Department of Climate Change
Federal Ministry of Environment

Land-Use, Land-Use Change and Forestry (LULUCF) Sectoral Institutional MRV System

Initiative for Climate Action Transparency (ICAT) – Consultancy Project(s) Capacity Building on application of Measure, Report and Verify (MRV) Greenhouse Gas (GHG) Emissions for Mitigating the Impact of Climate Change in Nigeria

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Abbreviation

AGB	Above-Ground Biomass
BGB	Below-Ground Biomass
BTR	Biennial Transparency Reports
BUR	Biennial Update Reports
CDM	Clean Development Mechanism
CLL	Concurrent Legislative List.
COP	Conference of Parties
DCC	Department of Climate Change
DW	Dead Wood
DSA	Data Sharing Agreement
DS	Diagonal Stakeholders
FDoF	Federal Department of Forestry
FCPF	Forest Carbon Partnership Facility
FRIN	Forestry Research Institute of Nigeria
GEF	Global Environment Facility
GHG	Greenhouse Gas
GPG	Good Practice Guidance
HS	Horizontal Stakeholders
HWPs	Harvested Wood Products
ICA	International Consultation and Analysis
ICAT	Initiative for Climate Action Transparency
IMCCC	Inter-Ministerial Committee on Climate Change
IPCC	Intergovernmental Panel on Climate Change
IT	Inverted T
LFA	Logical Framework Approach
LGAs	Local Government Areas
LI	Litter
LULUCF	Land-Use, Land-Use Change and Forestry.
MDAs	Ministries, Departments and Agencies
MRV	Monitoring, Reporting and Verification
NAMAs	Nationally Appropriate Mitigation Actions
NASRDA	National Space Research Development Agency
NBS	National Bureau of Statistics
NCs	National Communications
NDCs	Nationally Determined Contributions
NGOs	Non-Governmental Organizations
NIR	National Inventory Report
NPS	National Park Services
ONIA	Overarching National Institutional Arrangement
QA	Quality Assurance
QC	Quality Control
RW	Reversed Waterfall
SDoF	State Departments of Forestry
SEP	Stakeholders Engagement Plan
SOC	Soil Organic Carbon

TWG	Technical Working Group
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard
VS	Vertical Stakeholders

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Executive Summary

This report provides a comprehensive overview of the legal and institutional issues to consider when working towards preparing the Land-Use, Land-Use Change and Forestry (LULUCF) sector to contribute maximally to the monitoring, reporting and verification of Nigeria's climate change policies, programs, and projects. It addresses the architecture and dynamics of the LULUCF sectoral framework with a deep dive into the critical cross-cutting issues that weaken existing institutional framework with a view to designing, proposing and integrating the new LULUCF institutional arrangement into the broader Nigeria National MRV System.

Data generation, processing and archiving in Nigeria have been a problematic endeavor. From a universal perspective, Nigeria's data management ecosystem seems burdened with structural challenges, statistical gaps and reputational deficits. This is as a result of statistical data generation being on the Concurrent Legislative List [CLL] of Nigeria's Constitution and the perennial under-investment in statistical data management in the last 5 decades. The CLL empowers Federal, State and Local Governments to generate statistical data which they do mostly in silos. This imposes gaps on statistical data management, often weakening institutional arrangements for the implication of climate action in Nigeria.

This LULUCF Sectoral Framework gained insights from series of target-specific workshops and multi-level consultations involving relevant stakeholders from various MDAs to gauge and harness their expectations from an ideal institutional framework that anchor LULUCF MRV system and to communicate proposed architecture in line with the project's broader development objectives. These included rigorous consultations, review of various technical studies, collaborative cross sectoral engagements at various stages of the preparation process. Based on their inputs, a robust "inverted T" mimicking a "Reversed waterfall" LULUCF sectoral institutional architecture has been calibrated, highlighted and proposed for adoption and implementation as a major output of this LULUCF Sectoral Framework.

Following robust stakeholder engagement, the project consultant moved into the next phase of analyzing technical feedback with a view to understanding the subsisting data collection, processing, and archiving ecosystem. Surmounting the challenge of data collection will be based on the information and data received from the key stakeholders which in turn will enable critical recommendations that will facilitate the development of a robust MRV system.

To enhance transparency, this LULUCF sectoral framework report will be subjected to further peer review and quality assurance process in accordance with best practices during the mid-term workshop which we hope will help improve the report before the end of this project cycle. With Nigeria moving towards innovative integrated greenhouse gas (GHG) abatement approaches and MRV implementation, the institutional arrangements proposed in this LULUCF sectoral architecture will provide an ideal basis for GHG calculation and climate change activity impact reporting for the LULUCF sub-sector in Nigeria.

Chapter One – Introduction

1.0 MRV Overview

The historic Paris Agreement brokered in December 2015 established universal and harmonized measurement, reporting, and verification (MRV) provisions for climate action, enthroning and applying a common system of transparency on all countries. MRV is central to the efficient and effective implementation of the Nationally Determined Contributions (NDCs) submitted to the United Nations Framework Convention on Climate Change (UNFCCC) as building blocks of the Paris Agreement, which outlined countries' climate change mitigation goals and policies.

Credible measurement is needed to identify greenhouse gases emissions trends with a view to determining where to focus GHGs abatement activities. This also empowers tracking of mitigation-related support, and assessments to determine whether mitigation actions planned under NDCs are proving effective. Furthermore, MRV will enable evaluation of the impact of support received and monitoring of progress achieved in emissions reduction efforts. Reporting and verification of measurement outcomes are important for ensuring transparency, fidelity to best practice protocols, accountability, and credibility of results, and for building confidence that resources dedicated to implementing climate change mitigation projects and programs are utilized effectively.

As the attention on reduction of GHGs emissions and the impact of climate change generates global momentum and currency, it is imperative that Nigeria, as a member nation that ratified the Paris Agreement and submitted her NDCs in 2015, take actions towards achieving her NDCs targets and objectives.

After the failure of the much-anticipated Copenhagen Accord in 2009 which never came to be due to the top-down allocation, and/or imposition of emission GHGs emissions reduction targets, the NDCs became a bottom-up, realistic pathway to achieving global climate change governance consensus which was adopted in Paris in 2015 during the Twenty-First Meeting of the Conference of Parties to the UNFCCC (COP 21).

The NDCs are locally generated and nationally adopted plans and strategies from all countries that present the commitment by each country to reduce emissions based on their respective socio-economic peculiarities, capabilities, and capacities. The aggregation of these plans became the Paris Agreement in 2015 and countries are currently outlining and communicating their improved post-2020 climate actions to reach their goals in the ongoing update of the NDCs. The countries are expected to pursue domestic mitigation measures to achieve the objectives set in the NDC.

Nigeria is currently updating her NDCs to expand the economic sectors from five (5) to seven (7) with the capturing of the Water and Waste sectors as part of the economic sectors covered by her NDC. Nigeria's subsisting NDC highlighted key measures in the five sectors (Agriculture, Oil, and Gas, Transport, Industry, and Power) required to reach the UNFCCC goals: ending gas flaring by 2030, off-grid solar PV of 13GW, efficient gas generators, 2% per year economy-wide energy efficiency (30% by 2030), transport shift from cars to mass transit –buses, railway, improved electricity grid performance, climate smart agriculture and reforestation.

These mitigation measures can only be attained successfully when they are effectively integrated into national economy-wide and sectoral growth and development blueprints. It is also important to develop an accurate and reliable system of reporting climate information. Robust MRV system presents an effective tool to achieve these measures transparently as required by the Paris Agreement. Article 12 of the Paris Agreement obliges all Parties, to communicate to the Conference of the Parties (COP) information relevant to the implementation of the Convention, including emissions and removals. This allows the Convention to have reliable, transparent, and comprehensive information on emissions, actions, and support, thereby forming an essential basis for understanding current emission levels, and the ambition of existing efforts, as well as progress on both the national and international scale.

MRV refers to activities that track progress and steer towards climate change related targets. The term MRV was coined in Bali during the proceedings of COP 13 in 2007, bringing together all aspects pertaining to transparency under the climate regime. MRV systems will catalyze better understanding of the key sources and sinks of Greenhouse Gas (GHG) emissions, overall emissions trends, the effectiveness and impacts of mitigation strategies, and the necessary support for continuous improvement. MRV systems serve countries' domestic goals and priorities and are a tool to monitor the level of progress that has been achieved with a view to determine areas that need to be improved on.

A robust MRV system consists of three interconnected processes:

- ***Monitoring/Measuring (Data collection and assessment)***

  Parties to the Paris Agreement are expected to make efforts to address climate change including the level of GHG emissions by sources and removals by sinks, emission reductions and other co-benefits. These measurements occur at the national level. Initially, this was addressed as measurement of GHG emissions by sources and removals by sinks through the national GHG inventories, which are usually reported in National Communications (NCs).

  Based on the decisions adopted at COP 16 and COP 17, non-Annex I Parties now need to measure the specific effects of national mitigation actions as well as the support needed and received, and to provide this information, including a national inventory report, as part of their Biennial Update Report (BURs). The methodologies for measurement are not defined by the Convention; therefore, in undertaking measurement, non-Annex 1 parties rely on methodologies developed externally, including methodologies by the Intergovernmental Panel on Climate Change (IPCC) and other organizations.

Other parameters to be measured/monitored are:

  - Emissions reduced or avoided through mitigation actions.
  - Other relevant variables such as consumption of energy or materials (water), socio-economic or environmental variables, or co-benefits of mitigation actions.

- ***Reporting:***

  Non-Annex 1 Parties are required to report on their climate actions in their NCs and the BURs, which include information on the GHG inventories, adaptation, mitigation actions and their effects, constraints and gaps, support needed and received, and other information considered relevant to the achievement of the objective of the Convention. National Communications are to be submitted every four (4) years and prepared following the guidance contained in the Revised Guidelines for

the Preparation of National Communications for non-Annex I Parties. Also, developing countries are expected to submit their BURs every two years. The BURs will provide an update of the information presented in the NCs particularly on national GHG inventories, mitigation actions, constraints, and gaps, also including support that is needed and already received.

- ***Verification:***
  Verification processes can be carried out by third party auditors. However, at the national level, verification is implemented through domestic MRV mechanisms established by Parties. The importance of verification process is to increase the transparency of mitigation actions and their effects, and support needed and received.

1.1 MRV –Types and Relevance

There are three types of mitigation related MRV:

- ***MRV of GHG Emissions:***
  The concept of MRV of GHG emissions entails measuring and monitoring GHG emissions and removals associated with activities of entities such as countries, organizations, or facilities; reporting collected data in a GHG inventory and subjecting the process to review and verification. The process of MRV of GHG emissions on the national level involves conducting the MRV process at the sectoral level. On the sectoral level, MRV of GHG emissions involves building an organization-wide inventory of total emissions and removals from all sources within the organization's boundary.

- ***MRV of Mitigation Action:***
  This MRV involves implementing mitigation actions (interventions and commitments which include goals, policies, and projects that are undertaken either by the government or private organizations/individuals with the goal to reduce GHG emissions). The Concept of MRV of mitigation actions focuses on the effects of GHGs abatement on sustainable development and implementation progress.

- ***MRV of Support:***
  The concept of MRV of support is to track provision and receipts of climate support (finance), monitor results achieved from the actual implementation of projects and assess the impact of the implemented projects. For instance, countries track financial support provided for mitigation efforts and building capacity (e.g., climate finance, technology transfer, and capacity-building) to track provision and receipt of climate support, monitor results achieved, and assess impact.

A sustainable and robust MRV system consists of five basic principles that must be critically considered. These principles form the basis of all MRV processes and must be strictly adhered to have a sustainable MRV process. These Principles include the following:

- Transparency: This requires that all assumptions and methodologies used for an inventory be clearly explained in simple and transparent terms to allow for replication and assessment of the inventory by users of the reported information.

- Accuracy: This is a relative measure of the exactness of an emission or removal estimate. Estimates should be accurate in the sense that they are systematically neither over nor under stated, as far as can be judged, and that associated uncertainties are reduced as far as practicable.

Appropriate methodologies should be used, in accordance with the relevant MRV system guidance, to promote accuracy.

- Consistency: This requires that an inventory should be internally consistent in all its elements when compared to other years. An inventory is consistent if the initial methodologies that are used are the same with the subsequent years and if consistent data sets are applied to estimate emissions or removals from sources or sinks.
- Comparability: This requires that estimates of emissions and removals reported should be comparable among all reporting Parties.
- Completeness: This requires an inventory to cover all relevant sources and sinks, as well as all gases. Completeness also means full coverage of sources and sinks within a geographical cover like a country, region, or State.

Therefore, as part of efforts towards achieving the Nigeria NDC target, there have been continuous activity in setting up MRV system for all the key sectors identified in the Nigeria NDC report. For this assignment, the priority sector focused on under this Initiative for Climate Action Transparency (ICAT) –Consultancy Project on the application of MRV GHGs for Mitigating the Impacts of Climate Change in Nigeria is the Land-use, Land-use Change and Forestry (LULUCF).

1.2 Setting LULUCF MRV System

The sectoral LULUCF MRV system sets the framework and provides the principles for integration of the Land-use, Land-use Change and Forestry into a national MRV system with a special focus on Nigeria's NDC commitments. The concept of MRV framework was introduced in 2009 via the Copenhagen Accord, which states that supported Nationally Appropriate Mitigation Actions (NAMAs) will be subjected to international MRV. The Cancun Agreements in 2010 reinforced MRV further by stating that "*Domestically supported mitigation actions will be measured, reported and verified domestically in accordance with general guidelines to be developed under the Convention*" (Decision 1/CP.16 The Cancun Agreements).

MRV, as a framework, is critical for evaluating whether Nigeria is on track to meet the targets in her NDCs as part of building blocks of the Paris Climate Change Agreement. It is a generally accepted principle that it is almost impossible to monitor or track the progress of any activity or human endeavor if those activities cannot be measured, whether we want to lose weight or track greenhouse gases emissions. Organically generated data from activity centers is critical for such measurements. The concept of MRV, is the process that accounts, tracks, verifies and reports GHG sources and sinks within a geographical jurisdiction. A robust MRV will also include accounting for any capacity building, technological or financial support that impacts the GHG emissions within the assessment period.

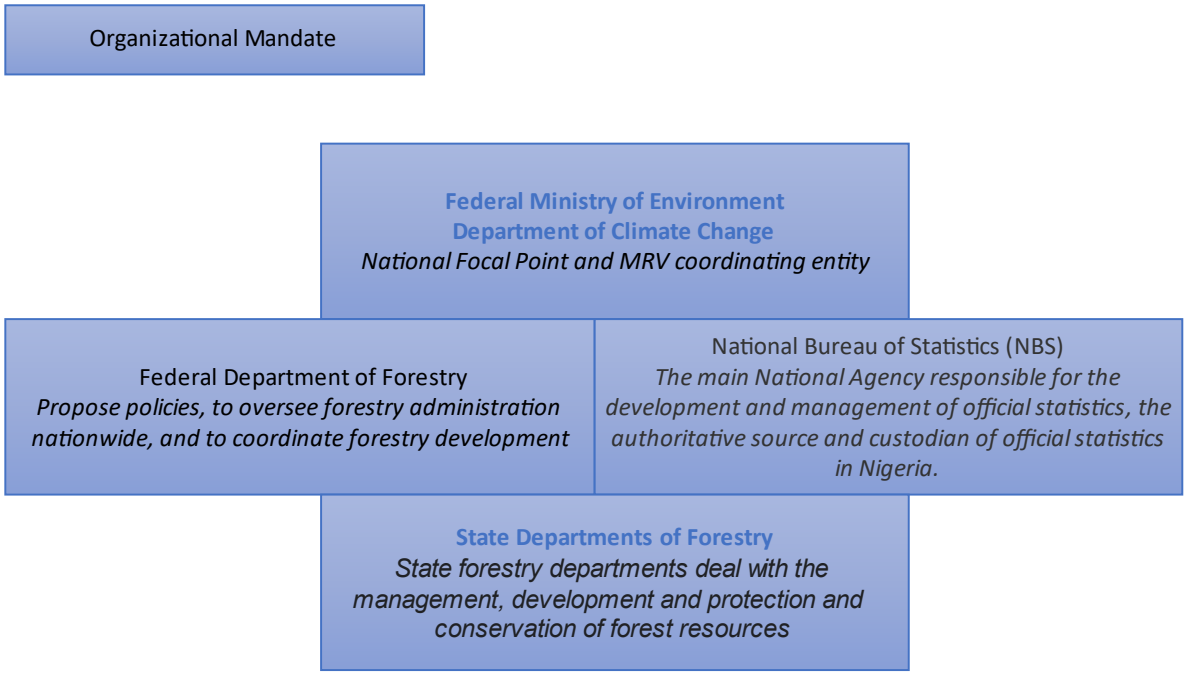
Chapter Two – Organizational Mandates

Organizational Mandates are structures put in place to clearly defined roles and responsibilities of identified key institutions. This includes legal frameworks, policies, and data sharing modalities that guarantees the human, financial and data resources needed are made available and to clarify decision making process.

2.1 GHG Inventory

The need for clarity in terms of roles and responsibilities of participating MDAs cannot be over emphasized A further consideration is the linkages, relationships and collaboration required for the inputs and skills needed for the Forest MRV to be functional. This includes capabilities in data (collection, handling, storage, standards, and maintenance), software, personnel, systems development and support. No single institution has the complete mandate, full range of data sets, the technical capacity and knowledge to operate the LULUCF MRV System in isolation. Figure 1 below shows the interaction between key MDAs and their mandates.

Figure 1: Organizational Mandates



Roles and Responsibilities

The Department of Climate Change of the Federal Ministry of Environment is the national focal entity designated with the role on coordinating the national inventory process of all the sector. The Federal Department of Forestry (FDoF) propose polices and oversee forestry administration nationwide and coordinate forestry development. The department does not engage in implementation of projects rather act as the oversee the stepdown to states.

State department of forestry implementing mitigation and adaption projects at the state level. Other conservation projects are also handled by the states.

National Park Services (NPS) manage national parks and reserved areas within the country. Although they don't engage in MRV related activities, they hold great potential in calculating carbon flux.

National Bureau of statistics (NBS) is the national entity saddle with responsibility of generating national statistics, coordination of research, methodology, data quality assessment and quality control. Building their capacity will increase institutional relevance and role in the LULUCF sector.

2.2 Mitigation

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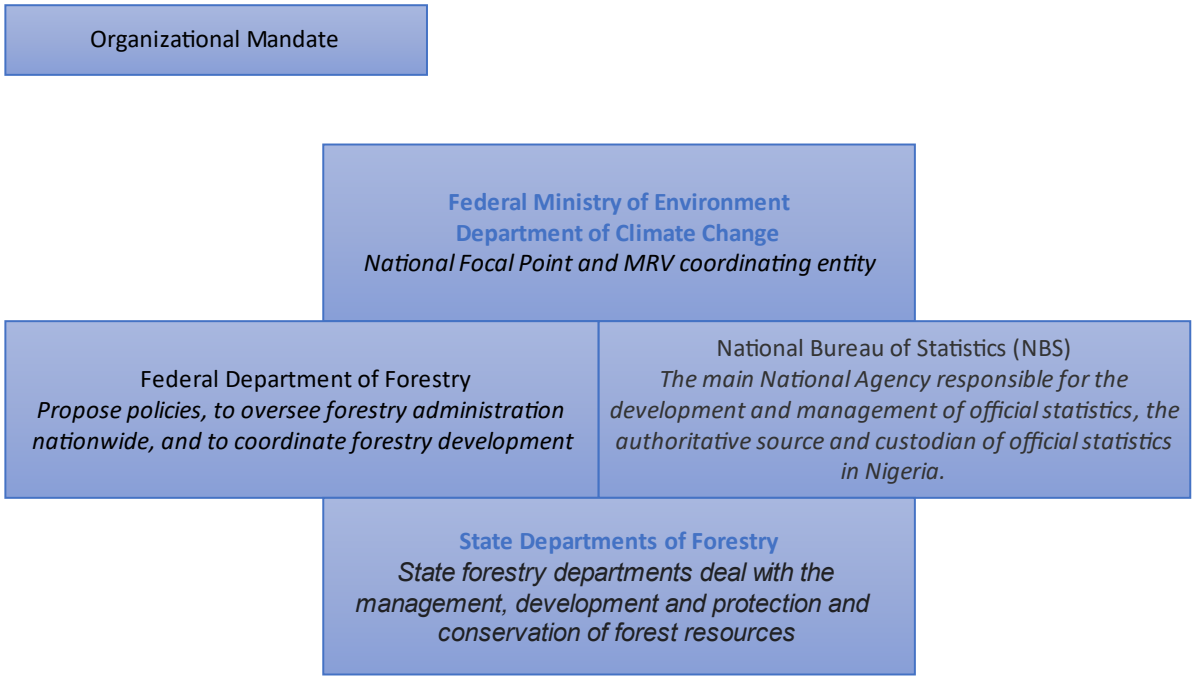
Figure 2: Organizational Mandates



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Chapter Three – Expertise

3.0 Preamble

The team of national experts should be capable of regularly gathering and processing data to produce the agreed outputs in a timely manner. The team should have suitable back-up expertise and access to relevant training materials. There should also be effective recruitment, retention and succession procedures in place that motivate the long-term and active involvement of experts in the reporting process. These aspects depend on suitable organizational mandates, as described in section 2.1 above. In the early phases of developing institutional arrangements, it may be helpful to contract external support to train and mentor the team of national experts. The team of national experts may also wish to bring in temporary additional support for new developments from time to time

National Experts

National experts are responsible for collecting, processing, and arranging the data and information for reporting of transparency themes. These experts often specialize in one or more of the transparency themes or sub-themes (e.g., GHG inventory, sectoral vulnerability assessment) (see table 1). In general, national experts should:

- Have good relationships with data providers.
- Be comfortable with data analysis and calculations, and associated science and methods, including IPCC guidelines.
- Have a good understanding of the benefits and limitations of the data sets.

3.1 GHG Inventory

The first consideration for this step is to define the roles and functions required to develop and prepare the GHG inventory. These functions of the GHG inventory cycle can, for example, be summarized in six stages: plan, collect, estimate, write, improve, and finalize (GHG inventory cycle). Using this concept, the team entails a variety of functions including management, coordination, data compilation and calculation, and expertise regarding sector emissions.

Profile of Main Team Members of a National GHG Inventory Technical Team

Here we present proposed profiles of the GHGI team to reflect the academic requirements, work experience, roles, and responsibilities that their designation entails.

Inventory Coordinator (like inventory compiler)

- The Inventory Coordinator should have a strong scientific, technical and policy background, with experience working both independently and with a variety of members of government, agencies, non-governmental organizations, and research institutions. The Inventory Coordinator should also have a strong understanding of UNFCCC, National GHG Inventory reporting, and the IPCC Guidelines for National Greenhouse Gas Inventories. The following list provides examples of the qualifications and knowledge desired for this role.
- Relevant experience in the field of climate change, with a focus on GHG inventories.

- A degree in a subject related to environmental studies/management, engineering, or similar (an advanced degree in Environment/Natural resources Management or specific GHG inventory sectors/categories could be beneficial);
- Demonstrated knowledge and application of the methodologies for preparing GHG inventories and familiarity with the IPCC inventory guidelines (Revised 1996 IPCC Guidelines, Good Practice Guidance (GPG) and IPCC 2006 Guidelines);
- Familiarity with UNFCCC processes and the content of National Communications.
- Experience managing a budget and a team in accordance with established procedures, employee skill levels and occupational specializations.
- Experience working with individuals with diverse technical backgrounds and specialties; and
- Evaluating and addressing complex issues associated with quantifying national GHG emissions using UNFCCC and IPCC guidelines.

Responsibilities and Duties/Activities of the Inventory Coordinator (similar to Inventory Compiler)

The following list highlights the main responsibilities and activities of the Inventory Coordinator:

Manage and support the National GHG Inventory staff, schedule, and budget in order to develop the inventory in a timely and efficient manner.

- Prepare a detailed work plan for producing the National GHG Inventory, including interim deliverables and specific outputs, in close consultation with sectoral leads and relevant data providers on a regular basis (e.g., monthly, biennial, annual etc.).
- Establish internal processes and schedule to ensure that the national inventory team produces accurate emission estimates.
- Develop Statement of Work documents and contracts with consultants to support inventory cross-cutting tasks and report compilation.
- Oversee sector leads/consultants handling the report compilation both at the sector level and compilation from all sectors to ensure incorporation of the inventory in the NC and BUR for submittal to the UNFCCC.
- Assist sector leads to prepare and implement sector specific work plans, including interim outputs/deliverables, as well as identify, collect, and organize data for inclusion in the inventory.
- Assist sector experts with the use of activity data and select and apply appropriate IPCC Good Practice Guidance to improve existing methodologies and emission factors.
- Assign cross-cutting roles and responsibilities, including those for QA/QC, archiving, key category analysis, uncertainty analysis, and compilation of the inventory section of the NC and/or BUR.
- For all project activities (i.e., QA/QC, uncertainty analysis, archiving, etc.), coordinate with cross-cutting leads to convey responsibilities to sector leads, consultants, national agencies and institutions, and relevant international organizations, such as United Nations Development Program (UNDP) country offices, IPCC, UNFCCC, and Global Environment Facility (GEF).
- Manage QA processes and inventory review periods (if applicable) with support from the QA/QC Coordinator.
- Maintain and implement a national GHG inventory improvement plan. Foster and establish links with related national projects, and other regional, international programmes as appropriate.

Responsibilities and Activities of the Quality Assurance and Quality Control (QA/QC) Coordinator

The following list highlights the main responsibilities and activities of the QA/QC coordinator:

- Manage the QC of all the working groups that build the National GHG Inventory to develop the inventory in a timely and efficient manner according to the quality level required by the UNFCCC.
- Prepare a detailed QC work plan with sectoral leads and relevant data providers on a periodic basis (e.g. monthly, annual, biennial).
- Establish internal processes and schedule to ensure that the national inventory team produces accurate emission estimates
- Review the accuracy of the methods used for estimations in all sectors.
- Develop Statement of Work documents and contracts with consultants to support inventory cross-cutting tasks in QC.
- Manage the QA process of the sector working groups and the assembled GHG report.
- Develop an independent review process for all deliverables of the working groups, using external consultants or ministry/agency experts to verify the quality level of the methods and outcomes.
- Manage an external process open to any stakeholders via web applications or workshops to get further feedback on the WG outcomes
- Manage cross-cutting roles and responsibilities for the improvement process of each reporting cycle.
- For all project activities (i.e., QA/QC, uncertainty analysis, archiving, etc.), coordinate with cross-cutting leads to convey responsibilities to sector leads, consultants, national agencies and institutions, and relevant international organizations, such as UNDP country offices, IPCC, UNFCCC, and GEF.
- Maintain and implement a national GHG inventory registry.

3.2 Mitigation

Mitigation: National Greenhouse Gas Inventory Experts

- Experts should understand the energy, transport, waste, industry, agriculture, and forestry sectors. More specific expertise may be required for sectors that are particularly complex, for example, road, shipping or aviation for the transport sector, fluorinated gases for some industrial processes, livestock and land use for the agriculture sector, and landfills and wastewater treatment for the waste sector.
- Experts should ideally have knowledge in the development of historical (e.g. from 1990 or 2005) and projected (e.g. to 2040 or 2050) time-series of estimated emissions and removals;
- Experts should be good with numerical data and data processing and analysis tools and models.
- Experts should have a thorough understanding of the IPCC guidelines and of the international reporting and review processes under the Convention and the Paris Agreement,
- Experts undertaking projections should have a good understanding of national policy and economic development and any sectoral economic, production or impact models.
- Experts should be able to clearly articulate the gaps and resource constraints facing the data-collection process and have the capacity to prioritize and address these gaps.

Adaptation: Climate Impact Monitoring and Analysis Experts

The national expert team may include many individuals from different institutions. Collectively, they need to be able to perform analyses of climate trends and their impacts, translating these to vulnerability and climate change impact assessments. More specifically:

- Experts must have a comprehensive understanding of the sectoral or overall risks, vulnerabilities and impacts of a changing climate.
- Cross-cutting sectoral experts should have knowledge in disaster response, hydro/meteorology and thematic areas that are impacted by climate change such as agriculture, water, urban planning, health, transport, and energy infrastructure.
- Sectoral experts should have a thorough understanding of the social and economic development issues of their sector (e.g. a thorough understanding of the impacts of drought on agricultural yields);
- Hydro/meteorologists and climate scientists should have broad knowledge of trends in climate and extreme weather events and their impacts on the physical environment.
- Disaster response teams who focus on preventative measures need an understanding of the causes of natural disasters and how to avoid their impacts.
- Experts should be well connected with policy officers and stakeholders who have a solid understanding of planned, ongoing and completed climate change adaptation projects in order to inform priorities.
- Experts should have a thorough understanding of the IPCC reports and guidelines on adaptation planning and reporting and of the reporting guidelines on adaptation for NCs and adaptation communications under the Paris Agreement.

Mitigation and Adaptation: Climate Action Planning, Tracking and Policy Experts

- Experts should have an awareness of national and sectoral strategies, mitigation and adaptation projects, their status and their investment/support needed/provided.
- Experts should understand the options and impacts (including benefits) of actions, and the indicators to track progress of implementation.
- Strong links with government departments, the private sector, NGOs and policy think tanks that can provide input on the feasibility of implementing action and input on tracking the progress of implementation.
- Well connected to decision-making on national and subnational strategies and policy implementation.
- Good understanding of the financial, technological and capacity-building support provided for climate actions (e.g. which projects have received support or funding, how much has been provided, how much is still needed and from who) from a bottom-up (by project) and top-down (by fund) perspective.

Chapter Four – Data Flows

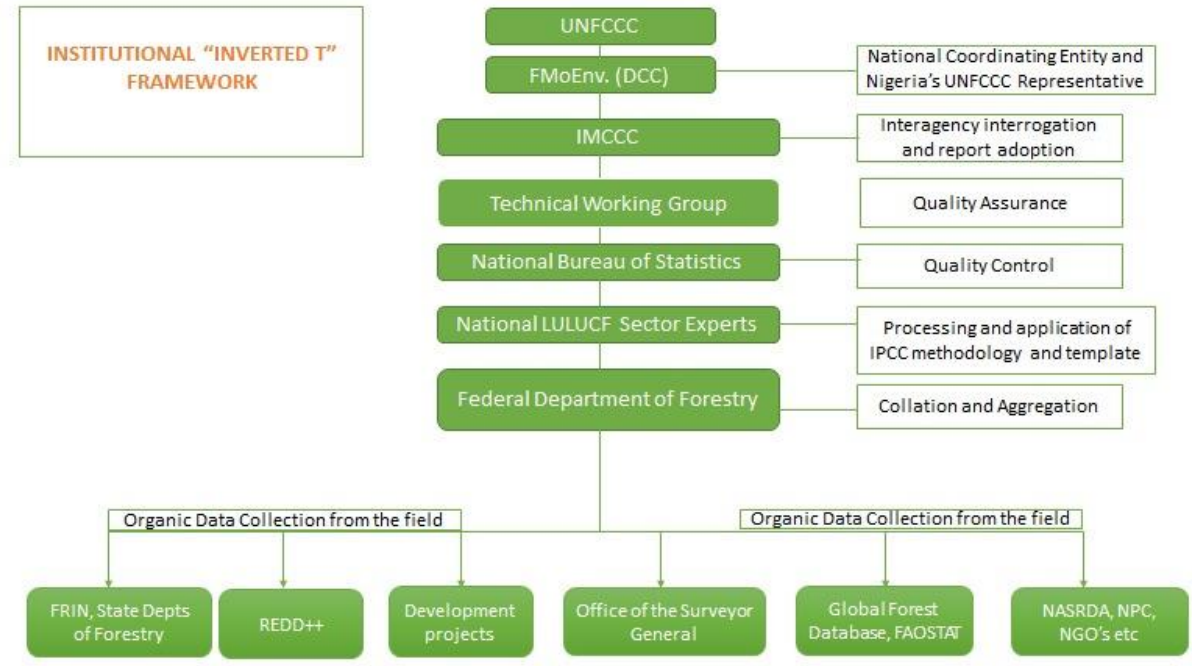
4.0 Overview

A basic LULUCF MRV system is a tool to report activities and their impact on GHG balance (net emission or sequestration). As such, it is also a management tool to support governance and policy decision to improve said balance for forestry activities. As it is based on activity data, it also indicates governance issues and efficiency of policy implementation.

An MRV system's quality is driven the by the underlying data and models. And while a lot of focus often goes towards well-structured and nice-looking reports, key to a good system is getting the right data and getting it sustainably. The MRV system also needs to be able to accommodate changes in data sources and data structure. A generally applicable set of requirements for data sources, handling and processing thus helps ensure that the quality of the MRV system is maintained over time:

The proposed data follow within the LULUCF sector is described in Figure 3 below:

Figure 3: Institutional "Inverted T" Framework showing Flow of Data



General Data Quality Requirements: Data used in MRV system should be:

- locally applicable for the envisaged purpose.
- accurate, with known uncertainty
- conservative (i.e. rather underestimating positive and overestimating negative effects), especially if uncertainty is high or unknown
- regularly updated at a frequency that fits the type of data and source

General Data Source Requirements:

Data used in MRV system must be from sources that are:

- official, specific, and up to date
- publicly available or with verified long-term access
- peer-reviewed (for scientific data) and with identified authorship and responsibility
- consistent over time (content, quality, and accessibility)

General Processing Requirements:

Processing functions in MRV system should be:

- transparent, i.e. with documented calculations and parametrization
- traceable and reproducible
- allow comparison with alternate models or data (e.g. for model or data transition)
- built in a modular architecture to allow changes to individual functions or models over time (without having to rebuild major parts of the processing layer)

Data-related System Requirements:

The MRV system should be:

- able to align new data sources with historic data (e.g. through parallel data use or retrospective modelling to identify potential bias). This is to ensure that changes can be reported seamlessly, even if a data source (e.g. satellite or database) is discontinued or replaced.
- flexible/adaptable to accommodate change in data structure or format (i.e. efficiently manageable and customizable data interfaces). Changes of measurement approach, processing or format of imported data (at the source or in the interface) can thus be handled quickly, ensuring continued data availability.

4.1 GHG Inventory

The greenhouse gas MRV (monitoring, reporting and verification) system to be developed is serving multiple purposes for a variety of stakeholders, requiring different outputs and processing of data from various sources. The basic technical MRV architecture described in this document will serve as a point of reference for design and development of the respective MRV elements. It also provides the framework for technical specification of data, processing, and reporting functions.

Note that the architecture may include elements that will not be developed in this project but are described to indicate potential future MRV system add-ons or links to external systems.

The descriptions and specifications provided in this document may be changed due to factors encountered during further development, e.g. changes in reporting needs, data availability or development efforts (cost/benefit considerations).

MRV Structure

The technical MRV system is built around four functional layers as explained below.

- The **reporting layer** contains the information output functions which are the core deliverable of an MRV system. This layer is the most visible and is customized to meet the MRV stakeholders' needs. Consequently, it also determines the data content and processing required in the lower MRV levels.

- To generate information for the reports, a **data processing layer** is essential. This layer encompasses the functions needed to transform the base data into the structured output and indicators listed in the reports. The functions can range from simple calculations (e.g. multiplying a base data element with a set of parameters to create the target information) to complex, cross-data analysis and statistical modelling (e.g. to indicate dependencies or causality, create scenario maps or run forecast models). The data processing layer can contain standard elements (e.g. calculation rules for greenhouse gas accounting) as well as highly customized functionality (e.g. a map showing forest stock loss risks based on a localized empiric analysis). This layer is thus one of the key costs and effort drivers of an MRV system, requiring thorough analysis and prioritization of functions to be included.

- The **data management layer** is providing the data required for processing and reporting. It serves as a data warehouse, combining data storage and handling functionalities with data quality assurance for input data and parameters, as well as results returned from the processing layer.

- Strongly linked and related to data management is the **data input and interface layer**. It describes the data flows in and out of the MRV system. It specifies technical interfaces to external systems, other data feeds (e.g. data sets which are collected, formatted or consolidated, and then loaded into the MRV system), as well as potential manual direct entry functions for the MRV system.

Data Set for the LULUCF Sector

Generally, two different options are available to estimate GHG emissions from LULUCF. The first is a land-based approach that proceeds from the classification of all the managed territory of a country into the IPCC land categories. Emissions and removals are calculated on the basis of this classification and may be due to management practices on the land remaining in the same category, or due to changes from one category to another (such as conversion from forest to cropland, or vice versa).

The second is an activity-based approach that proceeds from identifying specific activities occurring on the land that influence GHG fluxes. This approach focuses on the anthropogenic intervention and allows differentiation between activities. This approach can capture changes which would not be identified in the land-based approach e.g. a degraded forest which is restored (stock increase through planting) remains forest in the land-based approach (no change is captured) while the activity based approach captures the stock increase by measuring the carbon stock in the respective pools.

Activities

For the first commitment period (2008-2012) of the Kyoto protocol, the only mandatory and eligible forest activity was Afforestation/Reforestation (A/R), (except for limited additional voluntary activities), while for the 2nd commitment period (2013-2020), forest management became mandatory as well. The recent Paris Agreement includes now all REDD+ activities, specifically addressing forest conservation and restoration as crucial strategies to cut worldwide emissions. REDD+ is the acronym for "Reducing emissions from deforestation and forest degradation in developing countries", and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developed countries. The scope of REDD+ activities currently include the following activities:

- Reducing emissions from deforestation.
- Reducing emissions from forest degradation.
- Conservation of forest carbon stocks.
- Sustainable management of forests.
- Enhancement of forest carbon stocks

For Nigeria the following forest activity categories play a key role: afforestation/reforestation A/R (planting of trees on land that does not meet the forest definition at planting start), IFM (managed forest that will continue to be managed and timber may be harvested in a sustainable manner – this category also includes forest restoration) and conservation (planning and maintaining forests for the benefit and sustainability of future generation while no harvesting is allowed

Pools

Forest activities have an impact on specific carbon pools such as above-ground biomass (AGB), below-ground biomass (BGB), litter (LI), dead wood (DW), soil organic carbon (SOC) and harvested wood products (HWP) and thus all changes within these pools caused by an activity need to be monitored. All major carbon standards (CDM, Gold Standard, VCS, etc.) and national programmers (FCPF, UNFCCC, etc.) allow the omission of a pool for a specific activity if transparent and verifiable information is provided that demonstrates that the pool is insignificant. Definition and sources of above pools can be found in Table 1 below.

Table 1: Forest carbon pool definitions and sources

Term	Abbreviation	Source	Definition	Comments
Above Ground Biomass	AGB	IPCC 2006 GL FRA 2005	All living biomass above the soil including stem, stump, branches, bark, seeds, and foliage. Also includes trees, shrubs, and herbaceous vegetation.	Where the forest understory is a relatively small component of the above-ground biomass, it is acceptable to exclude it, provided this is done in a consistent manner throughout the inventory time series.
Below Ground Biomass	BGB	IPCC 2006 GL FRA 2005	All living biomass of live roots. Fine roots of less than	May include the below-ground part of the stump.

Term	Abbreviation	Source	Definition	Comments
			(suggested) 2mm diameter are sometimes excluded because these often cannot be distinguished empirically from soil organic matter or litter.	Turkey may use another threshold value than 2 mm for fine roots, but in such a case the threshold value used must be documented.
Deadwood	DW	IPCC 2006 GL	Includes volume of all non-living wood not contained in the litter, either standing, lying on the ground, or in the soil. Dead wood includes wood lying on the surface, dead roots, and stumps larger than or equal to 10 cm in diameter or any other diameter used by the country. Includes dead roots to usually 2mm diameter. Includes dead roots to usually 2mm diameter.	
Harvested Wood Products	HWP	IPCC good practice guidance (2003) VCS VMD0026 Version 1.0 VCS MODULE VMD002 6	include wood and paper products such as furniture, construction material, plywood, wood-based panels, and paper from harvested forests within the country	All standards and methodologies consider wood products with a lifetime longer than 100 years as permanently stored HWP does not include carbon in short-lived products, wood waste from production of long-lived products, harvested trees that are left at harvest sites or products made from imported wood
Litter	LI	IPCC, 2006	Includes all non-living biomass with a diameter less than a minimum diameter chosen by the country (for example 10 cm), lying dead, in various states of decomposition above the mineral or organic soil. This includes litter, fumic, and humic layers. Live fine roots (of less than the suggested	

Term	Abbreviation	Source	Definition	Comments
			diameter limit for below-ground biomass) are included in litter where they cannot be distinguished from it empirically.	
Soil Organic Carbon	SOC	IPCC 2006	Organic carbon in mineral soils to a specific depth chosen also including live and dead fine roots within the soil	

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Green House Gases (GHGs)

Land use and management influence a variety of ecosystem processes that affect greenhouse gas fluxes such as photosynthesis, respiration, decomposition, nitrification/denitrification, enteric fermentation, and combustion. These processes involve transformations of carbon and nitrogen that are driven by the biological (activity of microorganisms, plants, and animals) and physical processes (combustion, leaching, and run-off).

The key greenhouse gases of concern from forest activities are CO_2, N_2O and CH_4. CO_2 fluxes between the atmosphere and ecosystems are primarily controlled by uptake through plant photosynthesis and releases via respiration, decomposition, and combustion of organic matter. N_2O is primarily emitted from ecosystems as a by-product of nitrification and denitrification, while CH_4 is emitted through Methanogenesis under anaerobic conditions in soils and manure storage, through enteric fermentation, and during incomplete combustion while burning organic matter.

Generally, two approaches are possible: either all above listed GHGs are recorded per activity and pool (if applicable and significant), which requires significant efforts, or more pragmatically only CO_2 is recorded, and defaults are deducted from overall carbon stock for every below listed activity if such techniques are used in a specific area:

- Site preparation (burning of biomass: carbon stock =-10%)
- Nitrogen fertilizer: 0.005 tCO_2 per kg of nitrogen (N) fertilizer shall be deducted
- Emissions caused on N fixing species may be conservatively assumed to be zero
- Non-CO_2 emissions caused by fossil fuel from project activities (flight, management, etc) assumed to be zero.

In the following, generally the latter more pragmatic approach is suggested, except for IFM activity “avoided forest degradation through fire management” where CH_4 emissions are significant.

4.2 Mitigation

An MRV system's quality is driven the by the underlying data and models. And while a lot of focus often goes towards well-structured and nice-looking reports, key to a good system is getting the right data and getting it sustainably. The MRV system also needs to be able to accommodate changes in data sources and data structure. A generally applicable set of requirements for data sources, handling and processing thus helps ensure that the quality of the MRV system is maintained over time: The proposed data follow within the LULUCF sector is described in the chart below.

GHG Gases

Land use and management influence a variety of ecosystem processes that affect greenhouse gas fluxes such as photosynthesis, respiration, decomposition, nitrification/denitrification, enteric fermentation, and combustion. These processes involve transformations of carbon and nitrogen that are driven by the biological (activity of microorganisms, plants, and animals) and physical processes (combustion, leaching, and run-off).

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Chapter Five – Coordination, Systems and Tools

5.0 Overview

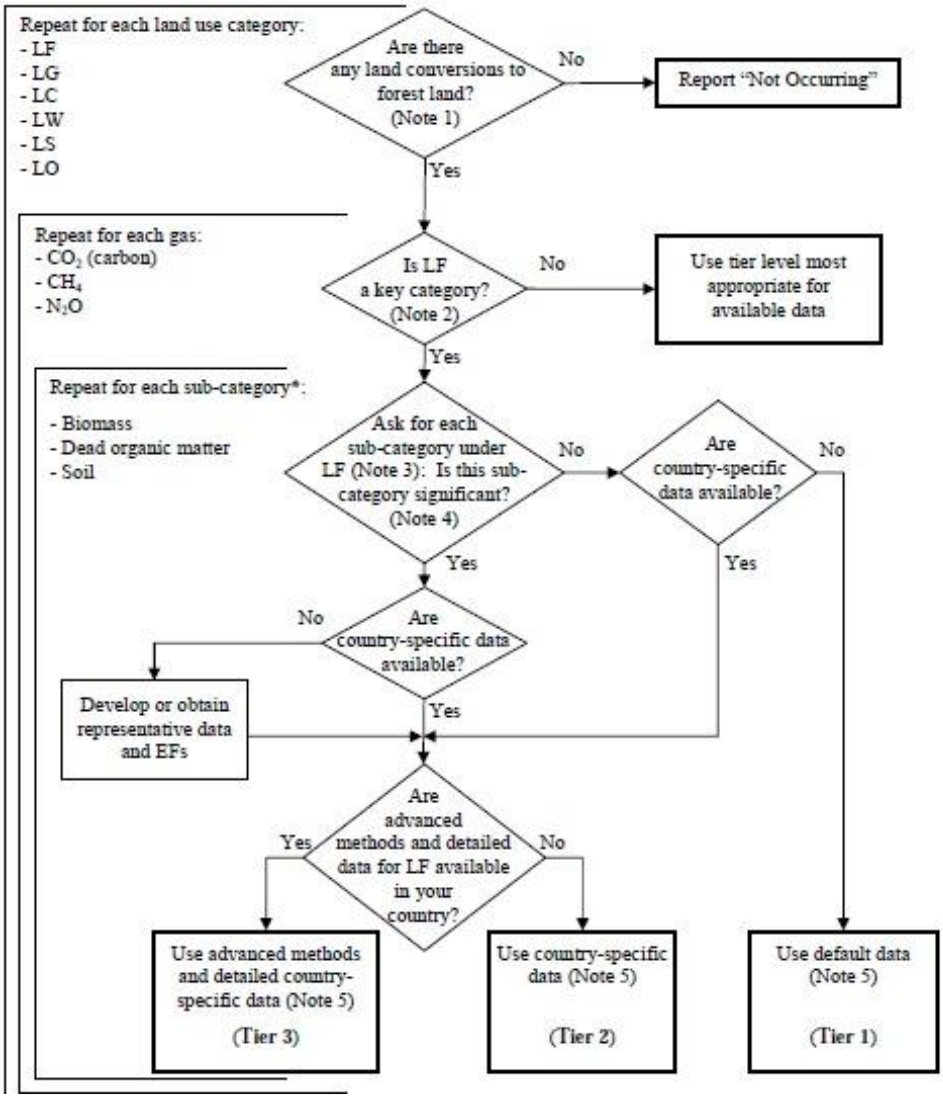
Coordination, systems, and tools are important for the smooth functioning of the LULUCF transparency system. The activities include managing the collection of activity data, analysis, QA/QC, summarizing and archiving of data. Institutional arrangements need to provide for the development and maintenance of work-plans, engagement tools, databases, data analyses, indicators, and reports. Effective coordination, systems and tools ensure that the team of national sector experts can harness and access the organic data from the field, manage the data flow, perform QA/QC and produce timely outputs of a sufficient quality that improves over time as it vertically progresses, like capillary action, in the "Inverted T" or "Reverse Waterfall" column from the data providers at the base to the UNFCCC at the apex. These national sector experts will also facilitate the engagement of a wide range of stakeholders who provide data and make use of the outputs.

The LULUCF sector is an emerging sector with no clearly defined data management and reporting process. The delivery of this project placed a high priority on bringing clarity on the proposed roles of identified institutions and how they can build on the REDD++ project experience to develop an efficient data management and reporting system within the sector. This is the reason for the proposal here that the Federal Department of Forestry should take the lead role as the LULUCF sector Coordinating Entity.

5.1 GHG Inventory

The activity data in the LULUCF sector are defined using the IPCC guideline which provided land classification approach, carbon stock calculations, carbon flux estimation methodology, quality control and quality assurance (QA/QC), the whole gamut of which are captured in the "Decision Tree" below

Figure 4: Decision Tree for Selection of Tier



The Table 2 below describes the datasets required and possible source of the activity data.

Table 2: Datasets Requirements and Sources of Activity Data

Dataset Information	Description
Category	Forest Land
Definition	The annual net CO_2 emissions/removals from Forest Land consist of the net carbon stock gain/loss in the living biomass pool (aboveground and belowground biomass) associated with Forest and Net Forest Conversion.
Methodology	The net CO2 emissions/removals from Forest Land consist of the net carbon stock change in the living biomass pool (aboveground and belowground) associated with: i) Forest, referring to C stock changes occurring on Forest Land in the reported year; and ii) Net Forest conversion from Forest Land to other land uses. The FAOSTAT data are computed at Tier 1, with the stock difference method, following the criteria established in IPCC 2006, Vol. 4, Chapters 2 and 4. The net CO2 emissions/removals (E/R) are estimated at country level, using the formula

Dataset Information	Description
	E/R = A * CSCF * -44/12 / 1,000 Where: • E/R = Net CO2 emission/removal, in Gg CO2 yr-1; • A = Activity data, representing the forest area under forest management or the forest area net change, in ha; • CSCF = per-hectare carbon stock change in the living biomass pool (aboveground + belowground) of forest land, expressed in units of t C/ha;
Category	**Cropland**
Definition	Greenhouse gas (GHG) emissions data from cropland are currently limited to emissions from cropland organic soils. They are associated with carbon losses from drained Histosols under cropland.
Methodology	GHG emissions data from cropland are currently limited to emissions from cultivated organic soils. They are associated with carbon losses from drained organic soils. The FAOSTAT data are computed at Tier 1, following the criteria established in IPCC, 2006, Vol. 4, Chapter. 5. The emissions are estimated at the pixel level, using the formula *Emission = A * EF* where • *Emission* = Annual emissions, in units of tonnes C yr-1; • *A* = Activity data, representing the annual area of cultivated organic soils, in hectares (1). • *EF* = Tier 1, default IPCC emission factors, expressed in units of tonnes C ha-1. The data are obtained through the stratification of two different global datasets. The Harmonized World Soil Database (FAO *et al.*, 2012), used to estimate the area covered by Histosols classes.
Category	**Grassland**
Definition	Greenhouse gas (GHG) emissions data from grassland are currently limited to emissions from grassland organic soils. They are associated with carbon losses from drained Histosols under grassland.
Methodology	GHG emissions data from grassland are currently limited to emissions from grassland organic soils. They are associated with carbon losses from drained organic soils. The FAOSTAT data are computed at Tier 1, following the criteria established in IPCC, 2006, Vol. 4, Chapter. 6. The emissions are estimated at pixel level, using the formula *Emission = A * EF* where • *Emission* = Annual emissions, in units of tonnes C yr-1; • *A* = Activity data, representing the annual area of grassland organic soils, in hectares. • *EF* = Tier 1, default IPCC emission factors, expressed in units of tonnes C ha. The data are obtained through the stratification of two different global data sets: the Harmonized World Soil Database (FAO *et al.*, 2012), used to estimate the area covered by Histosols classes, and the Global Land Cover dataset, GLC2000 (EU-JRC, 2003), used to estimate the amount of cropland and grassland area in each pixel

Quality Assurance and Quality Control

It is good practice to implement quality control checks as outlined in the 2006 IPCC Guidelines. Additional quality control checks and quality assurance procedures may also be applicable, particularly if higher-tier methods are used to estimate carbon stock changes and non-CO_2 GHG emissions.

Whilst Quality Control (QC) is a system of routine technical activities to assess and maintain the quality of the inventory as it is being compiled and it is performed by personnel compiling the inventory,
Quality Assurance (QA) is a planned system of review procedures conducted by personnel not directly involved in the inventory compilation/development process.

Verification refers specifically to those methods that are external to the inventory and apply independent data, including comparisons with inventory estimates made by other bodies or through alternative methods. Verification activities may be constituents of both QA and QC.

Some important issues are highlighted and summarized below.

- When compiling data for the LULUCF sector, it is good practice to cross-check estimates of GHG emissions and removals against independent estimates. For instance, it is good practice that the inventory compilers:
- Cross-reference aggregated production data (e.g. crop yield, tree growth) and reported area statistics with national totals or other sources of national data (e.g. agriculture / forestry statistics);
- Calculate implied emission/removal factors.
- Compare implied emissions/removals factors and other parameters with default values and data from other countries.
- Compare results, for each approach adopted for data collection activity, especially if generated from two different sources, such as national statistical data (NBS) versus remote sensing source (NASRDA) or two different remote sensing sources (Surveyor Generals Office), or two methods (gain-loss and stock-difference method).

It is also good practice to check that the sum of the disaggregated areas used to estimate the various emissions/removals equals the total area under the activity

Verification

It is also good practice to develop verification activities as part of the overall QA/QC process.
The following checklist can be adopted

- Compare activity data and/or emission factors and implied emission factors of the estimate with independent international databases and/or equivalent elements of estimates of other countries. For example, compare Biomass Expansion Factors of similar species with data from countries with similar forest conditions.
- Compare the estimate with results calculated using another tier methodology, including the IPCC defaults
- Compare uncertainty estimates with uncertainty reported in the literature, from other countries and the IPCC default values
- Carry out direct measurements (such as time series of local forest inventory, detailed growth measurements and/or ecosystem fluxes of GHGs.

Considering resource limitation, the information to be provided in the LULUCF Inventory Report should be verified as far as possible, particularly for Key Categories.

5.2 Mitigation

Adaptation and mitigation are the two main responses to climate change in the LULUCF sector. They are two sides of the same coin: mitigation addresses the causes of climate change and adaptation addresses its impacts.

In the forest sector, adaptation encompasses changes in management practices designed to decrease the vulnerability of forests to climate change and interventions intended to reduce the vulnerability of people to climate change.

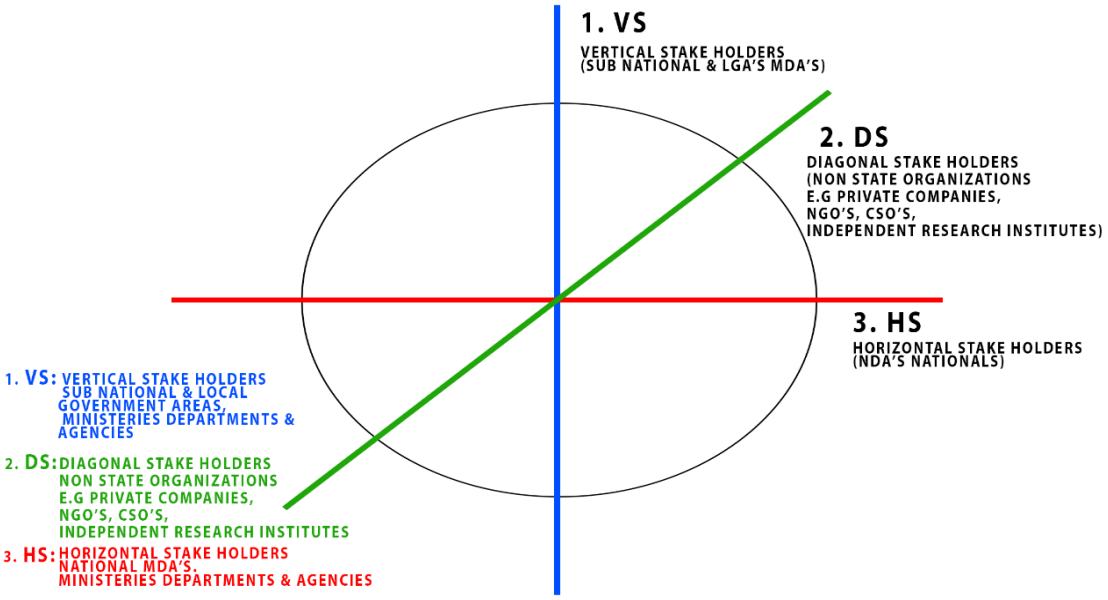
Mitigation strategies in the forest sector can be grouped into four main categories: reducing emissions from deforestation; reducing emissions from forest degradation; enhancing forest carbon sinks; and product substitution. Substitution comprises the use of wood instead of fossil fuels for energy and the use of wood fiber in place of materials such as cement, steel and aluminum, the production of which involve the emission of large quantities of greenhouse gases. National projects need to be tracked and measured to ensure transparency.

Chapter Six – Stakeholder's Engagement

6.0 Overview

Based on the existing institutional arrangement stakeholders, there was a stakeholder analysis that mapped and identified horizontal -Federal/National MDAs, vertical -Sub-National and Local Government Areas (LGAs) MDAs, and diagonal-Non-State organizations -Independent research institutes, NGOs, Private sectors, CSOs and development partners as the stakeholders responsible for generating, collecting and collating data required for the delivery of the Sectoral LULUCF MRV System in particular and meeting Nigeria's National reporting obligations to the UNFCCC in the post-Paris Agreement era in general. These are illustrated in the diagram below:

Figure 5: Full-spectrum, Broad-Based Stakeholder Mapping



Source: (Ijeoma, S.I; 2019[1])

This review also benefited from further consideration of the stakeholders of the dysfunctional data collection ecosystem impact on most of the stakeholders as well as what the roles and interests of these different stakeholders might be in addressing the observed structural challenges, plugging the embedded statistical gaps, and abating likely reputational deficits.

Collecting data and making use of the outputs requires strategic stakeholder engagement plan. The greater the engagement the better (and more useful) the transparency system will be for evidence-based decision-making and the production of reports.

Strong stakeholder engagement ensures that the transparency system reaches a broad range of stakeholders, including those from national government, local government, the private sector, academia,

[1] Unpublished proposal titled *"Enhancing Structural, Statistical and Reputational Integrity of Nigeria's Energy and Environment Data Management Ecosystem in Pursuit of Meeting Nigeria's Obligations to the United Nations Framework Convention on Climate Change [UNFCCC] via Biennial Update Reports [BURs], National Communications [NCs] and Nationally Determined Contributions [NDCs] in the Post-Paris Climate Change Agreement Era"* developed and submitted to *The Partnership in Statistics for Development in the 21st Century (PARIS21) 2020 Trust Initiative* Call for Proposal by Stanley Ijeoma on January 30, 2020.

NGOs, the media and the public, so that data can be gathered from the most reliable and relevant sources and the outputs can inform their decision-making processes. Engagement should include stakeholders involved in the implementation of action, provision of data and advice on understanding the data. This Stakeholder Engagement Plan (SEP) will be based on the guiding principles below:

- Ownership by all the concerned stakeholders required for operationalizing the LULUCF sectoral MRV framework, which will be ensured via a multi-stakeholder and consultative process.
- Promote the culture of sharing responsibilities as well as accountability by all the stakeholders in the LULUCF ecosystem based on their unique roles and mandates.
- Stakeholder engagement will be an ongoing process with follow up, continuous update and regular assessment of progress.
- Promotion of an inclusive, broad based and gender sensitivity in its functioning.
- Minimize and/or eliminate any conflict of interest of stakeholders in the LULUCF MRV process.

Table 3: Major Stakeholders and Responsibilities in the LULUCF Sector

Stakeholders	Responsibilities
Department of Climate Change (DCC)	National Focal Point and MRV coordinating entity
Federal Department of Forestry	Propose policies, to oversee forestry administration nationwide, and to coordinate forestry development
State Departments of Forestry	State forestry departments deal with the management, development and protection and conservation of forest resources
Forestry Research Institute (FRIN)	The FRIN has a mandate to conduct research into all aspects of forestry, forest products utilization, wildlife, watershed management, and agro-forestry.
National Space Research and Development Agency (NASRDA)	Satellite imagery production, geospatial data collection and analyses.
National Bureau of statistics (NBS)	National Agency responsible for the development and management of official statistics, the authoritative source and custodian of official statistics in Nigeria.
National Population Commission (NPoPC)	undertake periodic enumeration of population via sample surveys, censuses and provide data on population for the purpose of sustainable development planning
Office of the Surveyor-General of the Federation	Mandated to provide adequate geo-spatial and comprehensive mapping information for all sectors of the economy and all sections of Nigeria.
National LULUCF Experts and Technical Working Group (TWG)	Essential extra-institutional, non-state actors with relevant requisite expertise that will be empaneled and assigned defined roles/responsibilities in the proposed data sharing legislation, MOUs, and Agreements to ensure high quality data processing, management and reporting outcomes. This is a value-adding novelty that fits into the innovative "Inverted T" or "Reversed Waterfall" institutional arrangement.

6.1 GHG Inventory

Activity participation of key stakeholders is needed for the successful operation of the LULUCF MRV process. A formal technical working group will be established to provide input and play QC/QA role for data collected, and stepdown of methodologies, and endorsement of project outputs. The TWG will represent the government, private sectors, academia, civil society to provide guidance and technical advice to the MRV process.

Letters of Agreements, binding documents on implementation of concrete activities/sub-activities will be signed with individual responsible parties that will create a legal basis for participation of selected government authorities in inventory activities. Other key means for stakeholder engagement will be working group meetings, stakeholder workshops, trainings/Training of Trainers, information and promo campaigns, media and various networking events (e.g. community forums), internet and Facebook communications/forums.

6.2 Mitigation

Stakeholder engagement is an essential component of most policy or planning processes. This is surely true for mitigation and adaptation, considering its cross-cutting and cross-sectoral nature. Engaging stakeholders in the adaptation processes holds a great value in providing an opportunity for learning about the climate change, the MRV process and about the need for climate action and tracking. Participating in the development of adaptation plans, or climate action plans and projects helps create a climate-literate community ready to face demanding challenges that the climate change is posing to the entire society. Adaptation is of interest to a wide range of stakeholders, which are expected to participate in the co-generation of the needed knowledge and of the decisions to be taken along the entire process. Stakeholder engagement plays an important role for all of the adaptation steps. However, there is a clear need to focus the contribution of stakeholders, in particular to get the most benefit from the engagement process. Stakeholder participation needs to be organized and should be entrusted to communication and mediation experts. A well-designed engagement process is expected to pay attention to transparency, open communication, trust and relationships, clear identification of roles and responsibilities, and commitment of all participants

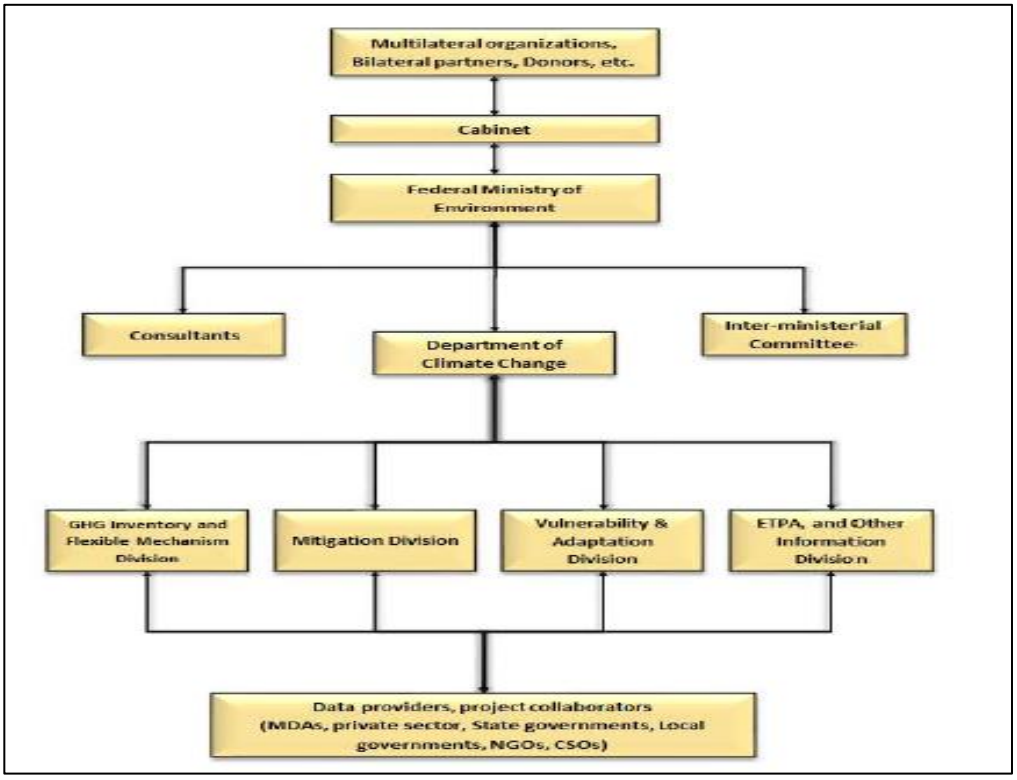
Letters of Agreements, binding documents on implementation of concrete activities/sub-activities will be signed with individual responsible parties that will create a legal basis for participation of selected government authorities in inventory activities. Other key means for stakeholder engagement will be working group meetings, stakeholder workshops, trainings/Training of Trainers, information and promo campaigns, media and various networking events (e.g. community forums), internet and Facebook communications/forums.

Chapter Seven – Institutional Arrangements

7.0 Organizational Structure of Institutional Arrangements

Structuring institutional arrangements helps to define coherent roles and responsibilities among the involved organizations. Describing the structure of the institutional arrangements in an organization chart offers a visual summary of the organizational linkages. This offers a generic structure that can be adapted to specific national circumstances. The structure reflects the cross-cutting nature of managing the gathering, analysis, compilation, reporting and use of data across the different transparency themes. There are common roles and responsibilities, practices and procedures. Clarifying the organizational structure and defining the roles and responsibilities in this way can help formalize and communicate the functional position of organizations within the transparency system. An informative diagram of organizational structure could also include organization names and link to a more detailed table highlighting specific roles and responsibilities.

Figure 6: Current Institutional Arrangement



Source: Nigeria's Third National Communication 2020

The Nigerian LULUCF MRV sectoral framework was developed following continuous stakeholder engagement, assessment of various institutions with related mandate, roles, and responsibility. This enabled the team to evaluate various models of institutional arrangements using the subsisting national circumstance, review of the basic requirements and/or pathway for natural data flow and consideration of the appropriate institutional arrangements that fits the emerging enhanced transparency framework and biennial transparency reporting obligations under the Paris Agreement.

Basic Characteristics and Principles

It has been possible to identify some common requirements, characteristics, attributes, and stakeholder expectations by observing the LULUCF MRV system development efforts in other countries. These are described below. The LULUCF MRV as part of the National Reporting will be used to:

- To meet international treaty obligations such as UNFCCC
- Support Nigeria's position in the international negotiations
- Provide information for domestic policy
- Provide monitoring capabilities (of emissions and removals)
- Provide the scientific and technical basis to negotiations
- Predict future GHG emissions and removals
- Provide the capacity for credible Reference Emission Level
- To improve national Reporting on GHG to UNFCCC

Characteristics of the custodian institution for the LULUCF MRV may include:

- Transparent, including the publication and availability of data, tools, and results
- Able to undertake or supervise Quality Assurance, Quality Control, and peer review
- Has capacity to outsource
- Stable and reliable with long term future in government
- Capable of compiling and finalizing LULUCF MRV outputs to standards and in formats as required
- Can support the Verification and Validation of the outputs by UNFCCC auditors and others
- Can manage the continual improvement of the system

Attributes of the host institution for the LULUCF MRV may include that it:

- Be an institution with ability (mandate?) to coordinate the development and updating of national reporting
- Be an institution with a credible governance structure
- Government and non-government stakeholders will have confidence.
- Be competent and credible, with the capacity to respond to the needs of global
- funding mechanisms
- Should have capacity to work with centers of expertise and specialization

Other Key Stakeholder Expectation:

- Government expects stability, reliability, robustness, policy and political relevance, cost effectiveness
- International community expects consistency, transparency, familiarity and good practice
- Individuals may require accessibility, use of current technology and of good science

Taken in combination these principles and characteristics provided a means to assess the suitability for roles and responsibilities of the candidate institutions considered in the development of the institutional arrangement.

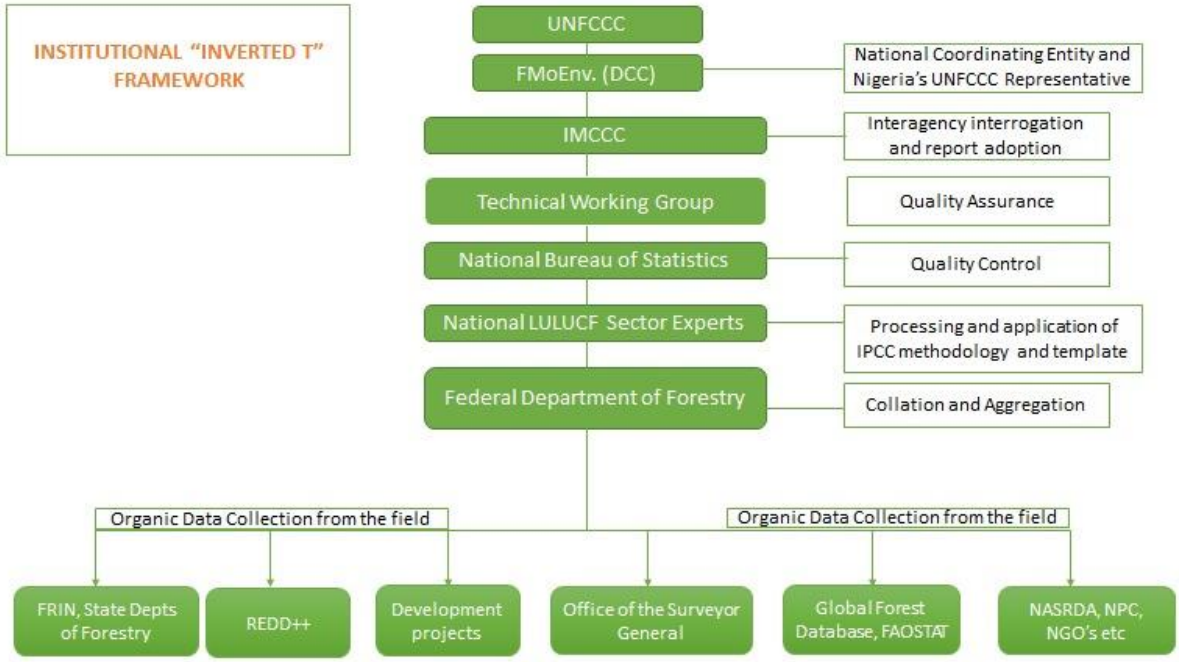
7.1 Organizational Structure of Institutional Arrangements

It should be noted that at the time of preparing this report, there does not yet seem to be an existing structure/framework put in place for the LULUCF sectoral MRV system in a clear, concise, and deliberate form. As observed from other country reports, the focus has on only the forest and forest resources and consequently forest related agencies take the lead but most times overlooking the requirements for all lands and pools to be evaluated in the national accounts. The team working on the sectoral framework is familiar with the requirements and on that understanding is proposing an institutional setup to provide a starting point for discussion among the identified key stakeholders and address in the first instance the key role of the Federal Department of Forestry and other related institutions.

It is a truism that everything rises and falls on leadership. The same can be extrapolated to MRV system setup and implementation: MRV implementation at all levels rises and falls on institutional framework. In this context, institutional framework represents the political, administrative, and technical leadership. The presence of a robust institutional framework is a key requirement for effective implementation of MRV system at every level of MRV interrogation, especially in a developing country like Nigeria.

For effective implementation of a robust MRV regime for the LULUCF in Nigeria in the post-Paris Agreement era, the following schematic represents the proposed institutional framework.

Figure 7: Institutional "Inverted T" or "Reversed Waterfall" Framework showing Institutional Arrangements



Structure, Form and Functionality.

The proposed institutional framework mimics an "inverted T" or "Reverse Waterfall" which is strategic from a project management perspective to enable optimization of the use of resources and time as well as mainstream efficiency and effectiveness in implementation. The lean, simple structural design can be visualized as a "Reverse Waterfall" under the influence of a capillary force sucking the water (raw data) up from the pool (data collectors) at the base to the UNFCCC at the apex. Between the data collectors at

the base and UNFCCC at the top are carefully selected entities calibrated into a vertical column with each step of responsibility and duty reinforcing the next steps with a view to address pre-existing structural challenges and gaps holistically and sustainably in the MRV governance and climate data management ecosystem by deploying project management best practices, conventions, and techniques that are considered the industry standard.

The "Inverted T" or "Reverse Waterfall" structure of the institutional arrangement encapsulate an inbuilt analytical approach that will be deployed for the planning, execution, monitoring, reporting and verification as well as sustainability of this MRV system setup project. The Logical Framework Approach (LFA) which could be seen below refined into a standard comprehensive 4x4 (16) Logical Framework Matrix will help in designing and planning data gathering and quality control templates that cover in-depth problem (cause and effect), stakeholder, objectives, and strategies (alternatives) analyses.

Before the design of this proposed institutional arrangement intervention, there was structured analyses of the existing situation and state of play (status quo), stakeholders relevant to addressing the issues, objectives of our proposed project interventions and strategies as well as alternatives to addressing structural challenges, plugging statistical gaps, and reducing reputational deficits associated with Nigeria's climate change data management ecosystem.

All of these pointed to the need for a simple, mutually-reinforcing, design that that flows horizontally at the base to capture data which is then sucked up vertically to be aggregated by the Department of Forestry of the Federal Ministry of Environment who maintains an active, kinetic interface with both the data providers under and national LULUCF experts above them.

After the aggregation of the datasets, the process moves up a notch where the national LULUCF experts start dimensioning and processing the data using the approved methodologies and templates. This happens while they maintain active, kinetic interface with the National Bureau of Statistics (NBS) above and Department of Forestry below them. The existence of an active, seamless interface means kinetic interactions and inputs of contiguous institutions are achieved leading to improved outcomes as the process moves up towards the UNFCCC.

After the dimensioning and processing phase, the datasets move up a notch for quality control which the NBS has the responsibility to deliver with the assistance of the National LULUCF Experts below and Technical Working Group above them.

After the QA duty of the NBS, the process advances to the Technical Working Group (TWG) for quality assurance after which it moves up to the Inter-Ministerial Committee on Climate Change (IMCCC) which serves to interrogate the datasets and then adopts the Draft National MRV Report after being satisfied that it captures all the country's climate change dimensions and dynamics. The adopted Final National MRV Report moves up to the next step where the Federal Ministry of Environment via the Department of Climate Change as National Focal Point takes possession of it and deploys its internal mechanism to align and/or or improve the report after which the DCC submits Nigeria's National MRV Report to the UNFCCC

and if required, the DCC will defend the Report on behalf of Nigeria with support of the Department of Forestry, National LULUCF Experts and the TWG as may be necessary.

Effective coordination, robust systems and innovative tools will ensure that the team of national LULUCF sector experts can harness and access the organic data from the field, manage the data flow, perform QA/QC and produce timely outputs of sufficient quality that improves over time as it vertically progresses, under the influence of capillary forces, in the "Inverted T" or "Reverse Waterfall" column from the data providers at the base to the UNFCCC at the apex. The duty of the national LULUCF sector experts in facilitating continuous engagements and interaction with and/or among a wide range of stakeholders who provide data and make use of the outputs continues until the next reporting cycle to ensure reporting consistency, transparency, and sustainability.

National Focal Point

The DCC is the lead Agency responsible for implementing and reporting climate action. The DCC comprises four divisions comprising GHG and Flexible Mechanism division, Vulnerability and Adaptation division, Mitigation division, as well as Education, Training, Public Awareness, and other information division coordinating activities within various components (DCC, 2021). The DCC also convenes and chairs the ICCC. The DCC as the national focal point will coordinate the activities needed to ensure that outputs are prepared and are of sufficient quality to meet the country's commitments.

Technical Working Group

A technical working group will be created for the LULUCF sector (carefully selected representatives of public sector MDAs, the private sector, NGOs, CSOs, etc who are relevant to the LULUCF sector) to provide a forum for collaboration around climate action, including monitoring challenges and proffering actionable solutions.

Management and Coordination

It is important that there be designated entities to coordinate and manage the MRV process. The Federal Department of Forestry working in collaboration with the national LULUCF experts have been identified as the key entities to coordinate data collection, tracking MRV improvement plans, facilitating legal arrangements and data supply agreements, day-to-day maintenance of data management systems and ensuring inter agency collaboration. They will also play key roles in facilitating the top-down finance support leading to improved MRV outcomes.

Data Providers

Data providers were identified and classified during the broad-spectrum stakeholder mapping conducted at the beginning of the project. It is established that to have a sustainable MRV system, there is need for consistent and continuous flow of data that supports the calculations and analyses required to inform decision-making and reporting on climate action and support. The data comes from a variety of sources, including national government departments and National Bureau of Statistics, Subnational governments, private sector organizations, academia, and NGOs. The list of data providers is organic in nature and will be updated from time to time. Some identified data providers include:

- State Departments of Forestry
- Office of the Surveyor-General
- National Space Research and Development Agency (NASRDA)
- National Population Commission (NPoPC)
- The REDD++ Project Office
- Forestry Research Institute
- Other international data bases like FAOSTAT, Global Forest Database etc

Establishing Legal Framework

Clear mandates backed with legal backing must be built into the institutional arrangement to ensure an efficient, sustainable, and robust MRV system for the LULUCF sector. It is established that these legal instruments are not yet in place; therefore, there is a need to establish the framework to operationalize the institutional arrangement. These frameworks formalize the new roles, responsibilities, resources, and relationships needed to deliver the transparency system outputs. In other agencies where some of the legal frameworks are in existence, such as data collection mandate of the NBS or Inventory compilation and reporting mandate of DCC; there is still need to update the mandates to reflect the proposed institutional arrangement and ensure sufficient data and resources are available to establish a fully functioning transparency system and that can deliver its mandated outputs. Such changes to the legal framework can include, but are not limited to:

- New laws and by-laws.
- The expansion of existing organizational mandates (e.g. on environmental data gathering and reporting);
- Well-structured service and framework contracts and/or MOUs.
- New DSAs.

Chapter Eight – Work Plan and Roadmap

8.1 Work Plan

The core objective of the transparency system to ensure countries meet their reporting obligations using the required format and timeline. There is need to have a robust work plan aligned with the BTR (2 years' timeline) which can feed the National communication (4 years' timeline). The work plan is intended to guide key decision makers at various levels and stages of inventory development. Table 4 below captures the proposed work plan adopted from the recommended inventory phases and activities.

Table 4: Proposed Schedule of Inventory Work Plan

Inventory States	Tasks and Deliverables	Completed Deadlines	Responsible Entity	Next Inventory Priority[2]
Planning stage	Review of preview estimates, procedures, feedback from ICA, comments from informal technical review, and list of planned improvement	Q1	DCC and FDoF	Very High
	Establish Inventory protocols. The protocol will contain instructions and procedures for preparing the inventory.		DCC and FDoF	High
	Validate and distribute protocols/instruction manuals to the teams and actors in the inventory.		DCC and FDoF	High
	Identify and form inventory-working groups for the inventory sectors and cross-cutting issues.		DCC and FDoF	Low
	Formulate and sign MOU among inventory institutions. The MOU defines specific functions of inventory institutions relating to estimation etc.		DCC and FDoF	Very High
	Organize a maiden meeting of the working group	Q2	DCC and FDoF	High
	Training for inventory teams to ensure readiness and distribute overall and sector inventory instructions, provide relevant training to teams.		DCC and FDoF	Medium
	Organize kick-off meeting.		DCC and FDoF	High
Preparation Stage	Identification and review of data sources including choices of data, methodologies, and software.	Q2	DCC and FDoF	Very High
	Data request, data review, evaluation, and documentation		DCC and FDoF	Very High

[2] Priority attention in terms of allocation of time and financial resources as well as adhering to strict timelines will be given to activities rated as High and Very High in the inventory cycle. This is because, these activities will support efficient delivery of the inventory.

Inventory States	Tasks and Deliverables	Completed Deadlines	Responsible Entity	Next Inventory Priority[2]
	Data request, data review, evaluation, and documentation		DCC and FDoF	Low
	Review performance of GHG online database and where necessary making changes to work efficiently.		DCC and FDoF	Medium
	Review performance of data storage server and where possible making necessary corrections		DCC and FDoF	Medium
	1st Quarter review meeting	Q2	DCC and FDoF	Low
	GHG estimation. Worksheets and text files for each source/removal due each entity	Q3 to Q5	DCC and FDoF	Very High
	All sector worksheets and documentations submitted national inventory compiler	Q6	DCC and FDoF	High
	Compile zero order draft of composite inventory and submit to inventory coordinator	Q6	DCC and FDoF	High
Management Stage	Distribute zero-order drafts for internal review and submit a comment to inventory compiler	Q6	DCC and FDoF	Medium
	Distribute source files (worksheets) and internal review to lead institutions	Q6	DCC and FDoF	Medium
	Incorporate internal comments, observations, and corrections	Q6	DCC and FDoF	High
	Collect uncertainty values from sectors and quantify uncertainty for the overall inventory.	Q6	DCC and FDoF	Very High
	Compile second order draft of inventory and revise worksheets	Q6	DCC and FDoF	High
	Compile second order draft of composite inventory, source files and submission to inventory compiler and external reviewers (QA)	Q6	DCC and FDoF	High
	External review of second order inventory (QA)	Q7	DCC and FDoF	High
	Comments to Inventory Compiler		DCC and FDo F	Medium
	2nd Quarter review meeting	Q6	DCC and FDoF	High
	Incorporate external comments and revise worksheets for all sectors	Q7	DCC and FDoF	Medium
Compilation stage	Draft improvement strategy for each sector due inventory compiler	Q7	DCC and FDoF	Medium
	Collect all pertinent paper and electronic source materials for archiving place in	Q8	DCC and FDoF	High

Inventory States	Tasks and Deliverables	Completed Deadlines	Responsible Entity	Next Inventory Priority[2]
	archive due national archiving and documentation institution			
	Compile final Inventory and preparation of key category analysis		DCC and FDoF	High
	Compile inventory improvement strategy due to inventory coordinator		DCC and FDoF	Medium
	Compilation of National Inventory Report (NIR)		DCC and FDoF	Very High
	NIR submitted to National Inventory Entity for incorporation into National Communication and Biennial Update Report		DCC and FDoF	Medium
	Dissemination of NIR – Submission to UNFCCC, inventory is available for public release		DCC and FDoF	High
Technical Review through ICA	DCC Coordinate the technical review process	Q8	DCC and FDoF	High
	Compile all comments, feedback, and planned improvement list	Q8	DCC and FDoF	High

8.2 Roadmap

The proposed work plan activities identified in section 8.1 above reveals the key stages and activities that are strongly recommended to be completed by the end of 2024 to meet the desired reporting requirements and effectively contribute to the implementation of Nigeria's updated NDC while positively reinforcing and adding value to the delivery of Nigeria's third biennial update report (BUR3), fourth national communication (FNC), and the first biennial transparency report (BTR). These present manifold possibilities and opportunities for value-driven impact on national, regional, and global climate change governance ecosystem. This section summarizes key actions and infrastructures that urgently need to be put in place to have a robust, efficient, impactful, and sustainable MRV system for Nigeria.

Table 5: Roadmap for Implementation

S/N	Components	Description of Strongly Recommended Actions to be Taken	Time Schedule
1	Adoption of Improved Institutional Arrangement	Institutional arrangement to be presented at the final project stakeholder workshop	December 2021
	Legislative Framework	Formalize mainstreaming within a legislative framework that updates the mandate of key institutions to empower them for efficient operations	3-6 months (earliest by March 2022 or latest by June 2022)

S/N	Components	Description of Strongly Recommended Actions to be Taken	Time Schedule
2	Development of Legally binding instruments like Data Sharing MOUs and Agreements	DCC in collaboration with Federal Department of Forestry to develop data sharing MOUs and Agreements	3 – 6 months from adoption of the MRV Project report (earliest by March 2022 or latest by June 2022).
3	Adoption of the Work Plan/Road Map as national working tools	Hold a stakeholder workshop and adopt the MRV Inventory work plan, sharing roles and responsibilities.	3 – 6 months from adoption of the MRV Project report (earliest by March 2022 or latest by June 2022).
4	Setup of LULUCF TWG	Commission, convene and formally inaugurate the National LULUCF TWG	3 – 6 months from adoption of the MRV Project report (earliest by March 2022 or latest by June 2022).
5	Setup Key Categories under LULUCF	Setup and adopt nationally appropriate LULUCF key categories to clarify the framework for data collection and processing under key IPCC categories in the LULUCF sector.	6 – 24 months from adoption of the MRV Project report (earliest by June 2022 or latest by December 2023).
6	QA/QC Protocol	Introduce and adopt a nationally appropriate process for quality control (QC) and quality assurance (QA) of all data collected in the sector.	3 – 6 months from adoption of the MRV Project report (earliest by March 2022 or latest by June 2022).
7	Methodology & Guidebook	Adopt methodologies for estimating mitigation and adaptation actions as well as develop a nationally appropriate play book as a guide to clarify and simplify the process.	6 – 24 months from adoption of the MRV Project report (earliest by June 2022 or latest by December 2023) to be improved periodically.
8	Capacity Building	Target-specific investment in certified training and capacity development programs designed to fill the MRV knowledge management and GHGs inventory skill gaps in the sector.	Certified training and capacity building programs to be designed and approved within 3 months (March 2022) and implementation of the first phase of the approved training programs to be implemented 6 – 24 months from adoption of the MRV Project report (earliest by June 2022 or latest by December 2023). This is intended to be a continuous exercise via deliverable of the next phases of the training program.

8.3 Conclusion

The operationalization of the Paris Agreement makes it a necessity for the development of a sectoral framework that feeds and fits into a broader national MRV framework. Anecdotal evidence points to many national legal frameworks lacking laws and measures specifically intended to tackle climate change in the agriculture sectors in general and LULUCF. Target-specific national laws locking-in carefully calibrated institutional frameworks are necessary to support the implementation of national climate change mitigation, adaptation and resilience building policies as well as international commitments on climate change encapsulated in Nigeria's updated NDCs as one of the building blocks of the Paris Climate Change Agreement.

From the perspective of the UN Global Goals' advocacy for the strengthening of the rule of law, and the guarantee of equal access to justice for all, the legislative interventions as well as the institutional framework proposed and highlighted in this LULUCF Sectoral Framework report become critical catalysts for the realization of the transformative objectives of the ICAT Nigeria MRV Systems Setup Project. In this context, robust and appropriately designed, stakeholders-informed, locally responsive, and internationally compliant national legislative and institutional frameworks become veritable vehicles to drive the implementation of Nigeria's commitments in the LULUCF component of her updated NDC as one of the building blocks of the Paris Climate Change Agreement.

Climate change presents multiple challenges that can be mitigated and adapted to via investment in robust MRV governance. The goal of the LULUCF MRV system is to ensure collection and collation of high quality organically, and locally generated data to be deployed for the monitoring, verification and reporting of Nigeria's climate policy, programs and project interventions relating to land-use, land-use change and forestry. This will lead to more high-quality, local data content in Nigeria's UNFCCC reporting obligations, which will translate to Nigeria moving up on the IPCC Methodologies Tiers scale.

The ambitious and simple "inverted T" or "Reversed Waterfall" structure of the institutional framework has been carefully calibrated and proposed as a fine-tuned institutional arrangement that is flexible and transparent with clearly delineated roles and responsibilities for the relevant stakeholders, entities, and MDAs. The idea is to pick up data from the horizontal plane of the "inverted T" or from the pool of a waterfall like a vertical suction pump and feed consistent, uninterrupted organically generated data vertically upwards with quality of data improved with each step of the column until it gets to the UNFCCC at the apex of the "inverted T".

This simplified and mutually reinforcing "Inverted T", or "Reversed Waterfall" institutional arrangement has the potential to transform the implementation of MRV frameworks in Africa and other developing countries with weak governance systems with a win-win outcomes for climate action and sustainable development generally. This is highly and strongly recommended to be adopted as the Overarching National Institutional Arrangement (ONIA) for the LULUCF sector and ICAT Nigeria MRV System Setup project in general.