Final Report on:

I. **Data management needs assessment across the 5 key sectors detailing capacity of the 5 sector hubs to collect, process, and interpret gender disaggregated data.**
II. **Training needs assessment across the 5 key sectors showing skills gaps and current capacity.**
III. **Manual and plan to address the gaps identified during the training and data management needs assessment**

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Compiled by
Sheila Kiconco and
John Begumana

Summited to:
Ministry of Water and Environment (Uganda) and
Conservation International

Executive Summary

Background

The Global Environment Facility (GEF) Secretariat approved a mid-sized project "Strengthening the Capacity of Institutions in Uganda to Comply with the Transparency Requirements of the Paris Agreement". The project is funded through The Capacity Building Initiative for Transparency (CBIT), established at COP 21 to support developing countries to enhance transparency requirements as defined in Article 13 of the Paris agreement in a timely manner. The project is executed by the Ministry of Water and Environment Climate Change Department (CCD MWE) and the Africa Innovations Institute (AfrII) in collaboration with Conservation International/ Vital Signs. It is under CBIT project that this assignment was commissioned by CCD MWE, Conservation International/ Vital Signs and AfrII. The objective of this assignment was to conduct a training needs and data management needs to identify capacity gaps across 5 key emission sectors (Agriculture, Forestry, Waste, Transport, Energy) in collection, processing, transmission and reporting of GHG data in Uganda.

The approach to the assignment was through document review to identify requirements for computing GHG emissions in each sector followed by design of tools for assessing training needs and data management needs. The assignment used stakeholder consultation to validate data and training needs. The stakeholders included; Climate Change Department, Ministry of Energy and Mineral Development, Uganda Bureau of Statistics, National Environment Management Authority (NEMA), Kampala Capital City Authority (KCAA), Ministry of Agriculture Animal Industries and Fisheries (MAAIF), National Water and Sewerage Corporation, National Forest Authority (NFA), Ministry of Works and Transport, Ministry of Lands Housing and Urban Development among others. In total 53 people were consulted as detailed in the list of Participants as attached in Annex 2. A validation meeting was organized to present the draft report and get feedback, contributions and confirmations on the data management needs, training needs and capacity required for each of the sectors. The validation meeting was attended by representatives from all the five key emission sectors (CBIT focal points and gender focal points), members of the CBIT Project Management Unit and Climate Change Department staff. In total 17 members attended the validation meeting.

Data Management Needs for GHG sectors

Assessment for each sector considered minimum data requirements (i.e., Tier 1 of IPCC guidelines) for sector specific GHG emissions computation. The assessments evaluated institutional capacity in data management at three levels of data availability, data collation and processing, and data integration including GHG computation and reporting. Data management needs and capacity gaps for sectors are presented as follows;

i. Energy

State of data: *Electricity Generation and Combined Power and Heat (CHP) generation are the most well documented sub sectors in the Energy Sector. Key data sources on electricity generation are Electricity Regulatory Authority (ERA), Energy balance and energy abstract documents by Ministry of Energy and Mineral Development (MEMD), and Energy Audit Reports by Uganda Bureau of Statistics (UBOS).Data from Combined Power \ Heat (CHP) facilities is synthesized and GHG emission offsets are computed for those facilities that intend to sale Certified Emission Reductions (CERs). Emissions related to fuel combustion are estimated based on fuel type, amount (mass or volume) of fuel consumed and emissions per terajoule (TJ) of unit output though data is not disaggregated to capture fuel type and amount used by each industry sub category. Data on fuel wood and firewood is not captured while data on charcoal production and charcoal use is based on special studies that are updated almost every five years.*

Data availability: *Generally, there are no proper data recording and archiving procedures and methodologies. Data on fuel imports and exports is adequately provided by Ministry of Energy and Mineral Development (MEMD) and Uganda Revenue Authority (URA). However, there is need to monitor in country fuel stock change which is currently not being done and is thus assumed to be zero for purposes of computing the energy sector GHG emissions.*

Collation and processing: *GHG computation is generally missing for all sub sectors. Coordination and structures in the energy sector are generally usable. Structures for data processing are considered present or*

usable in most sub sectors mainly because key personnel have received basic training in GHG data entry to the IPCC 2006 software. At sector level there is coordination, but the structures are not setup (or organized) to make the system functional.

Data integration and reporting: *Linkages to auxiliary data are mostly present and usable to a limited extent. There is limited submission of GHG computations to CCD. This implies data integration and GHG computation at sub sector level is generally unreliable although personnel have been trained to use the GHG software they do not regularly compute GHG.*

Gap Analysis: *The energy sector shows that there is generally good understanding of data requirements (present and usable) however; there is a big gap in data management, analysis, and computation of GHG emission and reporting to CCD. Data synthesis, GHG computation and reporting of emissions to CCD is lacking in all energy sub sectors.*

ii. Transport

State of data: *Data on fuel consumption in the transport subsector needs to be disaggregated for proper attribution and to further account for usage by the civil aviation, land transport and water transport. While data on fuel in the civil aviation industry is available in the energy balance and energy abstracts statistics, data on fleet by road, rail and water transport is insufficient and thus not usable.*

Data availability: *Institutions that collect data on transport (road and rail) are now aware of the data requirements and have started gathering data on fleet by vehicle category. Discussion on how to include key parameters like distance travelled and tonnage, number of passengers are under way. Fuel in the civil aviation industry has got an elaborated data collection system that meets requirement of GHG computation.*

Collation and processing: *Coordination and computation is lacking in all transport sub sectors because of lack of data management systems. Systems for data collection present are to some extent usable and this is attributed to data provided by aviation industry. Systems for management and collection of data are present and usable which is also attributed to the civil aviation industry and system being built by the Ministry of Works and Transport.*

Data integration and reporting: *Linkages to auxiliary data and reporting to CCD is lacking in all transport subsectors. This is attributed to lack of coordination and lack of data management systems described in the previous section.*

Gap Analysis: *Data collection, analysis and reporting in the transport sector is generally not well-developed at all levels. Data synthesis and computation at sub sector level is only possible for the civil aviation where there are mechanisms for data collection.*

iii. Waste

State of data: *There is generally paucity of data on waste generation and waste management in Uganda. Information is partly available fora few waste sub categories like managed waste at disposal sites, solid waste biological treatment sites, and industrial wastewater treatment and discharge.*

Data availability; *In about half of the waste sub categories, information on data sources, frequency of data collection, data sheets, data archiving and methodologies are rated as operational. Close to a quarter of the sub sector's key data availability parameters were considered missing while another quarter was known by the sub sectors but not functional (rated as present).*

Collation and processing: *The waste sub sectors consider coordination and structures as known but not operational (functioning) and usable. Collation and processing is only operational in Clean Development Mechanism (CDM) projects implemented by NEMA.*

Data integration and reporting in waste sector: *In more than half of the waste sub sectors, linkages to auxiliary data and the requirements to report to CCD are known but not practiced (i.e., present). Reporting to CCD is not known and is not done (i.e., missing) in slightly less than a half of the waste subsectors.*

Gap Analysis in Waste Sector: *All the waste sub sectors have good understanding of data requirements (present to usable) however, there is a big gap in data management, analysis, and computation of GHG emissions as well as reporting to CCD.*

iv. Agriculture

State of data: *Estimation of GHG emissions in the agriculture subsectors is data intensive requiring responsible institutions to collect data on an annual basis on livestock, manure management systems,*

fertilizer application (with the associated Nitrogen content), area ofrice cultivated or harvested annually by flood management and agricultural inputs.
Data availability: *Emissions from enteric fermentation of ruminant animals is based on livestock statistics data generated jointly by MAAIF and UBOS. However, the last census was conducted in 2007/8 and statistics in subsequent years are based on projections that assume a certain annual growth rate. Area under rice paddy cultivation is estimated from FAO agricultural statistics.*
Collation and processing: *Coordination is present in most agriculture sub sectors, systems, structures for management of correct data and GHG computations are missing. It is only in a few sub sectors where these systems are usable.*
Data integration and reporting: In *majority of sub sectors, linkages and requirements to report on GHG emissions to CCD are known but not implemented (i.e., present) or are missing. In a few cases they are usable but could be with high uncertainties.*
Gap Analysis: *Agriculture sub sectors lack of adequate systems and structures to collect data, and compute GHG emissions. Systems to estimate emissions that are attributable to livestock, soil management and rice paddy cultivation are just being put in place. Estimations of emissions in the agricultural sub sectors have high uncertainties.*

v. Forestry
State of data: *Estimation of emissions in the forestry subsector is data intensive requiring spatially explicit data on land conversions, biomass stocks, and wood extraction in all land units. The National Forestry Authority (NFA) has a mapping and forest inventory unit that is obligated to continuously provide data on forestry and land use statistics. Emissions due to "wildfires and other disturbances on unmanaged land are not included in the estimates, unless the disturbance caused land-use change".*
Data availability: *NFA has got an elaborate system for collecting and managing data that was updated every five to ten years in the past and is now being updated every two years.*
Collation and processing: *Most aspects of data collation and processing are considered operational. There are however gaps (i.e., missing) in structures and systems for data processing. Coordination is in some instances considered known but not being implemented.*
Data integration and reporting: *The level of data linkages to other auxiliary data like soils, climate and ecological zones in forestry in many instances is considered effective. Reporting to CCD is operational.*
Gap Analysis: *The forestry sector has a highly advanced data collection, analysis and GHG computation system. This is partly attributable to the REDD+ programme. Structures, systems and mechanisms for computations of emissions attributable to land use and land use change are the most advanced. This is mainly due to support received under the REDD+ programme that enabled Uganda to compute GHG emissions attributable to forestry sector.*

Training needs Assessment for GHG Sectors
Assessment of training needs for each sector identified current capacity, gaps and skills. Other areas of assessment considered institutional capacity, human resource, technical capacity and knowledge to understand required activity data, data sources, data sheets/tools used in data collection, data availability and capacity to report. During the assessment training needs for individuals and institutions were identified.

Institutional training needs: *CCD (Enhance their coordination skills, Retooling Course in GHG procedures and QA/QC data entry standardization), Cities /Urban Authorities (training top management on GHG computation concepts and their importance, training of personnel in data management covering conversion factors, emission factors and their application and use of IPCC tools), URA (Training to understand the GHG emissions concepts and their importance), Ministry of Lands, Housing and Urban Development (Need all the trainings as they generally have low capacity in all the areas and at institutional level there is no one in charge of GHG computation and data collection, IPCC tools used for urban sector and tools that can be institutionalized for data collection), National Water and Sewerage Cooperation (understanding of GHG computation concepts and their importance and tools for data collection).Other institutions Include NEMA, Ministry of Works and Transport and MAAIF among others.*

1. ***Energy***

Training on data collection, GHG methodologies, documenting and archiving systems. Support is needed to design a system for data collection, processing and reporting of GHG emissions. Strengthening existing

structures by identifying different individuals with responsibilities at different stages, and job descriptions should be very clear indicating the outputs required at each stage. Special studies to enhance data on charcoal production, firewood and charcoal use. Support to collect data on energy use in manufacturing industries to disaggregate data and to capture fuel type and amount used by each industrial sub category such as documenting data on manufacturing Industries like Iron & Steel. Disaggregating data to capture chemical industry, food processing, mining, wood processing, construction and textile industry.

2. Transport

Training and support to disaggregation of data, GHG emissions computation and enhance coordination. Support to design systems and individual training requirements to enhance data inputting, processing and use of the right data sheets for disaggregating GHG data. Support to collect data regarding types of vehicles, fuel quantities and distance covered by vehicles.

3. Waste

Support to profile waste sector in Uganda. Data collection, GHG methodologies, documenting, archiving, and designing systems and tools to collect data on wastewater generated (m^3) per (t) of industrial products in municipalities. Industrial products from abattoir, alcohol refining, beer &malt, soap and detergents, coffee, dairy products, fish, poultry, organic chemical, plastics and resins, starch production, sugar refining, vegetable oils, vegetable, fruits & juices, wine and Vinegar. Support to collect data on volume and density of the waste, quantities of waste, waste type by composition that is biodegradable and none biodegradable, estimation of project(facility) level emissions for instance Dundu and KCCA.

4. Agriculture

There is need to enhance data collection through documenting GHG methodologies, archiving and support to design data management systems in agriculture. Support agricultural sector to identify different individuals with responsibilities at different stages. Support for enhancing data collection for fertilizer imports\exports, study breed and feed types and data disaggregation, document manure management systems, develop Emission Factors, document annual nitrogen excretion and fractions of that N that volatilizes. Support to collect data on rice –area harvested and planted, categories of rice (low land and upland)rice paddy cultivation. Training on data collection and processing.

5. Forestry

A retooling course on data collection, documenting and archiving, designing systems, and strengthening existing structures should be undertaken. Support to design systems and institutionalize consistence in data collection, integration of wood extraction statistics in the data sheets and data collection structures of forestry. Support strengthening systems to estimate emissions that are attributable to livestock and soil management. Training on how to accurately record land use change especially areas covered by fires, areas planted within and outside central forest reserves.

Manual and plan to address the gaps identified during the training and data management needs assessment for GHG sectors

The main objective of this manual is to guide the implementation of the training needs and data management aspects in a systematic manner. It proposes a mode of delivery of the trainings that range from workshop trainings, field visits, benchmarking visits, on job training, hands on trainings, retreats to enhance institutional development, human resource aspects, online trainings and short courses.

Approach to the plan is stepwise: *To address the identified training gaps and data management needs the approach should be systematic as follows: Step one; Prioritizing training needs and support for capacity enhancement for the 5 sectors. Step two; Writing a concept for each of the prioritized training and capacity support. Step three; Checklists to assess the contribution of the CBIT project to GHG computation. Lastly, Step Four; Enhancing coordination and institutionalization of the training and or capacity support.*

Finally, a detailed Plan with guidance on means of delivery and timelines.

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Acronyms

AD	Activity Data
AFOLU	Agriculture, Forestry and Other Land Uses
AfrII	Africa Innovations Institute
CAA	Civil Aviation Authority
CBIT	Capacity Building Initiative for Transparency
CCD	Climate Change Department
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CHP	Combined Power and Heat
COP	Conference of Parties
DOC	Degradable Organic carbon
ERA	Electricity Regulatory Authority
FAO	Food and Agriculture Organization
FREL	Forest Reference Emission Level
GEF	Global Environment Fund
GHG	Green House Gases
GHGI	Green House Gas Inventory
GIS	Geographical Information System
IPCC	Inter Governmental Panel on Climate Change
KCCA	Kampala Capital City Authority
KWh	Kilo Watt hour
LECB-	Low Carbon Emission Capacity Building Project
LTO	Landing/Taking Off
MAAIF	Ministry of Agriculture Animal Industries and Fisheries
MEMD	Ministry of Energy and Mineral Development
MoFPED	Ministry of Finance Planning and Economic Development
MoWT	Ministry of Works and Transport
MRV	Measurement, Reporting and Verification
MWE	Ministry of Water and Environment
NARO	National Agricultural Research Institute
NEMA	National Environment Authority
NFA	National Forest Authority
NGHGI	National Green House Gas Inventory
NWSC	National Water and Sewerage Corporation
PA	Paris Agreement
QA/QC	Quality Assurance / Quality Control
REDD	Reducing Emissions from Deforestation and Degradation
UBOS	Uganda Bureau of Statistics
UGGDS	Uganda National Green Growth Development Strategy
UNFCCC	United Nations Framework Convention on Climate Change
UWA	Uganda Wildlife authority

1.0 Introduction and background

The Ministry of Water and Environment through the Climate Change Department (CCD MWE) is implementing a project "*Strengthening the Capacity of Institutions in Uganda to Comply with the Transparency Requirements of the Paris Agreement*" in collaboration with the Africa Innovations Institute (AfrII) and Conservation International/ Vital Signs. The project is funded by the Global Environment Facility (GEF) through the Capacity Building Initiative for Transparency (CBIT), established at COP 21 to support developing countries to enhance transparency requirements as defined in Article 13 of the Paris agreement.

The project aims to support the Climate Change Department (CCD) in the Ministry of Water and Environment (MWE) to strengthen institutional arrangements for GHG data collection and processing in 5 key emission sectors (***agriculture and land use, forestry, energy, transport and waste***) as well as build capacity of stakeholders on data collection and processing. The project targets to enhance the capacity and skills necessary for effective and efficient operationalization of National GHG Inventory (GHGI) and MRV system.

The main objective of this project is to support institutions in Uganda to respond to the Transparency Requirements of the Paris Agreement. The project has three main components:

- Establish & strengthen institutional arrangements for robust GHG emission inventory and MRV System,
- Build the capacity of key stakeholders to collect, process and feed gender disaggregated data into the GHG emissions inventory and MRV system and
- Test and pilot the GHG emission inventory and MRV system.

Capacity Building and Paris Agreement

According to the modalities, procedures and guidelines of the UNFCCC the support needed and received by developing country Parties for the implementation of transparency framework for Article 13 of the Paris Agreement and transparency-related activities, includes transparency-related to capacity-building. Information should include to the extent possible: (a) Support needed and received for preparing reports pursuant to Article 13; (b) Support needed and received for addressing the areas for improvement identified by the technical expert review teams.

GHG data management and training Needs

A national greenhouse gas (GHG) inventory is an estimate of the total quantity of GHGs emitted and removed because of human activities each year (IPCC, 2006). A national GHG inventory provides critical information regarding a country's emissions profile and is important for assessing progress toward meeting national reporting requirements and for prioritizing policies and actions. Under the United Nations Framework Convention on Climate Change (UNFCCC), countries (referred to as "Parties") that signed the Convention are required to submit a periodic national GHG inventory report. Annex I Parties submit national GHG inventories annually, while non-Annex I Parties prior to 2014 included a national GHG inventory report as part of their National Communication submission which varied in frequency. As of 2014, non-Annex I Parties, except for least developed Parties and small island states, are expected to submit reports every two years, which contain, among other inputs, a recent inventory of national GHG emissions and removals (UNFCCC, 2011).

Considering the new international reporting requirements and the importance of accurate national GHG inventories for domestic GHG mitigation efforts, many non-Annex I Parties are working to improve the quality, efficiency, and sustainability of their national inventory systems (MAPT Project, 2014a, b). A national inventory system is defined to include all the institutional, human resource, financial, and technological capacities necessary to develop a comprehensive national GHG inventory.

Data management systems are critical for developing and regularly updating national greenhouse gas (GHG) inventories that, in turn, are foundational to national and international GHG mitigation efforts. There is generally slow growth in the development of GHG inventory data management systems in Uganda. This assignment responds to the need for deploying inventories in Uganda's key emission sectors and additionally to support operationalization of the national GHG inventory. There is also responds to the need of meeting Uganda's NDC target through ensuring availability of data for informed decision-making and reporting.

1.1 The context and objectives

The overall objective of this assignment is to conduct a training needs and data management needs assessment to identify capacity gaps across 5 key emission sectors (Agriculture, Forestry, Waste, Transport, Energy) in collection, processing, transmission and reporting of GHG gender disaggregated data.

1.2Approach and methodology

Document Review: Documents to identify data requirements for GHG in each sector were reviewed mainly to design the tools on the data needs. The main documents that guided this review were the Intergovernmental Panel on Climate Change (IPCC 2014), 2006 IPPC guidelines for National Greenhouse Gas Inventories, IPCC methodology booklets for GHG for respective sectors. Other documents included reports developed by different sectors, and existing national documents on climate change and GHG reporting. The documents included;

a) Ministry of Water and Environment 2015, Green House Gas Inventory Manual for Uganda Version 1, submitted to Low Carbon Emission Capacity Building Project (LECB) Uganda,
b) Intergovernmental Panel on Climate Change (IPPC), (2006),
c) Guidelines for National Greenhouse Gas Inventories Volume 1,
d) General Guidance and Reporting.
e) Other guidelines consulted were
    - IPCC Guidelines for National Greenhouse Gas Inventories Volume 2, Energy, 2006
    - IPCC Guidelines for National Greenhouse Gas Inventories Volume 3, IPPU, 2006
    - IPCC Guidelines for National Greenhouse Gas Inventories Volume 4, AFOLU, and 2006
    - IPCC Guidelines for National Greenhouse Gas Inventories Volume 5, Waste,
f) Capacity development plan for CBIT-Uganda,
g) Project identification form for CBIT-Uganda,
h) CBIT-Uganda project document,
i) Technical report on Uganda's GHG inventory and MRV stakeholders; roles and responsibilities.

Designing of tools: a tool was designed to validate minimum data requirements for each sector, (see attached template in Annex 1). Another tool for assessing training needs for each sector was designed based on the report on data management needs (Annex1&2).

Stakeholder identification and engagement: Stakeholders for each sector were identified and stakeholder consultation workshop organized. The stakeholders at national level included Climate Change Department (CCD MWE), Ministry of Energy and Mineral Development (MEMD), Uganda Bureau of Statistics (UBOS), National Environment Management Authority (NEMA), Kampala Capital City Authority (KCCA), Ministry of Agriculture Animal Industries and Fisheries (MAAIF), National Water and Sewerage Corporation, National Forest Authority (NFA), Ministry of Works and Transport (MWT),

Ministry of Lands Housing and Urban Development among others. In total 53 people were consulted as detailed in the list of participants as attached in Annex 2.

Stakeholder consultations: Workshops were utilized for both data management needs and training needs assessment to collect information from stakeholders. The workshops were conducted in two sessions, presentations and breakup group sessions into the respective sectors to discuss and agree on aspects of availability of data, collation and integration of data for GHG inventory. Training needs assessment was conducted to identify and assess or confirm skills and gaps across the 5 key emission sectors. For sectors where information was not enough visits to sectors were done to assess the state of data and conduct a capacity (technical, technological and financial) assessment of sector hubs for the collection, processing and interpretation of gender disaggregated data.

Validation of draft report: A validation meeting was organized by AfrII, CI and CCD, attended by representatives from all the five key emission sectors and included CBIT Sector hub focal points and members of the CBIT Project Management Unit. In total 17 members attended the validation meeting. The draft report was presented, and feedback received on the contribution and confirmations of the data management needs, training needs and capacity required for each sectors.

2.0 Data Management Needs for sectors

The assessment for each sector considered minimum data requirements (i.e., Tier 1 of IPCC guidelines) for computing emissions. The assessment evaluated institutional capacity in data management at three levels of

a. data availability,
b. data collation and processing and
c. data integration including GHG computation and reporting.

Data availability was evaluated in terms of data sources being clear and known to everyone, frequency of data collection being agreed upon and followed, methods for data collection being in place and known by everyone, presence of data collection tools such as data sheets (digital or analogue) and whether data archiving policies were in place.

Data collation and processing evaluated data analysis systems, use of appropriate (correct) data sets, knowledge of GHG procedures (including software), and presence of structured system for GHG computation including level of coordination.

The integration of emissions with auxiliary or secondary data that improves estimation of emissions e.g., climatic zones and ecological zones and most importantly whether the institution can submit GHG emissions estimates to CCD the designated institution for reporting to UNFCCC.

The assessment for each sector considered minimum data requirements and management needs. The results are presented under the following categories: data availability, data collation, integration and reporting for each sub sector category. The key assessment areas are tailored to Uganda, and Tier1 minimum level reporting of the UNFCCC. The minimum requirements for activity data for each sector are unique.

2.1 Energy

GHG computations in the energy sector use both sectoral and reference approach. The sectoral approach, also referred to as bottom up approach, involves looking at the actual consumption of the specific subcategory. This approach helps countries to identify key emitting sub categories thus informs decisions for resource allocation and most importantly targeting of mitigation actions. The results from both approaches should be comparable.

2.1.1 Sectoral Approach for Energy Sector

Under the sectoral approach in the energy sector, emissions are estimated from combustion activities, fugitive emissions (energy transportation and emissions that escape without combustion). Under current circumstances, Uganda may only report on emissions related to combustion of fuel for electricity and heat production, fuel use in energy industries, transport, residential and commercial institutions and fuel use in agriculture and forestry activities. Emissions related to energy transformation e.g., estimation of wood fuel (firewood) utilised and charcoal production are of great significance in Uganda and needs to be estimated and reported on. Currently fugitive emissions (B) and petroleum refining (1.A.1.c) are not accounted for but are anticipated to be significant by year 2025.

2.1.1.1 State of data in Energy Sub sector

Emissions related to fuel combustion are estimated based on fuel type, amount (mass or volume) of fuel consumed and emissions per terajoule (TJ) of unit output. Electricity Generation and Combined Power and Heat generation are the most well documented in the Energy Sector.

Electricity use (i.e. KWh) is metered which enables categorization by end use and generation. Key data sources on electricity generation are Electricity Regulatory Authority (ERA), Energy balance and energy abstract documents by Ministry of Energy and Mineral Development (MEMD), and Energy Audit Reports by UBOS.

Combined Power \ Heat (CHP), also known as cogeneration systems generate more efficient and reliable power, compared to electricity provided by utilities. CHP systems are also designed to reduce facilities' carbon footprint, lower electricity and fuel costs and may thus act as net sinks. CHP is practiced by a few industries. CHP facilities are part of Uganda's mitigation activities and thus systems for data collection. Data from these facilities is synthesized and GHG offsets are computed for those facilities that intend to sale CERs.

Data on charcoal production and charcoal use is based on special studies that are updated almost every five years.

Energy use in manufacturing industries is not disaggregated to capture fuel type and amount used by each industry sub category as shown in Table 1.

Table 1: Data requirements and the state of data in energy sub sectors

	Energy	***Requirement (IPPCC)***	***State***
a)	Electricity Generation	Mass or Volume fuel consumed to per KWH	*Data available and well documented*
b)	Combined Power \ Heat	Mass or Volume fuel consumed to per KWH	*Data available and well documented at CHP facilities*
c)	Petroleum Refining	*Not Applicable until 2021*	
d)	Manufacture of Solid Fuel (Charcoal and firewood)	Mass or Volume fuel consumed to per unit of Charcoal produced	Data on charcoal production and use is based on special studies No documented data on firewood fuel use

	Energy	*Requirement (IPPCC)*	*State*
e)	Manufacturing Industries \Iron & Steel	Consumption (Mass or Volume) and Conversion factor (TJ/UNIT output)	Electricity used known, other fuels not documented
f)	Manufacturing Industries \ Chemicals	Consumption (Mass or Volume) and Conversion factor (TJ/UNIT output)	Data not desegregated to capture chemical industry
g)	Manufacturing Industries \ Construction\Pulp and Paper, Print	Consumption (Mass or Volume) and Conversion factor (TJ/UNIT output)	Uganda does not have pulp and paper manufacturing what is present is paper recycling.
h)	Manufacturing Industries \ Food Processing, Beverages, Tobacco	Consumption (Mass or Volume) and Conversion factor (TJ/UNIT output)	Data not disaggregated to capture food processing
i)	Manufacturing Industries \Mining And &Quarrying	Consumption (Mass or Volume) and Conversion factor (TJ/UNIT output)	Data not desegregated to capture mining
j)	Manufacturing Industries \Wood and Wood Products	Consumption (Mass or Volume) and Conversion factor (TJ/UNIT output)	Data not desegregated to capture wood processing
k)	Manufacturing Industries \Construction	Consumption (Mass or Volume) and Conversion factor (TJ/UNIT output)	Data not desegregated to capture construction
l)	Manufacturing Industries \Textile and Leather	Consumption (Mass or Volume) and Conversion factor (TJ/UNIT output)	Data not segregated to capture textile industry

2.1.1.2 Data availability in Energy Sub Sector

Generally, there are no proper data recording and archiving procedures and methodologies. Data required for GHG computation is acquired on ad hock basis, mainly organized by consultants and is not yet institutionalized. Although institutions are collecting some data, and they are known by mandate, there are no designated data sources neither are data collection procedures in place. Data collection methodologies, data sheets and data archiving are thus not applicable \ not available as shown in Table 2.

Table 2: Detailed evaluation of data availability in the Energy sub sectors

IPCC category	Current Source	Evidence agreed and practiced frequency	Evidence of Data Sheets	Evidence of Archiving	Methodologies and assumptions
Energy Industries \Electricity Generation	Metered by ERA	Continuously metered	Yes	digital recording	Meter recording
Energy Industries \Combined Power \ Heat	Metered by ERA	Continuously metered	Yes	digital recording	Meter recording
Energy Industries \Petroleum Refining	Currently Not applicable	Currently Not applicable	Currently Not applicable	Currently Not applicable	Currently Not applicable
Manufacture Of Solid Fuel (Charcoal)	MEMD studies, special reports	5 years	Yes	Yes	Ad hock by consultants, not at institutional level
Manufacturing Industries \Iron & Steel	Energy Audit Reports,	Not available	Yes	Not available	Not available

IPCC category	Current Source	Evidence agreed and practiced frequency	Evidence of Data Sheets	Evidence of Archiving	Methodologies and assumptions
	Quarterly Progress reports, ERA\MEMD				
Manufacturing Industries \ Chemicals	Not available	Not available	Not available	Not available	Not available
Manufacturing Industries \ Construction\Pulp, Paper	We not have paper industry	Not available	Not available	Not available	Not available
Manufacturing Industries \ Food Processing, Beverages, Tobacco	Not available	Not available	Not available	Not available	Not available
Manufacturing Industries \Mining And & Quarrying	Not available	Not available	Not available	Not available	Not available
Manufacturing Industries \Wood And Wood Products	Not available	Not available	Not available	Not available	Not available
Manufacturing Industries \Construction	Not available	Not available	Not available	Not available	Not available
Manufacturing Industries \Textile And Leather	Not available	Not available	Not available	Not available	Not available

Data sources are clearly known (i.e. present) in most sub categories and even operational in some sub sectors apart from electricity generation, CHP and to some extent charcoal production, data collection methodologies, archiving, data sheets and frequency of data collection are missing in all other sub categories (figure 1).

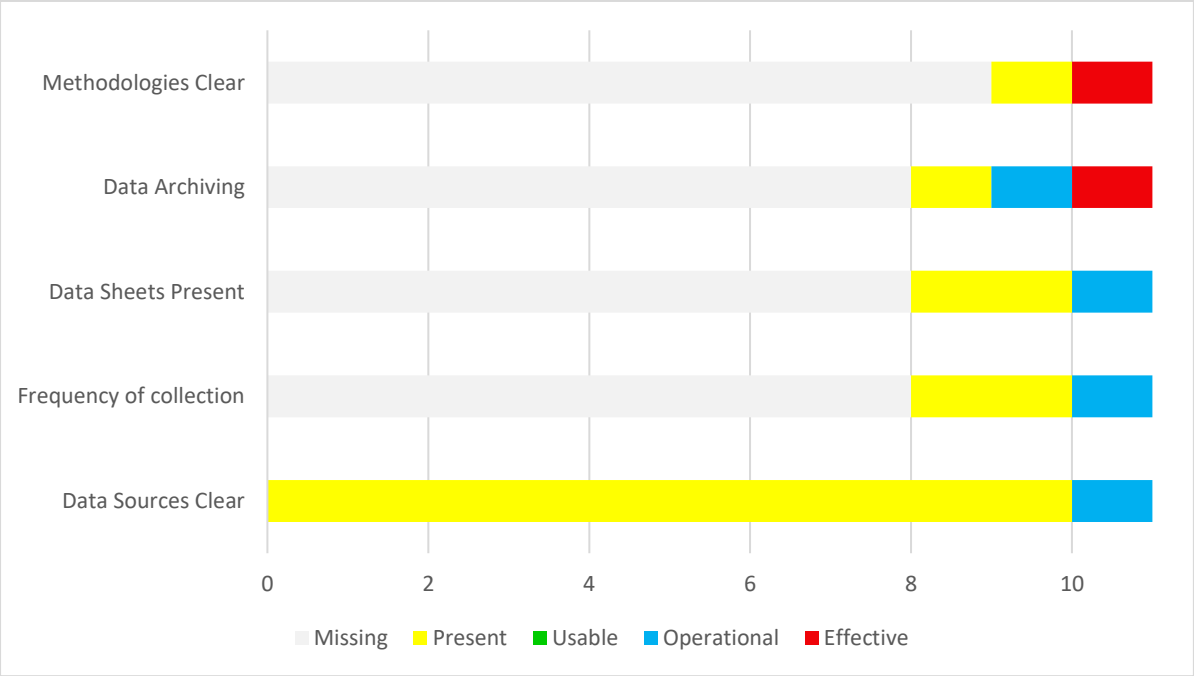

Figure 1: State of Data availability across sub categories in sub sectors

2.1.1.3 Collation and processing for Energy Sub Sectors

Coordination and structures in the energy sector are generally usable. However, systems for collating data management are rated low (i.e. present and usable) in most sub sectors. The low score is mainly attributable to the fuel use industries. GHG computation is generally missing for all sub sectors. Structures for data processing are considered present or usable in most sub sectors mainly because key personnel have received basic training in GHG data entry in to the IPCC 2006 software. Coordination is considered usable and to some limited extent operational (figure 2).

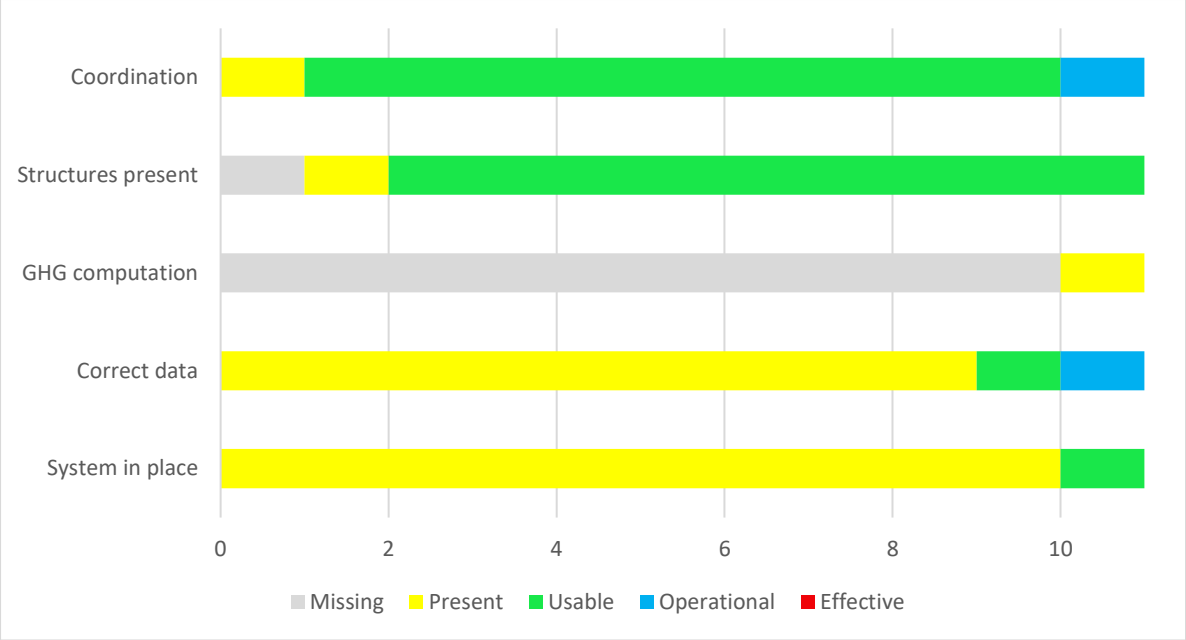

Figure 2. Data management and analysis in Energy Sub sector

2.1.1.4 Data integration *and Reporting in energy Sub Sectors*

Linkages to auxiliary data are mostly present and to some limited extent usable. Submission of GHG computation to CCD is mostly usable and to some limited extent operational. This implies data integration and GHG computation at sub sector level is generally unreliable though personnel have been trained they do not regularly compute GHG. This is shown in Figure 3.

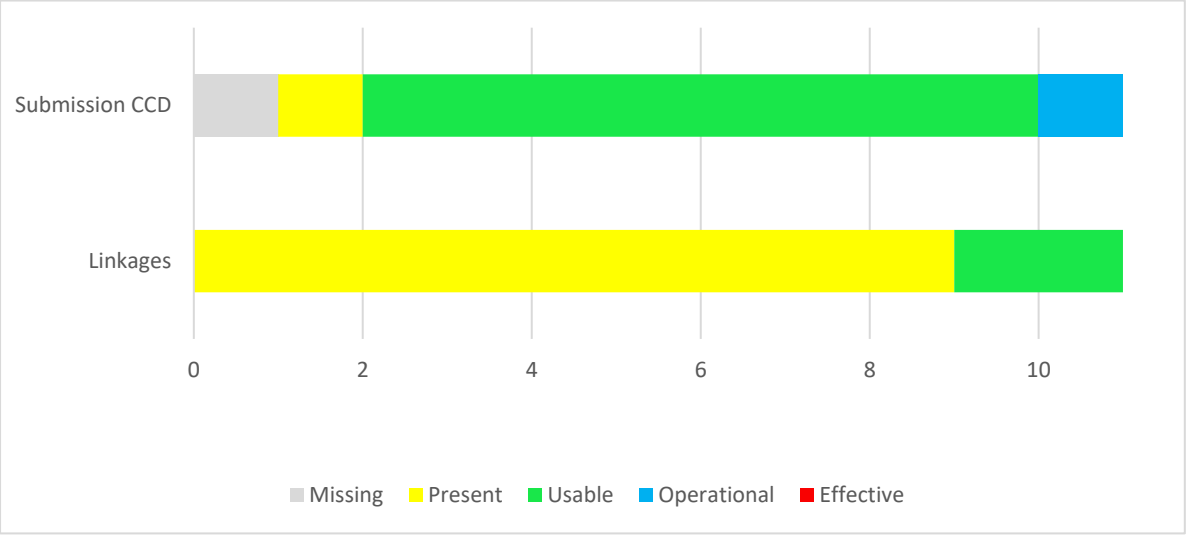

Figure 3. Integration and reporting in energy subsectors

2.1.2 The Reference Approach for Energy

The reference approach is based on the primary fuels supply and distribution, also known as the top down approach. The calculation of apparent consumption is based on the fuel imports, fuel exports and variations in the quantity of fuel in stock.

2.1.2.1 Data Availability for reference approach for energy sector

Data on fuel imports and exports is adequately provided by Ministry of Energy and Mineral Development (MEMD) and Uganda Revenue Authority (URA) as indicated in Table 3. However, there is need to monitor in country fuel stock change which is currently not being done and is thus assumed to be zero for purposes of computing the energy sector GHG emissions. Also, note that URA data does not include in country fuel production e.g. charcoal and wood-fuel production.

Table 3: Data Evaluation, Reference Approach

AD Existing	Current Source	Evidence agreed and practiced frequency	Evidence of Data Sheets	Evidence of Archiving	Methodologies and assumptions
Data on Imports and Exports Available, no data on Stock change, assumed equal to zero	URA records	No, but URA records sufficient	Digital at URA	Yes, though not at sector level	Yes

2.1.2.2 Collation and processing for reference approach for energy sector

Being top down approach, the reference approach does not require significant investment in structures and systems in the energy sector institutions. A system to track fuel imports, exports and in country stock changes suffices and as of now the URA provides this service as shown in Table 4.

Table 4: Data processing, GHG computation and Reporting (Reference Approach)

IPPC Reporting	Systems	Data captured correctly	Evidence of GHG Computation	Evidence of GHG Structures	Evidence of GHG Coordination	Evidence of Linkages to Auxiliary data	Submission to CCD
Reference approach	Yes- URA	Yes- URA	Ad hock basis, by consultants	No	Yes, some	Not applicable	Not institutionalized

2.1.3 Gap Analysis in Energy Sub Sector

Gap analysis in all the energy sub sectors show that there is generally good understanding of data requirements (present to usable) but there is a big gap or need in data management, analysis, and computation of GHG. Data synthesis, GHG computation and reporting of emissions to CCD are lacking in all energy sub sectors. This is shown in Table 5.

Table 5: Data management in the Energy

IPPC Reporting sector	Data Analysis Systems	Data captured correctly	Evidence of GHG Computation	Evidence of GHG Structures	Evidence of GHG Coordination	Evidence of Linkages to Auxiliary data	Submission to CCD
Energy Industries \Electricity Generation	Yes	Yes-usable	To some extent	Yes	To some extent	No	No
Energy Industries \Combined Power \ Heat	Yes	Yes-usable	To some extent	Only at facility level	To some extent	No	No
Energy Industries \Petroleum Refining	*No Applicable until 2021*						
Manufacture Of Solid Fuel (Charcoal)	Regular data	Usable with limitation	Ad hock	No	No	No	No
Manufacturing Industries \Iron & Steel	No		No	No	No	No	No
Manufacturing Industries \ Chemicals	No		No	No	No	No	No
Manufacturing Industries \ Construction\Pulp and Paper	No		No	No	No	No	No
Manufacturing Industries \ Food Processing, Beverages, Tobacco	No		No	No	No	No	No
Manufacturing Industries \Mining And & Quarrying	No		No	No	No	No	No
Manufacturing Industries \Wood And Wood Products	No		No	No	No	No	No
Manufacturing Industries \Construction	No		No	No	No	No	No
Manufacturing Industries \Textile And Leather	No		No	No	No	No	No

2.2 Transport

The mobile combustion emissions are generated from transportation of the energy carriers by road, ship, rail and air. Transport by land is the dominant means of transport in Uganda. The examples of land transportation are roads and railways, while civil aviation and marine navigation are transport by air and water respectively. The emission from fuels used in the international transport activities are reported separately and need to be excluded from the national inventory total.

2.2.1 State of data in Transport sector

Data on fuel consumption in the transport subsector needs to be disaggregated for proper attribution and to further account for usage by the civil aviation, land transport and water transport. While fuel in the aviation industry is available in the energy balance and energy abstracts statistics, data on fleet by road, rail and water transport is insufficient and thus not usable (Table 6).

Table 6: Data requirements and the state for Transport Sector

Transport	***Requirement (IPCC)***	***State of data***
TRANSPORT\CIVIL AVIATION	Aggregate fuel consumption domestic and international (LTO and cruise) and average emission factors	The aviation fuel consumption is available in national energy statistics and the energy balance
TRANSPORT\ROAD\RAIL	Fuel consumed by fleet category (distance and or tonnage)	Data on fleet of vehicles is incomplete, thus emissions cannot be computed by the sub sector
TRANSPORT\WATER & OTHER	Fuel consumed by water transport category and others (distance and or tonnage)	Data on fleet of vehicles is incomplete, thus emissions cannot be computed by thesub sector

2.2.2 Data availability in Transport Sub Sector

Institutions that collect data on transport (road and rail) are now aware of the data requirements and have started gathering data on fleet by vehicle category. Discussion on how to include key parameters like distance travelled and tonnage, numbers of passengers are under way. The fuel aviation industry has got an elaborated data collection system that meets requirement of GHG computation as shown in Table 7.

Table 7: Detailed evaluation of data availability in the Transport sub sectors

IPCC category	Current Source	Evidence agreed and practiced frequency	Evidence of Data Sheets	Evidence of Archiving	Methodologies and assumptions
TRANSPORT\CIVIL AVIATION	URA/CAA/UBOS/ National Energy statistics and energy balance	Continuously metered	Available flight receipts	digital recording	Meter recording
TRANSPORT\ROAD	Data on vehicles (UBOS and Works Dept.)	Just started, Historical un reliable	Yes, though not sufficient	Just started, Historical un reliable	Requirements now known, institutions in agreement
TRANSPORT\WATER & OTHER	No evidence	No evidence	No evidence	Currently Not applicable	Currently Not applicable

Methodologies for data collection and data archiving are only present (i.e., known) but not operational. Data sources, frequency of data collection, data sheets are considered present to usable but not adequate as shown in Figure 4.

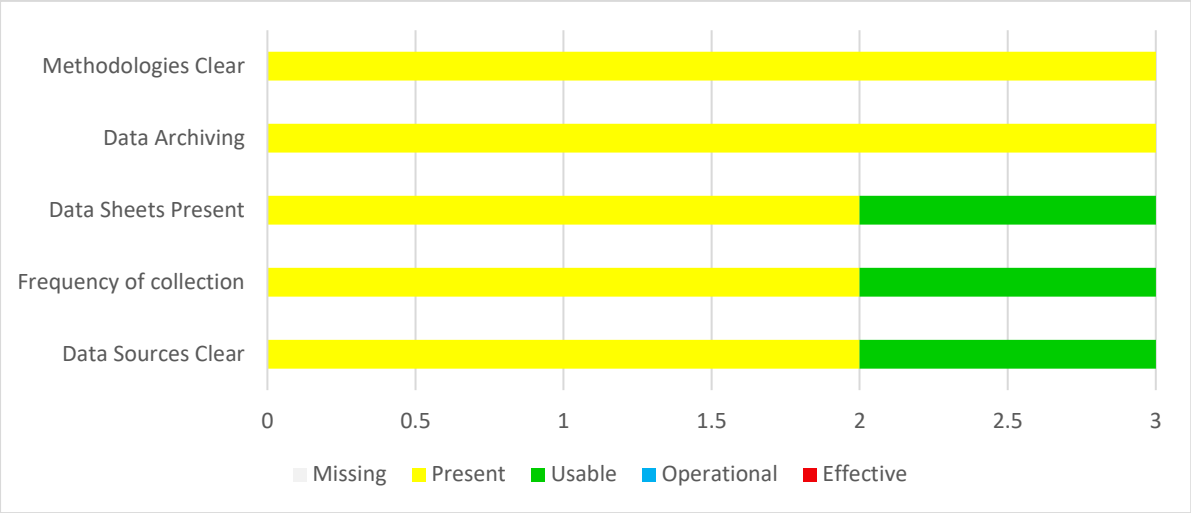

Figure 4: Data availability in the Transport sector

2.2.3 Collation and processing for Transport Sub Sectors

Systems for data collection are present to some extent and usable, this attributable to data provided by the aviation industry. Systems for use of correct data are considered present to usable which is also mainly attributable to the aviation industry and the data management system being built by the Ministry of Works and Transport. Coordination and computation is lacking in all transport sub sectors because of lack of data management systems. This equally applies to the aviation industry which has sufficient data (Figure. 5).

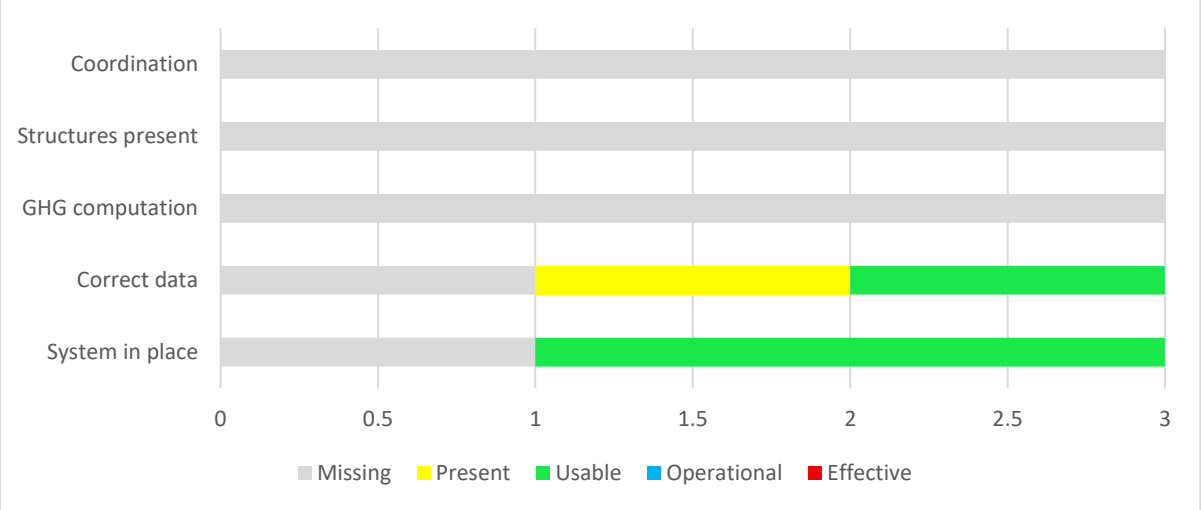

Figure 5. Data Management and analysis in Transport Sector

2.2.4 Data integration and Reporting in Transport Sub Sectors

Linkages to auxiliary data and reporting to CCD is lacking in all transport subsector (Figure.6). This is related and attributed to lack of coordination and lack of systems described in the previous section.

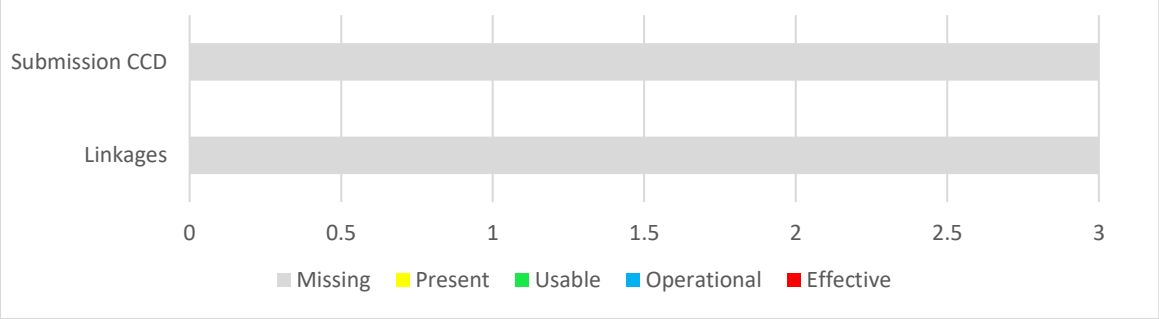

Figure 6: Data integration and Reporting in Transport Sub Sectors

2.1.5 Gap Analysis in the Transport Sub Sectors

Data collection, analysis and reporting in the transport sector are generally not well-developed at all levels. Data synthesis and computation at sub sector level is only possible for the civil aviation where there are mechanisms of data collection. The civil aviation data management system was not specifically built for GHG computation but data generated is usable to meet the requirements. There is no institutionalized data synthesis; GHG computation and reporting of emissions to CCD is lacking in all transport sub sectors as presented in Table 8.

Table 8: Data management in the Transport Subsectors

IPPC Reporting sector	Data Analysis Systems	Data captured correctly	Evidence of GHG Computation	Evidence of GHG Structures	Evidence of GHG Coordination	Evidence of Linkages to Auxiliary data	Submission to CCD
TRANSPORT\CIVIL AVIATION	Yes	Yes- usable	Not institutionalized	Yes	To some extent	No	No
TRANSPORT\ROAD	Have started	Yes- but lacking	Currently not possible	Yes	To some extent	No	No
TRANSPORT\WATER & OTHER	No system	No	No	No	No	No	No

2.3 Waste

Wastes are generated from day to day human activities. As, human population grows the quantities of the different categories of waste generated also increase proportionately. The problems of wastes are thus more pronounced in urban centers where there is concentration of human population and human activities. Rapid urban population growth compounds the situation. Municipal, industrial and other wastes produce significant amounts of greenhouse gases. In addition to CH_4, biogenic CO_2 and non-methane volatile organic compounds (NMVOCs) as well as smaller amounts of N_2O, NO_x and CO are also produced.

2.3.1 State of data in Waste Sector

There is generally paucity of data on waste generation and waste management in Uganda. Information is partly available in some few waste sub categories like managed waste at disposal sites, solid waste biological treatment sites and industrial wastewater treatment and discharge (Table 20).

The IPCC 2006 guidelines recommend using the methodology for estimating CH_4 emissions from Solid Waste Disposal Sites (SWDS) based on the First Order Decay (FOD). FOD method assumes that the degradable organic component or degradable organic carbon (DOC) in waste decays slowly throughout a few decades, during which CH_4 and CO_2 are formed. If conditions are constant, the rate of CH_4 production depends solely on the amount of carbon remaining in the waste. DOC is thus indicated as

an IPCC requirement in addition to type and amount of waste generated (mass or volume) annually by sub category as shown in Table 9.

Table 9:Data requirements and the state of data in Waste sub sectors

Waste	***Requirement (IPCC)***	***State***
Solid Waste\Managed Disposal Sites	Degradable Organic Carbon (DOC) and Methane fraction of waste by population and waste type (food, paper, textile, sludge, industrial waste, nappies etc.)	Data partly available on key Municipalities
Solid Waste\Unmanaged Disposal Sites	Degradable Organic Carbon (DOC) and Methane fraction of waste by population and waste type (food, paper, textile, sludge, industrial waste, nappies etc.)	Data not well documented
Solid Waste\Uncategorized Disposal Sites	Degradable Organic Carbon (DOC) and Methane fraction of waste by population and waste type (food, paper, textile, sludge, industrial waste, nappies etc.)	Data not well documented
Solid Waste\ Biological Treatment	Waste category amount (food, paper, textile, sludge, industrial waste, nappies etc.) treated mainly by municipalities (anaerobic and or Composite systems)	Data partly available on key Municipalities
Waste Incineration	Amount of waste incinerated by (food, paper, textile, sludge, industrial waste, nappies etc.) fraction of dry matter content, fraction of carbon in dry matter, fraction of fossil carbon in total carbon	Data partly available on key institutions
Open Burning	Population by region, fraction of population that burn waste, Kg waste /person/day, fraction burnt (compared to treated), days in a year	Data not available
Waste Water\Treatment and Discharge (Domestic)	Low \ High income rural and urban (discharge pathways i.e., sewer type, latrine by depth, latrine type, lagoon type)	Data partly available in key Municipalities
Waste Water\Treatment and Discharge (Industrial)	Waste water generated (m3) per (t) of industrial products (Abattoir, Alcohol refining, Beer & Malt, Pulp and Paper, Soap and detergents, coffee, dairy products, fish, poultry, organic chemical, Plastics and resins, starch production, Sugar refining, vegetable oils, vegetable, fruits & juices, wine and Vinegar)	Data partly available in key Municipalities

2.3.2 Data availability in Waste Sector

Generally, data recording and management in the waste sub sectors is partially available and level of documentation varies from municipality to municipality and by waste sub sector. Key agencies that have data on waste are: KCCA, NEMA, UBOS and NWSC as shown in Table 10.

Table 10: Detailed evaluation of data availability in the waste sub sectors

IPCC category	Current Source	Evidence agreed and practiced frequency	Evidence of Data Sheets	Evidence of Archiving	Methodologies and assumptions
SOLID WASTE\MANAGED DISPOSAL SITES	KCCA, NEMA, UBOSkey data providers	Systems being developed in some municipalities	Yes	Not clear	Ad hock by consultants, not at institutional level
SOLID WASTE\UNMANAGED DISPOSAL SITES	KCCA, NEMA, UBOSkey data providers	Not known	No	Not available	Ad hock by consultants, not at institutional level
SOLID WASTE\UNCATEGORIZED DISPOSAL SITES	KCCA, NEMA, UBOSkey data providers	Systems being developed in some municipalities	No	Currently Not applicable	Ad hock by consultants, not at institutional level
SOLID WASTE\ BIOLOGICAL TREATMENT	KCCA, NEMA, UBOSkey data providers	Systems being developed in some municipalities	Yes	Yes	Ad hock by consultants, not at institutional level
WASTE INCINERATION	KCCA, NEMA, UBOS key data	Systems being developed in some	Not sure	Not available	Not available

	providers	municipalities			
OPEN BURNING	KCCA, NEMA, UBOSkey data providers	Not available	Not available	Not available	Not available
WASTE WATER\TREATMENT AND DISCHARGE (DOMESTIC)	NWSC, KCCA, NEMA, UBOSkey data providers	Partially recorded by NWSC, what is disposed at own facilities	Partially available	Not available	Not clear
WASTE WATER\TREATMENT AND DISCHARGE (INDUSTRIAL)	NWSC, KCCA, NEMA, UBOSkey data providers	NEMA quarterly audits	Yes, partly	Yes, partly	Not clear

In about a half of the waste sub categories, data sources, frequency of data collection, data sheets, data archiving and methodologies for data collection are rated as operational. In about a quarter of the sub sectors key data availability parameters were considered missing while another quarter was known by the sub sectors but not functional (rated present) as shown in Figure 7.

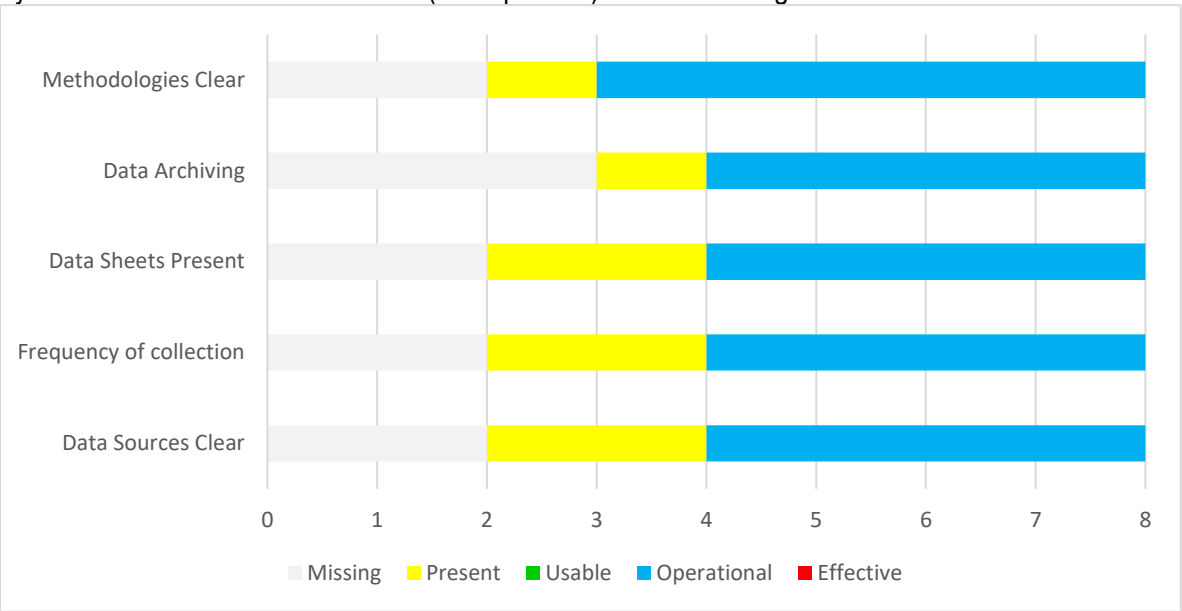

Figure 7: Data availability in waste

2.3.3 Collation and processing for Waste Sector

For slightly more than a quarter of the waste sub sectors, coordination and structures are known but not operational (present) usable. The rest of the systems are usable, operational or missing (Figure 8).

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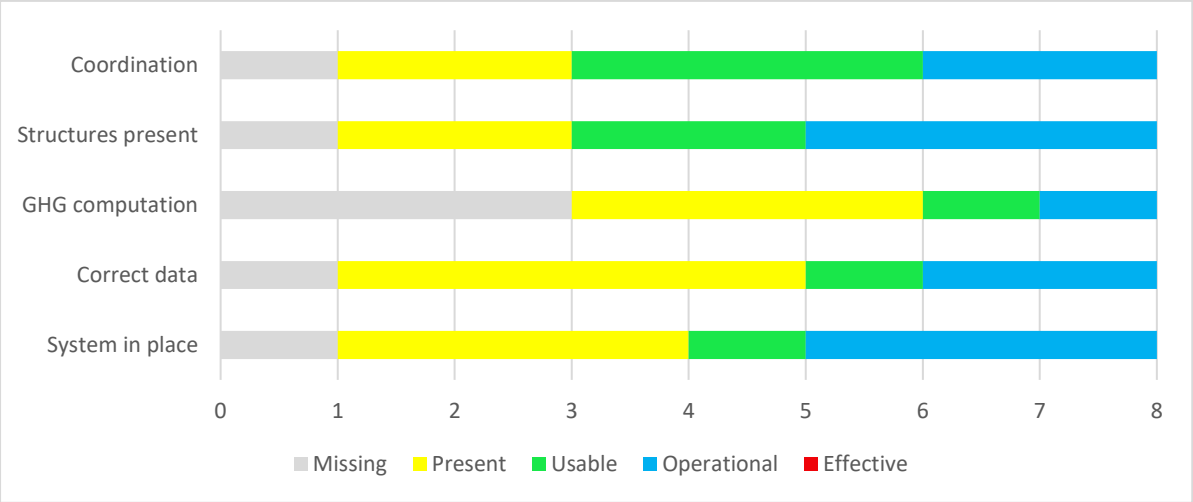

Figure 8:Data Management and analysis for waste sector

2.3.4 Data integration and Reporting in Waste Sector

In more than half of the waste sub sectors, linkages to auxiliary data and the requirement to report to CCD are known but not practiced (i.e., present, (Figure 9). For slightly less than half of the waste subsectors, reporting to CCD is not known and is not done (i.e., missing).

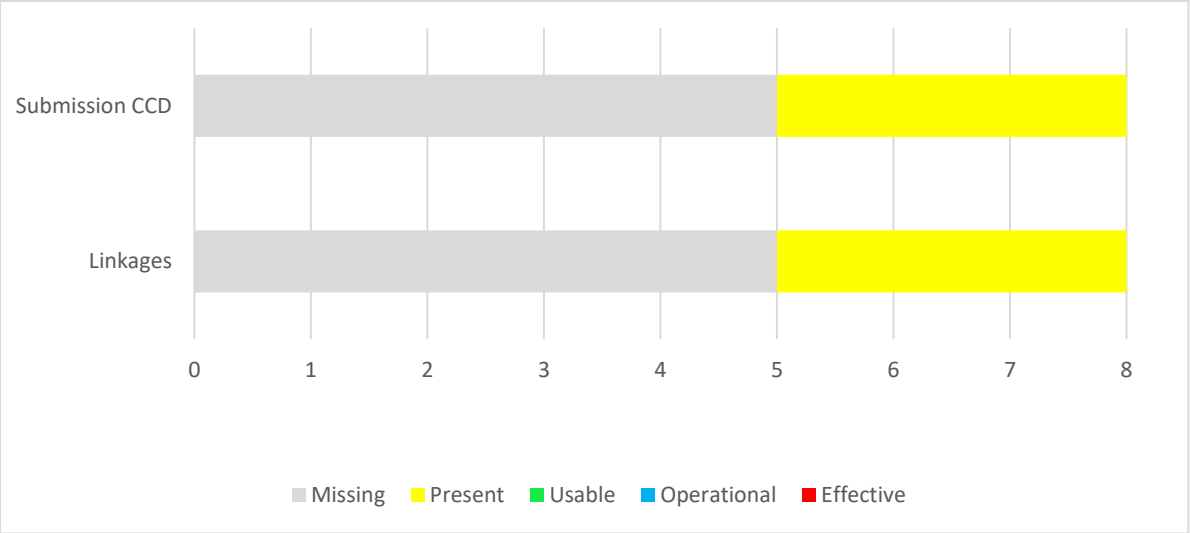

Figure 9: GHG reporting in waste Sector

2.3.5 Gap Analysis in Waste Sector

Gap analysis in all the waste sub sectors show that there is generally good understanding of data requirements (present to usable) but a big gap or need in data management, analysis, computation of GHG and reporting to CCD.

Data synthesis, GHG computation and reporting to CCD is lacking in all the waste sub sectors. Data is incomplete; systems for data synthesis, computation of GHG emissions and submission to CCD are not well-developed. GHG computation is observed only in facilities that intend to claim Certified Emission Reduction (CER) credits as presented in Table 11.

Table 11. Data management in Waste Subsectors

IPPC Reporting sector	Data Analysis	Data captured	Evidence of GHG Computation	Evidence of GHG	Evidence of GHG	Evidence of Linkages to	Submis sion to

	Systems	correctly		Structures	Coordination	Auxiliary data	CCD
Solid Waste\Managed Disposal Sites	Yes	Yes- usable	Only where facilities are targeting CER certificates	Yes	To some extent	No	No
Solid Waste\Unmanaged Disposal Sites	No	Yes- May not be usable	To some extent	Only at facility level	To some extent	No	No
Solid Waste\Uncategorized Disposal Sites	No	Not usable					
Solid Waste\ Biological Treatment	Regular data	Usable with limitation	Only where facilities are targeting CER certificates	No	No	No	No
Waste Incineration	A few institutions	Usable with limitation	No	No	No	No	No
Open Burning	No	No	No	No	No	No	No
Waste Water\Treatment And Discharge (Domestic)	No		No	No	No	No	No
Waste Water\Treatment And Discharge (Industrial)	Yes	Yes- for some industries	Only where facilities are targeting CER certificates	Only at facility level	To some extent	No	No

2.4 Agriculture

Though under the 2006 IPCC guidelines, Agriculture has been integrated with what was previously referred to as Land Use Land Use Change and Forestry (LULUCF) to what is now called Agriculture, Forestry and Other Land use, (AFOLU), this assignment treats the two subsectors separately for purpose of understanding the unique requirement of the responsible institutions.

2.4.1 State of data in Agriculture Sector

Estimation of emissions in the agriculture subsectors is data intensive requiring responsible institutions to collect data on an annual basis on livestock, manure management systems, fertilizer application (with the associated Nitrogen content), annual area of rice cultivated or harvested by flood management and agricultural inputs as shown in Table 12.

Table 12: Data requirements for AFOLU sub Sectors

Agriculture Subsector	***Requirement (IPPCC)***	***State***
Livestock Enteric Fermentation	Livestock numbers (annual) disaggregated by key breed categories	Extrapolated based on 2007 livestock census, disaggregation by breed types based on expert judgement
Livestock Manure Management (CH_4 And N_2O Direct)	Manure management systems disaggregated by key breed categories	Manure management systems based expert judgement
Aggregate Sources Lime Application	Annual amount of lime application	Burnt area estimated based on NASA data on burnt area, active fire also provides clues
Aggregate Sources Urea Application	Annual amount of urea application	Fertilizer imports \ Exports coupled with expert judgement
N_2O From Managed Soils (Direct)	Annual organic and chemical fertilizer application (Tones) and N fraction in fertilizer	Fertilizer imports \ Exports coupled with expert judgement
N_2O From Managed Soils (Indirect)	Annual organic and chemical fertilizer application (Tones) and fraction that volatilizes	Fertilizer imports \ Exports coupled with expert judgement
N_2O From Manure (Indirect)	Annual nitrogen excretion and fraction that N that volatilizes	Expert judgement \ IPCC default values
CH_4 Rice Cultivation	Annual rice area cultivated or harvested by flood management and agricultural inputs	Expert judgement \ IPCC default values
		FAOSTAT - harvested area

2.4.2 Data availability in Agriculture Sector

Emissions from enteric fermentation of ruminant animals are based on livestock statistics data generated jointly by MAAIF and UBOS. However, the last census was conducted in 2007/8 and statistics in subsequent years are projections that assume a certain annual growth rate as shown in Table 13. Area under rice paddy cultivation is estimated from FAO agricultural statistics, and there are efforts to document some parameters on soil by NARO with support from FAO.

Table 13: Detailed evaluation of data availability in the Agriculture sub sectors

IPCC category	Current Source	Evidence agreed and practiced frequency	Evidence of Data Sheets	Evidence of Archiving	Methodologies and assumptions
Livestock Enteric Fermentation	UBOS	Periodic	UBOS	UBOS	UBOS
Livestock Manure Management (CH_4 And N_2O Direct)	MAAIF expert judgement	N/A	No evidence	No evidence	Not available
Aggregate Sources Lime Application	URA Records \MAAIF expert judgement	Annual	Yes	Yes	Not available
Aggregate Sources Urea Application	URA Records \MAAIF expert judgement	Annual	Yes	Yes	Not available

IPCC category	Current Source	Evidence agreed and practiced frequency	Evidence of Data Sheets	Evidence of Archiving	Methodologies and assumptions
N_2O From Managed Soils (Direct)	URA Records \MAAIF expert judgement	Annual	No evidence	No evidence	Not available
N_2O From Managed Soils (Indirect)	IPCC default values	N/A	No evidence	No evidence	Not available
N_2O From Manure (Indirect)	IPCC default values	N/A	No evidence	No evidence	Not available
CH_4 Rice Cultivation	FAOSTAT - harvested area (assumes 90% of rice is paddy rice)	Annual	Yes	Yes	Not available

2.4.3 Collation and processing for Agriculture Sector

Coordination is present in many agriculture sub sectors while systems, structure for data collection and GHG computations are missing. Generally, it is only in a few sub sectors where these systems are useable as shown in Figure 10.

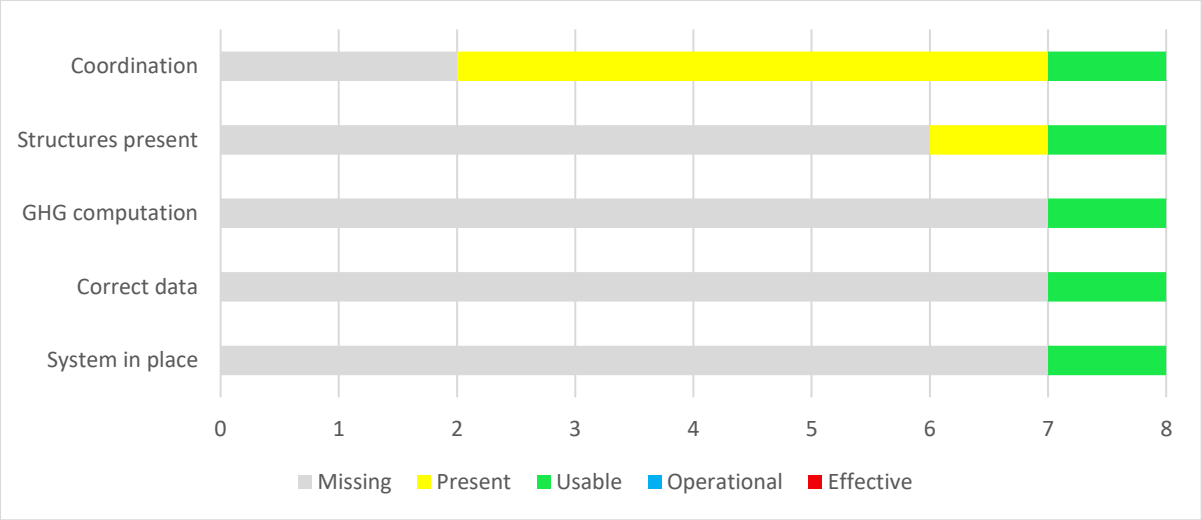

Figure 10: Data management and analysis for the Agricultural Sector

2.4.4 Data integration and Reporting in Agriculture Sector

In the majority of other sub sectors linkages and requirements to report on CDD are known (i.e., present) but not implemented or are missing. In some few cases they are usable but could be with high uncertainties as shown in Figure 11.

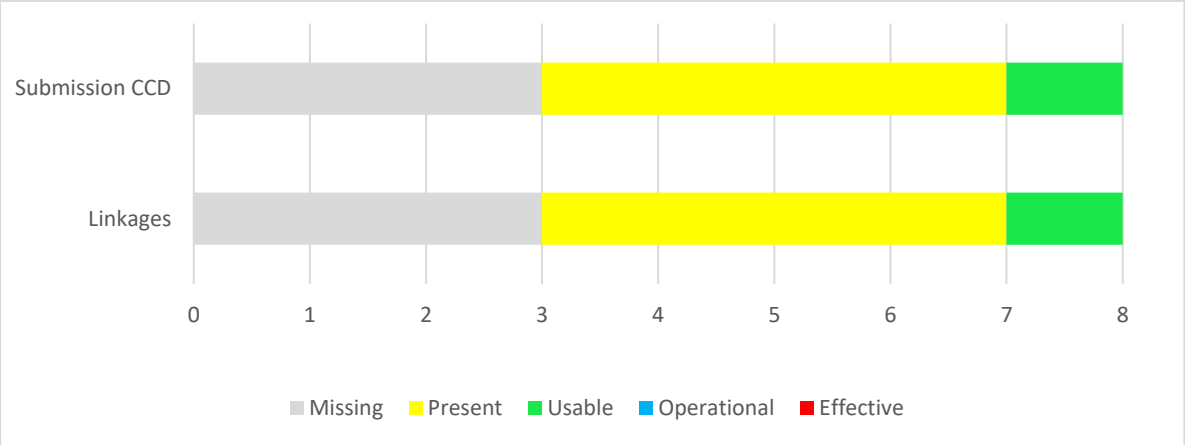

Figure 11: GHG reporting for Agricultural Sector

2.4.5 Gap Analysis in Agriculture Sector

Most of the agriculture sub sectors show lack of adequate systems and structures to collect data, and compute GHG emissions. Systems to estimate emissions attributable to livestock, soil management and rice paddy cultivation are just being put in place. Estimations of emissions in the agricultural sub sectors have high uncertainties as shown in Table 14.

Table 14: Data management in the Agricultural Subsectors

IPPC Reporting sector	Data Analysis Systems	Data captured correctly	Evidence of GHG Computation	Evidence of GHG Structures	Evidence of GHG Coordination	Evidence of Linkages to Auxiliary data	Submission to CCD
Livestock Enteric Fermentation	No	no, derived	No	No	No	No	No
Livestock Manure Management (CH_4 And N_2O Direct)	No	no	No	No	No	No	No
Aggregate Sources Lime Application	No		No	No	No	No	No
Aggregate Sources Urea Application	No		No	No	No	No	No
N_2O From Managed Soils (Direct)	No		No	No	No	No	No
N_2O From Managed Soils (Indirect)	Yes		No	No	No	No	No
N_2O From Manure (Indirect)	No		No	No	No	No	No
CH_4 Rice Cultivation	Yes		yes	Yes	Yes	No	No
Manufacturing Industries \Textile And Leather	No		No	No	No	No	No

2.5 Forestry

As already mentioned, in this assignment, Land Use Change and Forestry (LULUCF) is treated separately for purpose of understanding the unique requirement of the responsible institutions. In this sub sector, anthropogenic GHG emissions by source and removals by sinks are defined as those occurring on managed land. Managed land is defined as where human interventions and practices have been applied to perform production, ecological or social functions (2006 IPCC). All land in Uganda, include land in protected areas is considered managed.

2.5.1 State of data in Forestry Sector

The National Forestry Authority (NFA) has a mapping and forest inventory unit that is obligated to continuously provide data on forestry and land use statistics. In line with the notion of managed land, emissions and removals associated with all fires on managed land are now estimated, removing the previous optional distinction between wildfires and prescribed burning. Emissions due to "wildfires and other disturbances on unmanaged land are not included in the estimates, unless the disturbance causes a land-use change". Estimation of emissions in the forestry subsector is data intensive requiring spatially explicit data on land conversions and biomass stocks and wood extraction and biomass stock in all land units as shown in Table 15.

Table 15: Data requirements for the Forestry Sector

Forestry	***Requirement (IPCC)***	***State***
LAND REMAINING THE SAME LAND	Wood extraction and or change in biomass in land remaining the same	Wood extraction statistics
LAND CONVERSIONS	Spatially explicit data on land conversions and biomass stocks	Based on periodic satellite image interpretation and analysis
AGGREGATE SOURCES BURNING	Area burnt, fuel available for burning and EF burning by land strata	Burnt area estimated based on NASA data on burnt area, active fire also provides clues

2.5.2 Data availability in Forestry Sector

NFA has got an elaborate system for collecting and managing data that was being updated every five to ten years in the past and is now being updated every two years as shown in Table 16.

Table 16: Detailed evaluation of data availability in the forestry sector

IPCC category	Current Source	Evidence agreed and practiced frequency	Evidence of Data Sheets	Evidence of Archiving	Methodologies and assumptions
LAND REMAINING THE SAME LAND	Regional and Local Studies. Collaborated with NBS data	Derived annually from population projections	Being developed	Yes	Being developed, yet to be adopted
LAND CONVERSIONS	NFA	Yes 5 to 2 years	Yes, GIS data	Yes, digital spatial data sets	Yes,
AGGREGATE SOURCES BURNING	NASA MODIS satellite data, NFA biomass data	Monthly averages	Yes	Yes	Being developed and evaluated

Data sources and frequency of data collection in the forestry sector is considered usable and to a good extent operational. There are gaps in data sheets to capture parameters for GHG and data archiving. In some instance data collection procedures are not defined as shown in Figure 12.

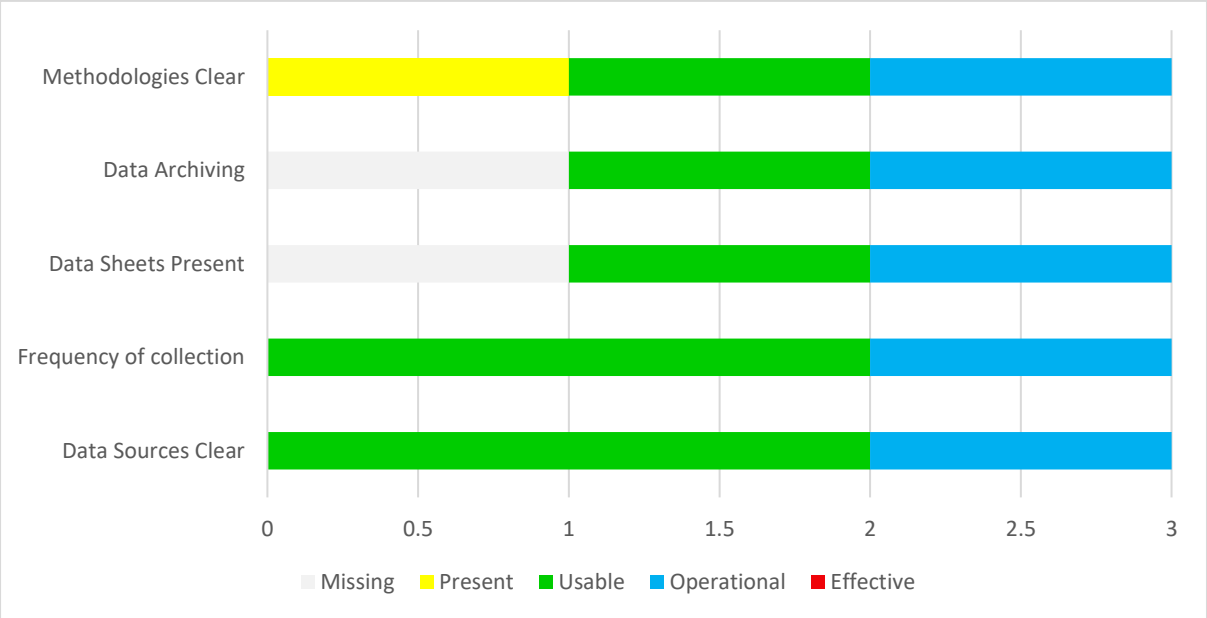

Figure 12: Data availability in forestry sector

2.5.3 Collation and processing for Forestry Sector

Most aspects of data collation and processing are considered operational. There are however gaps (i.e., missing) in structure and systems for data processing. Coordination is in some instances considered known but not being implemented as shown in Figure 13.

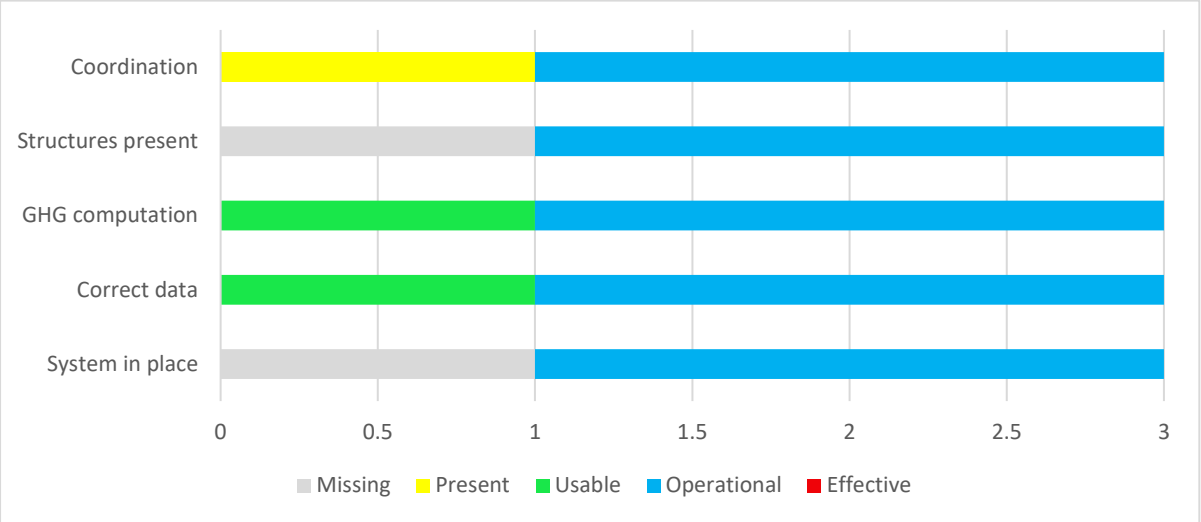

Figure 13. Data Management and analysis for forestry

2.5.4 Data integration and Reporting in Forestry Sector

The level of data linkages to other auxiliary data like soils, climate and ecological zones in forestry in many instances is considered effective. Reporting to CCD is operational as shown in Figure 14.

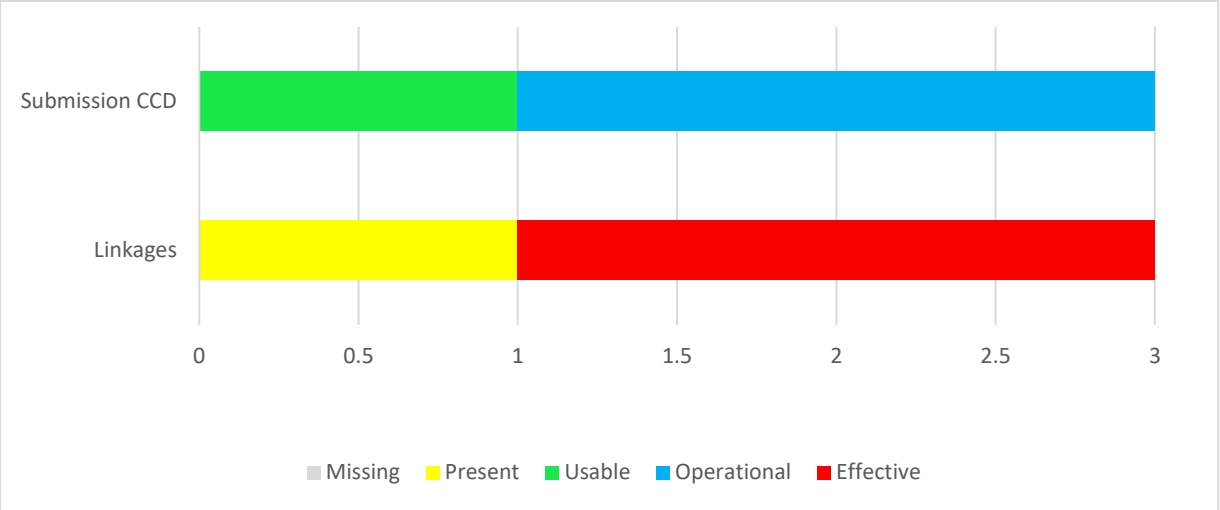

Figure 14: GHG reporting in forestry

2.5.5 Gap Analysis in Forestry Sector

The forestry sector has a highly advanced data collection, analysis and GHG computation system. This is partly attributable to the REDD+ programme. Monitoring of Forests and ground truthing are done only in the protected areas. There is no direct monitoring on private land except for the use of global satellite data which is coarse. Seasonal Bush burning is also not being assessed.

Structures, systems and mechanisms for computations of emissions attributable to land use and land use change is the most advanced. This is mainly due to support received under the REDD+ programme that has enabled Uganda to compute and report on emissions attributable to forestry (table14). Systems to estimate emissions that attributable to livestock, soil management and rice paddy cultivation are just being put in place as shown in Table 17.

Table 17: Data handling in the Energy Subsectors

IPPC Reporting sector	Data Analysis Systems	Data captured correctly	Evidence of GHG Computation	Evidence of GHG Structures	Evidence of GHG Coordination	Evidence of Linkages to Auxiliary data	Submission to CCD
Land Remaining The Same Land	Yes	To some extent	yes	Yes	REDD+	Climate and E zones	FREL
Land Conversions	No	Yes-usable	yes	Yes	REDD+	Climate and E zones	FREL
Aggregate Sources Burning	No		No	Yes	Yes	No	No

3.0 Training needs for Sectors

An assessment of training needs for each sector identified current capacity, gaps and skills. Other areas of assessment considered aspects of institutional capacity, availability of human resource, technical capacity to understand required activity data, data sources, data sheets used in data collection, data availability and capacity to report. More discussions were held to synthesize gender disaggregated data at different stages of data collection, processing and integration. Training needs for individuals and institutions were also identified.

3.1 Energy

3.1.1 Current capacity and gaps in Energy

Generally, the current data sources for all the energy sub sectors are known although the current capacity in the energy sector is still low especially on the knowledge for computing GHG. It is not clear how the officers in the energy sub sectors are involved since the coordination of sub sectors is not well organized. Although work is ongoing and is being documented in reports there is need to build capacity of the institution since most of the GHG computation work is carried out by consultants. There is moderate understanding of activity data and knowledge on collection of activity data, required parameters, right data sheets, archiving and documentation of methodologies. Although individuals in the energy sector have received basic training in GHG data entry using the IPCC 2006 software the sector is not computing GHG; emissions this could be a result of lack of guidelines to support the existing structures and functionality of the systems as shown in Table 18.

Table 18: Current capacity and gaps in Energy sector

State	Rate	Comment
Current Capacity	**Low, Medium, High**	**Gaps**
Collection Activity Data	Medium	• Mainly in renewable energy sub sector • Data is available in renewable energy generation • Venture into new technologies such as biogas
Parameters for Activity Data	Medium	• Acquainted with energy Conservation
Current Data Sources	High	• Sources are defined
Frequency of data collection	Medium	• Where the requirements are defined
Right Data sheets	Medium	• Data collected not disaggregated
Archiving	Medium	• No systems for documentation
Documentation of Methodologies	Medium	• Not very well documented / usually Consultants do computations
Functioning systems	Medium	• Structures are not well defined
Data captured in the system	Medium	• A lot of data is collected but use of that data depends on demand
Knowledge GHG computation	Low	• Usually Consultants do computations
Existing structures for computing	Low	• Not clear
Officers are involved in GHG computation	Low	• Focal persons are involved especially for consultations
Coordination of GHG in this Sector	Low	• There is a focal point
Linkage with Sub categories secondary data	Low	• Partnership with private sector such as CREEC, Nyabyeya Forest Research Institute Labs
Evidence of Submission to CCD	Medium	• Some Data on Energy is captured at CCD

3.1.2 Training needs and Skills Required in Energy

General training needs and skills required in energy sector are outlined as follows;

Data collection: Training to understand the required data, identification of data sources, designing forms and tables or systems for entering data. This will also include data segregation and capturing gender issues. Designing data collection sheets, and data collection procedures for energy related data.

GHG methodologies: Training in the requirements for computing GHG emissions for the energy sector, the different methodologies, protocols and the software used.

Documenting and Archiving: Training in proper data recording, archiving procedures and methodologies.

Designing systems: At institutional level there is need to design a system that can support collection, processing and reporting of GHG emissions.

Strengthening existing Structures: This process will include identifying different individuals with responsibilities at different stages. Their job descriptions should be very clear indicating outputs required at each stage. This will enhance the coordination in the sector.

Individual training requirements from specific sectors

- **Ministry of Energy and Mineral Development:** Data collection and management skills, GHG measurements, new ventures in biogas and charcoal improved technologies and how to disaggregate data.
- **All sub sectors in Energy:** Need capacity in areas of data collection, GHG methodologies, documenting and archiving, designing systems, strengthening structures and institutional development.

Specific capacity needs and support for energy sub sector

- Study to enhance data on charcoal production and charcoal use. This is because the current data set is based on special studies that are updated almost every five years.
- Energy use in manufacturing industries should be disaggregated to capture fuel type and amount used by each industry sub category
- Documenting data on manufacturing Industries \Iron & Steel, other fuels.
- Desegregating data to capture chemical industry
- Desegregating data to capture pulp and paper
- Desegregating data to capture food processing
- Desegregating data to capture mining
- Desegregating data to capture wood processing
- Desegregating data to capture construction
- Desegregating data to capture textile industry

3.2 Transport

3.2.1 Current capacity and gaps in Transport

The institutions in transport sector have knowledge on data and parameter requirements but have no hands-on experience. The current data sources and the frequency of data collection in the right data sheets are known. However, because data is not disaggregated at source, archiving and documentation methodologies are low. There is generally medium level of data capture in the system and most of the computation is done at CCD (coordination entity level) as shown in Table 19.

Table 19: Current Capacity and gaps in Transport Sector

State	Rate	Comment
Current Capacity	**Low, Medium, High**	**Gaps**
Collection Activity Data	High	• There is knowledge on data requirements
Parameters for Activity Data	High	• Officers know parameters required
Current Data Sources	High	• From UBOS and URA
Frequency of data collection	High	• Data is collected by URA
Right Data sheets	High	• UBOS, CAA
Archiving	Low	• Not done
Documentation of Methodologies	Low	• Yet to learn more
Functioning systems	Medium	• The systems not harmonized
Data captured in the system	Medium	• The systems are there but not functional
Knowledge GHG computation	Medium	• Done at CCD level
Existing structures for computing	Medium	• The systems are in place but not functional
Officers are involved in GHG computation	Medium	• Four members appointed but not functional
Coordination of GHG in this Sector	Medium	• Not clear
Linkage with Sub categories secondary data	Low	• Done at CCD
Evidence of Submission to CCD	Medium	• Sector data is at CCD

3.2.2 Training needs and Skills Required in Transport

General training needs and skills required in the transport sector are outlined as follows;

Disaggregation of data: Training will help proper attribution and to further account for usage by the civil aviation, land transport and water transport. Strengthen the adequacy of data collection sheets.

GHG Computation: Training in the requirements for computing GHG emissions for the Transport sector

Enhance coordination: This will support functioning of systems in all transport sub sectors.

Designing systems: At institutional level there is need to design a system that can support collection, processing and reporting of GHG. There are no institutionalized data syntheses, and GHG computation Reporting of emissions to CCD is lacking in all transport sub sectors.

Individual training requirements from specific sectors

- **Ministry of Works and Transport:** The sector needs a retooling training to enhance data inputting and processing.
- **Civil Aviation Authority:** Needs training specifically for on GHG computation.
- **Uganda Revenue Authority:** Needs to be trained on the right data sheets for disaggregating GHG required data.

Specific capacity needs and support for Transport sub sector

- Training on how to enhance data collection on fleet by road, rail and water transport
- Design systems for data collection from fleet of vehicles
- Training and strategies for integrating key parameters like distance travelled, tonnage and number of vehicles in GHG computations.
- Linkage of existing data to with auxiliary data.
- Designing a system for reporting to CCD for Transport subsector
- Support to collect data on
    - Types of vehicles
    - Fuel quantities
    - Distance covered by vehicles

3.3 Waste

3.3.1 Current capacity and gaps in Waste

The current capacity of waste sector is generally medium and there is evidence of initiatives for data collection under NEMA, CDM projects and UBOS. The data sources have been designated especially for urban centers and where resources are available there is high frequency of data collection. However due to limited knowledge on the parameters, the right data sheets are not used to collect data, archive and document methodologies. The coordination and reporting is generally low in this sector as presented in Table 20.

Table 20: Current capacity and gaps in Waste sector

State	Rate	Comment
Current Capacity	**Low, Medium, High**	**Gaps**
Collection Activity Data	Medium	• No training done, learning is done on Job.
Parameters for Activity Data	Low	• Some are not collected because they did not know about them
Current Data Sources	Medium	• They are known but not well coordinated
Frequency of data collection	High	• For projects regular collected like CDM under NEMA and UBOS • KCCA has some structures
Right Data sheets	Medium	• Not sufficient
Archiving	Medium	• Not sufficient
Documentation of Methodologies	Medium	• Not sufficient
Functioning systems	Low	• Not well coordinated at inter and Intra sectoral level
Data captured in the system	Low	• More capacity is required reports are available
Knowledge GHG computation	Medium	• Need practical training in GHG computation
Existing structures for computing	Low	• Not so clear and functional
Officers are involved in GHG computation	Medium	• Designated and act on demand
Coordination of GHG in this Sector	Low	• Not well coordinated at inter and Intra sectoral level
Linkage with Sub categories secondary data	Low	• Not well coordinated at inter and Intra sectoral level
Evidence of Submission to CCD	Low	• Evidence in not documented

3.3.2 Training needs and Skills Required in Waste

General training needs and skills required in waste sector are outlined as follows;

Data collection: There is need for training to understand the required data, identification of the data sources, designing forms and tables or systems for entering data. This will also include data segregation and capturing gender issues. Designing data collection sheets, and data collection procedures for waste.

GHG methodologies: Training in the requirements for computing GHG emissions for waste sector, the different methodologies, protocols and the software used.

Documenting and Archiving: Training on proper data recording, archiving procedures and required methodologies.

Designing systems: At institutional level there is need for designing a system that can support collection, processing and reporting of GHG emissions. This will support computation of GHG emissions and submission to CCD which are not yet well-developed.

Strengthening existing Structures: Coordination structures are known but not operational.

Individual training requirements from specific sectors

NEMA: Training to bridge the gap and need in data management, analysis, computation of GHG emissions and reporting to CCD.

- GHG estimation and reporting at project level
- GHG emission projections
- System to be able to link to various other data sources in the sector
- Refresher course on methodologies and assumptions for CDM municipalities and NEMA
- Gender training in identifying gender needs in Climate change

UBOS: Training in conducting surveys on waste characterization (Waste by type)

- Waste generation per capita from various sources of waste
- Data collection on waste quantities from various sources
- Design a standard tool for waste sector
- Specialized training for UBOS in waste to enhance their capacity to coordinate other sectors in waste collection

National Water and Sewerage Cooperation:

- GHG emission estimation and reporting at project level

- Training in waste water data requirements for GHG emissions and software capturing the data

Specific capacity needs and support for Waste sub sector

- Training on data collection for Degradable Organic Carbon (DOC) and Methane fraction of waste by population and waste type (food, paper, textile, sludge, industrial waste, nappies etc.) which is partly available in key Municipalities
- Training of collecting data and documenting degradable Organic Carbon (DOC) and Methane fraction of waste by population and waste type (food, paper, textile, sludge, industrial waste, nappies etc.)
- Training and design tools for Waste category amount (food, paper, textile, sludge, industrial waste, nappies etc.) treated mainly by municipalities (anaerobic and or Composite systems)
- Designing tools to collect data on Waste water generated (m^3) per (t) of industrial products (Abattoir, Alcohol refining, Beer & Malt, Pulp and Paper, Soap and detergents, coffee, dairy products, fish, poultry, organic chemical, Plastics and resins, starch production, Sugar refining, vegetable oils, vegetable, fruits & juices, wine and Vinegar) in municipalities
- Support to collect data on
    - Volume and density of the waste
    - Quantities of Waste
    - Waste type by composition biodegradable and none
    - Estimation of project level emissions for instance Dundu and KCCA
    - Training in e-waste data collection

3.4 Agriculture

3.4.1 Current capacity and gaps in Agriculture

The agricultural sector capacity is still very low in terms of data collection, collation and computation of GHG emissions. The gaps in capacity cover all sub sectors including NARO, MAAIF and other research institutions. The MAAIF climate change task force is a platform for coordinating agricultural sectors and has attended theoretical training on GHG computation, but this is not sufficient. This could be because of the complex nature of the parameters required for GHG computation as presented in Table 21.

Table 21: Current capacity and gaps in Agriculture sector

State	Rate	Comment
Current Capacity	**Low, Medium, High**	**Gaps**
Collection Activity Data	Medium	• There is a good level of understanding activity data and statisticians have attended theoretical trainings
Parameters for Activity Data	Low	• Limited knowledge by officer in charge
Current Data Sources	Medium	• Some are known (NARO is working on a project for enteric fermentation)
Frequency of data collection	Low	• There are no efforts to collect data
Right Data sheets	Low	• No systems under livestock sub sector
Archiving	Low	• Not done
Documentation of Methodologies	Low	• Not done
Functioning systems	Low	• Not clear
Data captured in the system	Low	• The system is not available
Knowledge GHG computation	Low	• Limited knowledge
Existing structures for computing	Low	• Not functional computation done at CCD
Officers are involved in GHG computation	Low	• Have a task force but no job description for specific officers
Coordination of GHG in this Sector	Low	• As a task force the sector is coordinated but not for GHG
Linkage with Sub categories secondary data	Low	• Not streamlined
Evidence of Submission to CCD	Low	• Communicates to CCD

3.4.2 Training Needs and Skills Required in Agriculture

General training needs and skills required in agricultural sector are outlined as follows;

Data collection: There need for training to understand the required data, identify the data sources, design forms and tables or systems for entering data. This will also include data disaggregation and capturing gender issues. Design data collection sheets, and data collection procedures for agriculture subsectors.

GHG methodologies: Training in the requirements for computing GHG emissions for Agriculture sector, the different methodologies, protocols and the software used.

Documenting and Archiving: Training in proper data recording, archiving procedures and methodologies.

Designing systems: There is need to design a system that can support collection, processing and reporting of GHG emissions at institutional level.

Strengthening existing coordination structures: Apart from the MAAIF climate change task force, structures can be strengthened by identifying different individuals and their responsibilities at different stages. Their job description should be very clear indicating the outputs required at each stage. This will enhance the coordination of the sector.

Individual training requirements from specific sectors

- **Ministry of Agriculture Animal Industry and Fisheries:** Data collection analysis, management and interpretation especially for livestock sub sector
    - Training on GHG emissions computation
    - Support to document Fertilizer data by designing a system for data input
- **NARO:** Data collection analysis, management and interpretation for Soil data
    - Support to document rice data

Specific capacity needs and support for Agriculture sub sector

- Study breed types through disaggregation
- Strengthening systems and structures to collect data, and compute GHG emissions.
- Training on data requirements
- Study on manure management systems
- Systems to estimate burnt area since they are currently based on NASA data on burnt area, active fire also provides clues
- Strengthen systems to estimate emissions attributable to livestock, soil management and rice paddy cultivation. Support towards data collection for fertilizer imports \ exports and manufacture
- Annual nitrogen excretion and fraction that N that volatilizes
- Support to bring on board the Department of Animal production and the Division of animal nutrition
- Support to collect data on
    - Rice –Area harvested and planted
    - Categories of rice (low land and upland)
    - Team (data, collection, processing)
- Support to develop Emission Factors
- Capacity in developing emission factors
- Training in IPCC software and ALU

3.5 Forestry

3.5.1 Current capacity and gaps in Forestry

Generally, for the forest sector NFA has an elaborate system for data collection. Parameters for GHG data requirements should be included in the data sheets that are used by forest rangers, archiving and documentation of the methodologies. Data collection procedures are not defined and documented. In some cases, structures and systems for data processing are not functional and thus considered medium as shown in Table 22.

Table 22: Current capacity and gaps in Forestry sector

State	Rate	Comment
Current Capacity	**Low, Medium, High**	**Gaps**
Collection Activity Data	High	• Support from REDD+ programme
Parameters for Activity Data	High	• Received training from Support from REDD+ programme
Current Data Sources	High	• Received training from Support from REDD+ programme
Frequency of data collection	High	• Received training from Support from REDD+ programme
Right Data sheets	Medium	• NFA Support from REDD+ programme field managers need the training and right data sheets for sustainability
Archiving	Medium	• Only NFA
Documentation of Methodologies	Medium	• Only NFA other institutions like UWA it's not clear and
Functioning systems	Medium	• Data is scattered
Data captured in the system	Medium	• Received several trainings apart from GIS data the other data is not well documented
Knowledge GHG computation	High	• Received training from Support from REDD+ programme
Existing structures for computing	High	• NFA inventory team has been trained
Officers are involved in GHG computation	Medium	• Designated but their job description not aligned therefore no effective functioning
Coordination of GHG in this Sector	High	• Coordinator designated
Linkage with Sub categories secondary data	High	• Done during computations
Evidence of Submission to CCD	Medium	• Systems are not yet in place, but reporting is done on demand

3.5.2 Training needs and Skills Required in Forestry

General training needs and skills required in forestry sector are outlined as follows;

Data collection: There is need to train field staff managers of the forest reserves. Design right data collection sheets, tools and procedures for them.

Documenting and Archiving: Training in proper data recording, archiving procedures and methodologies for the data collected from the field.

Designing systems: At institutional level, there is need to design a system that can support collection, processing and reporting of GHG emissions.

Strengthening Existing structures: These structures can be solidified by identifying different individuals with responsibilities at different data management stages. Their job description should be very clear indicating the outputs required at each stage. This will enhance the coordination of the sector.

Individual training requirements from specific sectors

- **Ministry of Water and Environment/ FSSD:** Data collection and management skills,
  - GHG computation training for their staff as these have normally been left out
  - Train forest managers on data capturing and design data collection tools
  - GHG computation in Forestry sector
- **NFA:** Capacity building for range managers and sector managers in GHG data collection
  - Refresher training in GHG computation
  - Training on how to use the GPS and other technologies for data collection
- **UWA:** Data collection and management skills,
  - GHG computation trainings for their staff as these have normally been left out.

Specific capacity needs and support for Forestry sub sector

- Design systems and institutionalize them to support consistence in data collection
- Support integration of Wood extraction statistics in the data collection structures of forestry
- Training on how to accurately record land use change especially areas covered by fires, areas planted within and outside central forest reserves.
- Training on GIS Mapping Land cover

Other Training Needs and Capacity Support for Specific Sectors

CCD

- Enhance their coordination skills
- Retooling Course in GHG procedures
- QA/QC data entry standardization

Cities /Urban Authorities

- Training top management on the understanding of GHG concepts and why it is important
- Training of personnel in data management including conversion factors and
- Training on emission factors and their application
- Training staff on use of IPCC tool

URA

- Training on the understanding of GHG concepts and why it is important

Ministry of Lands, Housing and Urban Development

- Need all the trainings they generally have low capacity in all the areas and at institutional level there is no one in charge of GHG computation and data collection
- Specific training in the IPCC tool for urban sector and a dedicated training for the same
- Design tools that can be institutionalized for data collection

National Water and Sewerage Cooperation

- Training on the understanding of GHG concepts and why it is important
- Design tools that can be institutionalized for data collection

4.0 Manual and plan to address the gaps identified during the data management and training needs and assessment in the GHG 5 sectors

4.1 Introduction

This document highlights the steps to guide implementation of the training needs and capacity enhancement support for data management identified across the five GHG sectors of Energy, Transport, Waste, Agriculture and Forestry. The key data management issues identified cover data availability, collation and processing, integration and reporting though all the issues were unique across the sectors as detailed in chapter 2 of this report. The training needs include data collection, GHG methodologies, documenting and archiving, designing systems and strengthening existing structures. The specific training needs were also unique across the five sectors as elaborated in chapter 3 of this report.

4.1.1 Objective of the manual

The main objective of this manual is to guide the implementation of the training needs and data management aspects systematically. The specific objectives include;

a) To guide systematic implementation of data needs and capacities
b) To identify targets and format for delivering the training and other capacity building activities

4.2. Approach to address the identified training gaps and data management needs

4.2.1 Step one

Prioritizing training needs and support for capacity enhancement for the 5 sectors.

a) For each sector the identified training needs and support for capacity will be prioritized by the project implementation team in consultation with that sector.
b) Prioritization should be based on the current state of each sector as well as procedures required for computing GHG emissions as follows
   1st. Data collection,
   2nd. Collation and processing,
   3rd. Documenting assumptions methodologies and archiving,
   4th. Computing GHG and reporting
c) The outputs from trainings and support for capacity enhancement selected should be feeding into each other.

4.2.2 Step two

Writing a concept for each of the prioritized training and capacity support

a) The concept should highlight the gap in the sector
b) State the objective for implementing the prioritized training need and capacity building
c) Define the scope
d) Stating the output expected from each of the training or support
e) State the expected outcome from the training and/or capacity support

4.2.3 Step three

Checklists to assess the contribution of CBIT Project to GHG computation

a) Checklist

Name of the Training need	What was the state	Level of improvement (Consider requirements for	Next steps (Consider requirements for

		GHG computation)	GHG computation)

b) State the short term and long-termindicators for the training and/or capacity support
c) Define a Monitoring Plan to track utilization of the knowledge acquired from the training and/or capacity support

4.2.4 Step Four

Enhancing coordination and institutionalization of the training and/or capacity support

a) Share the concept with the sector
b) Agree on the number of people to be involved and criteria for selection with gender consideration
c) Budget for the activity
d) Implement the training and/or capacity support required

4.3. Detailed Plan with guidance on means of delivery and timelines

Sectors	Training needs and capacity Support	Institutions	Means of Delivery	Timelines Quarters							
				Year 1				Year 2			
				1	2	3	4	1	2	3	4
Energy											
	• Data collection	• MEMD • All Sub Sectors	• Trainings and workshops • Addressing Human Resources Aspects and job description • Field Visits	x	x						
	• Documenting and Archiving	• MEMD • All Sub Sectors	• Trainings on Job • Benchmarking visit								
	• GHG methodologies	• MEMD • All Sub Sectors	• Retooling Trainings online	x							
	• Designing systems: Strengthening existing structures.	• MEMD • All Sub Sectors	• Systems design Consultant and training workshop on how to use the system		x	x					
	• Study on to enhance data on charcoal production, Fire wood, and charcoal use.	• MEMD • NFA • FSSD • CCD	• Feasibility Study • Short course	x	x						
	• Energy use in manufacturing industries should be disaggregated to capture fuel type and amount used by each industry sub category	• CCD • URA • Ministry of Trade Industry and Cooperatives • MEMD	• Training workshop • Meetings to agree and include the Parameters for mileage on the form for third party	x							

	• Documenting data on manufacturing Industries Iron & Steel, other fuels.
	• Desegregating data to Capture
	  ○ chemical industry
	  ○ food processing
	  ○ mining
		• CCD
		• URA
		• Ministry of Trade Industry and Cooperatives
		• NFA
			• Feasibility Study to establish the state and Emission factors			x	x				

Sectors	Training needs and capacity Support	Institutions	Means of Delivery	Timelines Quarters							
				Year 1				Year 2			
				1	2	3	4	1	2	3	4
	○ wood processing ○ construction ○ textile industry	• FSSD									
Transport											
	GHG computation and data inputting and processing	• CCD • Ministry of Works and Transport • Civil Aviation Authority • Uganda Revenue Authority	• Retooling training and workshop	x							
	Designing systems for road, Rail and Water and enhance coordination • Designing a system for reporting to CCD for Transport subsector	• Ministry of Works and Transport • CCD • Uganda Railways Cooperation	• Support for Consultant • Training on how to use the system • Short course		x						
	• Data collection on fleet by road, rail and water transport • Design systems for data collection from fleet of vehicles	• CCD • Ministry of Works and Transport • Uganda Revenue Authority	• Training and strategies for integrating key parameters like distance travelled, tonnage and number • Trainings on Job • Benchmarking visits					x			
	• Support to collect data on ○ Types of vehicles ○ Fuel quantities ○ Distance covered by vehicles	• CCD • Ministry of Works and Transport • Uganda Revenue Authority • Uganda Insurance Regulatory Authority	• Support for a feasibility study and profile • Designing tools for data collection • Training on how to collect data			x	x				
Waste											
	Data collection	• CCD • NEMA	• Workshop training on the knowledge and understanding of the required data identification of						x		

Sectors	Training needs and capacity Support	Institutions	Means of Delivery	Timelines Quarters							
				Year 1				Year 2			
				1	2	3	4	1	2	3	4
		• UBOS • National Water and Sewerage Cooperation	the data sources, designing tools/forms and tables or systems for entering data. • Training workshop in data management, analysis, computation of GHG and reporting to CCD • Exchange visit and benchmarking studies • Field visits • Designing tools • Procurement of tools for data collection • Training on conducting the surveys on waste characterization (Waste by type) • Waste generation per capita from various sources of waste • Data collection on data waste quantities from various sources • Specialized training for UBOS in waste to enhance their capacity to coordinate other sectors in waste collection								
	• Design a standard tool for waste sector	• CCD • NEMA • NWSC • UBOS • Selected Cities and Local Governments	• Support to design the tool for data collection							x	
	GHG methodologies	• CCD • NEMA • NWSC • UBOS • Selected Cities and Local Governments	• Training the different methodologies, protocols and the software used. • GHG emission estimation and reporting at project level • GHG projections • Support to design system to be able to link to various other data sources in the sector							X	

Sectors	Training needs and capacity Support	Institutions	Means of Delivery	Timelines Quarters							
				Year 1				Year 2			
				1	2	3	4	1	2	3	4
			• Refresher course on methodologies and assumptions for CDM projects in municipalities and NEMA • Gender training in identifying gender needs in Climate change								
	Documenting and Archiving	• CCD • NEMA • NWSC • UBOS • Selected Cities and Local Governments	• Training on proper data recording and archiving procedures and methodologies. • Benchmarking visits						x		
	Documenting Waste Sector Profile at National Level	• CCD • NEMA • NWSC • UBOS • Selected Cities and Local Governments	• Support to a consultant to profile Waste sector at National Level • Short course • Benchmarking exposure visits							x	
Agriculture											
	Data collection	• CCD • MAAIF • NARO	• Training workshop on data collection analysis, management and interpretation especially for livestock sub sector	x			x				
		• NARO	• Data collection analysis, management and interpretation for Soil data • Support to document rice data	X							
		• CCD • MAAIF Crop Department	• Support to document Fertilizer data design a system and data input	X							
	Strengthening existing coordination Structures	• Ministry of Agriculture Animal Industry and Fisheries • NARO	• Benchmarking visits • Field trips and visits • Addressing Human resource aspects of Job description			x					

Sectors	Training needs and capacity Support	Institutions	Means of Delivery	Timelines Quarters							
				Year 1				Year 2			
				1	2	3	4	1	2	3	4
	GHG methodologies	• CCD • MAAIF • NARO	• Training on the requirements for computing GHG emissions for Agriculture sector, the different methodologies, protocols and the software used. • Retooling training on IPCC software							X	
	Documenting and Archiving	• CCD • MAAIF • NARO	• Training on proper data recording and archiving procedures and methodologies				X				
	Designing system	• CCD • MAAIF • NARO	• Support to design a system that can support collection, processing and reporting of GHG emissions.				x				
	Conduct Special Studies	• CCD • MAAIF • NARO • MUKDepartment of Animal production • Division of animal nutrition	• Study breed types desegregation • Study on manure management systems • Annual nitrogen excretion and fraction that N that volatilizes • Emission factors • Support to collect data on o Rice –Area harvested and planted o Categories of rice (low land and upland) o Train team on data, collection, and processing.							X	
	Systems to estimate burnt area currently they are based on NASA data on burnt area, active fire also provides clues	• CCD • MAAIF • NARO	• Support to design systems							x	
Forestry											
	Data collection	• CCD • NFA Field staff • District Forest Services • UWA field staff • Ministry of Water and	• Workshop training • Designing right data collection sheets, tools and procedures for them.	x							

Sectors	Training needs and capacity Support	Institutions	Means of Delivery	Timelines Quarters							
				Year 1				Year 2			
				1	2	3	4	1	2	3	4
		Environment/ FSSD • NFA									
	Refresher training in GHG computation ○ Training on how to use the GPS and other technologies for data collection	• UWA • CCD • NFA Field staff • District Forest Services • UWA field staff • Ministry of Water and Environment/ FSSD • NFA	• Workshop Training • Field Visits		x						
	Documenting Methodologies and Archiving	• CDD • NFA FSSD	• Hand on training on proper data recording and archiving procedures			x					
	Designing systems: At institutional level there is need to design a system that can support collection, processing and reporting of GHG emissions.	• UWA • CCD • NFA Field staff • District Forest Services • UWA field staff • Ministry of Water and Environment/ FSSD • NFA	• Training on how to accurately record land use change especially areas covered by fires, areas planted within and outside central forest reserves.				x				
	Strengthening existing Structures	• CCD • NFA	• Retreat for institutional development to enhance coordination of the sector • Support to design systems and institutionalize them to support consistence					X			
	Training on how to accurately record land use change especially areas covered by fires, areas planted within and outside central forest reserves.	• CCD • NFA • UWAS • District Forest Services	• Training Workshop to support integration of Wood extraction statistics in the data collection structures of forestry						X		
	• Training on GIS Mapping Land cover	•	• Online training							X	

Sectors	Training needs and capacity Support	Institutions	Means of Delivery	Timelines Quarters							
				Year 1				Year 2			
				1	2	3	4	1	2	3	4
			• Field Training								

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Annex 1: Tool for data management and needs assessment

Key areas for data management and assessment	**Minimum requirements per sector**	**Overall Score on Data availability =** *how many times the elements (M,P,U,O&E)in the score guide appears*
Summary of data needs assessment	Score summary for each sector based on minimum requirements for IPCC tier 1	
Data availability is assessed by minimum data requirements (Tier 1) by each IPPC category	Name of the activity data for each sector	
	Percentage of Power from Thermal and HEP	
	General overview and description of data situation	
	Current Data Source	
	Frequency of data collection	
	Evidence of Data Sheets	
	Evidence of Archiving	
	Evidence of documentation of methodologies and assumptions	
Collation and processing	Evidence of system	
	Evidence of data captured in the system correctly	
	Evidence of GHG computation	
	Evidence of structures	
	Evidence of Coordination	
Data integration and Reporting	Evidence of linkages of sub categories, auxiliary data e.g., climate zones and difference in GHG computation	
	Evidence of Submission to CCD	

The Score guide for the for the tool		
M	*Missing*	*Does not Exist*
P	*Present*	*The is evidence that the organization knows, is documented but not able to make computations*
U	*Used but not suitable*	*In use but limited to local circumstances, results not guaranteed*
O	*Operational*	*The is evidence of use and there are some results*
E	*Effective*	*Effective use with desired outcomes*

Annex 2: Tool for identifying gaps and skills for training needs assessment

		CAPACITY & SCORE			
Key areas for capacity Assessment Area	**Assessing the understanding on minimum requirements for Activity Data**	**Low (1)**	**Medium (2)**	**High (3)**	**Comment (For Sector)**
1. Data availability is assessed by minimum data requirements (Tier 1) by each IPPC category	Understanding the activity data for your sector				
	Parameters for Activity Data				
	General understanding of the data situation in the aspects below				
	• Current Data Sources				
	• Frequency of data collection				
	• Documenting of the right Data Sheets				
	• Documentation requirements for Archiving				
	• Documentation of methodologies and assumptions				
2. Collation and processing	Are the systems functioning for all the above aspects				
	What is your level of knowledge on data captured in the system				
	What is your level of Knowledge of GHG computation				
	Do structures for GHG computation exist in your sector				
	How many officers are involved in GHG computation in your sector				
	Who is in charge of Coordination for GHG in this sector				
3. Data integration and Reporting	What is the linkage of sub categories, secondary data e.g., climate zones and difference in GHG computation in your sector				
	Evidence of Submission to CCD				

Low (1): You know about capacity area but have not attended any training or done any work in the area
Medium (2): You know about capacity area have attended training or but have not done any work in the area
High (3): You know about capacity area have attended trainings and done some work in the area

Annex 3: List of Participants Consulted

List of Participants for the Training from the five Sectors					
	Name	**Sector**		**Institution**	**Designation**
1.	Annunciata Hakuza	Agriculture	CBIT gender focal point	MAAIF	Senior Economist - CBIT gender focal point
2.	James Ogwang Mark Okidi	Agriculture (Fertilizer)	Fertilizer	MAAIF	AI
3.	Oketch Lazarus Mark	Energy		MAAIF	
4.	Mukasa Alex	Agriculture (Crop)	Crop	MAAIF	PVO
5.	Kanzomba Imelda	Agriculture (Manure management)	Manure management & CBIT focal point	MAAIF	Senior Agricultural Officer -CBIT focal point
6.	Lwasa James	Agriculture (Soil)	Soil & CBIT contact	NARO	GIS Specialist (CBIT contact)
7.	Eleth Nakazzi	Waste (solid waste)	solid waste	KCCA	Project Manager (KCCP)
8.	John Paul Sajjabi	Waste (solid waste)	solid waste	KCCA	Manager QHS
9.	Ajam Angella Lowra	AfrII	AfrII	AfrII	Research Officer
10.	Eng. Joe Kamanyi	Waste (Waste water)	Waste water	NWSC	Manager Projects
11.	Dan K. Kiguli	Waste	CBIT -focal point	NEMA	Environmental Inspector (CBIT -focal point)
12.	Mukasa Mugambwa Richard	Waste (Waste water)	Waste water	NEMA	Environmental Inspector
13.	Fridah Basemera	Forestry (Forest Monitoring)	Forest Monitoring-CBIT focal point	NFA	Coordinator GIS and Mapping Unit
14.	Aheebwa Justine	Forestry		NFA	Environment Management officer
15.	Atino Juliet	Transport		MoWT	CBIT gender focal point
16.	Victor Esendi	CI	CI	CI	CI
17.	Brenda Owomugisha	MEMD	MEMD	MEMD	MEMD
18.	Innocent Kayiza	E.Alert	E.Alert	E.Alert	Environment Officer
19.	Nakalema Christine	Energy (Green Charcoal Project)	Green Charcoal Project	MEMD	Energy Officer
20.	Mercy Kanyesigye	Energy		MEMD	Project officer
21.	Oketh Lazarus	Energy	CBIT focal point	MEMD	Project Officer
22.	Sadam Yiga Kiwanuka	Energy (Efficient cook stove)	Efficient cook stove	KCCA	Project Officer
23.	Keith Ahumuza	Energy	Statistician	UBOS	Statistician
24.	Free de Konning	CI	CI	CI	CI

List of Participants for the Training from the five Sectors					
	Name	**Sector**		**Institution**	**Designation**
25.	Charles Mutemo	Transport		MLHUD	PEO (CBIT focal point)
26.	Jonathan Muyambi	Transport (Efficiency)		MLHUD	PUDO
27.	Sheila Kiconco	Training Data (Team Leader)			Consultant
28.	John Begumana	Training Data (Technical Specialist)			Consultant
29.	Susan Bingi	MoU (Team Leader)		n/a	Consultant
30.	Flavia Anyango	MWE		MWE	
31.	Geoffrey Gabiri	Natural resources, GIS expert		n/a	Consultant
32.	Charity Nalyanya	CI-GEF		CI-GEF	CI-GEF Agency Project Manager
33.	Henry Bbosa	CCD		MWE	Senior Climate Change Officer (CBIT -focal point)
34.	Isaac Okiror	CCD		MWE	IT Officer
35.	Isaac Rubayiza	CCD		MWE	Mitigation Officer
36.	Derrick Senyonga	CCD		MWE	Mitigation Officer
37.	Anthony Tugaineyo	Consultant			Consultant
38.	Eseza Kalangwa	CCD		MWE	M & E
39.	Justine Akumu	MEMD		MEMD	MEMD
40.	Martin Ojok	CCD		MWE	Adaptation Officer
41.	Nabukulu Catherine	NFA		NFA	CBIT gender focal point
42.	Dr. Felly Mugizi Tusiime	CBIT		AfrII	Project Manager
43.	Arthur Ssebbugga-Kimeze	CBIT		AfrII	GHG Expert/ Statistician
44.	Elizabeth Ahumuza	CBIT		AfrII	Climate Scientist
45.	Prossy Ogwal	CBIT		AfrII	Finance Manager
46.	Prof. G. W. Otim Nape	AfrII		AfrII	CEO
47.	Sylivia Ayebare	AfrII		AfrII	Communications Officer
48.	Florence Keishanyu	AfrII		AfrII	Senior Administrator
49.	Gorettie Nabanoga	Gender		MAK	Consultant
50.	Muyambi Jonathan	Energy		MLHUD	
51.	Wangama Ibrahim	Transport		ALL	
52.	Akullo Monique	Waste		NEMA	CBIT gender focal point
53.	Victor Esendi	CI	CI	CI	Senior Technical Manager
54.	Charity Nalyanya	CI	CI	CI	CI-GEF Project

List of Participants for the Training from the five Sectors					
	Name	**Sector**		**Institution**	**Designation**
					Agency Africa Manager