THE GOVERNMENT OF PAPUA NEW GUINEA

NATIONAL GREENHOUSE GAS (GHG) INVENTORY IMPROVEMENT PLAN 2022 - 2024

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FOREWORD

Mr. William Lakain

Papua New Guinea (PNG) signed the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 and ratified the convention in 1994. Since then, PNG has been committed to meeting its obligation under the convention. This includes the preparation and submission of the Initial National Communication in 2002, the Second National Communication in 2015 and the First Biennial Update Report in 2019 which includes a REDD+ Technical Annex.

In 2015, PNG was among the 196 Parties that adopted the Paris Agreement in the 21st Conference of Parties. PNG ratified the Paris Agreement in 2016 and further passed the United Nations Paris Agreement (Implementation) Act in Parliament. This shows that PNG will be committed to meeting its obligation under the Paris Agreement.

Such commitment can be seen with the preparation and submission of the country's Nationally Determined Contribution as per Article 4 of the Paris Agreement in 2016. This was followed by the preparation and submission the Enhanced NDC in 2020.

More recently in 2022, PNG prepared and submitted its BUR2 which includes a REDD+ Technical Annex and a stand-alone National Inventory Report. Following this submission,PNG will be transitioning into Enhanced Transparency Framework as per Article 13 of the Paris Agreement. This includes the improvement and enhancement of its existing Measurement, Reporting and Verification system in order to meet the modalities, procedures and guidelines (MPGs) of Article 13 as per decision 18/CMA1 as well as guidance for operationalizing the MPGs contained in decision 5/CMA 3.

The Climate Change and Development Authority (CCDA) is the mandated government entity in PNG that is responsible for coordinating the implementation of the Paris Agreement in PNG. Therefore, CCDA will be responsible for making sure that the country stives to meet the MPGs of Article 13 of the Paris Agreement. However, as a small island developing state PNG will require support from the international community.

CCDA has received technical and funding assistance from the GIZ the NDC Partnership Climate Action and the Pacific Regional NDC Hub to develop the National GHG Inventory Improvement Plan. In addition to this, CCDA also received technical and funding support from the Food and Agriculture Organization of the United Nations through the Global Environment Facility-Capacity Building Initiative for Transparency (GEF-CBIT) Project and the Green Climate Fund Readiness Project.

The National GHG Inventory Improvement Plan will address areas of improvement in PNG's GHG inventory system in order for PNG to meet the MPGs of Article 13 of the Paris Agreement. The improvements will be reflected in the National Inventory Report that PNG plans on submitting in 2024 to the UNFCCC as a stand-alone document with the First Biennial Transparency Report.

The success of the National GHG Inventory Improvement Plan will depend on the support provided by key stakeholders especially data providers identified that were identified. Therefore, CCDA requests the support from these key stakeholders.

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William Lakain

Acting Managing Director, Climate Change and Development Authority

ACKNOWLEDGEMENTS

The Greenhouse Gas Inventory Improvement Plan 2022-2024 was supported through the NDC Partnership Climate Action Enhancement Package (CAEP) with technical assistance from GIZ and the Pacific Regional NDC Hub. The Plan was prepared by JAC Consultancy Services under the guidance of the Climate Change Development Authority (CCDA) and the AFOLU and Energy Sub-Technical Working Committees of the Government of Papua New Guinea.

CCDA would also like to express our appreciation to the Food and Agriculture Organization of the United Nations for the financial and technical assistance provided through the Global Environment Facility-Capacity Building Initiative for Transparency (GEF-CBIT) Project and the Green Climate Fund Readiness Project.

CCDA would like to acknowledge the valuable inputs of stakeholders engaged through the process and engagement from members of the AFOLU and Energy Sub-Technical Working Committee, relevant development partners and key stakeholders. Following are the key stakeholders that contributed towards the development of this plan:

- PNG Forest Authority (PNGFA);
- Department of Agriculture and Livestock (DAL);
- Conservation and Environment Protection Authority (CEPA);
- National Energy Authority (NEA);
- PNG Power Limited (PPL);
- National Statistical Office(NSO);
- Water PNG (WPNG);
- National Capital District Commission(NCDC).

And finally, officers under the MRV and National Communications division for delivering this project.

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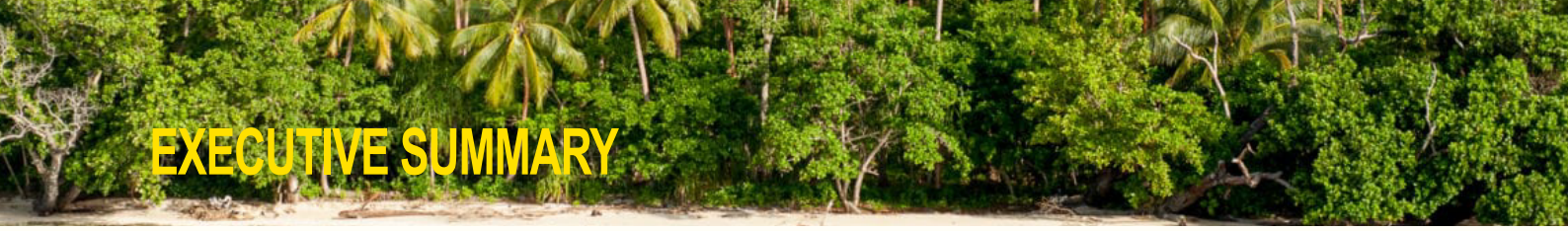
ACRONYMS

APERC	Asia Pacific Energy Research Centre
BUR	Biennial Update Report
BTR	Biennial Transparency Report
CCDA	Climate Change Development Authority
CEPA	Conservation and Environment Protection Agency
CH_4	Methane
CMA	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
CO_2	Carbon dioxide
CP	Conference of Parties
CSO	Civil Society Organizations
DAL	Department of Agriculture and Livestock
FAO	United Nations Food and Agriculture Organisation
FREL	Forest Reference Emission Level
FRL	Forest Reference Level
GDP	Gross Domestic Product
GEF	Global Environment Facility
Gg	Giga gram
GHG	Greenhouse Gas
GHGi	Greenhouse Gas inventory
ha	Hectare
HFC	Hydrofluorocarbon
ICAO	International Civil Aviation Organization
IPP	Independent Power Producers
IPPU	Industrial Processes and Other Product Use
JICA	Japan International Cooperation Agency
K	Kina, monetary unit of Papua New Guinea
KCA	Key Category Analysis
km	Kilometer
ktoe	Kilo-tonne of oil equivalent
LNG	Liquefied Natural Gas
LULUCF	Land use, Land-Use Change and Forestry
MP-NFI	Multi-Purpose National Forest Inventory
MRA	Mineral Resources Authority
MRV	Monitoring, Reporting and Verification
MW	Megawatt
NC	National Communication
NCDC	National Capital District Commission
NDA	National Designated Authority
NDOH	
NEA	National Energy Authority
NFI	National Forest Inventory
NSO	National Statistical Office
N_2O	Nitrous Oxide
PFC	Perfluorocarbons
PNG	Papua New Guinea
PNGFA	Papua New Guinea Forest Authority
QA/QC	Quality Assurance and Quality Control

REDD+	Reducing Emissions from Deforestation and forest Degradation and the role of Conservation, Sustainable management of forest and enhancement of carbon stocks
SF6	Sulphur hexafluoride
SWDS	Solid Waste Disposal Site
UNFCCC	United Nations Framework Convention on Climate Change
UPNG	University of Papua New Guinea



EXECUTIVE SUMMARY

Papua New Guinea (PNG) recently prepared and submitted a National Inventory Report (NIR) together with the Second Biennial Update Report (BUR2) to the United Nations Framework Convention on Climate Change (UNFCCC) in 2022. Following this submission, the country plans to prepare a NIR for the new reporting obligation under Article 13 of the Paris Agreement. The NIR will be prepared in accordance with the modalities, procedures and guidelines (MPGs) for the implementation of Article 13 of the Paris Agreement as contained in the Annex of decision 18/CMA 1. The guidelines require Parties to the Paris Agreement to submit to the UNFCCC by 2024 a NIR that could be either part of the Biennial Transparency Report (BTR) or as a stand-alone document.

The National GHG Inventory Improvement Plan outlines PNG's plans to make improvement on its GHG inventory which will be reported in the NIR as a stand-alone document that will be submitted with the BTR to the UNFCCC in 2024. The main objective of this document is to identify areas of improvement in the recent GHG inventory and address them in order to meet the MPGs of Article 13 of the Paris Agreement on Enhanced Transparency Framework (ETF) as contained in Annex of decision 18/CMA 1. The plan will be guided with the principle of Transparency, Accuracy, Completeness, Comparability and Consistency (TACCC).

The designated entity for preparing and communicating the BURs and National Communications (NCs) to the UNFCCC is the Climate Change and Development Authority (CCDA). This is as per its mandate under the Climate Change (Management) Act 2015. The responsible division within the CCDA structure is the Measurement Reporting and Verifications (MRV) and National Communications division. Under this arrangement, CCDA was able to prepare and submit PNG's BUR1 including REDD+ Technical Annex in 2019. This also includes the current preparation of the BUR2 including the REDD+ Technical Annex and NIR. Development partners have also provided financial and technical support to CCDA for the preparation of these reports. This includes the Food and Agriculture Organisation of the UN (FAO) and Japan International Cooperation Agency (JICA).

CCDA has enhanced its institutional arrangement by establishing an Energy Sub Technical Working Committee (ESTWC) and Agriculture Forestry & Other Land Use Sub Technical Working Committee (AFOLU STWC). The STWCs consist of key government agencies, private sector agencies, and Non-Government Organisations from the energy and AFOLU sectors in PNG. The STWCs is responsible for providing technical inputs for the preparation of the BUR2. In addition to this, there are also other institutions from other sectors that have provided information to CCDA for the preparation of this document.

The Improvement Plan section of this GHG Inventory Improvement Plan outlines the overall and sector-specific strengths and limitations of PNG National GHG Inventory system, specifically, Inventory Arrangement, Quality Assurance and Quality Control, Key Category Analysis, Uncertainty Analysis, National Inventory Improvement Plan, Archiving System, Methods and Data Documentation, Recalculations, and TACCC Principles. The important improvement gaps were identified during the preparation of PNG's BUR1, BUR2 and the National Inventory Report (NIR) and should be addressed to enable improvement in PNG's national GHG inventories.

PART

1

INTRODUCTION

BACKGROUND

The national greenhouse gas (GHG) inventory measures a country's progress against its obligations under the United Nations Framework Convention on Climate Change (UNFCCC) and is the official basis for measuring the country's meaningful contribution to the reduction of global emissions. GHG inventories are to be included in reports under Articles 4 and 12 of the Convention (National Communications), and in Biennial Update Reports (BUR) required by decision 2/CP.17 under the Convention as applicable to Non-Annex I Parties (or developing countries).

National Communications are to be reported every 4 years and are required to be developed using guidelines contained in decision 17/CP.8. The BURs are to be reported every 2 years as required by decision 1/CP.16 under the Convention.

Papua New Guinea (PNG) prepared its first GHG inventory for the Initial National Communication (INC) that was submitted to the UNFCCC in 2002. Followed by this was the GHG inventory for the SNC that was submitted to the UNFCCC in 2015 and the GHG inventory for the BUR1 that was submitted in 2019. The GHG inventories for these reports were developed in accordance with guidelines that exist under relevant decisions under the Convention (2/CP.7 and 17/CP.8). The requirements for GHG inventories relate to general reporting requirements; the coverage in inventory years and GHGs; metrics; methodology; and specific requirements for each sector of the GHG inventory which includes Energy, Industrial Processes and Product Uses, Agriculture Forestry and Other Land Uses, and Waste.

PNG recently prepared and submitted a National Inventory Report (NIR) together with the BUR2. Unlike the previous reports (INC, SNC and BUR1), the NIR provides detailed information on the methodology and results for each category under each sector. Following this submission, the country plans to prepare a stand-alone NIR for the new reporting obligation under Article 13 of the Paris Agreement on Enhanced Transparency Framework (ETF).

The NIR will be prepared in accordance with modalities, procedures and guidelines (MPGs) for Article 13 of the Paris Agreement on ETF as contained in the Annex of decision 18/CMA 1. The guidelines require Parties to the Paris Agreement to submit to the UNFCCC by 2024 a national inventory report that could be either part of the Biennial Transparency Report or stand-alone document. In order to meet these guidelines, there is need for improvements on the recent GHG inventory. Therefore, PNG has prepared the National GHG Improvement Plan which outlines country's plans to make improvement on its recent GHG inventory.

PART
2

OBJECTIVES

OBJECTIVES

The objective of the National GHG Inventory Improvement Plan is to identify areas of improvement in the recent GHG inventory and address them in order to meet the MPGs for the implementation of Article 13 of the Paris Agreement on ETF as contained in Annex of decision 18/CMA 1. The improvement plan will be guided with the principles of Transparency, Accuracy, Completeness, Comparability and Consistency (TACCC).

PART
3

EXISTING NATIONAL INVENTORY SYSTEM

EXISTING NATIONAL INVENTORY SYSTEM

This section outlines the existing national GHG inventory system and includes information on the institutional arrangement, GHG preparation process, GHG achieving system and the tools used to estimate GHG emissions and removals.

SECTION 3.1 INSTITUTIONAL ARRANGEMENT

SUB - SECTION 3.1.1 Arrangement for the preparation of BUR and NC

The designated entity for preparing and communicating the BURs and NCs to the UNFCCC is the Climate Change and Development Authority (CCDA). This is as per its mandate under the Climate Change (Management) Act 2015. CCDA is also responsible for the following BUR and NC elements:

- *Identify constraints and gaps, and related financial, technical and capacity-building needs, including a description of support needed and received;*
- *Keep any management committees and working groups informed of progress and emerging issues;*
- *Develop and implement Quality Assurance and Quality Control strategies for the entire BUR and NC;*
- *Manage the overall budget for the preparation of the BUR and NC;*
- *Compile and integrate all sections of the BUR and NC into a cohesive document;*
- *Develop and maintain an archiving system to ensure institutional memory and to fully and systematically document all the activity data and the methods used;*
- *Collect and maintain statistical records;*
- *Conduct an evaluation exercise to identify key lessons learned and areas for improvement; and*
- *Consider results of the International Consultation and Analysis (ICA) process.*

The responsible division within the CCDA structure is the MRV and National Communications division. Under this arrangement, CCDA was able to prepare and submit PNG's BUR1 including REDD+ Technical Annex in 2019. This also includes the preparation of the BUR2 including the REDD+ Technical Annex and NIR. Development partners have also provided financial and technical support to CCDA for the preparation of these reports. This includes the Japan International Cooperation Agency (JICA) and the UN Food and Agriculture Organisation (FAO).

According to the BUR2, CCDA has enhanced its institutional arrangement by establishing an Energy Sub Technical Working Committee (ESTWC) and Agriculture Forestry & Other Land Use Sub Technical Working Committee (AFOLU STWC). The STWCs consist of key government agencies, private sector agencies, and Non-Government Organisations from the energy and AFOLU sectors in PNG. The STWCs are responsible for providing technical inputs for the preparation of the BUR2. In addition to this, there are also other institutions from other sectors that have provided information to CCDA for the preparation of the BUR2.

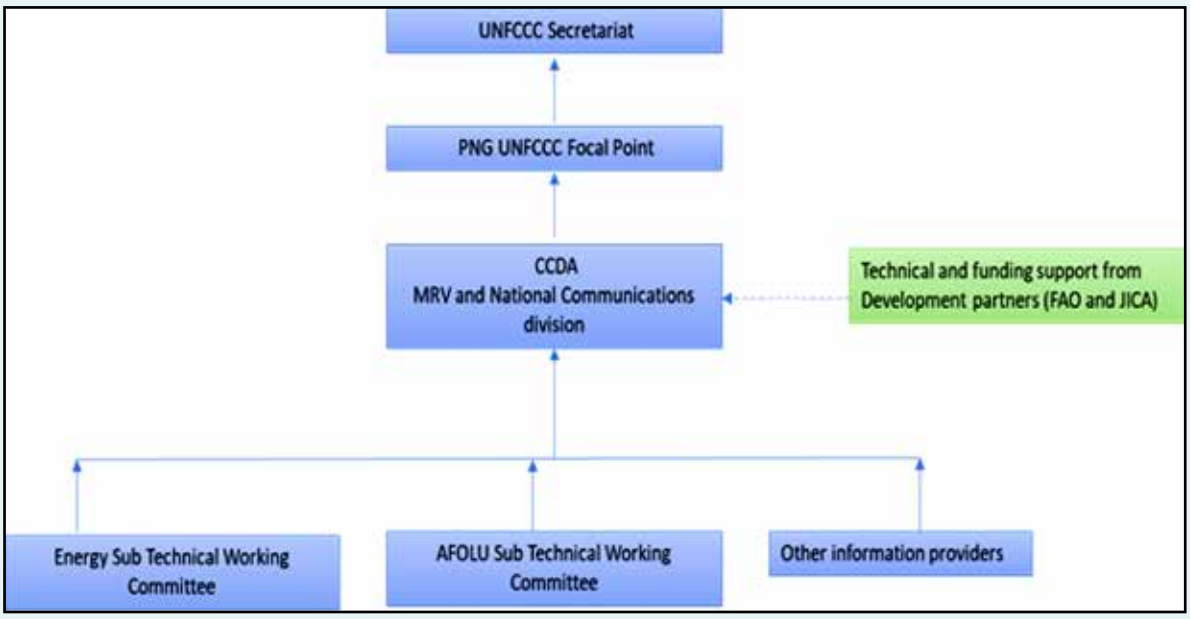


Figure 3-1: General Institutional Arrangement for the preparation of the BUR2, REDD+ Technical Annex and National Inventory Report (Source: PNG's Second Biennial Update Report)

SUB - SECTION 3.1.2 GHG Inventory Team

The structure of the CCDA GHG inventory team is as follows: General Manager with oversight responsibilities, the inventory coordinator who is responsible for the day-to-day management of the team, the inventory compiler who is the lead technical expert who is responsible for compiling the inventory, and the sector experts who will carry out activities to prepare the inventory for his/her responsible sector, including the inventory report. Due to staff shortages in CCDA, an expert may take on two roles, such as the compiler and a sector responsibility.

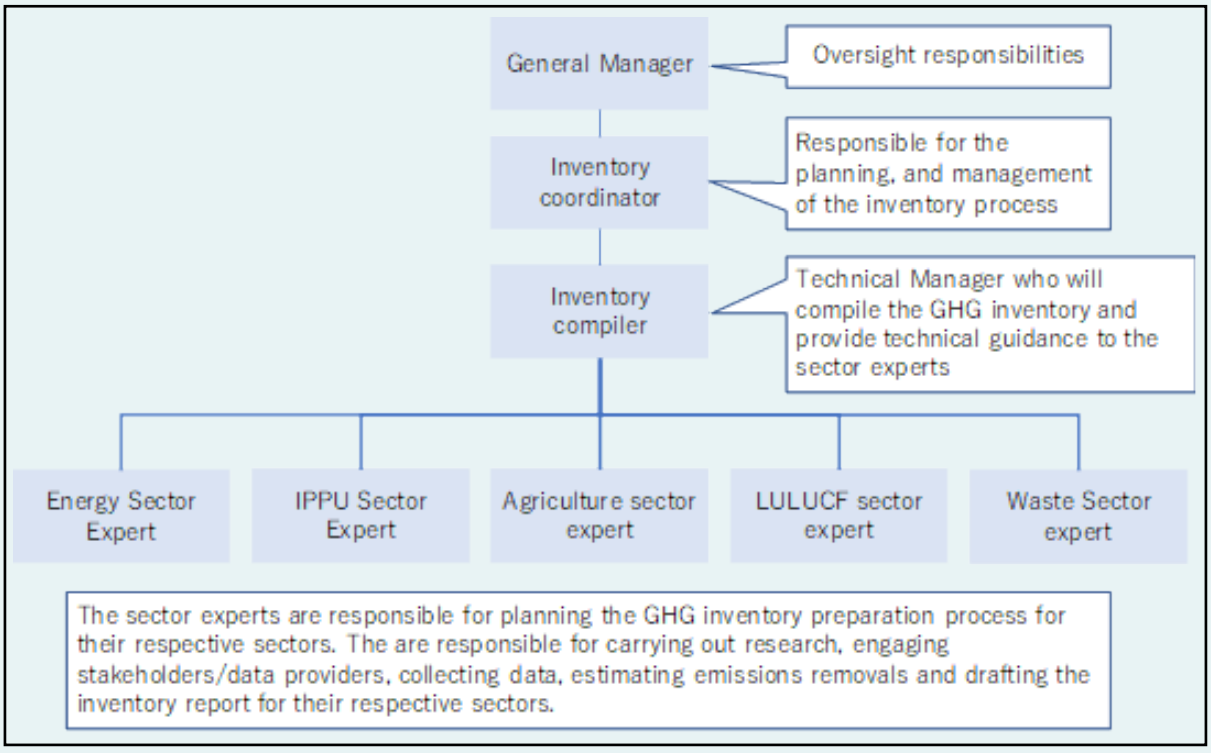


Figure 3-2: Structure of the CCDA GHG Inventory Team

SUB - SECTION 3.1.3 GHG Inventory Data-Sharing Arrangement

CCDA collaborates with the designated lead sector agencies to compile the GHG inventory. Through this collaboration, CCDA receives activity data and emission factors to enable the estimation of GHG emissions and removals. Private companies also provide the relevant data when sector lead agencies don't have the available data.

For the Energy sector, the National Energy Authority (NEA) was involved but the activity data used was from the energy balance table compiled by the Asia Pacific Energy Research Centre (APERC) by using the Oil and Natural Gas data provided by the NEA. For the Industrial Process and Product Use sector, two private companies were involved one is an importer of products containing N_2O, and the other imports and uses lubricants.

Data on the import of bulk HFCs in refrigeration and air-conditioning equipment was provided via a consultancy and used to validate corresponding data provided by PNG Customs. For the Agriculture, Forestry, and Other Land Use Sector (AFOLU), the Department of Agriculture and Livestock, the lead agency for the agriculture sector, and the PNG Forest Authority, the lead agency for the forestry sector were involved and provided forest and land use assessment data and to some extent emission factor data. And for the Waste Sector, three government agencies namely Water PNG, National Statistical Office, and the National Capital District Commission were involved.

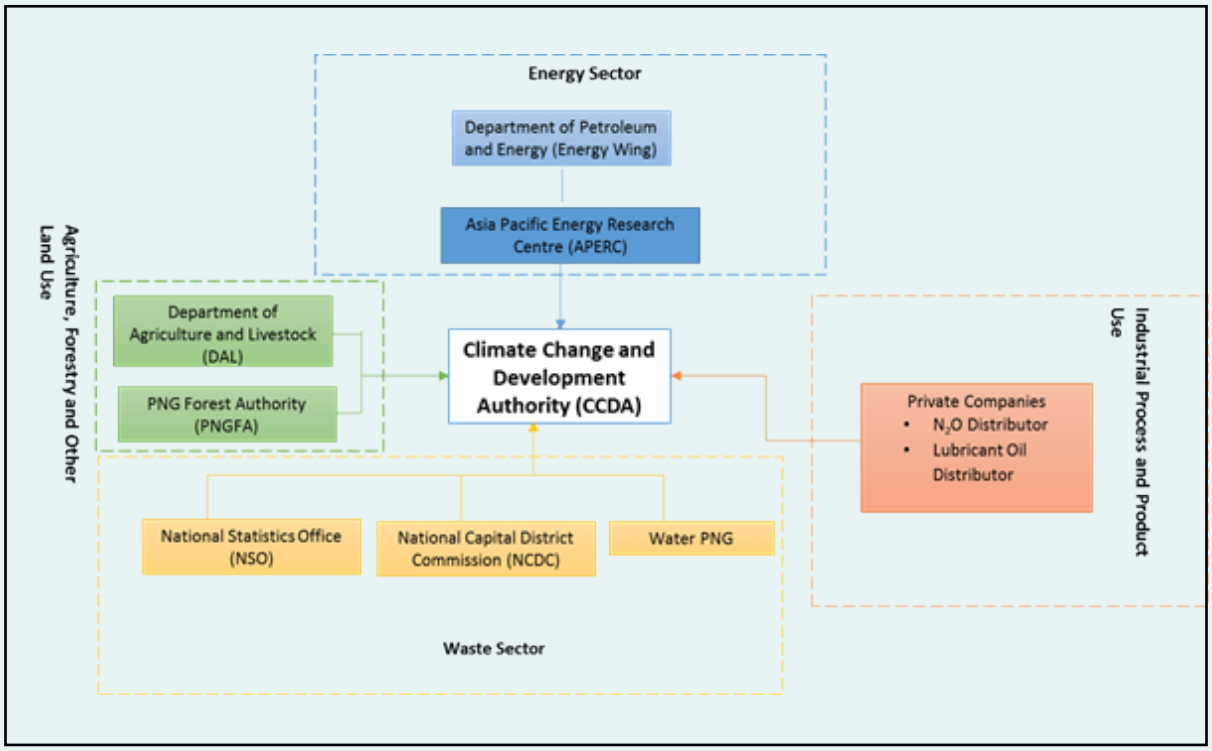


Figure 3-3: Current data sharing arrangement

SECTION 3.2 GHG INVENTORY TOOLS

The GHG inventory team used Microsoft excel to estimate GHG emissions and removals from all four sectors including the overall compilation of national totals. In addition to this, activity data for the LULUCF is extracted from collect earth assessment. The collect earth assessment used the collect earth tool which is a software that enables data collection through Google Earth software. This can be undertaken in conjunction with Google Earth, Bing Maps and Google Earth Engine.

SECTION 3.3 GHG ACHIEVING SYSTEM

There is still need to establish a well structure GHG archiving system.

PART
4

RECENT NATIONAL INVENTORY REPORT

SECTION 4.1 METHODOLOGY USED

The methodology used for the recent National Inventory Report was the 2006 IPCC guidelines. Emissions and removals from most categories have been estimated with tier 1 methods with exception of some categories in the LULUCF, IPPU (HFC emissions) and waste sectors which were estimated using the tier 2 method. The recent National inventory report uses the global warming potentials as contained in the Second Assessment Report (SAR) of the IPCC.

SECTION 4.2 IDENTIFIED IMPROVEMENTS

Improvements were identified for each category in the recent national inventory report. This section outlines the categories that were reported under each sector and the preliminary planned improvements that were identified.

SUB - SECTION 4.2.1 Energy

According to volume 2 of the 2006 IPCC guidelines, there are 3 sources under the energy sector: i. 1A Fuel combustion activities; ii. 1B Fugitive emissions from fuels; and iii. 1C Carbon dioxide transport and storage. Under these sources there are 11 categories.

5 categories were reported in the recent NIR since the other categories do not exist in PNG. The table below provides a list of the categories under the energy sector as well as the planned improvements identified in the recent NIR.

Table 4-1: Planned improvements identified for the energy sector categories (Source: National Inventory Report 2000-2017)

2006 IPCC Code	Category name	Reported In Recent NIR	Method used (Tier)	Planned Improvements Identified In Recent NIR
1A1	Energy Industries	Yes	Tier 1	Development of PNG national energy balance table with country specific data
1A2	Manufacturing Industries and Construction	Yes	Tier 1	Development of PNG national energy balance table with country specific data. Disaggregation of activity data into specific sub categories. Development of country specific emission factor.
1A3	Transport	Yes	Tier 1	Development of PNG national energy balance table with country specific data.
1A4	Other Sectors	Yes	Tier 1	Development of PNG national energy balance table with country specific data.
1A5	Non-Specified	No		Not applicable
1B1	Solid Fuels	No		This category does not exist in PNG
1B2	Oil and Natural Gas	Yes	Tier 1	
1B3	Other emissions from Energy Production	No		Not applicable
1C1	Transport of CO2	No		This category does not exist in PNG
1C2	Interjections and Storage	No		This category does not exist in PNG
1C3	Other	No		This category does not exist in PNG

SUB - SECTION 4.2.2 Industrial Processes and Product Uses

According to volume 3 of the 2006 IPCC guidelines, there are 8 sources under the IPPU sector. This is further broken down into categories.

Only 3 categories under 3 sources were reported in the recent NIR. The table below provides a list of the sources under the IPPU sector as well as the planned improvements identified in the recent NIR.

Table 4-2: Planned improvements identified for the IPPU sector sources (Source: National Inventory Report 2000-2017)

2006 IPCC Code	Source	Reported In Recent NIR	Method used (Tier)	Planned Improvements Identified
2A	Mineral Industry	No		The GHG Inventory Improvement Plan includes an exercise to confirm whether any mineral industry activities are occurring inPNG and whether these activities generate GHG emissions.
2B	Chemical Industry	No		GHG Inventory Improvement Plan whether chemical industry occurs whether its industrial processes generate GHG emissions
2C	Metal Industry	No		GHG Inventory Improvement Plan whether metal industry occurs whether its industrial processes generate GHG emissions
2D	Non-Energy Products from fuels and solvent use	Only 2D1 lubricant use was reported	Tier 1	CCDA has no planned improvements in the methodology and emission factors to estimate CO_2 emissions from lubricant use. This is based on a need toprioritize improvements in the GHG inventory based on outcomes of the key category assessment.
2E	Electronics Industry	No		GHG Inventory Improvement Plan whether electronics industry occurs whether its industrial processes generate GHG emissions
2F	Product Uses as Substitutes for Ozone Depleting substances	Only 2F1 Refrigeration and Air Conditioning	Tier 1	The HFC Emission Inventory Report (September 2021) provided to the CCDA lists identified improvement to the Product uses as substitutes for ODS (2.F). These improvements can be generalized as: • CDA collaborate with CEPA and PNG Customs on an interim arrangement to obtain annual HFC bulk import data to enable emissions estimation, • Concurrently, CEPA collaborates with CCDA and PNG Customs onimproving mechanisms, arrangements, processes and procedures to collect data by imported equipment type, the stock of equipment in PNG by end-use, and the refrigerant 'bank', and • Collaborate with PNG Customs and PNG Energy to identify sources of data on SF6 in electrical equipment.
2G	Other Product Manufacture and Use	Only 2G3 N_2O from product uses	Tier 1	CCDA has no planned improvements in the methodology and emission factors to estimate N2O emissions from medical applications. This is based on a need to prioritize improvements in the GHG inventory based on outcomes of the key category assessment.
2H	Other	Not applicable		

SUB - SECTION 4.2.3 Agriculture

According to volume 4 of the 2006 IPCC guidelines, there are 2 sources under the agriculture sector: i. 3A Livestock; ii. 3C Aggregates sources and non-CO2 on managed soils. Under these sources there are 9 categories.

5 categories were reported under the agriculture sector in the recent NIR. The table below provides a list of the categories under the energy sector as well as the planned improvements identified in the recent NIR.

Table 4-3: Planned improvements identified for the agriculture sector categories (Source: National Inventory Report 2000-2017)

2006 IPCC Code	Source	Reported In Recent NIR	Method used (Tier)	Planned Improvements Identified
3A1	Enteric fermentation	Yes	Tier 1	PNG is planning to set up data collection activities that lead to improve the detail of the activity data and eventually move to higher tiers especially for the most representative livestock species in the country.
3A2	Manure management	Yes	Tier 1	Planned improvements for this sub category involve a proper survey to identify the types of manure management systems practiced in PNG.
3C2	Liming	No		PNG is planning to set up data collection activities that lead to improve the detail of the activity data.
3C3	Urea application	No		PNG is planning to set up data collection activities that lead to improve the detail of the activity data.
3C4	Direct N_2O emissions from managed soils	Yes	Tier 1	Planned improvements for this sub category includes identifying potential data sources for other sources of organic fertilizers (FOS) and N in mineralization associated with loss of soil organic matter resulting from change of land use or management of mineral soils (FSOM). Further improvements involve identifying and using country specific data for synthetic N fertilizers and crop residues.
3C5	Indirect N_2O emissions from managed soils	Yes	Tier 1	Similar improvements for the direct N_2O emission from managed soils (3C4) sub category also applies to this sub category.
3C6	Indirect N_2O emissions from manure management	Yes	Tier 1	Similar improvements for the manure managed (3A2) sub category also applies to this sub category
3C7	Rice cultivation	No		PNG is planning to set up data collection activities that lead to improve the detail of the activity data.
3C8	Other	Not applicable		

SUB - SECTION 4.2.4 Land Use Land Use Change and Forestry

According to volume 3 of the 2006 IPCC guidelines, there are 8 categories under the 3B Land. 5 categories were reported in the recent NIR. The table below provides a list of the categories under the LULUCF sector as well as the planned improvements identified in the recent NIR.

Table 4-4: Planned improvements identified for the LULUCF sector categories (Source: National Inventory Report 2000-2017)

2006 IPCC Code	Category	Reported In Recent NIR	Method used (Tier)	Planned Improvements Identified
3B1	Forest land	Yes	Tier 1 and Tier 2	- Increasing the sampling intensity in Collect Earth to allow improved accuracy in forest remaining forest (FF) category - Using Planet Labs high-resolution imagery to re-assess all Collect Earth sampling plots that faced a land use conversion and, also those that are categorized as FF (with or without a forest disturbance) - Assessment of natural forest disturbances
3B2	Crop land	Yes	Tier 1 and Tier 2	- Increasing the sampling intensity in Collect Earth to allow improved accuracy in croplandremaining cropland (CC) category. - Collecting country specific activity data for carbon stock change due to losses in CL-CL sub category and in organic soil. - Using Planet Labs high-resolution imagery to re-check all Collect Earth sampling plots that faced a land use conversion to cropland or vise-versa. - Improve coordination and participation with Department of Agriculture and Livestock and with National Agriculture Research Institute (NARI) - Define management practice for cropland to generate activity data for carbon stock change in organic soils and mineral soils. - Verifying cropland area by sub-category with ground surveying.
3B3	Grassland	Yes	Tier 1	- Increasing the sampling intensity in Collect Earth to allow improved accuracy in grassland remaining grassland (GG) category. - Improving carbon stock for woody and herbaceous biomass - Define management practices for grassland - Using Planet Labs high-resolution imagery to re-check all Collect Earth sampling plots that faced a land use conversion and, also those that are categorized as GG.
3B4	Wetlands	No		
3B5	Settlements	Yes	Tier 1	- Improve carbon stock values from national forest inventory - Spatial explicit data to track forest to settlement - Urban biomass waste
3B6	Other land	No		
3C1	GHG emissions from biomass burning	Yes (only for biomass burning on forestland)	Tier 1	
3D1	Harvested wood products	No		
3D2	Other	No		

SUB - SECTION 4.2.5 Waste

According to volume 4 of the 2006 IPCC guidelines, there are 5 sources under the Waste sector: i. 4A Solid waste disposal; ii. 4B Biological treatment of solid waste; iii. 4C Incineration and open burning of waste; iv. Wastewater treatment and discharge; and v. Other. The table below provides a list of the sources under the waste sector as well as the planned improvements identified in the recent NIR.

Table 4-5: Planned improvements identified for the waste sector categories (Source: National Inventory Report 2000-2017)

2006 IPCC Code	Category	Reported In Recent NIR	Method used (Tier)	Planned Improvements Identified
4A	Solid Waste Disposal	Yes	Tier 1	**a. Change of Methane Correction Factor (MCF) after 2018** Baruni disposal site in Port Moresby has improved and operated as semi-aerobic landfill site now. The GHG emissions since 2018 must reflect this improvement by changing MCF. **b. Improvement of Municipal Solid Waste Estimation** The current estimate is based on the data collected in Port Moresby and some expert judgements. Collecting other cities data about waste composition and/or waste treatment types may lead more accurate emission estimation from SWDS. **c. Resolving NE for ISW and Sludge** Solid waste generated from industry and sludge from wastewater treatment go to landfill are not estimated. PNG tries to collect relevant data.
4B	Biological Treatment of Solid Waste	Yes	Tier 1	The issue identified in 4A Solid Waste disposal is also relevant to 4B in terms of AD improvement. There is no plan of improvement for equations and EFs.
4C	Incineration and Open Burning of Waste	Yes	Tier 1	The issue identified in 4A Solid Waste disposal is also relevant to 4C in terms of AD improvement. When the data relevant to this source especially for industrial waste, hazardous waste and clinical waste will be available, this source will be estimated.
4D	Wastewater Treatment and Discharge	Yes	Tier 1	In order to complete the estimate of this category, it is necessary to clarify how much wastewater is emitted from main industrial organic wastewater emitters, which industries or factories are connected to domestic wastewater collecting system and how wastewater is treated if unconnected.
4E	Other	Not Applicable		

PART
5

IMPROVEMENT PLAN

IMPROVEMENT PLAN

SECTION 5.1 CROSS-CUTTING

This section outlines the strengths and limitations of PNG National GHG Inventory system, specifically, Inventory Arrangement, Quality Assurance and Quality Control, Key Category Analysis, Uncertainty Analysis, National Inventory Improvement Plan, Archiving System, Methods and Data Documentation, Recalculations, and TACCC Principles.

These overarching strengths and limitations were identified during the preparation of PNG's BUR1, BUR2 and the National Inventory Report (NIR) and should be addressed to enable improvement in PNG's national GHG inventories.

SUB - SECTION 5.1.1 Inventory Arrangement

The table below outlines the elements of the inventory arrangement with the current situation and the recommended improvements that need to be addressed.

Table 5-1: Elements, current situation and recommended improvements for the inventory arrangements

Elements	Current Situations	Recommended improvements
Institutional Arrangements	There are several entities which are not included in the inventory arrangements, as described, for instance, in the improvement plan of the energy sector	There is a need to improve the existing institutional arrangement when new data providers are identified through the implementation of this improvement plan. Such arrangements can be enhanced through Memorandum of Understanding (MoU) and Memorandum of Agreement (MoA).
	Data providers do not provide data on a regular basis yet. There are potential data providers not providing data. Not all agencies have MoUs for providing data. The data providing is on a need-basis.	It is recommended to establish formal arrangements with data providers so that data can be provided on annual basis. The Climate Change Management Act (CCMA, in place already) considers that the CCDA has the mandate to collect data; agreements need to be established in this framework.
	Experts estimating the emissions and removals and inventory compilers seem to understand the limitations of data. However, inventory compilers do not seem to follow the same procedures for the inventory compilation, QC, formats, etc.	It is recommended that: - the inventory compilers gather regularly to share issues which affect several sectors; - the inventory coordinator establish common formats and rules for the inventory compilation to be followed by all compilers; - the data providers get involved in the validation of the data and the enhancement of the data.
Procedural Arrangements	There was a schedule within the framework of the PNG BUR2 project that set a timeline for inventory compilation, in which the stakeholders are involved	In the future it is recommended to institutionalise the process, to establish a schedule (work plan) for the inventory compilation for each compilation cycle, along stakeholders.
Legal Arrangements	Law or regulation that will formalises the institutional setup for the inventory preparation are indicated in the CCMA (2015), although not yet formalised in a specific regulation; Certain technical working group (e.g. AFOLU TWC) has been established between CCDA and the data provider(s) without formalisation of an MoU. For example, CCDA collects LULUCF data from PNGFA for BUR1 and BUR2 reporting without the existence of a formal MoU.	- CCDA to develop the regulations within the climate change management act (CCMA) in consultation with stakeholders to regularly provide information. An MoU with relevant agencies should be put in place in the absence of regulation.
Documentation	PNG' s inventory arrangement has been described in the BUR and NIR	- An expert judgement protocol should be designed by CCDA to document the expert judgments used for the inventory compilation

SUB - SECTION 5.1.2 Quality Assurance and Quality Control

The table below outlines the elements of the QA/QC with the current situation and the recommended improvements that need to be addressed.

Table 5-2 QA/QC elements, current situation and recommended improvements

Elements	Current Situations	Recommended improvements
General QC procedures	There is no proper QA/QC plan in place. This is an area where capacity building is a priority.	- Develop a QA/QC plan following the guidance provided by 2006 IPCC Guidelines and implement it. The following steps are proposed: 1. Define the general QC procedures of the inventory 2. Define the category specific QC procedures 3. Define the QA activities 4. Define the timeline for the QA/QC 5. Define roles and responsibilities. The QA/QC plan must be continuously updated in future inventory editions. *(See the IPCC good practice guidance Table 8.1, chapter 8.)*
	Many of the sector leads who perform the GHG emission/removal estimation does not involve in the implementation of the QC procedures.	CCDA to develop a QA/QC plan following the guidance provided by 2006 IPCC Guidelines and implement it.
	There are inconsistencies/errors in certain sector and categories in BUR reporting. E.g. totals when disaggregated by categories or gas do not match each other. Not clear understanding of how estimates have been produced.	Data should be collected in disaggregated form for the different categories. Data providers shouldbe made aware of the required data per the categories in 2006 IPCC Guidelines.
	There are insufficient QC checks performed on data collection, input, handling, data documentation, and calculation.	Develop a QA/QC plan following the guidance provided by 2006 IPCC Guidelines, and implement it.
	Not much effort put to the comparison of emission estimates in BUR1 and BUR2.	Develop a QA/QC plan following the guidance provided by 2006 IPCC Guidelines and implement it. *(See IPCC good practice guidance chapter 8.7.1.4. page 8.12.)*
	Not much effort put in comparison of the activity data with data sets from international statistics (IEA in energy sector, International Industry statistics for IPPU sector, and FAO for the Agriculture sector)	Recommend to compare forest activity data with international sources e.g. Global Forest Watch and reconcile the differences (e.g. it seems that what is labelled by PNG as forest degradation contains a large part of conversion to crops e.g. oil palm) Develop a QA/QC plan following the guidance provided by 2006 IPCC Guidelines and implement it.
Verification	There were no use of other methods to compare the emissions/removals estimation results with other tier methods in BUR1 and BUR2.	Develop a QA/QC plan following the guidance provided by 2006 IPCC Guidelines and implement it.
QA	Responsible bodies for conducting QA are not clearly identified in the CCDA inventory arrangement and QAs are not performed regularly.	It would be useful to identify in-house capacity for QA if any, and/or to check if among neighbouring countries there is any available for a mutual QA exercise. Develop a QA/QC plan following the guidance provided by 2006 IPCC Guidelines and implement it.
Documentation	No information on QA checks implemented has been provided by entities conducting QA checks on PNG BUR1 and BUR2; Documentation on elements of the inventory has been done. However, it is not being done in an exhaustive way.	Recommend to report and archive all documentation on QA currently done. Develop a QA/QC plan following the guidance provided by 2006 IPCC Guidelines and implement it. *(See IPCC good practice guidance chapter 8.10.1.)*

SUB - SECTION 5.1.3 Key Category Analysis (KCA)

The table below outlines the elements of the key category analysis with the current situation and the recommended improvements that need to be addressed.

Table 5-3: KCA elements with current situation and recommended improvements that need to be addressed

Elements	Current Situations	Recommended improvements
Purpose of the Key Category Analysis	The KCA is not developed for the base year or the trend, only the latest year (2017).	Improve the KCA by: 1. Developing the KCA for the base year and the latest year with and without LULUCF. 2. Developing the KCA for the trend with and without LULUCF. 3. Using the qualitative assessment. It is also recommended that PNG assess if there is any category with potential to be included using the qualitative assessment (this is the case, for instance, of biomass consumption in the energy sector).
	It is not clear that the KCA is used for the improvement plan.	The results of the KCA shall be used for prioritising efforts in the improvement plan.
Method	The aggregation level of category does not seem appropriate in terms of the appropriate level of detail.	It is recommended to perform the KCA following the aggregation level suggested by IPCC. *(See the IPCC good guidance chapter 7, page 5-6.)*
	No qualitative criteria were applied in the key category analysis.	It is recommended to use the qualitative approach for identifying certain Key Category, i f necessary. *(See the IPCC good practice guidance chapter 7, page 13.)*
Documentation	Insufficient information made available/ documented on the chosen aggregation.	Need to improve this in line with the IPCC Good Practice Guidelines. *(See Table 7.A1-7.A3 of the IPCC good practice guidance.)*

SUB - SECTION 5.1.4 Uncertainty Analysis

The table below outlines the elements of the uncertainty analysis with the current situation and the recommended improvements that need to be addressed.

Table 5-4 Uncertainty analysis elements with current situation and recommended improvements

Elements	Current Situations	Recommended improvements
Purpose of the Uncertainty Analysis	Uncertainty has been assessed but the analysis results have not been used effectively for its intended purposes i.e. help prioritize national efforts to reduce the uncertainty of inventories in the future, and guide decisions on methodological choice.	Uncertainty analysis should be conducted as follows: 1. Identify and allocate uncertainty values to each activity data and emission factor (at category level) using the guidance provided by 2006 IPCC Guidelines 2. Estimating the combined uncertainty using the equations provided by IPCC.
Uncertainty Analysis	Certain inventory component parts such as EFs, AD and other estimation parameters don't undergo uncertainty assessment. Uncertainty estimates was done in BUR2 but lack completeness.	Assess the uncertainties in all estimation parameters.
	Quantifying uncertainty and comparing with qualitative evaluation is one of the big challenge and capacity need for PNG inventory compilers.	Assess the quantitative and qualitative uncertainties
Documentation	Methodology for uncertainty estimation explained in BUR2 but needs improvement in terms of the description.	The description of the uncertainty analysis should begin with a conceptualization, the assumptions and method used, and results of the analysis.

SUB - SECTION 5.1.5 Developing Sectoral Improvment Plan

The table below outlines the elements for developing sectoral improvement plan with the current situation and recommended improvements that need to be addressed.

Table 5-5 Developing sectoral improvement plan with current situation and recommended improvement

Elements	Current Situations	Recommended improvements
National Inventory Improvement Plan	Team leaders/sector leads of the inventory compilation at sectoral level develop improvement plans. The coordinator of the inventory checks the improvement plan proposed by each sectoral expert. The criteria followed are not clear. The periodicity is not specified, even the timeline is considered in the improvement plans	It is recommended to improve the way in which the sector leads make the improvement plans, by: 1. Identifying the improvement areas of the inventory. The possible areas of improvement will cover all the inventory aspects: institutional arrangements, data compilation, data validation, documentation, archiving, the development of estimates, KCA, uncertainty assessment, QA/QC, the definition of roles and responsibilities, the establishment of schedule (timeline for all the inventory cycle); 2. Considering the results of the uncertainty analysis and the KCA for prioritising among actions; 3. Improving the communication between sectoral inventory compilers and data providers. The identification of improvement areas and the prioritization of actions should be discussed between sectoral inventory compilers and data providers.
	In terms of prioritising the necessary improvements within the improvement plan, the agencies which are more important are prioritised for data collection.	- It is recommended to not limit the improvement plans to data collection but to extend them to other areas of the inventory (transparency, management systems, institutional arrangements, etc.).

SUB - SECTION 5.1.6 Archiving System

The table below outlines the elements of the archiving system with the current situation and recommended improvements that need to be addressed.

Table 5-6 Archiving system elements with current situation and recommended improvements

Elements	Current Situations	Recommended improvements
Archiving	The archiving of information is not formalised. Each inventory compiler has his/he own information. There is no a centralised system for archiving.	It is recommended to design and implement an archiving system for the inventory, by: 1. Establish an archiving platform (i.e. Dropbox, Sharepoint, etc.) to archive the information of the inventory. This includes: raw data provided by data providers, data providers contact, calculation files, reports, QA/QC procedures, Validation results, KCA assessment, uncertainty estimates, management procedures, reference documents used, etc. 2. Establish procedures for archiving. This includes: the way in which users archive the information (formats), the development of back-ups with the information loaded, the periodical verification of the data stored, etc. 3. Establish roles and responsibilities for the archiving. Specifically, it is important to designate officers to be responsible for the archiving.
	There is no archiving plan in place at CCDA. Data and worksheets are currently just stored in a physical drive. An archiving system is currently being developed.	Archiving should be conducted as part of the inventory preparation process, with clear allocation of responsibility.
	Inventory data, supporting data, and inventory records are not archived systematically to facilitate detailed review.	Establish a procedure for data archiving as well as data access. Add cloud storage.
	The archived documents are stored in the computers of each inventory compiler; specific security procedures not set yet.	The archive should be closed and retained in secure place following completion of the inventory.

SUB - SECTION 5.1.7 Methods and Data Documentation

The table below outlines the elements of the methods and data documentation with the current situation and recommended improvements that need to be addressed.

Table 5-7 Methods and documentation with current situation and recommended improvements

Elements	Current Situations	Recommended improvements
Choice of Tier	Tier 1 is applied everywhere. However, it is noted that in many cases national datasets need to be used instead of global dataset (e.g. FAOSTAT) and IPCC default values. Additionally, data quality and time series consistency needs to be enhanced across time. Overall, appropriate tier methods have been used.	Recommend to achieve a complete Tier 1 inventory with national activity data as soon as possible for all sectors. From that achievement, the use of Tier 2 methods, example for livestock in agriculture sector, can be explored.
Higher Tier Methods	Lack of country specific data and appropriate skills in data management has prevented the use of Tier 2 methods.	Data availability and skills are expected to increase across time so the use of higher tiers a likely expectation for future GHGIs.
	Data collection is not yet made operational through a robust scheme of agreements with all data providers. Further, the availability of data from such provider is not yet fully known, so it is unlikely that additional data collection routines will need to be implemented. CCDA is working in several areas for improving the inventory. One of the key areas is the coordination with data providers.	Recommended to focus on the operationalization of data collection and data sharing through a legally-binding instrument. Such instrument must provide requirements in terms of data quality and timing as well as it has to provide for its periodic update. *(See "Choice of Method" section in the IPCC good practice guidance.)*
Expert Judgement	Expert judgement protocol does not exist	It is recommended to design an expert judgment protocol to document the expert judgments used for the inventory compilation. *(See IPCC good practice guidance, chapter 6.2.5.)*
Documentation	Insufficient description of the assumptions and methodologies used to facilitate replication and assessment of the inventory (i.e. a description of the basis for methodological choice, EF, AD and other parameters, including references and documentation of expert judgements)	To ensure that all information needed in order to understand the data quality (time, definitions, methods of collection) is published as well as that the estimate are replicable (information on methods, assumption and data used be published). The use of the relevant EPA tool for reporting is strongly suggested to ensure that all information needed to understand how each estimates have been prepared and possibly to allow for their replicability. The documentation included in the excel files should be improved. The inventory team was also recommended to use common rules and formats in the excel files of the different sectors, aiming at enabling the peer review of the estimates and the QC of the inventory.

SUB - SECTION 5.1.8 Recalculations

The table below outlines the elements of recalculations with the current situation and recommended improvements that need to be addressed.

Table 5-8 Recalculation elements with current situation and recommended improvements

Elements	Current Situations	Recommended improvements
Recalculations	All categories has been recalculated to 2006 IPCC Guidelines	Recalculations are very useful as a QC tool, so it is recommended to check for recalculations in the next inventory.
	2006 IPCC Guidelines method have been applied to all years in the time series that are recalculated	(Same as above)
	Assumptions taken in the sectors (e.g. Waste sector) should be reviewed. This issue should lead to a recalculation.	(Same as above)
Documentation	There is inadequate explanation – in the inventory submission – on the rationale for the recalculation together with a description of the new methodology and changes to the previous one	Future recalculations with use of updated or new methodology should be documented or explained well in the inventory submissions.

SUB - SECTION 5.1.9 TACCC Principles

The table below outlines the elements of the TACCC principle with the current situation and recommended improvements that need to be addressed.

Table 5-9 TACCC principle elements with current situation and recommended improvements

Elements	Current Situations	Recommended improvements
Completeness	There are three key issues of completeness: one in the energy sector, one in the IPPU sector and other in the waste sector. For the energy sector, biomass emissions are not estimated and this emission source is likely to be a key category for the country. The IPPU sector faces a big challenge of data availability. However, there are sources of emissions that could have been estimated with the available information, such as the category 2F. In the waste sector, the emissions of all waste generated are not estimated.	For the energy sector, obtaining the information on biomass needs to be addressed. For the IPPU sector, the inventory compiler needs to work with the statistical office and other agencies in the country to: i) analyse all data which is currently available; ii) describe the data needs of the inventory; and iii) to improve the data available. Besides, there are categories that could be estimated with the information available, such as category 2F. Other categories that might be occurring are: glass production; ceramics; consumption of other carbonates; solvent use; Product Uses as Substitutes for Ozone Depleting Substances and electrical equipment. For the waste sector, there is a completeness issue due to the fact that not all wastes management practices are identified and estimated.
	There are estimates for all years in the time series, although no explanation on gap-filling provided	It is recommended to provide information on what data have been gap-filled and on how gap-filling has been implemented and the consistency of the methodology applied with IPCC methods (see chapter 5 volume 1).
	The BUR chapter includes a section for each sector describing "Improvements made, challenges, areas for further improvement in the future"	The improvement plan by sector should be updated based on the results of this QA exercise.
Transparency	All basic reporting elements were reported in PNG BUR1 and BUR2.	
	No confidentiality information was used (i.e. any AD and/or EFs not presented for reasons of confidentiality) in BUR1 and BUR1 hence description does not apply.	
	Efforts were put by inventory compilers to ensure the National GHG inventories are neither over- nor under-estimates so far as can be judged. This means making all endeavours to remove bias from the inventory estimates.	
	There is a big issue with the documentation, archiving and transparency of the information, mostly affecting the calculation files. This will affect future inventories, as it will be challenging to reproduce the estimates.	The documentation included in the excel files should be improved. The inventory team was also recommended to use common rules and formats in the excel files of the different sectors, aiming at enabling the peer review of the estimates and the QC of the inventory.

Elements	Current Situations	Recommended improvements
Accuracy	PNG has used correct estimation equation (2006 IPCC equations) and EF/AD/other parameters to prepare emission estimates.	It is recommended to always use 2006 methods and factors, and not mix with the use of Rev. 1996 GLs.
	Most sectors and categories used IPCC default EFs to estimate emissions.	The use of higher tier methods or country specific emission factors is recommended to produce more accurate results with less uncertainty.
	Certain sector categories apply country-specific EF based on literature values. E.g. LULUCF	The assumptions taken and the country specific coefficients used in should be further analysed and documented.
	There are no QC procedures in place for the country-specific emission factors	It is recommended to compare the country specific EF with other countries with similar national circumstances or check whether the EF values are within range of the EF provided by the IPCC guidelines. A QA/QC plan shall be designed and implemented to address this issue.
	Not all the data sources are clear in the Excel files. The documentation shall be improved.	Inventory compilers need to report the data sources and possibly data quality (i.e. timing of collection, method of collection, any elaboration on coarse data has to be provided). The Documentation of the excel files shall be improved, specifying all data sources, methodologies followed, etc.
	Limited information made available on AD gaps filled	The inventory reports should clearly document/ explain how the AD is estimated and how the data gaps have been filled. Any assumptions made should be reasonable.
	Category-specific QC has been conducted in certain sectors, e.g. AFOLU	In the Agriculture sector, comparison of country-specific data with FAOSTAT is recommended. In LULUCF, comparison with GFW seems of high interest; it is recommended to do so. (A comparison exercise includes the analysis of differences in order to reconcile these; even through data correction or changes in the data collection methodology, where needed).
Comparability	Scope of individual categories in PNG's national GHG inventories is in line with the IPCC description and the emissions and removals are reported correctly as per the IPCC worksheet used in BUR1 and BUR2. Thus national GHG inventories can be compared with national GHG inventories for other countries who apply the 2006 IPCC Guidelines.	
Consistency	The AD and EFs used in PNG BUR1 and BUR2 are consistent throughout the time series. However, this is an area to be explored for certain categories. For example, data currently used, including FAOSTAT data, show large inter-annual variability, such variability needs to be investigated.	It is recommended to do time series analysis to identify "outliers" to be further investigated. It is recommended to contact the PNG focal point for FAOSTAT (likely in PNGFA), to assess the quality of such information and to work on enhancing it as needed, including through time series consistency and gap-filling.

SECTION 5.2 ENERGY SECTOR

This section outlines the GHG inventory improvement plan for the energy sector. The priority of the energy sector to do with TACCC is completeness and accuracy as can be seen from each category below.

SUB - SECTION 5.2.1 1A. Fuel combustion activities

The table below outlines the improvement plan for each category under 1A Fuel Combustion activities.

Table 5-10: Improvement plan for categories under 1A Fuel combustion activities

Data request	Potential Data provider (s)	Purpose	TACCC	Priority
Energy consumption data in energy industries. In addition, Country-specific Calorific Values and carbon content	PNG Power and National Energy Authority	Activity Data for Energy Industry and Emission Factor for fuel combustion.	Completeness and Accuracy	Medium
Energy consumption data in energy industries especially for Independent Power Producers.	Independent Consumer and Competition Commission and National Energy Authority	Activity Data for Energy Industry.	Completeness and Accuracy	Medium
Energy consumption data in Mining and Petroleum category and by fuel type. Check for country-specific EF for fugitives. In addition, Calorific Values and carbon content for Oil and Gas produced in the country	NEA, CEPA and Chamber of Mines and Petroleum (Check for the list of companies operating in PNG)	Activity data for Petroleum Refining, Other Energy Industries, Mining and Quarrying, and fugitive emissions from Oil and Natural Gas. Emission Factors from fugitive emissions from Oil and Natural Gas and fuel combustion	Completeness and Accuracy	High
Energy consumption data in Industry and Construction category and by fuel type	NEA, CEPA and Industry and Construction Associations (check if there is)	Activity data for Manufacturing Industry and Construction	Completeness and Accuracy	Medium
Energy consumption data by the transport category	NEA, Department of Transport (Check what data they have)	Activity data for the Transport (Land, Aviation, Marine) Category	Completeness and Accuracy	High
Total Fuel consumption from civil aviation. Then the fuel consumption by aircraft type number of LTOs by aircraft type	NEA, Airline Companies (still need clarification of which companies/ association)	Activity data for the Aviation category	Completeness and Accuracy	Medium
Total Fuel consumption from civil aviation. Then the fuel consumption by aircraft type number of LTOs by aircraft type	NEA, Civil Aviation Safety Authority (Check what data they have) and National Airports Corporation	Activity data for the Aviation category	Completeness and Accuracy	High
Energy consumption data in the navigation category	NEA, National Marine Safety Authority (Check what data they have)	Activity data for the Marine category	Completeness and Accuracy	High
Fuel supply data by category and by fuel type	NEA, Energy Supply Companies (still need clarification of which companies/association)	Activity data for all categories	Completeness and Accuracy	Medium

Data request	Potential Data provider (s)	Purpose	TACCC	Priority
Energy consumption data by category and by fuel type particularly in the Residential category. Energy Import and Export data. Bi-annual Energy Survey	NEA, National Statistics Office	Activity data for all categories	Completeness and Accuracy	High
Energy Import and Export data. International Bunker fuels (If available)	PNG Customs	Activity data for all categories	Completeness and Accuracy	High

SUB - SECTION 5.2.2 1B. Fugitive emissions from fuels

The table below outlines the improvement plan for each category under 1B Fugitive emissions from fuels.

Table 5-11: Improvement plan for categories under 1B Fugitive emissions from fuels

Data request	Potential Data provider (s)	Purpose	TACCC	Priority
Energy production and consumption data in the Oil and Gas category	Department of Petroleum (Check what data they have)National Energy Authority	Activity data for Oil and Natural Gas Category and Other Energy Industries	Completeness and Accuracy	High

SECTION 5.3 IPPU SECTOR

This section outlines GHG inventory improvement plan for the IPPU sector. The priority of the IPPU sector to do with TACCC is completeness as can be seen from each category below.

SUB - SECTION 5.3.1 2A Mineral Industry

The purpose of the improvement plan for the categories under 2A Mineral Industry is to confirm the occurrence of the activity in PNG then obtain activity data. Potential data providers include: i. Customs PNG; ii. National Statistical Office; iii. Industry associations. The table below provides a list of data request for each of the categories.

Table 5-12: Improvement plan for categories under 2A Mineral Industry

Category	Data Request	TACCC	Priority
2A2 Lime Production	Quantity of carbonates (by type) used in the domestic lime production process by type (high calcium, dolomite, hydraulic)	Completeness	High
2A3 Glass production	Quantity of glass as feedstock (by type of glass) used in PNG to manufacture glass	Completeness	High
2A4 Other process uses	Quantity of soda ash used in other process uses of carbonates	Completeness	High
2A4c Non-Metallurgical Magnesia Production	Quantity of magnesia produced	Completeness	High

SUB - SECTION 5.3.2 2B Chemical Industry

The purpose of the improvement plan for the categories under 2B Chemical Industry is to confirm the occurrence of the activity in PNG then obtain activity data. Potential data providers include: i. Customs PNG; ii. National Statistical Office; iii. Industry associations. The table below provides a list of data request for each of the categories.

Table 5-13: Improvement plan for categories under 2B Chemical industry

Category	Data Request	TACCC	Priority
2B1 Ammonia Production	Quantity of ammonia produced, Fuel required per unit for production, fuel type	Completeness	High
2B2 Nitric Acid Production	Quantity of Nitric Acid Produced and Technology type used by the production plant	Completeness	High
2B3 Adipic Acid Production	Quantity of Adipic Acid Produced and Technology type used by the production plant	Completeness	High
2B4 Caprolactam, Glyoxal, and Glyoxylic Acid Production	Quantity of Caprolactam, Glyoxal, and glyoxylic acid Produced and Technology type used by the production plant	Completeness	High
2B5 Carbide Production	Activity data on Petroleum coke consumption or quantity of Carbide produced	Completeness	High
2B6 Titanium Dioxide Production	Quantity of titanium slag produced, synthetic rutile or rutile, and Amount of reducing agent or carbothermal input	Completeness	High
2B7 Soda Ash Production	Quantity of Trona used or soda ash produced	Completeness	High
2B8a Methanol	Natural gas is used to produce methanol (through Conventional Reforming Process).	Completeness	High
2B8b Ethylene	Petrochemical feedstocks are used to produce ethylene (Steam Cracking)	Completeness	High
2B8c Ethylene Dichloride and Vinyl Chloride Monomer	Quantity of ethylene and chlorine used to produce (Direct Chlorination and Oxychlorination Processes) Ethylene Dichloride and the quantity of Ethylene Dichloride produced.	Completeness	High
2B8d Ethylene Oxide	Quantity of Ethylene oxide produced and the catalyst -the type used with oxygen for production (vent strum process)	Completeness	High
2B8e Acrylonitrile	Quantity of Acrylonitrile produced (SOHIO Process). Amount of propylene, ammonia, and oxygen and the type of catalyst.	Completeness	High
2B8f Carbon Black	Quantity of Carbon Black produced(Furnace Black Process). Quantity and type of petroleum-based or coal-based feedstock used in the production.	Completeness	High
2B9 Fluorochemical Production	Quantity of HCFC-22 produced	Completeness	High
2B9a By-product emissions	Quantity of fluorinated greenhouse gas produced	Completeness	High
2B9b Fugitive emission	Quantity of fluorinated greenhouse gas produced	Completeness	High
2B10 Other	Confirm if other subcategories need to be calculated for emission purposes	Completeness	Low

SUB - SECTION 5.3.3 2C Metal Industry

The purpose of the improvement plan for the categories under 2C Metal Industry is to confirm the occurrence of the activity in PNG then obtain activity data. Potential data providers include: i. Customs PNG; ii. National Statistical Office; iii. Industry associations. The table below provides a list of data request for each of the categories.

Table 5-14: Improvement plan for categories under 2C Metal Industry

Category	Data Request	TACCC	Priority
2C1 Iron and steel production	1). Quantity of Steel produced in the country and by process type, the total amount of pig iron produced that is not processed into steel, and the total amount of coke produced. or 2). Total Crude Steel Production	Completeness	High
2C2 Ferroalloys Production	Quantity of ferroalloy produced and by product type.	Completeness	High
2C3 Aluminum Production	Quantity of Aluminium Produced by cell technology type	Completeness	High
2C4 Magnesium Production	1). Quantity of magnesium production from dolomite and quantity of magnesium production from magnesite. 2). Total amount of magnesium casting	Completeness	High
2C5 Lead Production	1). Quantity of lead produced by Direct Smelting 2). Quantity of lead produced from Imperial Smelting Furnace 3). Quantity of lead produced for secondary material	Completeness	High
2C6 Zinc Production	1). Quantity of zinc produced by electro-thermic distillation 2). Quantity of zinc produced by the pyrometallurgical process(Imperial Smelting Furnace Process) 3). Quantity of zinc produced by Waelz Kiln Process	Completeness	High
2C7 Other	Confirm if other subcategories need to be calculated for emission purposes	Completeness	Low

SUB - SECTION 5.3.4 2D Non-Energy Products from Fuels and Solvent Use

The purpose of the improvement plan for the categories under 2D Non-Energy Products from Fuels and Solvent Use is to confirm total import for usage to determine GHG emission estimation purposes. Potential data providers include: i. Customs PNG; ii. National Statistical Office; iii. Industry associations. The table below provides a list of data request for each of the categories.

Table 5-15: Improvement plan for categories under 2D Non-Energy Products from Fuels and Solvents

Category	Data Request	TACCC	Priority
2D2 Paraffin Wax Use	1). Quantity of Wax consumption/ Quantity of Paraffin wax imports 2). Paraffin wax type	Completeness	High
2D3 Asphalt Production and Use	1). Quantity of asphalt produced, imported, and quantity of asphalt used 2). Asphalt application type	Completeness	High
2D4 Solvent Use	Emissions of NMVOCs are occurring but further discussions into including this category would be considered for future inventory	Completeness	Low
2D5 Other	Confirm if other subcategories need to be calculated for emission purposes	Completeness	Low

SUB - SECTION 5.3.5 2E Electronics Industry

The purpose of the improvement plan for the categories under 2E Electronics Industry is to confirm total import for usage to determine GHG emission estimation purposes. Potential data providers include: i. Customs PNG; ii. National Statistical Office; iii. Industry associations. The table below provides a list of data request for each of the categories.

Table 5-16: Improvement plan for categories under 2E Electronics Industry

Category	Data Request	TACCC	Priority
2E1 Integrated Circuit or Semiconductor	Amount and volume of Gas and surface area (e.g. silicon or glass)	Completeness	Medium
2E2 TFT Flat Panel Display	Amount and volume of Gas, the quantity of liquid FCs used, and surface area (e.g. silicon or glass)	Completeness	Medium
2E3 Photovoltaics	Amount and volume of Gas, the quantity of liquid FCs used, and surface area (e.g. silicon or glass)	Completeness	Medium
2E4 Heat Transfer Fluid	Amount and volume of Gas, the quantity of liquid FCs used//purchased, and surface area (e.g. silicon or glass)	Completeness	Medium
2E5 Other	Confirm if other subcategories need to be calculated for emission purposes	Completeness	Low

SUB - SECTION 5.3.6 2F Fluorinated Substitutes for Ozone Depleting Substances

The purpose of the improvement plan for the categories under 2F Fluorinated Substitutes for Ozone Depleting Substances (ODS) is to confirm total imports for usage to determine GHG emission estimation purposes. Potential data providers include i. Customs PNG; ii. National Statistical Office; iii. Industry associations; and Conservation and Environment Protection Authority. The table below provides a list of data requests for each of the categories.

Table 5-17: Improvement plan for categories under 2F Fluorinated Substitutes for ODS

Category	Data Request	TACCC	Priority
2F1 Refrigeration and Air Conditioning	1) Import Data and Product Type 2) Chemical Type 3) Amount of agent in equipment 4) Amount of Agent used in servicing 5) Amount of agents destroyed	Completeness	High
2F2 Foam Blowing Agents	HFC used in manufacturing new closed cell foam or Production data and type	Completeness	High
2F3 Fire Protection	1) Import Data and Type of PRODUCT 2) Chemical Type 3) Amount of agent in fire protection equipment	Completeness	High
2F4 Aerosols	1) Import /Sales Data and Product Type 2) Chemical Type 3) Amount of HFC AND PFC contained in the aerosol product	Completeness	High
2F5 Solvents	1) Quantity of Solvent SOLD 2) Type of Products	Completeness	High
2F6 Other Applications	Quantity of HFCs and PFCs SOLD	Completeness	Low

SUB - SECTION 5.3.7 2G Other Product Manufacture and Use

The purpose of the improvement plan for the categories under 2G Other Product Manufacture and Use is to confirm total imports for usage to determine GHG emission estimation purposes. Potential data providers include i. Customs PNG; ii. National Statistical Office; iii. Industry associations; and Conservation and Environment Protection Authority. The table below provides a list of data requests for each of the categories.

Table 5-18: Improvement plan for categories under 2G Other Product Manufacture and Use

Category	Data Request	TACCC	Priority
2G1a Manufacture of Electrical Equipment	SF6 consumption data by equipment manufacturers and a nameplate capacity of new and retiring equipment	Completeness	Medium
2G1b Use of Electrical Equipment	1) Quantity of SF6 in equipment container at the beginning of the year 2) SF6 purchased from Chemical Producers 3) SF6 contained in the new equipment delivered to the customer	Completeness	Medium
2G1c Disposal of Electrical Equipment	1) SF6 consumption data by equipment 2) Quantity of SF6 in equipment container after usage	Completeness	Medium
2G2 SF6 and PFCs from Other Product Uses	Quantity of SF6 in the equipment container	Completeness	Low
2G3b Propellent for Pressure and Aerosol Products	1) Data on import of aerosol food products 2) Consumption of N_2O by manufacturers and Distributors of N_2O Products	Completeness	High
2G3c Other	Confirm if other subcategories need to be calculated for emission purposes	Completeness	Low

SUB - SECTION 5.3.8 2H Other

The purpose of the improvement plan for the categories under 2H Other to confirm total imports for usage to determine GHG emission estimation purposes. Potential data providers include i. Customs PNG; ii. National Statistical Office; iii. Industry associations; iv Conservation and Environment and Protection Authority; v. Paper/pulp industry manufacturers and distributors; and vi. Food and beverage industry manufacturers and distributors. The table below provides a list of data requests for each of the categories.

Table 5-19: Improvement plan for categories under 2H Other

Category	Data Request	TACCC	Priority
2H1 Pulp and Paper Industry	1) Production Data 2) Type of Pulp/Paper	Completeness	Low
2H2 Food and Beverages Industry	1) Production Data 2) Type of Food/ Beverage	Completeness	Low
2H3 Other	1) Production Data 2) Type of Product produced	Completeness	Low

SECTION 5.4 AGRICULTURE SECTOR

This section outlines GHG improvement plan for the Agriculture sector. The priority of this sector to do with TACCC is accuracy and completeness as can be seen from each category below.

Category	Sub-categories	Data Request	TACCC	Priority
3A1 Enteric Fermentation	***CH_4 emissions***	1) Avg number of head/ category/ year 2) Emission factor for enteric fermentation	Completeness	High
3A2 Manure Management	***Direct CH_4 emissions***	1) Avg number of head/ category/ year 2) Emission factor for manure management (mass manure CH_4/ head/ yr)	Completeness	High
	Direct N_2O emissions	1) Avg # head/ category/ year 2) N excretion per ton animal live weight per day 3) Avg animal mass per category % of manure managed per manure management system (MMS) per year 4) Emission factor for direct N_2O-N emissions per kg N per MMS per year	Completeness	High
3C1 Biomass Burning	***3C1a - forest lands***	1) Area burned (ha) by initial land use (FL or non-FL) and by current FL subcategory 2) Mass of fuel available for combustion (t dry matter/ ha) 3) Combustion factor (% of available fuel burned) 4) Emission factor (g GHG/ kg dry matter burned) by GHG (CH_4, CO, N_2O, NOx)	Completeness	High
	3C1b – croplands	1) Area burned (ha) by initial land use (CL or non-CL) and by current CL subcategory 2) Mass of fuel available for combustion (t dry matter/ ha) 3) Combustion factor (% of available fuel burned) 4) Emission factor (g GHG/ kg dry matter burned) by GHG (CH_4, CO, N_2O, NOx)	Completeness	High
	3C1c – grasslands	1) Area burned (ha) by initial land use (GL or non-GL) and by current GL subcategory 2) Mass of fuel available for combustion (t dry matter/ ha) 3) Combustion factor (% of available fuel burned) 4) Emission factor (g GHG/ kg dry matter burned) by GHG (CH_4, CO, N_2O, NOx)	Completeness	High
	3C1d - other lands	1) Area burned (ha) by initial land use (OL or non-OL) and by current OL subcategory 2) Mass of fuel available for combustion (t dry matter/ ha) 3) Combustion factor (% of available fuel burned) 4) Emission factor (g GHG/ kg dry matter burned) by GHG (CH_4, CO, N_2O, NOx)	Completeness	Medium

Category	Sub-categories	Data Request	TACCC	Priority
3C2 Liming	***CO_2 emissions***	1) Applied mass of calcic limestone/ calcium carbonate ($CaCO_3$) 2) Emission factor for calcic limestone (t C/ t $CaCO_3$) 3) Applied mass of dolomite ($CaMg(CO_3)2$) 4) Emission factor for dolomite (t C/ t $CaMg(CO_3)2$)	Completeness	High
3C3 Urea application	***CO_2 emissions***	1) Applied mass of urea (t/ yr) 2) Emission factor for urea (t C/ t urea)	Completeness	High
3C4 Direct N_2O emissions from managed soils	***N_2O emissions (Other than for flooded rice cultivation)***	1) Applied mass of synthetic N fertilizers 2) Applied mass of animal manure, compost, sewage sludge 3) Applied mass of crop residues 4) Mass of N mineralized in mineral soils in association with loss of SOC from SOM due to changes in land management 5) Area of managed/ drained organic soils disaggregated by CL-GL/ FL, Temperate/ Tropical, and nutrient-rich/ -poor (for FL temperate only) 6) Amount of urine and dung N deposited by grazing animals on pasture, range, and paddock disaggregated by cattle-poultry-pigs (CPP)/ sheep and other animals (SO) 7) Emissions factors for the preceding N sources	Completeness	High
3C5 Indirect N_2O emissions from managed soils	***N_2O emissions***	1) N mass from applied synthetic fertilizers 2) % of synthetic N fertilizer that volatizes 3) N mass from applied animal manure, compost, sewage sludge 4) N mass from urine and dung deposited by grazing animals on pasture, range, and paddock 5) % of applied and deposited organic N fertilizers that volatizes 6) Emission factor for N_2O emission from atmospheric deposition of N and soils and water 7) N mass returned to soils (above and below ground) via applied crop residues, N-fixing crops, forest/ pasture renewal 8) % of N additions to managed soils that is lost to leaching and run-off 9) N_2O emissions factor for N leaching and run-off	Completeness	High

Category	Sub-categories	Data Request	TACCC	Priority
3C6 Indirect N_2O emissions from manure management	***N_2O emissions***	1) Excreted N by manure management system (MMS) and by livestock species/ category 2) % of excreted N that volatizes by MMS and livestock species 3) % of excreted N that is lost in the MMS by MMS and livestock species 4) No. of animals per livestock species per MMS 5) % of total excreted N managed in MMS per livestock species 6) N from bedding per MMS per livestock species 7) N_2O emission factor for atmospheric deposition of N on soils and water	Completeness	Medium
3C7 Rice cultivation	***CH_4 emissions***	1) Production area (ha) by subcategory for irrigated, rainfed and deepwater, and upland 2) Growing period (days) 3) Baseline emission factor for continuously flooded fields without organic amendments 4) Scaling factor for differences in water regime during growing period 5) Scaling factor for differences in water regime prior to growing period 6) Applied organic amendment (t/ ha, fresh weight) 7) Conversion factor for organic amendment 8) Scaling factor for soil type, rice cultivar, etc., if available	Completeness	Low

SECTION 5.5 LULUCF SECTOR

This section outlines GHG improvement plan for the LULUCF sector. The priority of this sector to do with TACCC is accuracy and completeness as can be seen from each category below.

Category	Sub-categories	Data Request	TACCC	Priority
3B1b Land converted to forest land	***Below-ground biomass***	Ratio of below- to above-ground biomass (dry matter)	Completeness	High
	Dead organic matter	Mass of dead organic litter	Completeness	High
	Soil carbon	1) Area of drained organic soil by FL subcategory	Completeness	High
		2) Emission factor for climate type, if any	Completeness	High
3B2a Cropland remaining cropland	***Above-ground biomass***	1) Average annual growth in perennial woody biomass per area 2) Mass or portion of perennial woody biomass harvested	Completeness	High
	Dead organic matter	(Required country-specific data under dead organic matter not available)	Completeness	Medium
	Soil carbon	1) Area by mineral soil subcategory type 2) SOC per ha by mineral subcategory type 3) SOC stock change based on land-use category, land-management practices, or addition of organic matter 4) Emission factor by climate type [by subcategory, if possible]	Completeness	Medium
3B2b Land converted to cropland	***Above-ground biomass***	1) Biomass stock before conversion 2) Increase in perennial biomass carbon/ yr 3) Loss of biomass carbon/ yr	Completeness	High
	Dead organic matter	1) Dead wood/ litter stock before conversion 2) Dead wood/ litter stock under CL 3) Time of transition period	Completeness	High
	Soil carbon	1) Sub-categories for combinations of climate, soil type, and soil management regime 2) Areas (by CL subcategory) converted from each other land use category 3) Initial SOC by climate/ soil combination 4) SOC stock changes (or rates) based on land-use category, land-management practices, or addition of organic matter 5) Area of cultivated organic soil by climate type 6) Emission factor by climate type [by subcategory, if possible]	Completeness	High

Category	Sub-categories	Data Request	TACCC	Priority
3B3a Grassland remaining grassland	***Soil carbon***	1) Sub-categories for combinations of climate, soil type, and soil management regiment 2) Areas of each land use sub-category (matched to prior sub- category if possible) 3) Initial SOC by climate/ soil combination 4) SOC stock changes (or rates) based on land-use category, land-management practices, or addition of organic matter 5) Area (ha) of cultivated organic soil by climate type 6) Emission factor by climate type	Completeness	Medium
3B3b Land converted to grassland	***Above-ground biomass***	1) Biomass stocks after conversion 2) Biomass stocks before conversion 3) C% of dry matter 4) Biomass C growth rate (t C/ yr) 5) Biomass C loss rate (t C/ yr)	Completeness	High
	Dead organic matter	1) Land area converted to grassland by GL sub-category and type of dead organic matter (dead wood or litter) 2) Dead wood/ litter stocks before conversion 3) Dead wood/ litter stocks after conversion 4) Transitional time period	Completeness	Medium
	Soil carbon	1) Initial SOC by climate/ soil combination 2) SOC stock changes (or rates) based on land-use category, land-management practices, or addition of organic matter 3) Area of cultivated organic soil by climate type 4) Emission factor by climate type	Completeness	Medium
3B4ai Peatlands remaining peatlands and Land converted for peat extraction	***CO_2 emissions***	1) Area (ha) of nutrient-rich peat soils managed for peat extraction by subcategory, if any 2) Emissions factors (Gg C/ ha/ yr) for CO_2 from nutrient-rich peat soils managed for extraction 3) Area (ha) of nutrient-poor peat managed for peat extraction by subcategory, if any 4) Emissions factors for CO_2 from nutrient-poor peat soils managed for peat extraction 5) Area converted from non-peat to peatlands 6) Biomass stocks before conversion 7) Biomass stocks after conversion 8) C% of dry matter 9) Air-dried weight of extracted peat per year by subcategory, if any 10) C% of air-dried peat	Completeness	High
	Non-CO_2 emissions	1) Area of nutrient-rich peat soils managed for peat extraction (incl. abandoned areas still draining) by subcategory, if any 2) Emission factor for drained nutrient-rich peat soils 3) Area converted to nutrient-rich peat extraction (by subcategory, if any) from other categories, by category (i.e., FL, CL, GL, SL, OL)	Completeness	Medium
3B5b Land converted to settlements	***Dead organic matter***	1) Dead wood/ litter stock (t C/ ha) under old land use 2) Time period of the transition from old to new land use	Completeness	Medium

Category	Sub-categories	Data Request	TACCC	Priority
	Soil carbon (for mineral soils and organic soils)	<u>For mineral soils</u> 1) Area (ha) of mineral soils changed to SL subcategory (climate/ soil combination) by previous land use (i.e., FL, CL, GL, WL, OL) 2) C stock from prior land use 3) Time dependence of C stock-change or transition period 4) C stock-change factor for current or latest land-use system 5) C stock-change factor for current or latest management regime 6) C stock-change factor for previous management regime 7) C stock-change factor for C inputs <u>For organic soils</u> 8) Area (ha) of organic soils converted to SL subcategory 9) Emission factor by climate type (t C/ ha/ yr)	Completeness	High
3B6b Land converted to other land	***Soil carbon***	<u>For minerals soils</u> 1) Area (ha) of mineral soils changed to OL subcategory (climate/ soil combination) by previous land use (i.e., FL, CL, GL, WL, SL) 2) C stock from prior land use 3) Time dependence of C stock-change or transition period 4) C stock-change factor for current or latest land-use system 5) C stock-change factor for current or latest management regime 6) C stock-change factor for previous management regime 7) C stock-change factor for C inputs <u>For organic soils</u> 8) Area (ha) of organic soils converted to OL subcategory 9) Emission factor by climate type (t C/ ha/ yr)	Completeness	
3D1 Harvested wood products	***CO_2 emissions***	1) Volume of harvested wood per year 2) Ratio of harvested wood to harvested biomass 3) Ratio of harvested below-ground wood to harvested above-ground wood 4) % C of dry matter 5) Volume of harvested fuelwood per year 6) Average fuelwood density 7) Area affected by disturbance type (e.g., pest, disease) 8) Biomass (dry matter) per area 9) Portion of biomass lost to disturbance	Completeness	High

SECTION 5.6 WASTE SECTOR

This section outlines GHG improvement plan for the waste sector. The priority of the Waste sector to do with TACCC is accuracy and completeness as can be seen from each category below.

SUB - SECTION 5.6.1 4A Solid Waste Disposal

The table below outlines the improvement plan for each category under 4A Solid Waste Disposal.

Table 5-20: Improvement plan for categories under 4A Solid Waste Disposal

Data request	Potential Data provider (s)	Purpose	TACCC	Priority
The amount of waste goes to Solid Waste Disposal Sites (SWDS) in Port Moresby from 1950 to 2022	NCDC, CEPA, UPNG	Activity data for Solid Waste Disposal Site (to update current estimation method)	Accuracy	Medium
Waste composition data in Port Moresby from 1950 to 2022	NCDC, CEPA, UPNG	Activity data for Solid Waste Disposal Site (to update current estimation method)	Accuracy	Medium
Waste generation ratio in Port Moresby from 1950 to 2022	NCDC	To estimate amount of generated waste by using population data in POM and waste generation ratio	Accuracy	Medium
Waste generation ratio in provinces from 1950 to 2022	NCDC	To estimate amount of generated waste by using population data in provinces and waste generation ratio	Accuracy	Medium
Waste treatment method in Port Moresby from 1950 to 2022	NCDC, CEPA	To estimate amount of waste which goes to SWDS or other methods	Accuracy	Medium
Type of SWDS in Port Moresby from 1950 to 2022	NCDC	To apply appropriate MCF value	Accuracy	Medium
The amount of industrial solid waste goes to SWDS	NCDC	Activity data for Solid Waste Disposal Site	Completeness	High
The amount of industrial solid waste goes to SWDS	Industries	Activity data for Solid Waste Disposal Site	Completeness	High
The amount of waste goes to SWDS in provinces from 1950 to 2022	Provincial Town Authorities	Activity data for Solid Waste Disposal Site (to update current estimation method)	Accuracy	Medium

Data request	Potential Data provider (s)	Purpose	TACCC	Priority
Waste composition data in provinces from 1950 to 2022	Provincial Town Authorities	Activity data for Solid Waste Disposal Site (to update current estimation method)	Accuracy	Medium
Waste generation ratio in provinces from 1950 to 2022	Provincial Town Authorities	To estimate amount of generated waste by using population data in provinces and waste generation ratio	Accuracy	Medium
Waste treatment method in provinces from 1950 to 2015	Provincial Town Authorities	To estimate amount of waste which goes to SWDS or other methods	Accuracy	Medium
Type of SWDS in provinces from 1950 to 2022	Provincial Town Authorities	To apply appropriate MCF value	Accuracy	Medium
Population data by region from 1950 to 2022	National Statistics Office	To estimate amount of generated waste by using population data in POM and provinces and waste generation ratio	Accuracy	High

SUB - SECTION 5.6.2 4B Biological Treatment of Solid Waste

The table below outlines the improvement plan for each category under 4B Biological Treatment of Solid Waste.

Table 5-21: Improvement plan for categories under 4B Biological Treatment of Solid Waste

Data request	Potential Data provider (s)	Purpose	TACCC	Priority
Waste treatment method in Port Moresby from 1950 to 2022	NCDC, CEPA	To estimate amount of waste which goes to SWDS or other methods	Accuracy	Medium
Waste treatment method in provinces from 1950 to 2015	Provincial Town Authorities	To estimate the amount of waste that goes to SWDS or other methods	Accuracy	Medium

SUB - SECTION 5.6.3 4C Incineration and open burning of waste

The table below outlines the improvement plan for each category under 4C Incineration and open burning of waste.

Table 5-22: Improvement plan for categories under 4C Incineration and open burning of waste

Data request	Potential Data provider (s)	Purpose	TACCC	Priority
Fraction for Open burning activity	DAL (small scale farming)	To estimate amount of open burned waste mainly in rural area	Completeness	High
Amount of incinerated hospital waste	National Department of Health (NDOH)and Hospitals	To estimate amount of incinerated fossil hospital waste by using incinerated hospital waste data and waste composition in hospital waste	Completeness	High
Composition of incinerated hospital waste	NDOH and Hospitals	To estimate amount of incinerated fossil hospital waste by using incinerated hospital waste data and waste composition in hospital waste	Completeness	High

SUB - SECTION 5.6.4 4D Wastewater treatment and discharge

The table below outlines the improvement plan for each category under 4D Wastewater treatment and discharge.

Table 5-23: Improvement plan for categories under 4D Wastewater treatment and discharge

Data request	Potential Data provider (s)	Purpose	TACCC	Priority
Amount of industrial wastewater	Water PNG and CEPA	Activity data for industrial wastewater treatment and discharge	Completeness	High
Amount of industrial wastewater	Water PNG, CEPA, NCDC, and Industries	Activity data for industrial wastewater treatment and discharge	Completeness	High
Inlet industrial wastewater concentration	Water PNG, CEPA, NCDC, and Industries	Activity data for industrial wastewater treatment and discharge	Completeness	High
Ratio for wastewater treatment system in Port Moresby	Water PNG and CEPA	To apply appropriate important parameters of "Wastewater treatment system"	Accuracy	High
Ratio for wastewater treatment systems in provinces	Water PNG	To apply appropriate important parameters of "Wastewater treatment system"	Accuracy	High
EF for domestic wastewater	IPCC EFDB	To quote country-specific CH_4 and N_2O emission factors	Accuracy	High
Protein Consumption data	NDOH and UPNG Medical facility	To update protein consumption data for N_2O from human waste	Accuracy	Low

PART

6

SCHEDULE

SCHEDULE

Activities in the GHG inventory improvement plan will be implemented in the period 2022-2024 which falls within the timeframe of PNG Enhanced Transparency Framework (ETF) roadmap. The successful implementation of the GHG inventory improvement plan will be reflected in the NIR that will be submitted together with the First Biennial Transparency Report (BTR1) that will be submitted to the UNFCCC by the end of 2024. After the submission of the NIR with the BTR1, the reports will undergo a technical assessment review that will most likely take place in 2025. The timeline below shows the schedule of major activities that CCDA will be implementing together with the national stakeholders and other relevant partners to address the major gaps relating to the national GHG inventory and the National Greenhouse Gas Inventory Management System in order to meet the objectives of the Enhanced Transparency Framework of the Paris Agreement.

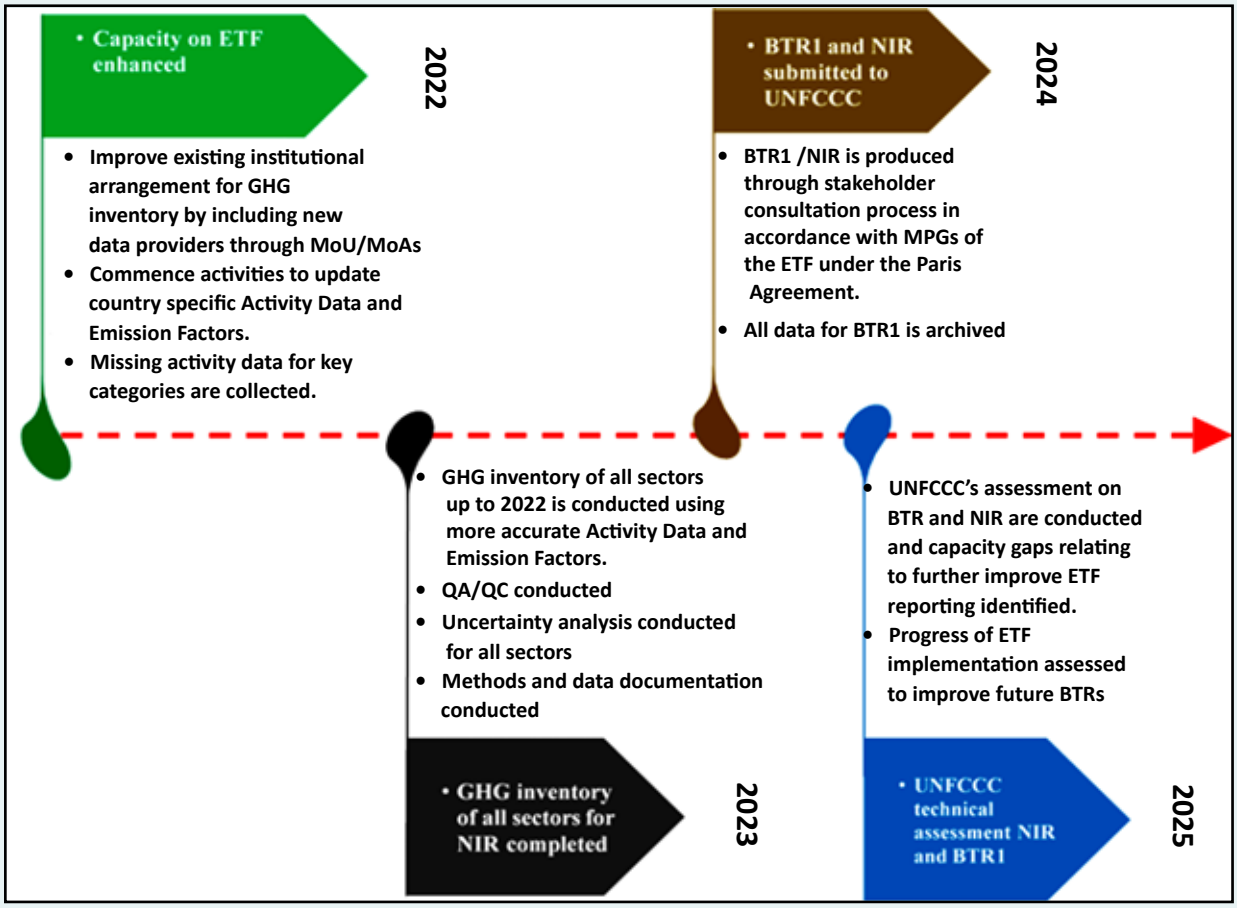


Figure 4: Schedule of the GHG inventory Improvement Plan

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