn timber, which they mainly source from natural forests. Although pit sawing has been promoted as a pro-poor, ecofriendly 'low impact' forest harvesting practice, it comes with the risk of high value timber species being creamed off.

Overexploitation of high value timber species in Uganda has led to traditional species like mvule, pine, mahogany and cypress virtually disappearing in private and community forests (MWE 2013 and WWF

2012). In Kenya, illegal selective logging impacts major water towers despite a ban on commercial concessions for indigenous species. In response to widespread illegal logging, Kenya, Uganda, Tanzania, Mozambique and Madagascar signed the Zanzibar Declaration in 2015 and are participating in Forest Law Enforcement, Governance and Trade (FLEGT) discussions, whilst Mozambique banned log exports.

Fires

Most forest fires in the region are due to human activity – resulting in 90% of Mozambique’s forest fires (FAO 2001 as cited in Siteo et al. 2012). Fires are caused by shifting cultivation; livestock grazing where herders intentionally set fires to encourage grass regrowth; hunting; charcoal production; and honey harvesting. According to Rucker and Tiemann (2012), an average 11 million ha of forests is burnt annually; 75% of which is miombo woodland; 20% being forest plantations and 5% being montane forests (Kweka et al. 2015). Mozambique’s fire monitoring program generates monthly reports or bulletins on fire occurrence for relevant ministries and the fire service, whilst annual campaigns educate communities on forest fires and associated risks. Forest fires result in deforestation and degradation, depletion of non-timber forest products, biodiversity loss and increased greenhouse gas emissions from burning large amounts of biomass, and economic losses, particularly with plantation forests.

Infrastructure development

Large infrastructural development (roads, railways, pipelines) cause deforestation and degradation directly through forest clearing and increased access to forests, and indirectly results in settlements, consequently increasing forest loss and degradation through wood fuel and food extraction. Tanzania’s national road network has expanded over the last decade, with roads linking forests to markets. This network is closely linked to resource exploitation, increased wildfire frequency, and displacement of smallholder farmers (Milledge et al. 2007). Similarly, several large infrastructure projects threaten Kenya’s dry woodland areas, including the Lamu Port Southern Sudan-Ethiopia Transport (LAPSSET) corridor, Konza technology city, Northern Corridor Transport Project, standard gauge railway line from Mombasa to Kisumu, and the irrigation scheme in the Tana Delta region and Kitui county (MFW 2013).

Mining

Mining activities like oil exploration and mineral extraction promote deforestation and degradation through settlements, direct mining activities and environmental pollution. Oil exploration and exploitation is occurring in Kenya and Uganda around the Albertine Rift. Mozambique has vast reserves of underground natural resources (coal, natural gas and oil) and exports coking coal. Though evidence of mining activity impact remains scarce, the continued discovery of underground natural resources poses threats to forests through direct activity, population relocation from mining concession areas, and opening forest access through infrastructure development.

Overgrazing

Livestock herding in forests, especially plantations, damages young trees through soil erosion and nutrient loss. Increased livestock grazing in forest during droughts put forest ecosystems under pressure through overexploitation. Livestock also damage trees while grazing which affects forest regeneration.

5.4.2 Indirect drivers

Direct drivers interact with underlying factors to indirectly drive degradation and loss of forests. Underlying factors are complex and relate to socio-economic factors and dynamics like population growth, poverty and inappropriate trade policies, resulting in high dependence on subsistence farming, natural resources and biomass energy. Other underlying drivers are climate change effects, ambiguous and insecure forest tenure rights, governance and implementation of policies.

Governance challenges

The past two decades have seen remarkable transformations in governance. Sector reforms in the 1990s, intended to improve governance and administration through incentivizing communities with management and ownership tenure rights, decentralizing management, and restructuring administration to enhance coordination. Despite these efforts, governance issues like coordination failures, political interference and corruption, caused by inadequate budgets, implementation bottlenecks and policy gaps, remain key challenges (WWF 2012 and MWE 2013). The sector is characterized by illegality, lack of transparency, political interference and mistrust among stakeholders (Siteo et al. 2012; World Bank 2017). Decentralization, intended to broaden participation in forest management, diffuse management authority, and create motivation for sustainable management and conservation of forests appears to have fallen short of its promise. It has neither strengthened coordination, improved distribution of benefits and burdens, nor increased local budgetary allocations. Community participation is equally hindered by ambiguous and insecure tenure rights over forests and land. Local government autonomy has been undermined, local capacity is inadequate to manage and conserve natural resources, and revenue collected by local governments is unfairly shared (Kweka et al. 2015).

Lack of coordination between local and central governments sees weakened governance, whilst local governments are not financially benefitting from local forests due to fees being challenged to central finance (Siteo et al. 2012). To improve this, Tanzania has signed MoU between central government forestry agency and local governments to share resources, capacity building and joint operations (MNRT 2010 as cited in Kweka et al. 2015).

Undefined and insecure community rights is a major cause of deforestation and forest degradation (MWE 2016b). Legal frameworks provide poor protection of community tenure rights, particularly in collaborative forest management/co-management of public forests, where rights are partial, conditional on sustainable use and management and can be revoked (MWE 2016b). In Tanzania deforestation is highest in unreserved land where rights are poorly defined and enforced and tenure security is weakest (Kweka et al. 2015). Village-level land use planning is incomplete due to inadequate financial resources. Customary tenure arrangements on village lands are not always regarded as valid to legally register land. The Village Land Act also allows government to transfer village land to general or reserved lands, thereby reducing the amount of village land and jeopardizing local rights.

Inappropriate and conflicting policies like reduced conservation incentives, ambiguous land tenure and inappropriate energy prices have had significant impacts on forestry. MFW (2013) noted Kenya's forestry sector experienced drastic funding reduction in recent reforms yet it is still expected to contribute to biodiversity conservation, socio-economic development, and global commitments in the face of pressure from competing land uses. Tanzania's adoption of policies like the Structural Adjustment Programme

(SAP) in 1986 indirectly drove deforestation through forestry budget and staff cuts, promoting tourist infrastructure in protected areas, reducing farmer subsidies, and increasing social service fees affecting agricultural extension services (Kweka et al. 2015). Liberalization measures like removing export company registration requirements, export taxes and licensing systems likewise increased deforestation (Kweka et al. 2015). Uganda's removal of price regulation increased commercialization and specialization in the agriculture sector, contributing to agricultural expansion into forests and wetlands (MWE 2017).

Inadequate management capacity has hampered forest monitoring and enforcement. In some Tanzanian reserves, just two qualified foresters oversee 100,000 ha of forestland (Milledge and Kaale 2005 as cited in Kweka et al. 2015), whilst one law enforcement official oversees every 50 ha of forest in Mozambique, against an ideal of 1 for every 15 ha (MITADER 2016) and Kenya Forest Service has weak presence in the vast dry woodlands where most wood biomass is found (MFW 2013). In Uganda, the Forest Sector Support Division (FSSD) is poorly equipped, understaffed and underfunded and implementing agencies have not effectively carried out mandates due to inadequate resources (WWF 2012). Inadequate budget provision is behind capacity issues, yet Tanzania's forestry sector has been allocated just 1% of total national charge forest rents (timber sale royalties and ecosystem services related fees), despite these being high enough on unreserved lands to cover entire management costs.

Corruption and political interference hinder law enforcement, illegal activity monitoring, and sustainable management of high revenue resources. Corruption takes on various forms - embezzlement of revenues, non-compliance to revenue collection procedures and logging license quotas, and undervaluation of forest products. (MWE 2013). Political leaders also compromise forest management stances to avoid upsetting voters (MWE 2013), whilst law enforcement agencies and forest managers usually withdraw from effective law enforcement during elections, allowing local communities to invade and overexploit forests causing irreversible damage.

Efforts to improve governance

To improve governance, Mozambique has instigated a participatory audit of forest concessions, suspended new exploration requests, banned log exports, is updating policies and regulations, and starting an ambitious forestry protection, conservation and management project called *Floresta em Pé*. Reforestation is among Mozambique's national development priorities with a national strategy (Siteo et al. 2012) to establish 2 million ha tree plantations and zone another 3 million ha for investor exploitation. Kenya's Forest Act of 2005 greatly improved public and private sector participation in forest management and restricted politically-motivated excisions by requiring parliament, rather than a single minister, to approve excisions. The Act enhanced community participation in forest management, adopted an ecosystem approach to forest management and planning, introduced management plans for major forest ecosystems, recognized the Payment for Ecosystem Services (PES) concept, promoted commercial tree growing, and made commitments to ensure sustainable forest management (MFW 2013).

5.5 Conclusion

Forests in the region have been on the decline over the past two decades. Paradoxically, these high rates of deforestation have occurred even after governance reforms were instituted to try and curb deforestation, expand the range of rights, incentivize forest-adjacent communities to engage in

sustainable forest management, and strengthen management authority capacity. The highest rates of deforestation are found in Tanzania, while Kenya's forest cover appears to have increased since 2000. Transborder and periodic comparisons of forest cover are hindered by the use of different classification systems, forest definitions and methodologies for assessing change. Monitoring is mostly top-down, with little involvement of communities and lower-level authorities. Implementation of an Eastern African Forest Observatory would address this by providing opportunity for transborder harmonization of approaches and classifications. The observatory would also allow a coordinated approach to monitoring and measuring regionally consistent deforestation drivers like agricultural expansion, charcoal production and illegal logging. Weak monitoring and enforcement capacity is associated with inadequate budget allocations to the sector, political interference and corruption. Coordination failures and conflict with other sectors exacerbate forest conversion to other land uses.

Deforestation drivers are not mutually exclusive; they occur concurrently and are mutually reinforcing; urban expansion requires urban population energy needs to be met. This chapter shows that deforestation rates vary according to variables such as forest ecosystem type, location and tenure regime. In Uganda, deforestation is higher in private forests while in Tanzania communal tenure shows the highest deforestation rates.

Information in this chapter should be viewed against the backdrop of earlier chapters such as Chapter 2 (on legal and policy frameworks) and Chapter 3 (or REDD+ initiatives). Legal and policy frameworks demonstrate efforts to review earlier reforms to generate lessons, identifying future interventions and changes to be adopted, just as all countries are attempting to provide an enabling environment for REDD+ interventions. As addressing deforestation drivers and monitoring performance are key aspects of REDD+, a regional effort that pools resources, capacities and best practices would help make up for shortfalls of a purely national approach. The region's countries have made commitments to the AFR100 and Bonn Challenge, identifying restoration targets by 2030. These commitments are important and provide opportunities for addressing issues underpinning forest decline within a regional framework.

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6. CONCLUSIONS AND RECOMMENDATIONS

ESTHER MWANGI

Rather than recapping the key features and findings of this report, which are highlighted in each chapter and consolidated in the Executive Summary, this conclusion will be forward looking. We will consider some of the ways in which a regional approach to forest monitoring and assessment would complement national approaches and provide recommendations on how this approach might look.

Clearly, each of the Eastern African countries are facing severe limitations in their national forestry sectors, especially in the face of forest cover loss and forest degradation; assessment of the latter facing distinct methodological challenges. All countries have opportunities, both individually and collectively, being at varying stages of sectoral law and policy review. Likewise, all face similar sector-related challenges, including poor budget allocations relative to other sectors. Although the story of forest cover change is overwhelmingly of decline, there are instances where a country's overall forest cover has increased. There is opportunity to learn from each other, as well as great scope to harmonize and standardize monitoring methodologies and indicators, whilst streamlining data types for meaningful comparisons across the region. Lastly, and very importantly, all the countries share global commitments on climate mitigation and reforestation. The main opportunity deriving from coordinating activities and methodologies is that of improving capacity to reliably report on these commitments and provide evidence of performance.

We recommend that an Eastern African Forest Observatory be piloted and implemented, with the aim of addressing key issues in forest monitoring as highlighted in this report. The observatory will comprise a database, a widely (and easily) accessible web platform and policy products, targeted at regional policymakers, focused on key thematic areas (e.g. effects of policies on drivers of deforestation, ecosystem service potentials, fire distribution and management, and biomass energy).

One of the first activities in the observatory's implementation would be a mapping of actors in each participating country, any existing collaborations relating to observatory functions, and the mode of cooperation. Such mapping would enable the identification of entry points and how best to strengthen collaboration.

To address the absence of regionally comparable datasets (due to different forest definitions, classification standards and data collection methods, gaps and data quality issues, and inadequate resources for data generation, the following actions are required:

- Develop sound reference datasets, through interpreting high resolution satellite imagery to support generation and systematic validation of land use/land cover (LULC) products;
- Set up common standards for data collection methodologies or procedures, based on international standards and forest type definitions, so that data from one country or site is comparable with others. Tanzania's NAFORMA methodological approach could prove a useful template, as it gathers biophysical, socio-economic and institutional data.
- Provide guidance on best practices for data generation and application, through helping actors to access related resources, such as tools, approaches and publications.
- One of the main challenges to such a system would be reluctance to share data; this emanates from fears of losing relevance and motivation to recoup the costs associated with data generation. One way to deal with this reluctance is to focus on creating joint products from the data, analyzing and reporting it jointly. Most countries have laws requiring information to be freely available, with the exception of Tanzania, which restricts data sharing.

Initial consultations show strong support for the observatory among each country's technical and policy/political actors. The observatory is envisioned to have multiple uses. In addition to generating and synthesizing regional-level data and information for policy decisions, it will help countries meet reporting obligations, and provide a platform for learning and exchange. However, countries are aware that these multiple uses are longer-term benefits, realized only when the observatory is well-established. Nonetheless, interest remains in the observatory's ability to support forest conservation and better land use in the region, particularly to promote the understanding that forests are a legitimate land use that contributes to local, national and regional economies alike.



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