MRV ACTIVITIES IN TANZANIA
Progress and Plans

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Institutional framework

Tanzania has embarked on a number of MRV set ups, namely;

- **The development of the National Forest Carbon Accounting System (NCAS-T)**
- **Establishment of a baseline Scenario/REL & RL**
- **The Establishment of the National Carbon Monitoring Center (NCMC)**
- **National Forest Resource Assessments & Monitoring (NAFORMA)**
- **National REDD Framework (Road Map to REDD strategy)**
- **The development of National REDD Strategy**
- **The Readiness Preparation proposal (RPP)**

Current Status of Carbon Emissions Estimation

- Currently, Tanzania has limited inventory data sets and data on Status of Carbon Emission Estimation
- Therefore, Tanzania will rely mostly on historical trends in estimating forest carbon/ stocks and emissions for development of its baseline scenario
- Tanzania is executing the NAFORMA, which will contribute to the in-situ data sets to establish baseline information for forest and carbon stocking and emission levels in the future

REDD readiness & MRV implementation

- **Tanzania has finalized its Readiness Preparation Proposal (RPP) under the Forest Carbon Partnership Facility (FCPF)**

- **Tanzania has planned for Data sets, Models/methods to be used under the MRV system by**

➢ **Establishment of guidelines/standard methods to be used for forest & carbon data collection, processing and reporting ;**

➢ **Development of allometric equations for forest and carbon modelling;**

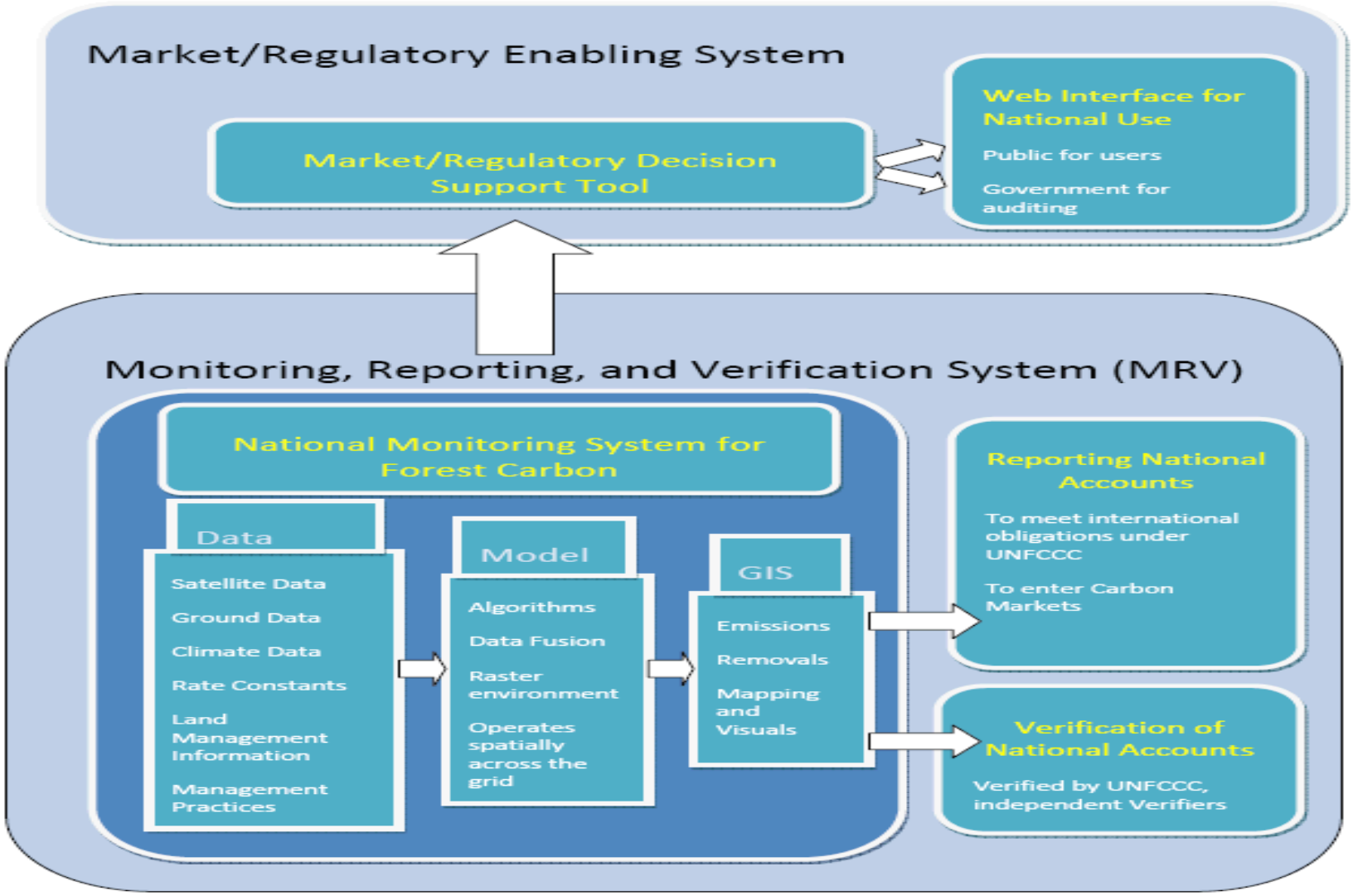
➢ **Development of guidelines for independent monitoring system**

The Royal Government of Norway, FAO/UNREDD are/and have been supporting Tanzania in developing the MRV system by

– **Supporting MRV country coordination for provision of data and methodologies**

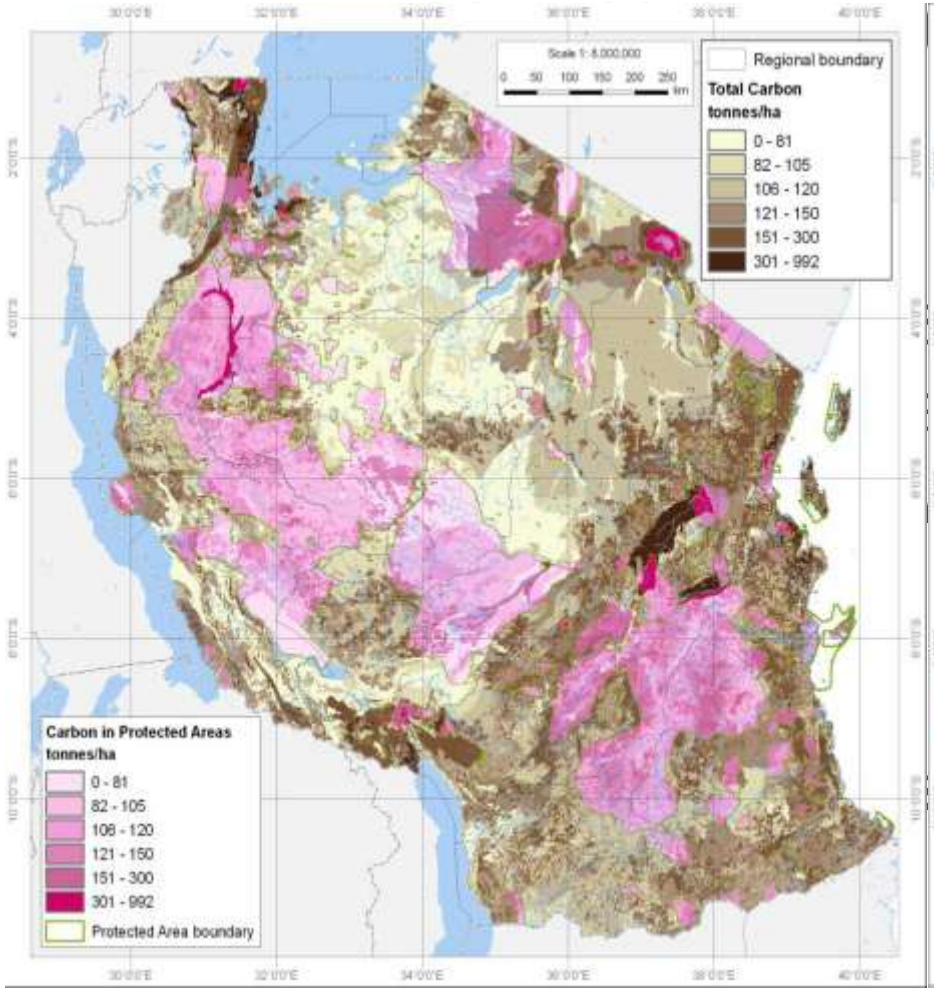
– **Strengthening of institutions /cross-sectoral participation that deals with forest assessment, monitoring and reporting**

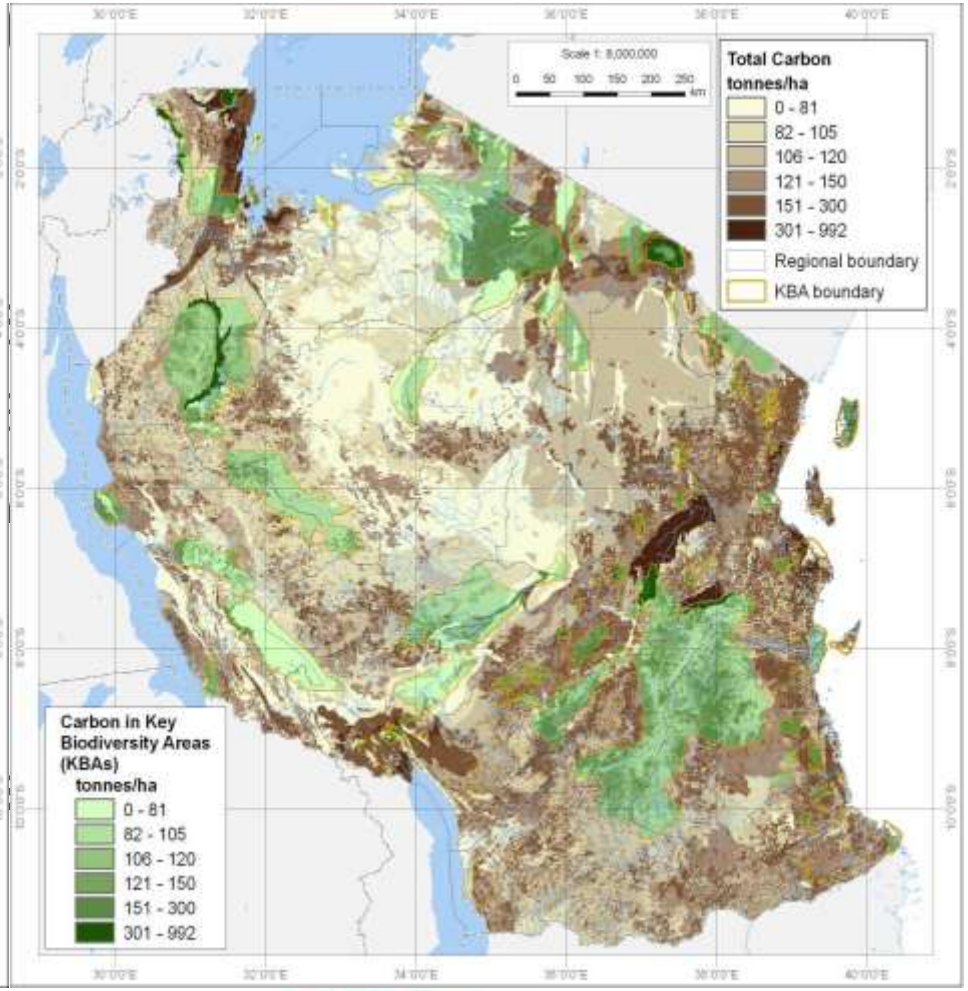
Tanzania MRV Conceptual Framework



Forest & carbon overview/historical data

FBD/UNEP/WCMC,2009

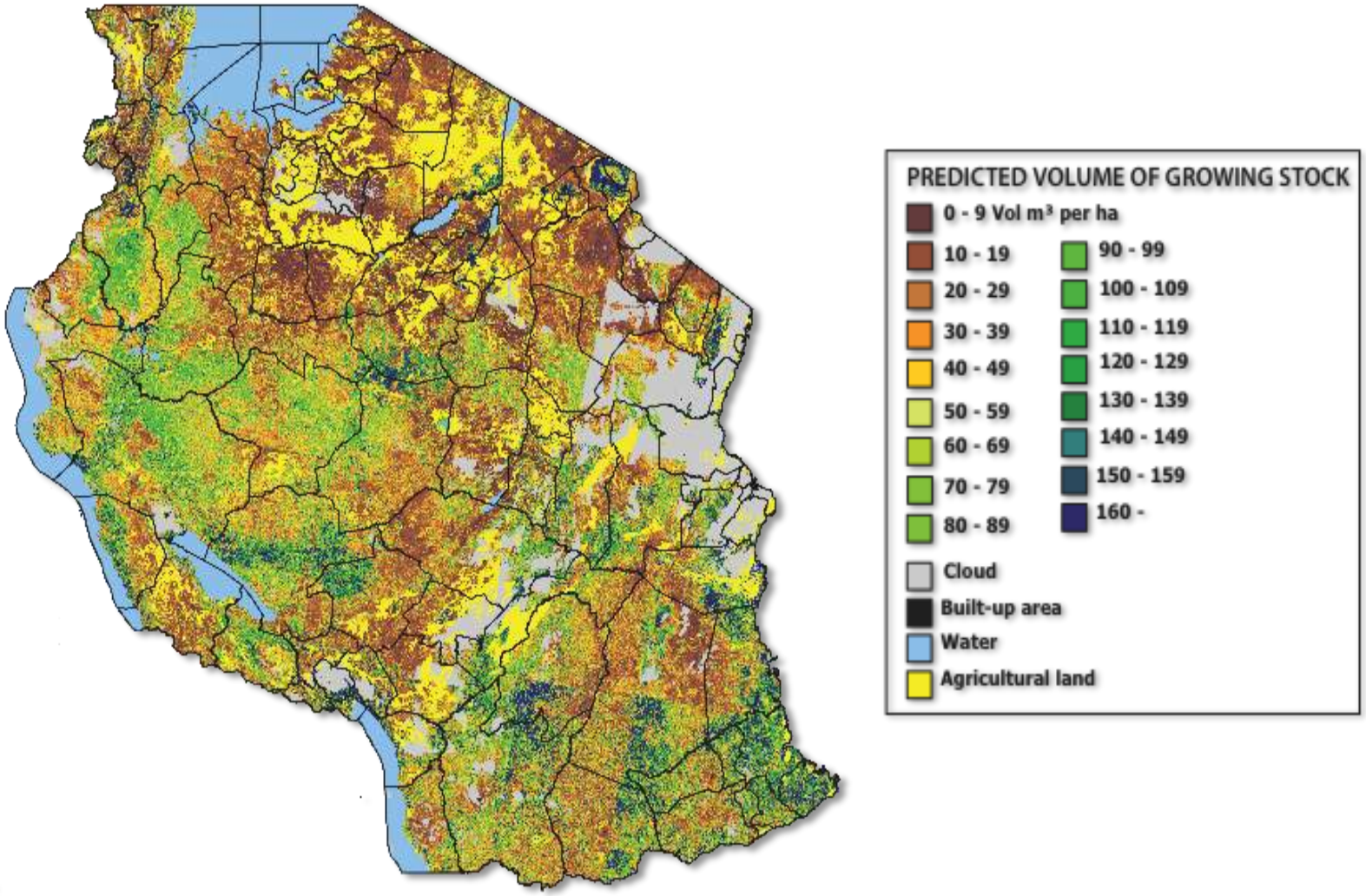




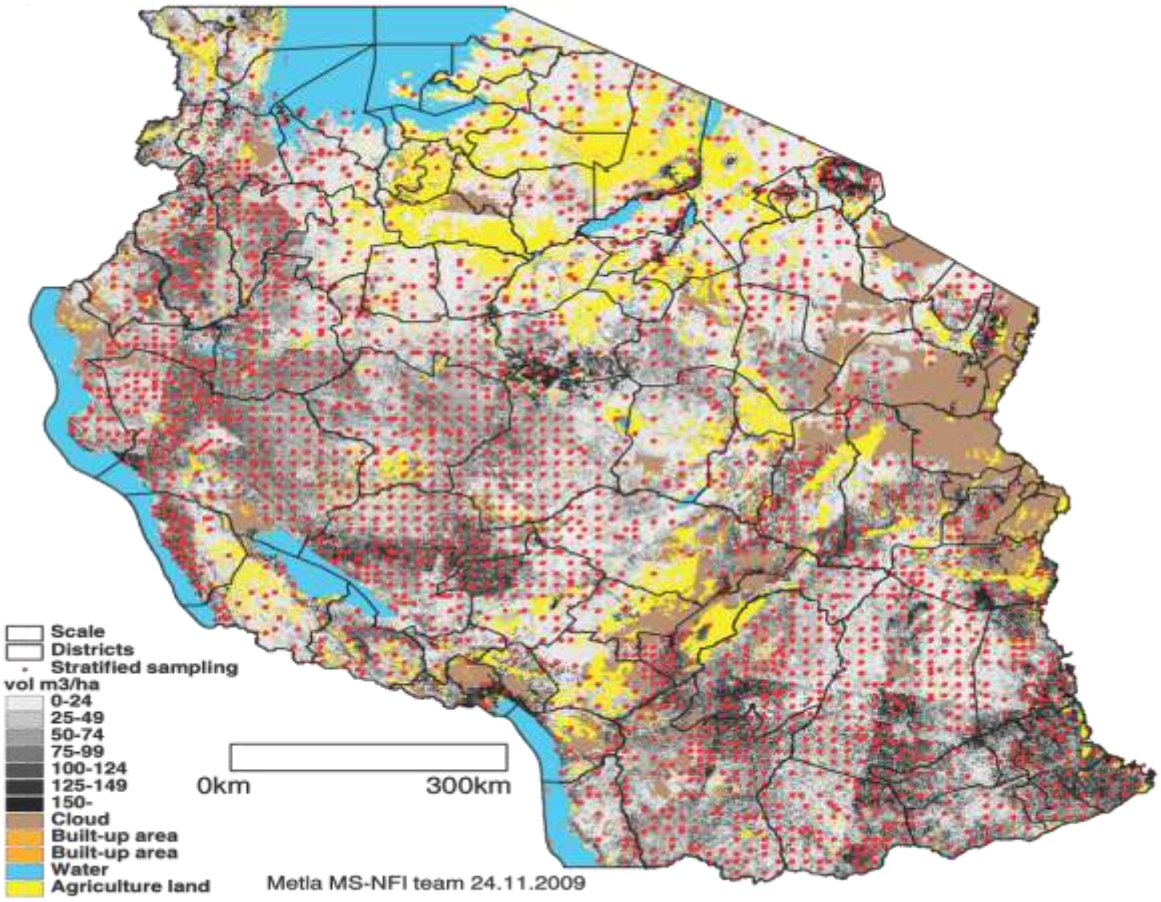
Available Data

- Access to regular satellite data for the country is so limited
- In-situ, forest inventory data for the whole country will be available after completion of the NAFORMA
- Land Cover Land Use Classification is available (1995)
- Updated land cover and land use maps is planned to be produced by NAFORMA

Predicted volume of growing stock used for National Stratification and Sampling Frame



National Forest Stratification and Sampling Design



Vice President's Office and
Ministry of Natural Resources and Tourism

National REDD Readiness Initiative

REDD
Reduced Emissions from Deforestation and Forest Degradation

Designing National Forest Monitoring and Assessment: An important data provider for REDD

The National Forest Monitoring and Assessment (NAFORMA) is the first comprehensive and nationwide forest inventory for Tanzania. Over the last 30 years sub-national inventories for different parts of the country have been carried out. In 1996 a national land-use mapping survey was undertaken.

In addition to providing very useful data on sustainable forest management, NAFORMA is key for Tanzania's Reduced Emissions from Deforestation and Forest Degradation (REDD) initiative as it will provide important forest-based biomass data for feeding into a National Carbon Accounting System.

The NAFORMA methodology is based on a backbone of 'permanent sample sites' that are initially 'assessed' (surveyed) and then 'monitored' at regular intervals into the future. NAFORMA has been designed to provide robust data from the district level upwards. The NAFORMA methodology is divided into two components:

- *A **'Biophysical'** component which:*
  - *Provides information on the extent and conditions of the forest and 'trees outside forests' (TOF) resources, and;*
  - *Captures deforestation and forest degradation though re-measurements.*
- *A **'Socio-economic'** component which:*
  - *Provides knowledge about the human factors that affect changing forest conditions in a country – driving forces for forest change;*
  - *Potential REDD+ linkages (ecosystem services).*

Both components when put together are a powerful tool in assessing the effectiveness of forest and other related policies such as land use planning.

The objective of the survey design process has been to develop a methodology for NAFORMA that results in an accurate, repeatable, time- and cost-efficient survey. Attaining an indicative understanding of the overall distribution of forest resources in Tanzania has been key to planning the survey. Knowing where the trees are, how many there are likely to be and how difficult it is to get to them helps in designing a survey that is accurate (the more trees, the more measurement), repeatable (for monitoring), and time- and cost- efficient (good logistics planning).

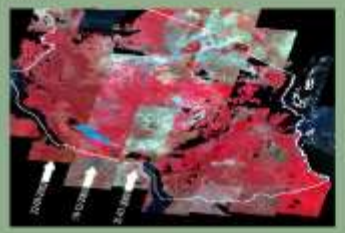
'Input' data has been used iteratively to model design solutions such that the survey:

- *achieves efficiency and accuracy/precision;*
- *provides reliable information at national & district level;*
- *improves the Food and Agriculture Organisation (FAO) National Forest Monitoring and Assessment (NFMA) methodology;*
- *uses multi-source input data.*

This poster provides an overview of the innovative methodology developed to address complex design considerations in the planning of the bio-physical component of NAFORMA. The methodology has been developed by the Forest and Beekeeping Division in collaboration with the Finnish Forest Research Institute, Sokoine University of Agriculture and FAO.

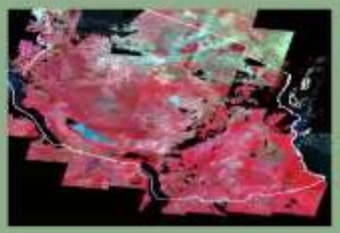
Landsat Mosaic Image

Reflectance at top of the atmosphere, based on the GLS 2000 (Global Land Survey) data set from USGS.



Corrected Landsat Mosaic Image

MODIS Aqua Composite used to compute surface reflectance from the original image data.



Predicted Growing Stock

A non-linear volume model was used to predict the size and distribution of growing stock (trees) using robust non-linear estimation, parameters estimated with Finnish data, top of atmosphere Landsat TM data with atmosphere correction. The model explained 75 % of the volume variation. Other variables, such as brightness, greenness, wetness, were also tested.

Distance and time planning

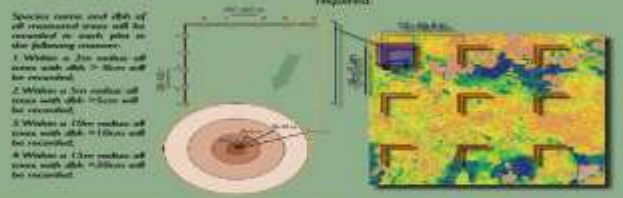
The most time efficient work plan for the sample clusters is resolved in relation to the existence of roads, foot paths and topography (not shown). Multiple solutions can be modelled and generated to provide cost and time estimates.

Sampling solutions for the survey

One of many potential sampling solutions for Tanzania, based on stratification and optimal allocation of the field plot clusters using the volume predictions and assessed measurement time, is shown below. Clustering and optimal allocation substantially increases the accuracy and efficiency of the inventory.

Clumped /stratified sampling

The predicted growing stock density is then used as the basis upon which to vary the distance between sample plot clusters. Several sampling designs are tested to find the most optimal in terms of the accuracy and costs. A model is run many times to generate the optimal placement of the clusters for the whole country which provides the sampling pattern with the smallest predicted error with the given costs. Each field plot cluster has ten sample plots. Each sample plot consists of four concentric circles, designed in such a way as to capture as much variability in the plot while minimising the measuring effort required.



About the National REDD Task Force

Tanzania is developing a National REDD Strategy in anticipation of a post-2012 climate change agreement that will include a new global facility for Reduced Emissions from Forest Degradation and Deforestation. A National REDD Task Force has been established through the Vice President's Office and Ministry of Natural Resources and Tourism. The Task Force coordinates and guides the development of REDD-Readiness initiatives underway in Tanzania.

An interim National REDD Framework has been developed that sets out key areas for achieving REDD-Readiness, including:

- *Baseline establishment, monitoring, reporting & verification;*
- *Financial mechanisms and incentives;*
- *Stakeholder engagement and community participation;*
- *Coordination of REDD Implementation;*
- *Market access and negotiation;*
- *Governance and policy;*
- *Capacity building;*
- *Applied research;*
- *Information management and networking.*

The Government of the United Republic of Tanzania is working with a diversity of implementing and funding partners, including local communities, international organisations, universities, local civil society, the private sector and development partners in preparing for REDD. As part of this process, key collaborative initiatives underway are the National REDD-Readiness Initiative and the UN-REDD Tanzania Quick Start Initiative - both funded by the Norwegian Government.

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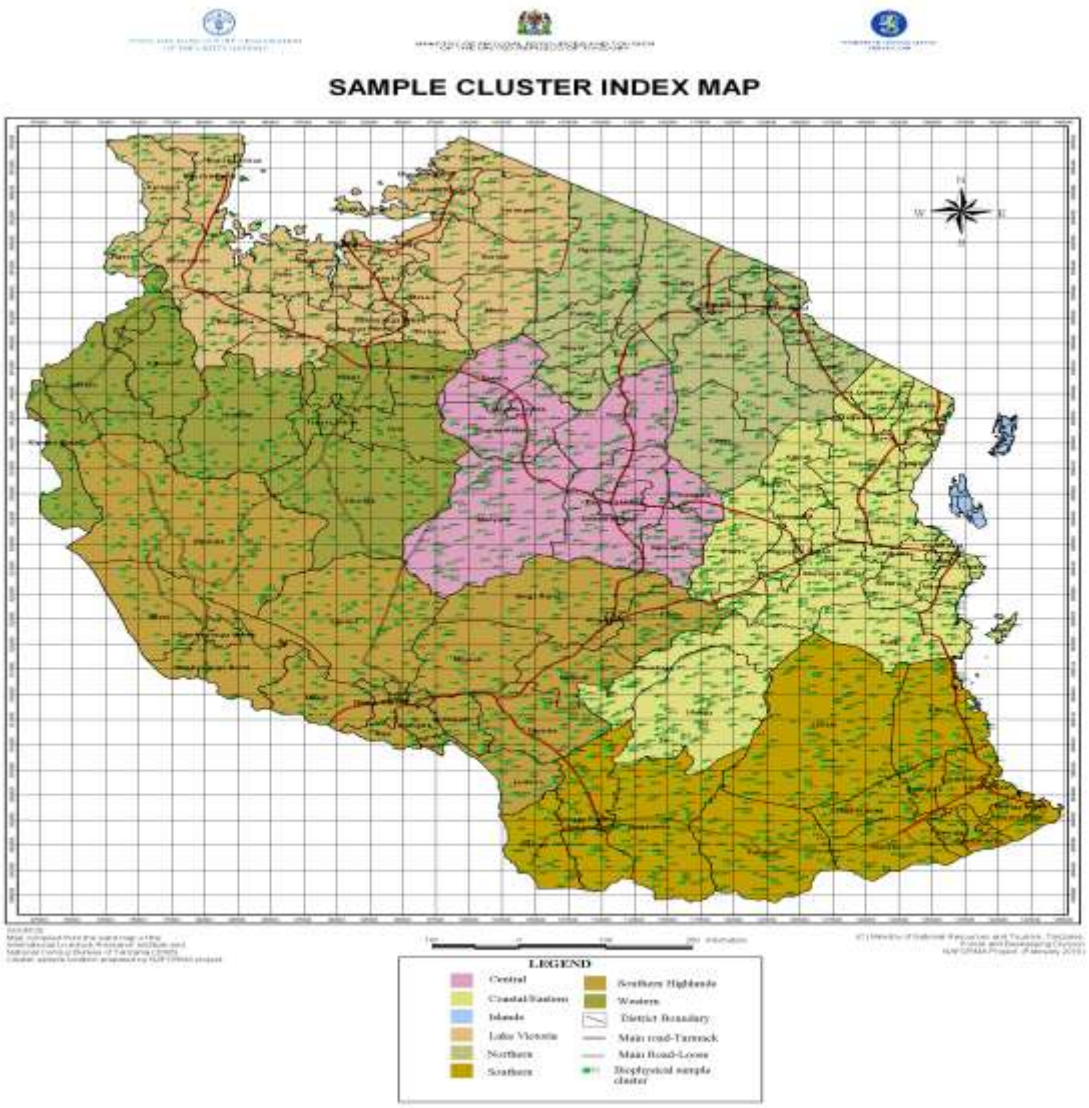
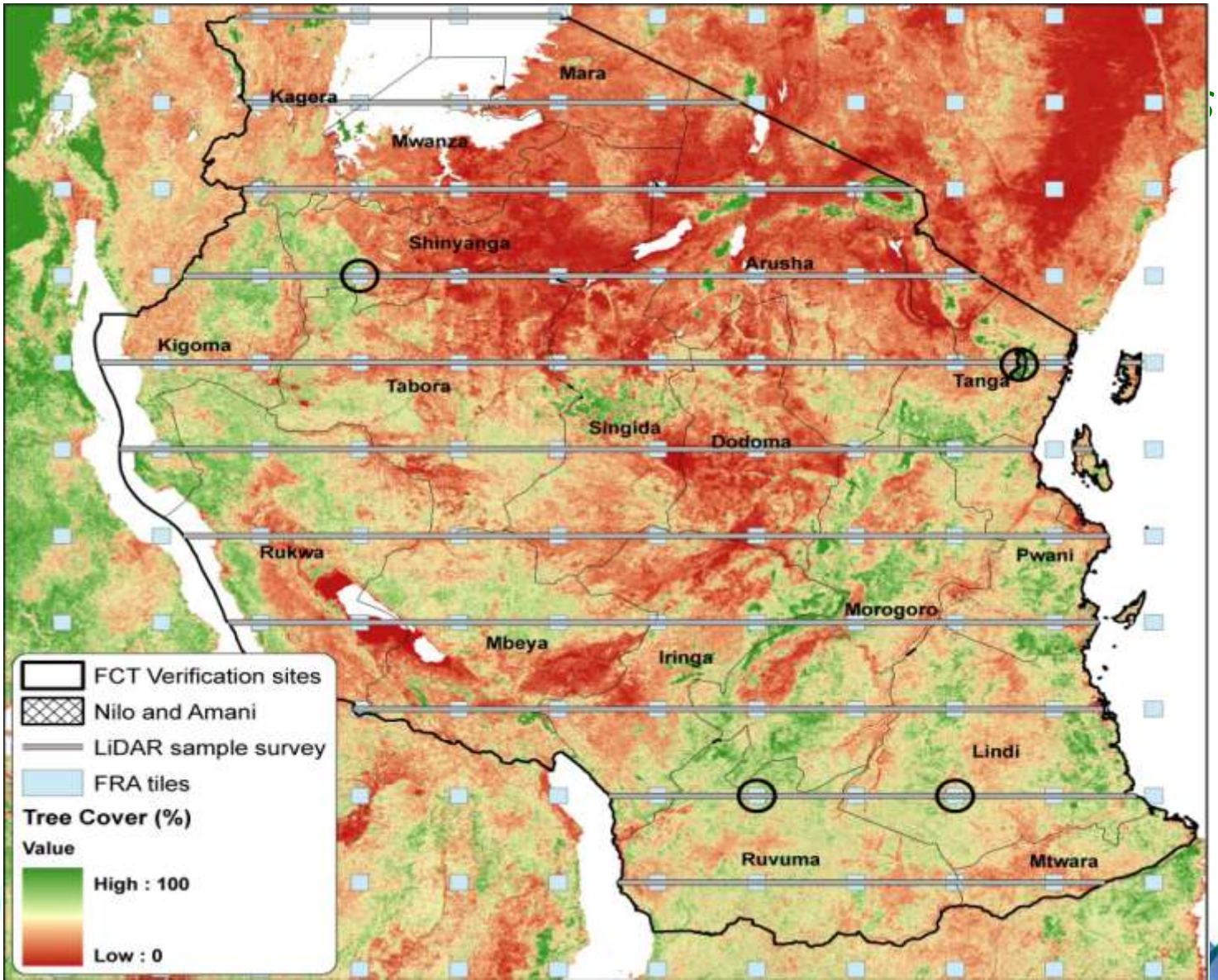
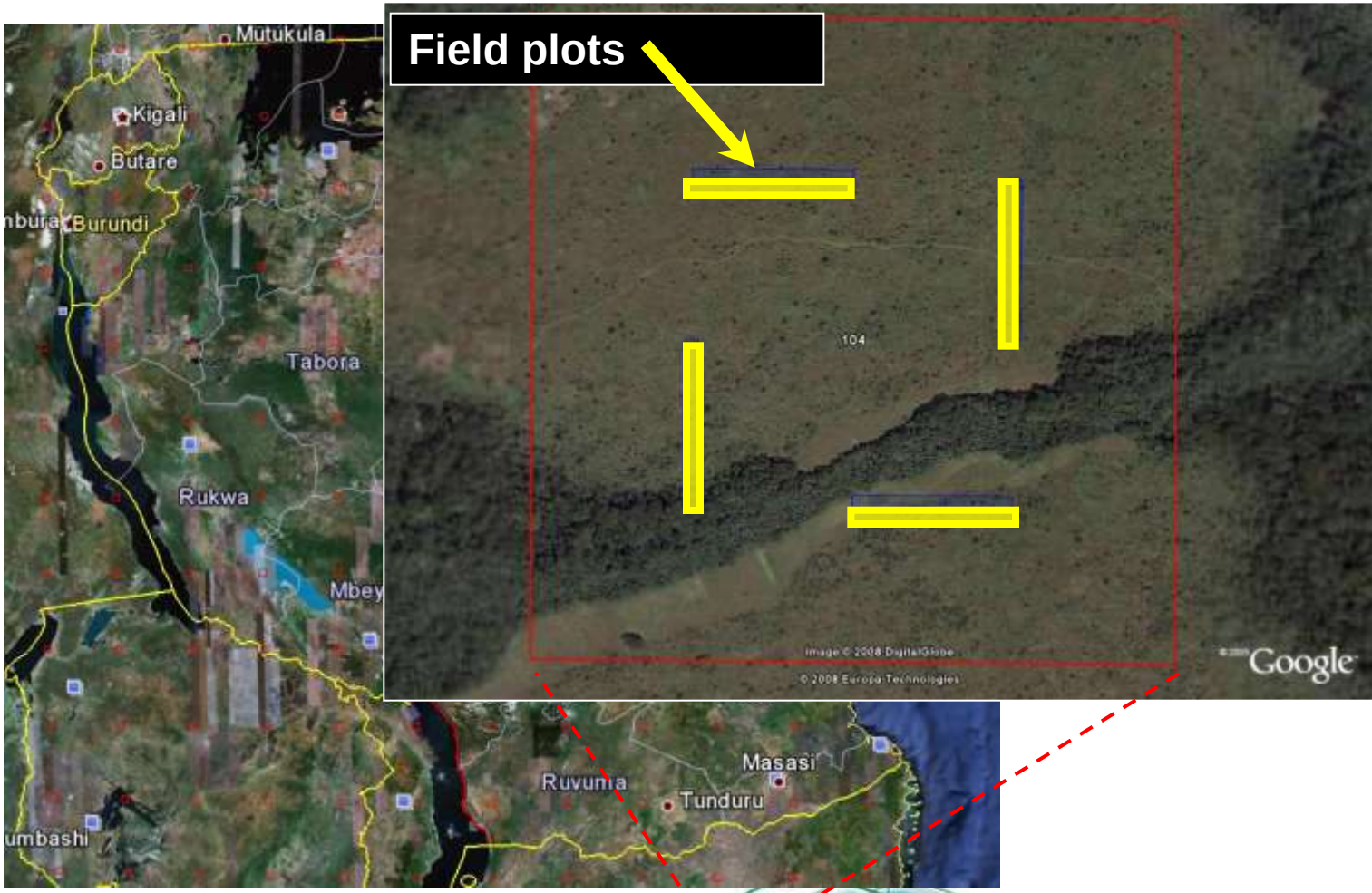
SAMPLE CLUSTER INDEX MAP



Verification Sites (VS) under Collaboration with GEO-FCT, FRA 2010-RSS & Lidar

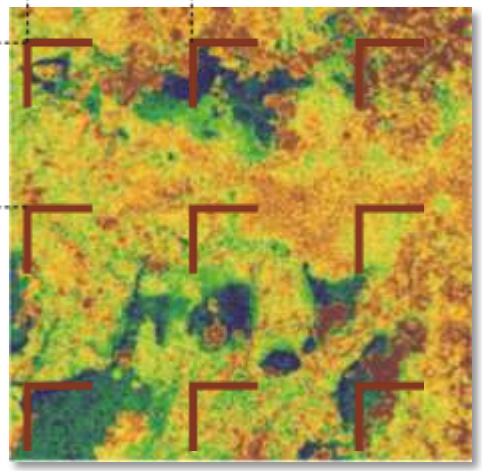


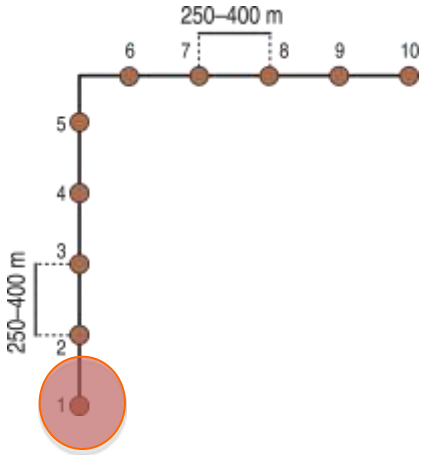
Linking RS with Ground Survey Under NAFORMA



NAFORMA APPROACH

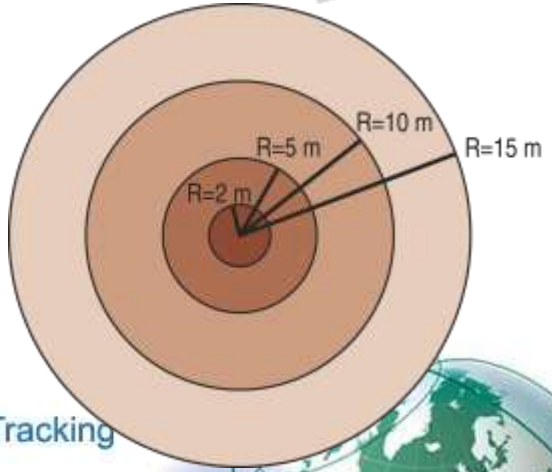
BIOPHYSICAL SURVEY DESIGN – FIELD SAMPLING





Cluster distance correlated with growing tree stock density:

Clumped /stratified sampling



Species name and dbh of all measured trees will be recorded in each plot in the following manner

1) Within 2 m radius: all trees with dbh > 0 cm will be recorded
2) Within 5 m radius; all trees with dbh > 5 cm will be recorded
3) Within 10 m radius; all trees with dbh > 10 cm will be recorded
4) Within 15 m radius; all trees with dbh > 20 cm will be recorded

Spatial Data Infrastructure & Data processing

We have planned for the spatial-data infrastructure, GIS and web-based delivery systems for NAFORMA,MRV, National Forest Carbon Monitoring and Reporting (NCMC).

In-country capacity to process data and prepare forest/non-forest maps and carbon estimates is available but lacks financial support to operationalize activities and fill the knowledge gaps.

After finalizing the NAFORMA, Tanzania will determine the forest and carbon stocking levels, map and avail these resources into GIS and web based delivery systems,

Capacity-Building & Support Needs

- The major capacity building needs
  - Development of spatial-data infrastructure, GIS and web-based delivery systems for National Forest Monitoring and Carbon reporting/MRV
  - Acquisition, processing and use of remotely sensed data (Radar and Lidar among others) for effective national REDD monitoring/MRV

Efforts are in place (planned under UNREDD/FAO)

Thank you