Using spatial information to support decisions on safeguards and multiple benefits for REDD+ in Tanzania

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Vision of Tanzania Forest Service: A center of excellence in the conservation of forest and bee resources and sustainable supply of quality forest and bee products and services in Tanzania. Mission of Tanzania Forest Service: To sustainably manage the national forest and bee resources in order to contribute to the social, economic, ecological and cultural needs of the present and future generations.

The UN-REDD Programme is the United Nations collaborative initiative on Reducing Emissions from Deforestation and forest Degradation (REDD+) in developing countries. The Programme was launched in 2008 and builds on the convening role and technical expertise of the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP). The UN-REDD Programme supports nationally-led REDD+ processes and promotes the informed and meaningful involvement of all stakeholders, including Indigenous Peoples and other forest-dependent communities, in national and international REDD+ implementation.

The United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) is the specialist biodiversity assessment centre of the United Nations Environment Programme (UNEP), the world's foremost intergovernmental environmental organisation. The Centre has been in operation for over 30 years, combining scientific research with practical policy advice.

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1. Introduction

An estimated 6-17% per cent of all anthropogenic greenhouse gas (GHG) emissions are caused by deforestation and forest degradation, including peatland emissions (van der Werf et al. 2009). The maintenance and careful management of forest carbon stocks can therefore make an important contribution to global climate change mitigation. However, pressure to convert and degrade forests continues to be high, particularly in forest-rich developing nations. Countries through the United Nations Framework Convention on Climate Change (UNFCCC) are preparing to address this issue through REDD+: a climate change mitigation mechanism aiming to significantly reduce emissions from deforestation and forest degradation, and increase removals of carbon dioxide, whilst promoting the sustainable development of the nations involved. REDD+ actions fall under five main activities (see Figure 1).

REDD+ has the potential to contribute to achieving more policy goals than climate mitigation alone. By maintaining and restoring forests, REDD+ could secure the many ecological functions of forests, including biodiversity conservation and the provisioning of a number of ecosystem services that people depend upon, such as water regulation, erosion control and the supply of timber and non-timber forest products. Direct social benefits from national REDD+ implementation are also anticipated, ranging from improved forest governance to direct financial improvements to livelihoods.

The Government of Tanzania expects to attain a range of multiple benefits from implementing its

REDD+

= **Reducing emissions from Deforestation and forest Degradation**

+

Conservation of forest carbon stocks
Sustainable management of forests
Enhancement of forest carbon stocks
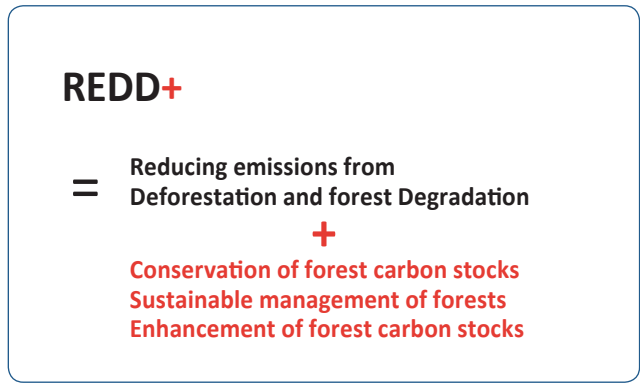
Figure 1: REDD+ activities

REDD+ strategy. To achieve this, the country could develop and employ a suite of approaches to REDD+ implementation to account for the variation in environmental, social and cultural factors in different locations. As stated by the country's REDD+ Strategy:

"A properly designed [REDD+] implementation mechanism is expected to contribute to multiple benefits, depending on the location and type of REDD+ activity. These benefits include poverty alleviation, maintenance of forest dependent communities' rights, improved community livelihoods, technology transfer, sustainable use of forest resources and biodiversity conservation."
Source: Tanzania Vice President's Office (2013a)

This report presents spatial analyses developed during two working sessions in 2013 with members of the Tanzania Forest Service, Sokoine University of Agriculture, Forestry Training Institute (FTI) Olmotonyi

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and the UN-REDD Programme. The maps developed aim to support assessments of the potential for multiple benefits of REDD+ implementation at the national scale in Tanzania, and contribute to REDD+ plans, taking REDD+ safeguards into account. The maps also contribute towards the action in the Tanzania REDD+ Action Plan, which states that the country will: "(1.3) Develop integrated methods to quantify REDD+ and other forest benefits such as biodiversity, ecotourism, and water catchment related to PES [(Payments for Ecosystem Services)]", with a specific activity to "Develop a package of integrated methods for REDD+ co-benefits mapping" (Tanzania Vice President's Office 2013b).

It should be noted that the maps were developed using the best available data at the time, and can be updated when better data become available. To support decision making, the maps will need to be complemented with additional information for each REDD+ action that is being considered, including local data and knowledge. For a more detailed account of the mapping methodology used in this report, please refer to the Tanzania Methodological Brief, available at:http://www.un-redd.org/tabid/1028/Default.aspx.

1.1 Forests in Tanzania

The United Republic of Tanzania is the largest country in East Africa, with a mainland area of 946 270 km^2, and 2 470 km^2 on the islands of Zanzibar (Unguja and Pemba). In 2012, the country had a population of 44.9 million people (Tanzania National Bureau of Statistics 2013). The country's forest ecosystems include humid and evergreen montane and lowland forests, seasonal and semi-evergreen coastal forests and thickets, strongly seasonal and deciduous miombo woodlands, Acacia-Commiphora woodlands and mangroves. These forests provide a range of different goods and services for people, many of whom are forest dependent (Blomley & Iddi 2009). For example, goods include timber and non-timber forest products (NTFPs) such as medicinal plants, and services include water and climate regulation. The forests in Tanzania are also high in biodiversity: aside from a rich fauna, the country contains over 10 000 plant species, hundreds of which are nationally endemic. Of the plant and animal species in Tanzania, 724 species are identified as Threatened in the IUCN Red List, with 276 species classified as Endangered (IUCN 2013).

In 2013, Tanzania, with financial support of the Government of Finland and technical support of the FAO-Finland Forestry Programme, completed its first comprehensive forest inventory – "NAFORMA".

It is one of the biggest efforts made to date by a developing country to map its forest resources, and one of the purposes was to help the country meet its requirements under REDD+. The NAFORMA inventory comprised 32 660 ground plots organized in 3 419 clusters, and over 240 000 trees were measured (Ministry of Natural Resources & Tourism 2010; NAFORMA 2013). The biophysical assessment covered not only tree parameters, but also the state of the land and notable features at the plot location, such as land use, vegetation type, soil, shrubs, regeneration, forest management, disturbances, dead wood, stumps, bamboos and forests products and services (Ministry of Natural Resources & Tourism 2010). A new comprehensive land-use land-cover map was also developed from Landsat imagery to be accurate for the year 2010. For this map, vegetation classes were mainly adopted from the Hunting Technical Services (1995) map for the country, with a few modifications to reflect ground conditions (Map 1).

The biophysical assessment in NAFORMA was complemented by a socioeconomic survey, aiming to collect data on land uses from the local users, to support national decision making on improved land-use policies that takes into account people's reality and needs. Socioeconomic data was collected from 3 500 household and 1 100 key informant interviews. In total, over 200 parameters[1] were recorded in the interviews.

The first analysis of the NAFORMA field inventory by FAO estimates 51 per cent of Tanzania's land area to be woodland and 4 per cent to be forest, including humid montane and lowland forest, and mangroves.

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[1] Parameters recorded included: household income sources; food security including use of wild food plants; harvesting of forest products including charcoal, fuelwood and honey by zone and region; household perception of user rights and local rules with regard to the harvesting of forest products; household energy; awareness and participation of key informants and household respondents in PFM; forest disturbance and governance.

The mean density of growing stock in Tanzania is low, on average 34 m³/ha for all land covers. NAFORMA plots show higher woody volumes in remote areas due to inaccessibility and thereby document a substantial human impact. Forest in protected areas, where harvesting is not allowed, holds about half of the woody biomass volume in the country.

The main direct causes of uncontrolled deforestation and forest degradation in Tanzania's forests include: small-scale agricultural expansion, human settlements and population increase, firewood and charcoal production, uncontrolled fires (especially June - October), timber extraction, overgrazing, development of infrastructure, industry and mining, and introduction of large-scale agriculture. Together, these drivers contribute towards an annual deforestation rate of between 130 000 and 500 000 ha per annum (FAO 2010).

Map 1: NAFORMA land-use land-cover (LULC) map for Tanzania

This map shows broad land-use and/or land-cover classes in Tanzania (excluding Zanzibar).

Legend:

- Capital City
- Regional boundaries
- Nodata

NAFORMA land-use land-cover

- Built-up area
- Bushland
- Closed woodland
- Cultivated bushland
- Cultivated woodland
- Forest plantation
- Fresh water
- Grains & other crops
- Grassland
- Ice
- Mangrove forest
- Montane & lowland forest
- Open land
- Open woodland
- Salt water
- Thickets
- Wetland
- Wooded crops
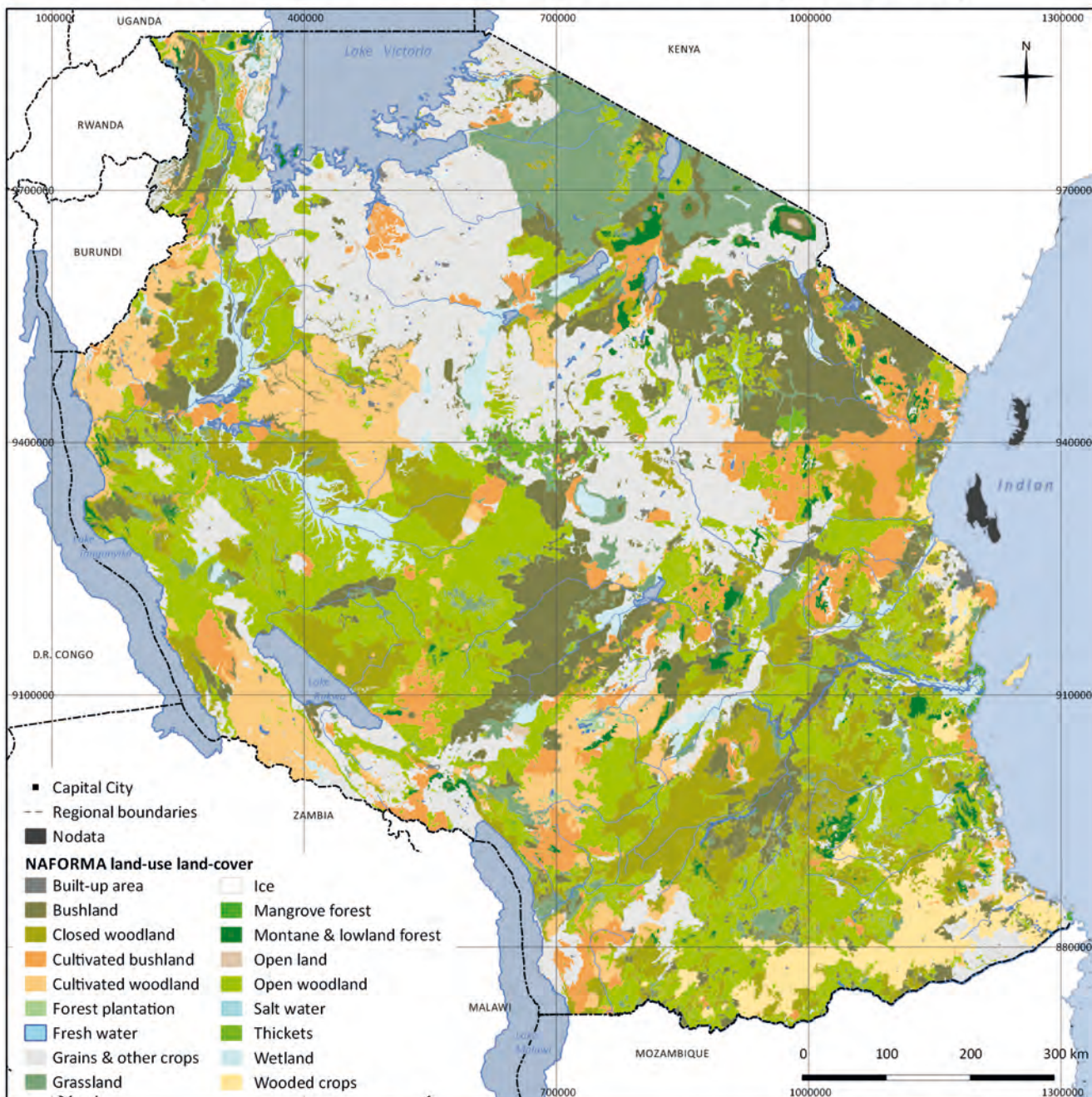
Data sources:
NAFORMA. 2013. NAFORMA land-use land-cover map 2010.
Regional boundaries: Ministry of Lands, Housing and Human Settlements Development. 2011. Administration Map of Tanzania. Surveys and Mapping Division, Dar es Salaam Tanzania.

Map projection: WGS84 / UTM Zone 36S
Map prepared by Tanzanian Forest Service (TFS), UNEP-WCMC, FAO, Sokoine University of Agriculture (SUA) and Forestry Training Institute (FTI). Date: May 2013.

1.2 REDD+ implementation and safeguards in Tanzania

In 2008, Tanzania received bilateral financial support from Norway to start the Tanzania REDD+ Initiative. In addition, multilateral support from the UN-REDD Programme enabled the launch of Tanzania's UN-REDD National Programme in 2009, now scheduled to conclude in 2013.

In March 2013, the Government endorsed the National REDD+ Strategy and its Action Plan. It is anticipated that there will be changes to legal frameworks that regulate incentives, rights, financing options and practices as a result of REDD+. The REDD+ Strategy recognizes that this does not automatically ensure that there will be no negative impacts on the environment or livelihoods and the rights of communities (Tanzania Vice President's Office 2013a), and affirms that the implementation of REDD+ activities will be done in accordance with the Cancun REDD+ Safeguards[2].

The REDD+ Strategy also states that a system for providing information on safeguards is to be developed that is consistent with the Cancun Safeguards, and in line with World Bank policies on Environmental Assessment, Natural Habitats, Forests, Involuntary Resettlement, and Indigenous Peoples. The Strategy further states "this system will require spatial monitoring information that is: (...) consistent with the conservation of natural forests and biological diversity" (Tanzania Vice President's Office 2013a). The Measuring, Reporting and Verification (MRV) System is to be integrated with the REDD+ Safeguards Information System.

At the time of writing, Tanzania has a draft REDD+ Safeguards document (dated June 2013), which constitutes the national interpretation of the Cancun Safeguards in accordance with the country's REDD+ Strategy. The draft may still change substantially, as it is being subjected to several stakeholder consultations and drafting rounds during 2013.

On environmental aspects, the draft REDD+ Safeguards document states that the REDD+ Programme will maintain and enhance conservation of Tanzania's biodiversity and other ecosystem services, considering the needs of forest dependent communities and appropriate management and utilization methods (see Table 1). It specifies that REDD+ activities are to be designed to maintain and enhance biodiversity and

Table 1: Excerpt from the June 2013 version of the draft Tanzania REDD+ Safeguards: Principle 7 (Tanzania Vice President's Office 2013c). Other parts of the document are also relevant to the topics covered in this publication, but key text for biodiversity and ecosystem services are included under Principle 7.

Principle 7: REDD+ Programme maintains, promotes and enhances the conservation of the country's natural forests for their biodiversity and other ecosystem services (co-benefits) while meeting the needs of forest dependent communities.	
Criteria	**Indicators**
7.1 The REDD+ initiative analyses the possible impacts on biodiversity and other ecosystem services when considering options for REDD+ actions	7.1.1 The national MRV system incorporate the assessment of biodiversity and other ecosystem services
	7.1.2 Positive and negative impacts of REDD+ on Biodiversity and other ecosystem services identified and analyzed in a transparent and participatory way using available scientific methods
	7.1.3 Scientifically sound assessment frameworks for analyzing impacts of REDD+ on biodiversity and other ecosystems services are in place and utilized
	7.1.4 Mechanisms to address negative and promote positive impacts of biodiversity and ecosystems services as a result of REDD+ programme in place and implemented
7.2 REDD+ initiative maintains and enhances the conservation of biodiversity and other ecosystem services and considering the needs of forest dependent communities and appropriate management and utilization methods.	7.2.1 Additional resources to maintain and enhance biodiversity and other ecosystem services are generated by the REDD+ initiative
	7.2.2 Species or ecosystems that are rare, endemic or threatened with extinction are identified, protected and monitored.
	7.2.3 REDD+ activities are designed to maintain and enhance biodiversity, ecosystem services and forest dependent community needs
	7.2.4 Monitoring plan for the impacts/outcomes of REDD+ activities on biodiversity and ecosystems is developed and implemented
	7.2.5 Biodiversity and other ecosystem services research and information dissemination plan developed and implemented to improve biodiversity conservation and management
	7.2.6 Biodiversity and other ecosystem services conservation and management guidelines developed and incorporated in forest management plans in REDD+ sites
7.3 The REDD+ programme protects natural forests from degradation and conversion to other land uses including forest plantations	7.3.1 REDD+ actions that protect natural forests from conversion are identified, prioritized and implemented
	7.3.2 Monitoring of impacts of REDD+ actions on natural forests is done in a transparent and participatory way
	7.3.3 REDD+ activities are designed to maintain and enhance protection of natural forests
7.4 The REDD+ Programme ensures restoration of degraded areas using indigenous species.	7.4.1 The REDD+ activities promotes and uses indigenous species to restore degraded areas
	7.4.2 Mechanisms to monitor the use of indigenous species in the restoration of degraded areas are in place and utilized

[2] Annex 1 of UNFCCC Decision 1/CP.16

ecosystem services, and that species or ecosystems that are rare, endemic or threatened with extinction should be identified, protected and monitored. It implies that the REDD+ Programme will protect natural forests from degradation and conversion to other land uses, including to forest plantations, and that it shall also promote and use indigenous species to restore degraded areas. Furthermore, it states that the REDD+ Programme shall analyse the possible impacts on biodiversity and other ecosystem services when considering options for REDD+ actions.

2. Planning for REDD+ multiple benefits and safeguards

When identifying potential zones for REDD+ action, several considerations are likely to be relevant (Figure 2). First, the goals of REDD+: to reduce forest carbon emissions, maintain or enhance forest carbon stocks, as well as to deliver the other benefits that REDD+ is expected to bring. The aim is to achieve an overall reduction in forest carbon stock losses and overall gain in carbon stocks compared to those in an anticipated non-REDD+ future; whilst applying the agreed safeguards for REDD+. This means that, second, the drivers of forest loss and degradation need to be tackled in order to avoid leakage and ensure persistence of the achieved results. This implies an identification of the pressures that forests may be subject to in future, and the vulnerability of forest carbon stocks to those pressures. Third, decision-makers will need to consider feasible actions

that can be used to achieve the goals, and evaluate them in terms of what benefits they can provide, under what conditions they will be effective, and what risks they may carry. These actions and their effects should be consistent with the REDD+ safeguards. For example, the draft Tanzania REDD+ Safeguards expect the REDD+ Programme to analyse the possible impacts on biodiversity and ecosystem services when considering options for REDD+ actions.

The maps in section 2 of this report aim to assist decision-makers in this process of identifying potential zones for REDD+ action. Some relevant themes are also identified for which spatial information is not yet available.

2.1 Biomass carbon stocks of Tanzania

The central value that REDD+ is intended to protect and enhance is forest carbon, in biomass and potentially also soils. Spatial planning for REDD+ implementation therefore needs to include a consideration of existing carbon stocks and their rate of loss; to inform decisions on which stocks will be maintained, which will be enhanced, and which may be lost even in the context of REDD+ implementation.

The NAFORMA inventory has resulted in a new, field-based map of woody biomass for Tanzania, at 5 km resolution. Another, higher resolution map which will account for all above ground biomass is in preparation by NAFORMA, building on a multi-source approach, combining the field based survey and remote sensing. This map will be available in late 2013.
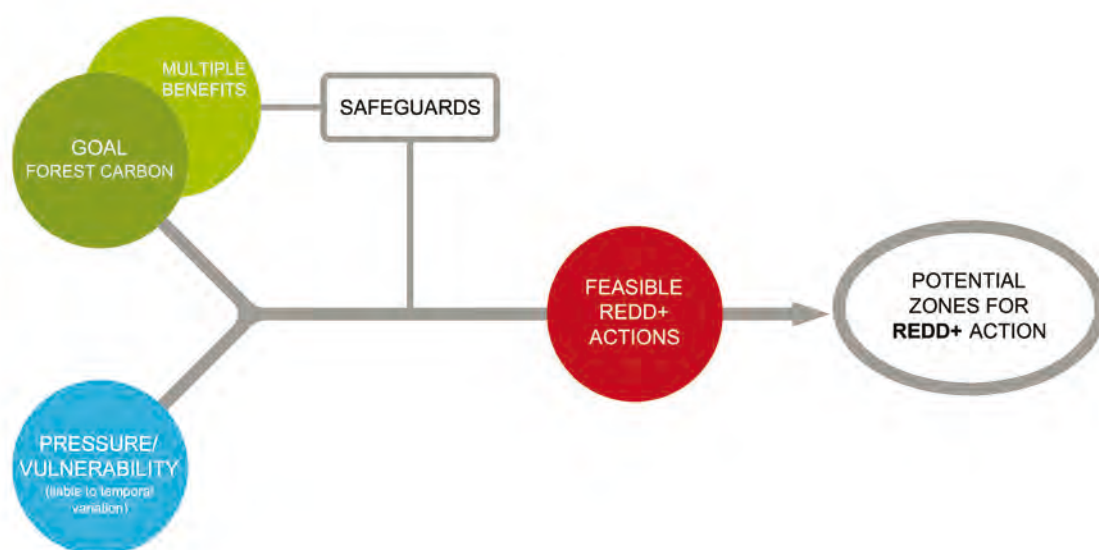

Figure 2: When identifying potential zones for REDD+ action, several factors are likely to be relevant. Identifying the current and desired spatial distribution of forest carbon stocks and multiple benefits (the goals of REDD+) is a first consideration. Current and future pressures on forests determine what additional value REDD+ actions can bring. Feasible actions in different locations is a third consideration. These actions should be consistent with the REDD+ safeguards, which intend to ensure that REDD+ actions promote multiple benefits and avoid harm.