PAPUA NEW GUINEA

PNG Action Plan for Enhanced Transparency Framework on AFOLU and REDD+National Forest Monitoring System

2022-2025

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Message by the Acting Managing Director of the Climate Change and Development Authority

William Lakain | Acting Managing Director Climate Change and Development Authority

Climate change is causing dangerous and widespread disruption in nature and is affecting the lives of billions of people around the world. Papua New Guinea (PNG) is among the most vulnerable countries to the adverse impacts of climate change. The Government of Papua New Guinea (GoPNG) has established Climate Change and Development Authority (CCDA) under the Climate Change Management Act (CCMA) 2015 with a role to address issues and develop policies on climate change in PNG which will contribute towards global efforts in mitigating greenhouse gas emissions.

GoPNG has shown its commitment to fulfilling its obligations under the United Nations Framework Convention on Climate Change (UNFCCC) by mainstreaming climate change in its development priorities, as captured in the Vision 2050, the National Development Strategic Plan 2010-2030, National Strategy for Responsible Sustainable Development (StaRS) and the Medium-Term Development Plan III.

Additionally, PNG has been at the forefront of the process to draft, adopt, ratify, and operationalize the Paris Agreement. On 29 March 2016, PNG became the first country to submit its first NDC under the agreement. PNG signed the Paris Agreement at the earliest opportunity, 22 April 2016, and ratified the agreement 21 September 2016. The Paris Agreement aims to strengthen the ability of countries to respond and adapt to climate change. Article 13 of the Paris Agreement describes a planned Enhanced Transparency Framework (ETF) for measurement, reporting, and verification (MRV) associated with UNFCCC commitments.

The ETF specifies how parties to the Paris Agreement (such as PNG) must report on progress in climate change mitigation, adaptation measures and support provided or received from all sectors and level of government. To ensure PNG complies with the climate change mitigation and adaptation reporting provisions under Paris Agreement, CCDA with support from the GEF funded FAO Capacity-building Initiative for Transparency (CBIT) project, has develop this action plan with an aim to address the key capacity gaps and challenges particularly in the Agriculture, Forestry and Other Land Use (AFOLU) sector.

We hope that this action plan will play a crucial role in enhancing the coordination between CCDA and its key AFOLU stakeholders and increase mutual understanding of the roles and responsibilities amongst government, industry and the community for top-priority actions to allow the provisions of better quality information for PNG to meet the reporting requirements under the transparency framework of the Paris Agreement

William Lakain
Managing Director

Acknowledgement

Abbreviations

AFOLU	AFOLU Agriculture Forestry and Other Land-use
AP	Action Plan
BTR	Biennial Transparency Report
BUR	Biennial Update Report
cap	Capacity
CBIT	Capacity-Building Initiative for Transparency
CCDA	Climate Change and Development Authority
CCMA	Climate Change Management Act
CEPA	Conservation and Environment Protection Authority
CO₂ eq	Carbon dioxide equivalent
COP	Conference of the Parties
DAL	Department of Agriculture and Livestock
DNPM	Department of National Planning and Monitoring
EF	Emission Factors
ETF	Enhance Transparency Framework Under the Paris Agreement
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	The Food and Agriculture Organization Corporate Statistical Database
FCPF	Forest Carbon Partnership Facility
FRL	Forest Reference Level
Gg	Gigagram
GCF	Green Climate Fund
GDP	Gross domestic products
GEF	Global Environment Facility
GFOI	Global Forest Observations Initiative
GHG	Greenhouse Gas
GHGI	Greenhouse gas inventory
GoPNG	Government of Papua New Guinea
Ha	Hectares
ICA	International Consultation and Analysis
IPCC	Intergovernmental Panel on Climate Change
KCA	Key Category Analysis
LDCs	Least Developed Countries
LULUCF	Land use, land-use change, and forestry
MoA	Memorandum of Agreement
MoU	Memorandum of Understanding
M&R	Monitoring and Reporting
MPG	Modalities, Procedures and Guidelines
MRV	Measurement Reporting and Verification
NAP	National Adaptation Plan
NC	National Communication
NDA	Nationally Designated Authority
NDC	Nationally Determined Contributions
NGHGIMS	National Greenhouse Gas Inventory Management System
NFI	National Forest Inventory
NFMS	National Forest Monitoring System
NIR	National Inventory Report
NSO	National Statistics Office
PA	Paris Agreement
PNG	Papua New Guinea
PNGFA	PNG Forest Authority
QA/QC	Quality Assurance/Quality Check
RBP	Results-based Payment
REDD+	Reducing Emissions from Deforestation and forest Degradation and the role of Conservation, Sustainable management of forest and enhancement of carbon stocks
SIDS	Small Island Developing States
SLMS	Satellite Land Monitoring System
STWC	Sub-Technical Working Committee
TA	Technical Annex
UNFCCC/Convention	United Nations Framework Convention on Climate Change
VNA	Vulnerability Needs Assessment

Executive Summary
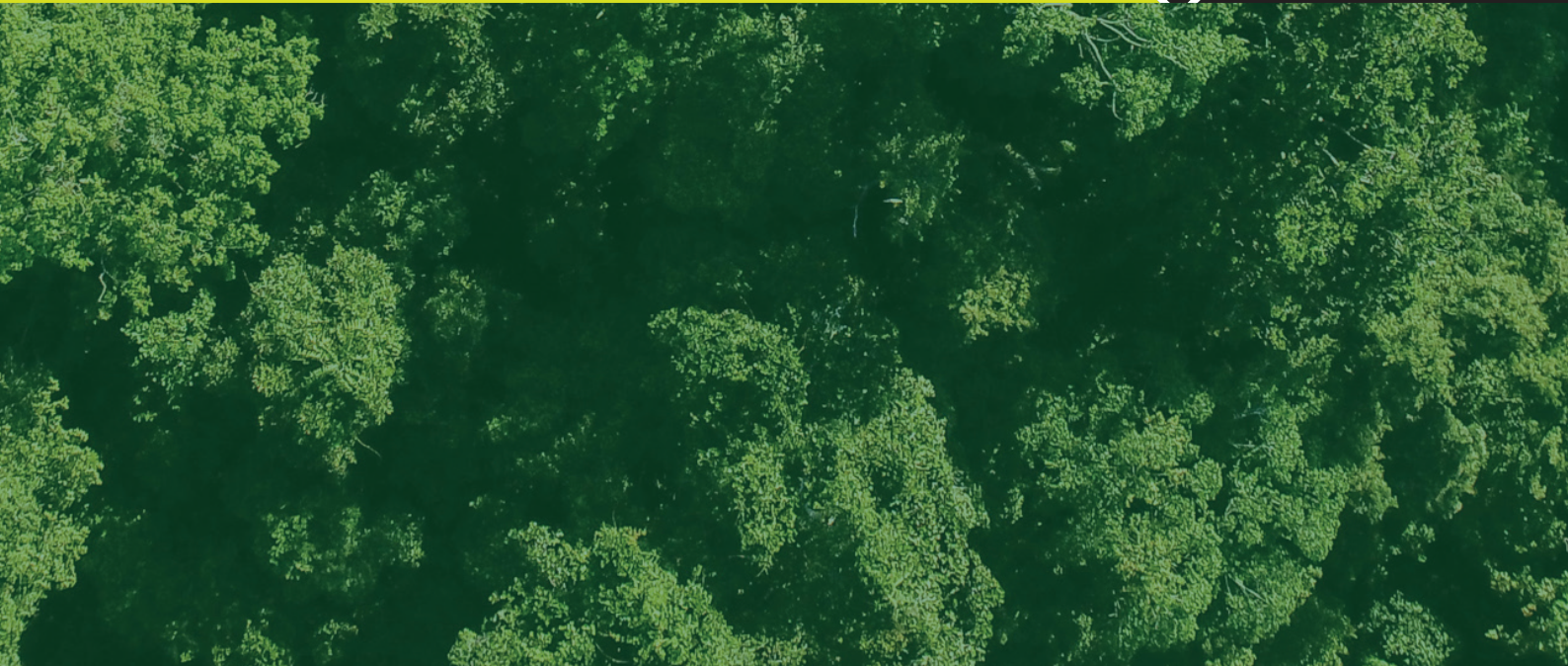
1. Introduction
• Background

PNG has been at the forefront of the process to draft, adopt, ratify, and operationalize the Paris Agreement. The Paris Agreement sets the world on a course towards sustainable development, aiming at limiting the global average temperature to well below 2, preferably to 1.5 degrees Celsius above pre-industrial levels. Parties also agreed to a long-term goal for adaptation and to work towards making flows of finance consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.

PNG was one of 196 Parties to the United Nations Framework Convention on Climate Change (UNFCCC) that came together under the historic Paris Agreement in 2015. The Paris Agreement formally entered into force on November 4, 2016. Other countries have continued to become parties to the Paris Agreement as they complete their domestic approval procedures. PNG has ratified the Paris Agreement on 21 September 2016. As of January 2021, 190 parties have ratified the Paris Agreement.

The Enhanced Transparency Framework (ETF) specifies how parties to the agreement must report on progress in climate change mitigation, adaptation measures and support provided or received. The Paris Agreement sets out to build a common set of guidelines for all countries, while providing flexibility for developing countries that need it. The ETF is central to the design, credibility and operation of the Paris Agreement.

• Objectives of the Action Plan

The PNG Action Plan for Enhanced Transparency Framework on AFOLU and REDD+ NFMS (2022-2025) is a five-year plan developed by the Climate Change and Development Authority (CCDA) in consultation with key AFOLU stakeholder (PNGFA, DAL, DLPP, et al) to address the key capacity gaps in the PNG's AFOLU MRV system and the National GHG Inventory Management system to ensure PNG is 'ETF-ready' by 2024. The Action Plan describes the necessary activities to ensure effective compliance with the Katowice Modalities, Procedures and Guidelines (MPGs) for ETF to allow PNG to fulfil its AFOLU Reporting Requirements under the Paris Agreement (for Non-Annex I Parties) on Climate-change Mitigation (required) and Climate-change Adaptation (encouraged). The action plan will play a crucial role in enhancing the coordination among key AFOLU stakeholders to ensure better quality information is reported under the AFOLU sector.

2. Development Methodology

The PNG Action Plan for Enhanced Transparency

Framework on AFOLU and REDD+ National Forest Monitoring System 2022-2025 is placed in the context of PNG's climate change policies and plans. The activities in this action plan were derived from the following sources:

*   Recommendations from UNFCCC Regional Work shop on the Building of Sustainable National Green house Gas Inventory Management Systems, and the Use of the 2006 IPCC Guidelines for National Green house Gas Inventories;

*   Capacity needs identified in the UNFCCC technical assessment reports of PNG's BUR1 and REDD+ Technical Annex/REDD+ results;

*   ETF readiness assessment update;

*   AFOLU MRV gap assessment; and

*   Climate change adaptation gap analysis in AFOLU sector.

The activities are consistent with the PNG MRV roadmap and AFOLU implementation roadmap on PNG'S Enhanced NDC. Following steps were used in the development of this action plan:

(i)   Step 1:
      Establishment of an AFOLU MRV sub-Technical Working Committee;

(ii) Step 2:
      Stakeholder consultation and drafting; and

(iii) Step 3:
      Validation and endorsement

3. National Circumstances

Geography and population
PNG comprises the eastern half of the island of New Guinea which is ranked the 3rd largest Island in the world after Greenland and contains the third largest tropical rainforest after Amazon Basin and Congo Basin. The country lies between latitudes 0° and 12°S, and longitudes 140° and 160°E. PNG has a coastline of 5,152 kilometres and an exclusive economic zone of 2.4 million km2 and a total land area of about 46.2 million hectares. The population of PNG has grown from 3.8 million in 1990 to 7.3 million according to 2011 National Population Census.

Biodiversity

PNG covers less than 1 percent of the world's land mass but host six percent of the world's most biologically diverse ecosystems. The flora of PNG varies from tidal swamps at sea level to alpine conditions. PNG also harbours a rich array of animals with approximately a third of the species are endemic to PNG.

Agriculture

Agriculture provides livelihood for 85% of the rural population who rely directly on subsistence farming for their basic needs, having only little contact with the formal economy. In 2019 it made up 25% of GDP and contributed to the livelihoods of 85% of the population. The country's key crops include cocoa, coffee, copra, palm oil, rubber and tea, most of which are exported and form an important source of foreign exchange (forex) revenues. The contribution of agriculture to food security, through domestic cultivation for home consumption is estimated at K5.0 billion annually, while its contribution to export trade economy was estimated at K2.9 billion in 2011. By 2050, the population of PNG is projected to be about 17 million with over 60% still heavily dependent on agriculture.
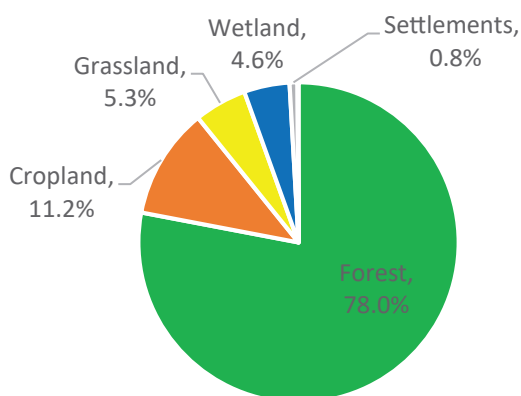
Forest and land use

PNG's forests are highly diverse, including 12 distinct forest types, with carbon-rich lowland tropical forest constituting over 50% of forest area. Forestry's contribution to the economy of Papua New Guinea (PNG) is significant. In 2017, it was reported by the Ministry of Forest that the forest industry contributes more than K300 million directly to the Government's revenue every year. The forestry sector employs 10,000 people and provide infrastructure in rural areas, including health and education facilities.

Additionally, the forests play an important role in PNG's effort to climate change mitigation, particular in REDD+ since forests cover about 78 % of PNG's total land area of 46.2 million hectares with about 75% (PNGFA 2019) of the forest still remaining intact/undisturbed. However, the forests are coming under increasing pressure from logging, agriculture (commercial and small-scale) and mining activities.

➢ Land use in PNG in 2015.
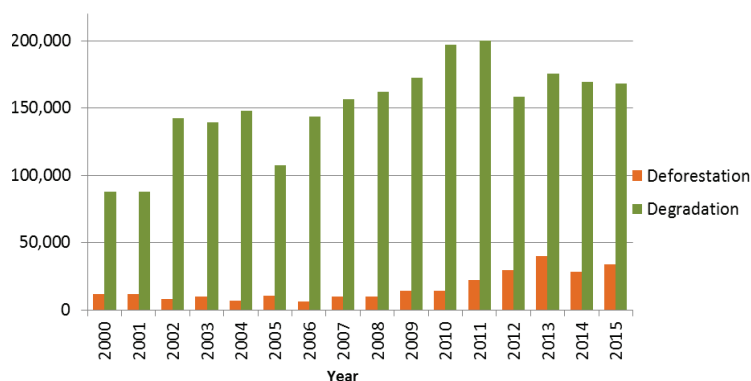
➢ Area of deforested and forest degraded in PNG from 2000 to 2015.

(Source: PNGFA (2019 *Forest and Land Use Change in PNG 2000-2015.* PNG Forest Authority)

Emission Summary of AFOLU sector

According to PNG's BUR1, emissions from the Agriculture sector amounted to 796 Gg CO2 eq in 2015, an increase of 114 Gg CO2 eq when compared with the year 2000.Direct and indirect emissions from managed soils contributed 58% of the total sector emissions in 2015, followed by enteric fermentation and manure management that contributed together 41% and biomass burning of crop residue contributing 1% of the total sectoral emission.

The Land use and Land Use Change and Forestry sector (LULUCF) has been one of the most significant sector in PNG with both the highest removals and emissions among all sectors. LULUCF sector historically acted as a sink. However the sector has evolved into a smaller sink over time due to the decrease in forest lands over time. The net removals from the LULUCF sector amounted to 1,716.46 Gg CO2eq in 2015 compared to 21,635.94 Gg CO2eq in 2000 which is a total decrease of removals amounting to 19,919.48 Gg CO2

Climate change risks

About 85% of the PNG's population lived in rural areas and depend on subsistence farming for living; consequently, most of PNG's population is vulnerable to climate variability and change. Coastal and inland flooding rank amongst the highest level of climate change risks in PNG.

• Domestic Policies and legislation that support climate change mitigation and adaptation initiatives in PNG

The GoPNG has over the years taken various actions to address the effects of climate change by mainstreaming climate change in its development priorities, as captured in the Vision 2050, the National Development Strategic Plan 2010-2030, National Strategy for Responsible Sustainable Development (StaRS) and the Medium-Term Development Plan III. The most recent steps taken by PNG to act on climate change have been the development of PNG's SDG 13 Climate Action Roadmap and the submission of the Second (Enhanced) NDC and the NDC Implementation Plan and Roadmaps (for AFOLU and Energy sectors) to the UNFCCC.

National development goals
The key pillars that provide a roadmap to address climate change issues in PNG include; PNG Vision 2050 (2009); Papua New Guinea Development Strategic Plan 2010-2030; National Strategy for the Responsible Sustainable Development (StaRs); PNG Medium Term Development Plan III (MTDP III); and Papua New Guinea's Sustainable Development Goal 13 Roadmap: 30 actions by 2030.

Legal Instruments
The fundamental legislations that give mandate and responsibility to CCDA to take the lead in implementing climate change adaptation and mitigation initiatives are;
(i) Climate Change (Management) Act (2015), passed in in Parliament on the 28th July 2015; and

(ii) United Nations Paris Agreement (Implementation) Act 2016, passed in Parliament in 2016 following the adoption of the Paris Agreement. The Paris Agreement (Implementation) Act 2016 gives effect to the implementation of the State's obligation under the Paris Agreement.

Key sectoral policies
The main sectoral policies that address climate change adaptation and mitigation initiatives include;

(i) National Climate Compatible Development
   Management Policy (2014);

(ii) National REDD+ Strategy (2017);

(iii) National Adaptation Plan (draft) which is being formulated by CCDA with specific focus on addressing climate change adaptation needs in the agriculture, health, transport and infra-structure sectors; National Forest Policy; and the National Sustainable Land Use Policy (draft) which is being developed with an aim to provide an overarching framework that will guide the planned allocation, development, management and best use of land and land resources in Papua New Guinea.

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4. Enhanced Transparency Framework (ETF) of the Paris Agreement

The Paris Agreement is a legally binding international treaty on climate change with a goal to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. The Paris Agreement formally entered into force on November 4, 2016. Other countries have continued to become parties to the Paris Agreement as they complete their domestic approval procedures. As of January 2021, 190 parties have ratified the Paris Agreement. PNG has ratified the Paris Agreement on 21 September 2016. The ETF specifies how parties to the agreement must report on progress in climate change mitigation, adaptation measures and support provided or received.

Modalities, Procedures, and Guidelines (MPGs) for the transparency framework for actions and support referred to in Article 13 of the Paris Agreement have been adopted on December 2018 during the Katowice Climate Change Conference (COP24). Key guiding principles of the MPGs include:

• Maintaining frequency and quality of reporting, and

• Improved reporting and transparency over time

The MPGs recognises different starting points of parties and give flexibility to those developing country Parties that need it in the light of their capacities. The Katowice outcome also recognizes that developing country Parties will continue to require support (both technical and financial) to implement activities under the ETF.

5. Progress made by PNG in moving towards the Enhanced Transparency Framework – Assessment

• Institutional Arrangement of PNG's National GHG Inventory

The CCDA being the UNFCCC's Nationally Designated Authority (NDA), acts as the key focal point and coordinator of the GHGI development and reporting and has also established memoranda of agreement (MoAs) and memoranda of understanding (MoUs) with the key data providers/stakeholders for data provision/collection and also for other support required to drive CCDA's initiatives. CCDA is also responsible for establishing and managing the national GHG inventory data archiving system. This institutional arrangement will be further improved under the enhanced transparency framework to cater for climate change impacts and adaptation reporting.
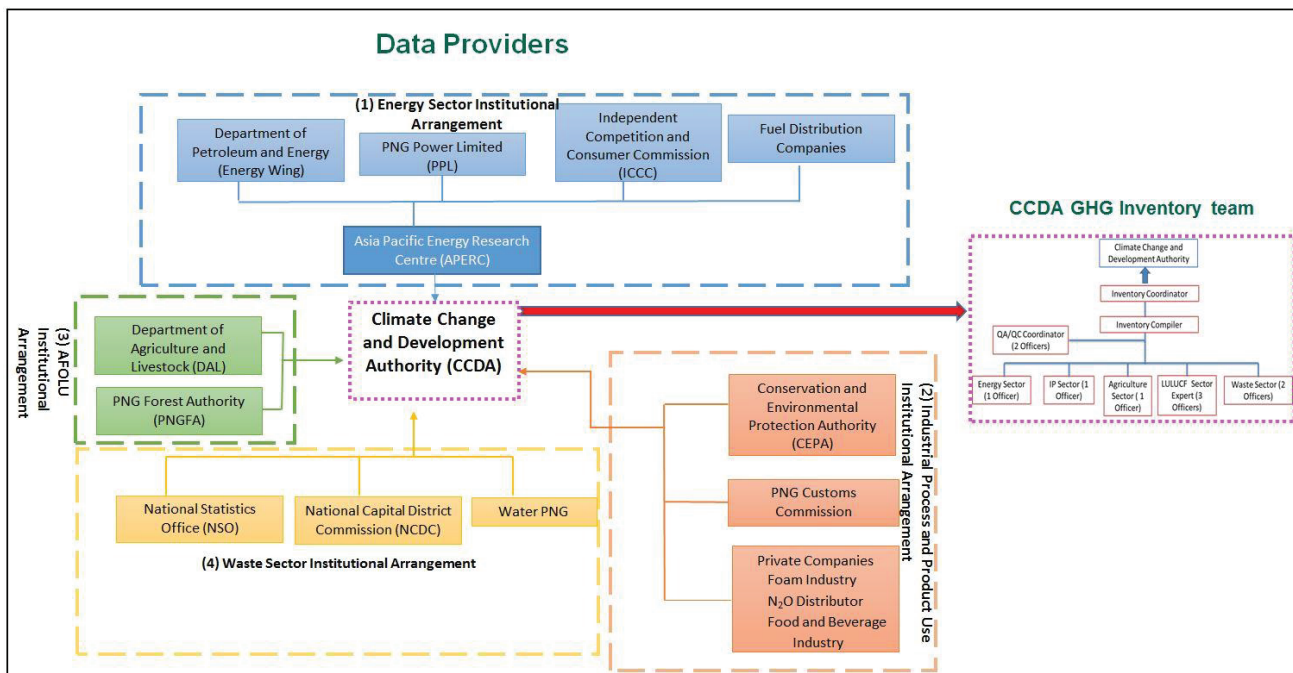
> PNG's current institutional arrangement for national GHG inventory

• National MRV system

PNG's existing MRV system provides the basis for the country to prepare and implement the enhanced transparency framework under the Paris Agreement. PNG understands that the ETF is not something completely new as it enhances/builds on within the current MRV arrangement/transparency system under the UNFCCC.
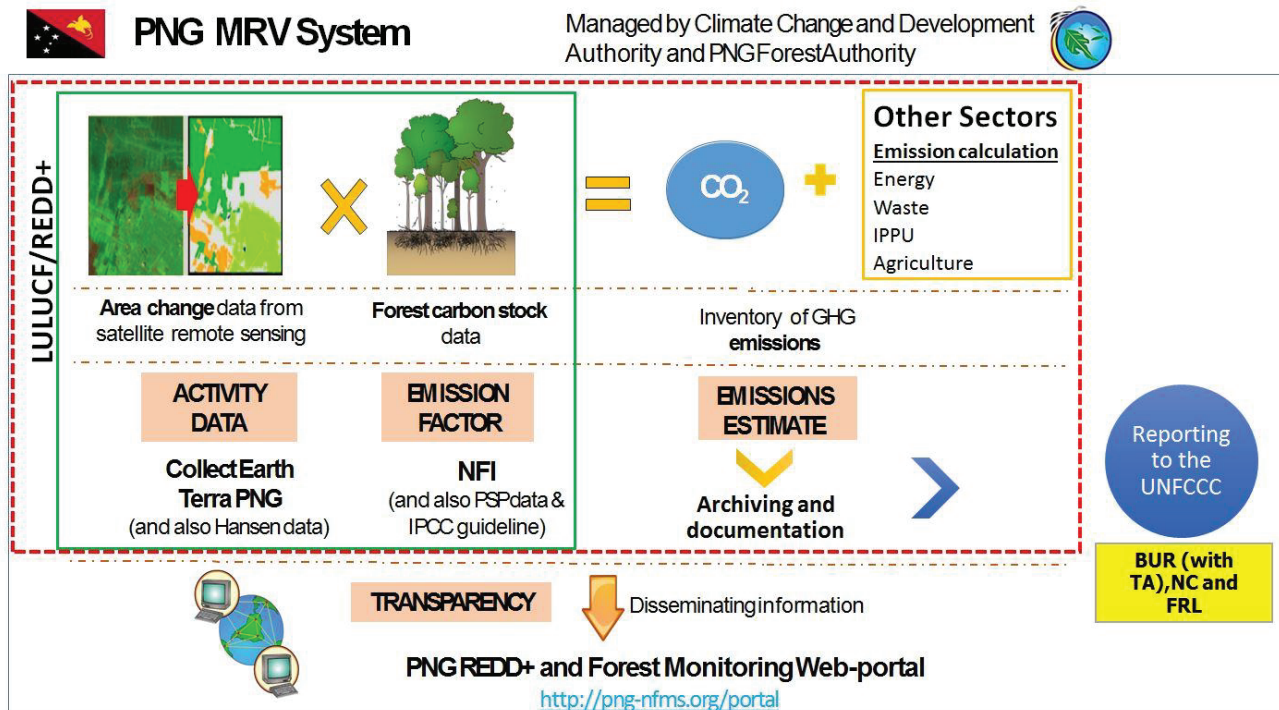
> PNG's current MRV system

• Forest Reference Level

PNG submitted its Forest Reference Level (FRL) to the UNFCCC in 2017. After the UNFCCC technical assessment process the modified FRL was submitted and published on UNFCCC website. PNG FRL submission shows steady increase of historical (2001-2013) annual emissions of the forest sector from 21.5 million tCO2eq/yr in 2001 to 41.7 million tCO2eq/yr in 2013. The linear regression model was used to predict the annual emissions during the reference period 2014-2018.

• **Biennial Update Report**

PNG submitted its first Biennial Update Report to UNFCCC on 18 April 2019. PNG also reported its REDD+ results in 2014 and 2015 in the technical annex (REDD+ Technical Annex) to the BUR1.Both the BUR1 and the REDD+ Technical Annex underwent the Technical Analysis process and the reports of the technical analysis were published on the UNFCCC website.

PNG's BUR is mostly in alignment with the updated requirements under ETF on National GHGi report, as described in the table below. BUR2 will be prepared as fully complying with the ETF requirements. PNG is planning to commence preparation of the Biennial Transparency Report (BTR1) in 2022 for submission before the end of 2024, the submission deadline set under the MPGs.

➢ Different requirements between BUR and BTR, and how PNG is addressing the BTR requirements

BUR requirement	BTR (ETF) requirement	PNG BUR
1996 IPPC Guidelines.	2006 IPCC Guidelines.	PNG applied 2006 guidelines for BUR1.
Encouraged to provide consistent time series back to the year of the previous NC.	Consistent annual time series starting from 1990. Flexibility given to the developing countries starting 2020 onward.	PNG reported consistent annual time series starting 2000 in BUR1.
Report the inventory for the calendar year no more than four years prior to the date of the submission.	The latest reporting year shall be no more than two years prior to the submission. Flexibility is given to the developing countries for three years prior to the submission.	PNG reported up to 2015 in BUR1 submitted in 2019. PNG will be reporting up to 2019 in BUR2 to be submitted in 2021, which meets the EFT requirement.

PNG BUR1 Technical Annex
PNG's REDD+ results [1]was submitted to UNFCCC as an annex to the First Biennial Update Report (BUR1) in April 2019. In line with UNFCCC decisions, these results were measured against the technically assessed FRL, which is a linear regression of historical emissions from deforestation and forest degradation. The total REDD+ results achieved by PNG in 2014 and 2015 against the technically assessed FRL was 9,003,314 tCO2.

• **National Communications**
PNG submitted its First National Communication under the UNFCCC (NC1) on 27 February 2002 and its Second National Communication report (NC2) on 15 December 2015. The NC1 and NC2 are a summary of important climate change related information in PNG.

• **Nationally Determined Contributions**
On 29 March 2016, PNG became the first country to submit NDC under the Paris Agreement. PNG had submitted its enhanced NDC for the 2021-2030 reporting period in December 2020 together with the NDC Implementation Plan. PNG through CCDA had submitted revised NDC Implementation Plan (2021-2030) and the NDC Implementation Roadmap for the AFOLU and Energy sectors in December 2021. CCDA has also developed a NDC regulation titled "Climate Change (Management) (Nationally Determined Contribution) Regulation 2021". AFOLU/LULUCF targets

In the PNG's Enhanced NDC 2020, the country aims to reduce 10,000 Gg CO2 eq of the net emission from the LULUCF subsector by 2030 by 25% reduction of annual deforestation; 25% reduction of annual forest degradation; and increase of forest plantation and enhancement of ecosystem restoration.

Emissions in LULUCF Sector in PNG

- BAU emission in 2030 28,784 Gg CO2eq
- Emission in 2015 1,716 Gg CO2eq
- NDC target in 2030 -8,284 Gg CO2eq

Legend:
- Non CO2 gases - forest burning
- Settlements
- Grassland
- Cropland
- Forest land
- LULUCF Sector total
- Linear regression (LULUCF Sector total): BAU scenario
- NDC target scenario
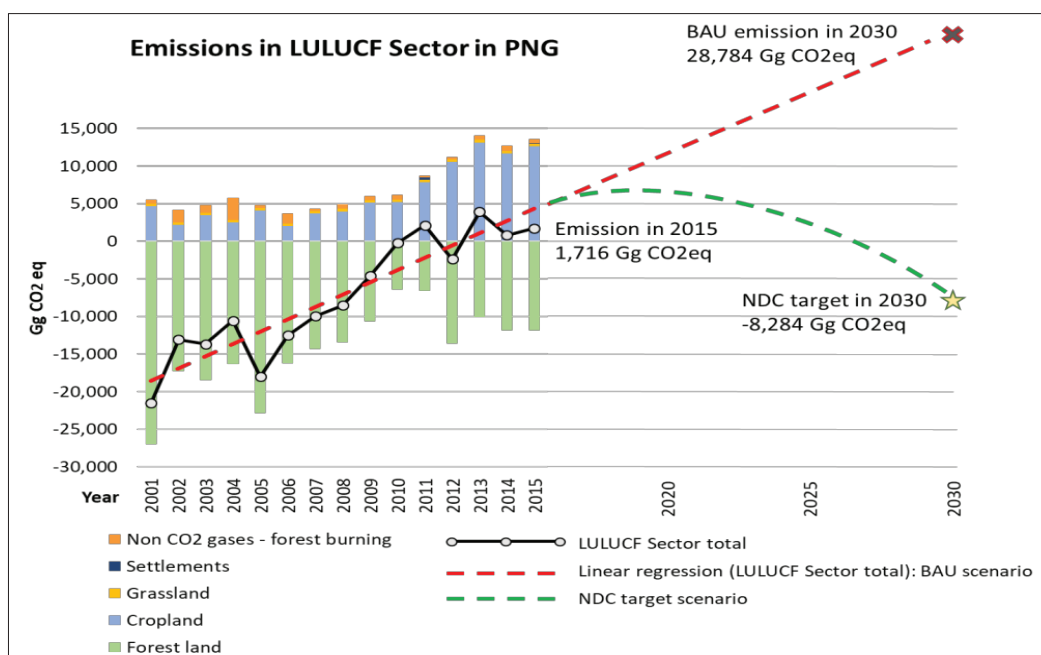
➢ PNG's Enhanced NDC 2020 LULUCF target

Adaptation targets

The approach for defining PNG's adaptation targets was undertaken by conducting a series of surveys and work-shops which included sub-national and sector vulnerability and adaptation assessments, data collection, and multi-criteria analysis. The adaptation targets are measured against beneficiaries for the agriculture and health sectors, and the value and number of assets for the transport and infrastructure sector.

➢ Adaptation targets in PNG's Enhanced NDC 2020

Priority Development Sector per the NAP	Adaptation Target 2030
Agriculture	10% of the total population (0.8 million beneficiaries (25% are women)) have increased resilience with respect to food and water security, health and well-being in PNG.
Health	100% of the population benefits from improved health measures to respond to malaria and other climate-sensitive diseases in PNG.
Transport	US$1.2b (PGK 4.2b) value of transport (air, sea, and land) infrastructure and assets built/rehabilitated according to climate-resilient codes and standards.
Infrastructure	6 million people (70% of the population) benefit from improved early warning systems/information to respond to extreme climate events. US$172m (PGK 608m) value of building and utility infrastructure assets built/rehabilitated according to climate-resilient codes and standards.

• GHG Inventory Data Archiving system

PNG through CCDA has been developing its GHGI archiving system for UNFCCC reporting with support from FAO. The system will allow key data collection of all significant sources of GHG emissions in PNG. The need for archiving and documenting the inventory data is important for future use and for ensuring transparency. The archiving system is planned to be operational before the end of 2021.
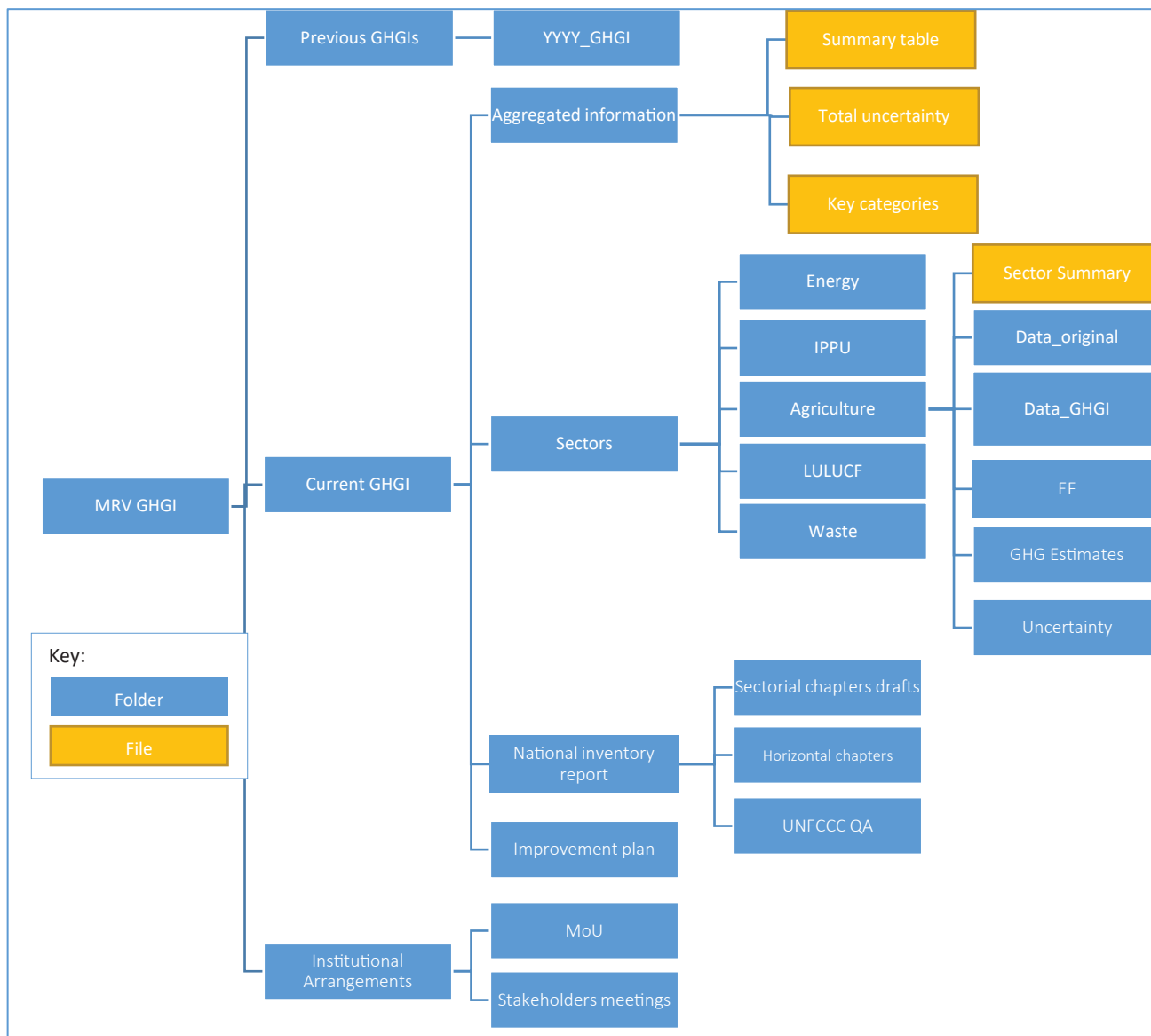
➢ PNG GHGI archiving system structure

• **Monitoring and reporting adaptation in the agriculture sector**

PNG is developing a framework to track adaptation progress in the agricultural sectors at the provincial level base on the FAO publication 'Tacking adaptation in agricultural sectors'. The main categories and sub-categories of indicators used to track adaptation in agriculture are; (i) Natural Resources and Ecosystems; (ii) Agricultural Production Systems; (iii) Socio-Economics; and (iv) institutions.

6. Capacity assessment

The capacity needs for the AFOLU MRV system, GHG inventory management system, and Adaptation M&R for the AFOLU sector were derived from various consultative meetings with the relevant stakeholders and data providers at national and sub-national levels; and qualitative assessment from a Consolidated QA Template provided by UNFCCC after the PNG "Regional Workshop on the Building of Sustainable National Greenhouse Gas Inventory Management Systems, and the Use of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories" in March 2019. Other important sources are; the outcome of PNG BUR1 ICA process; the UNFCCC Technical Analysis of the PNG's BUR1 Technical Annex; PNG NDC Implementation Plan (2021-2030) and National Adaptation Plan (NAP) proposal.

7. Implementation Plan

The activities/outputs listed are aimed at strengthening PNG's capacities for measurement, reporting, and verification (MRV) in the AFOLU sector as a means to improving the overall quality and accuracy of the National Greenhouse Gas Inventory and prepare PNG to transition to the Enhanced Transparency Framework (ETF) under the Paris Agreement. All activities/outputs were validated by the AFOLU Sub-Technical Working Committee (sub-TWC) as well as the AFOLU wider stakeholders that contribute to the AFOLU MRV in PNG. Following are the overarching capacity needs relating to AFOLU MRV in PNG.

(i) Institutional arrangement: current institutional arrangements do not fully facilitate meeting PNG's MRV commitments under the Paris Agreement. There is limited, ad hoc coordination and information-sharing between agencies.

(ii) Funding: funding is not reliably sufficient to conduct regular MRV or to maintain staffing. There are significant uncertainties about the sources, preconditions, amounts, and reliability of potential long-term funding sources.

(iii) Capacity: PNG has insufficient capacities related to the AFOLU sector for (i) country-specific ETF reporting and

(ii) reporting on climate-related adaptation with adequate quality to guide national policies.

To address the short-term and long-term capacity needs and challenges of PNG's AFOLU MRV, the following outcomes are expected to be achieved within the timeframe of this action plan.

(i) Outcome 1: Institutional framework on the Enhanced Transparency Framework strengthened;

The current institutional arrangements do not fully facilitate meeting PNG's MRV commitments under the Paris Agreement. PNG's commitments under UNFCCC and the Paris Agreement are generally not institutionalized beyond the CCDA/NDA.   For example, obligations for data-collection and reporting are generally not reflected in the mandates and work plan of respective agencies. CCDA has the authority under the CCMA 2015 to issue regulations and reporting requirements in order to fulfill PNG's international climate change commitments. However, drafting of those regulations has stalled due to certain technical and operational challenges.
Outputs under outcome 1 include:

• Output 1.1: Institutional arrangement between CCDA and key AFOLU data providers is strengthened;

• Output 1.2: Sectoral coordination mechanisms are established (i.e. establishment of AFOLU Sub-Technical Working Committee);

• Output 1.3: AFOLU ETF readiness assessment is updated.

(ii) Outcome 2: Transparency of AFOLU and REDD+ monitoring enhanced;

As part of enhancing PNG's capacity on the REDD+ and NDC monitoring/tracking, FAO in collaboration with CCDA, PNGFA and CEPA has developed a Near-real time Deforestation and Forest Degradation Alerts and Monitoring system and upgrading the PNG REDD+ and NFMS Web-Portal with support from the FAO GEF CBIT project and FAO GCF Readiness project. The Near Real-time Deforestation (and Degradation) Alerts and Monitoring System will provide near-real-time deforestation information to the government authorities and the organizations managing agriculture, forestry, conservation, REDD+, and other land development projects.

The REDD+ and NFMS Web-Portal will be upgraded for the following reasons; disseminating recent achievements of the country (PNG) related to Land Use and Land Use Change and Forestry (LULUCF) through Web-Interface (and API) as a part of National Forest Monitoring System (NFMS); Stakeholders (government organizations, developing partners, private sectors and NGOs) can understand the information available in the country and publish their achievements/data through one single web-based platform; and Preparing the base information/system for Enhanced Transparency Framework (ETF) under the Paris agreement .
Outputs under Outcome 2 include:

• Output 2.1 Web-GIS portal for PNG NFMS are updated and improved;

• Output 2.2: Near-real-time deforestation and forest degradation alert system is established and operationalized;

• Output 2.3: Awareness activities and materials on the ETF are enhanced.

(iii) Outcome 3: NFMS and REDD+ Forest Reference Level updated and improved;

FRL and NFMS are two important pillars of REDD+; PNG finalised and launched its NFMS in March 2016 and submitted its initial FRL to the UNFCCC for technical assessment in January 2017. Since then PNG had prepared its Results of 2014 and 2015 against the technical assessed FRL and submitted to UNFCCC in April 2019 as a technical annex to the First Biennial Update Report (BUR1). PNG also completed its national GHG Inventory in the AFOLU sector and reported the results in the BUR1. PNG is now into its next cycle of GHG inventory and reporting; hence it will require the updating of FRL and NFMS to meet the ETF reporting requirement under the Paris Agreement as well as to meet requirements for REDD+ Results-based Payment under GCF. The updating of these two elements is also required in order to effectively monitor the progress of NDC implementation in the country.
Outputs under outcome 3 include:

• Output 3.1: Activity Data on forest and land use is periodically updated in accordance with the ETF reporting interval;

• Output 3.2: Emission Factor (EF) is enhanced with more reliable country specific data;

• Output 3.3: NFMS is updated using latest available tools and technology;

• Output 3.4: Forest Reference Level is updated in accordance with the UNFCCC guidelines;

• Output 3.5: REDD+ results are reported in accordance with the ETF reporting guidelines.

(iv) Outcome 4: GHG inventory of AFOLU conducted and improved;

The AFOLU sector is an important sector in PNG as it contains significant sources of GHG emission and sink. The sector plays an important role in PNG's effort to climate change mitigation and adaptation as reflected in PNG's Enhanced NDC 2020. As PNG is transitioning to the ETF, we will be expected to use more country-specific activity data and emission factors in the GHG emissions/removals estimations and the inventory preparation and reporting must be done in accordance with the ETF reporting guidelines.
Outputs under outcome 4 include:

• Output 4.1: 50x2030 Initiative implemented to build strong national agricultural data system

• Output 4.2: GHG inventory of forest and other land use is conducted using the Activity Data and Emission Factor developed under Outcome 3;

• Output 4.3: GHG inventory of agriculture sector is conducted using more country-specific activity data and emission factor;

• Output 4.4: GHG inventory reports on AFOLU produced in accordance with the ETF reporting guidelines.

(v) Outcome 5: Monitoring of AFOLU related adaptation conducted;

Due to climate change, frequencies of extreme weather events such as floods, droughts and heat waves are expected to increase in the future. Papua New Guinea is of no exception to these threats and exposure to the climate induced vulnerabilities as we are part of the global community. The natural environment already poses significant risks to Papua New Guinea today, and climate change will make it worse. Hazards like coastal flooding; inland flooding; landslides; and droughts take a severe toll on the people and the economy. Climate change is likely to exacerbate some of these event-driven hazards and may also introduce new hazards due to gradual shifts in climatic conditions – most prominently, increased malaria penetration in the highlands, changes in agricultural yields and damage to coral reefs. Hence, effective monitoring and reporting of those climate induced vulnerabilities and hazards, and adaptation needs is crucial for the country to receive financial and technical support from the international community. Outputs under outcome 5 include:

• Output 5.1: Monitoring of AFOLU related adaptation required for ETF reporting is conducted;

• Output 5.2: Reports on AFOLU related adaptation monitoring are produced in accordance with the ETF reporting guidelines.

(vi) Outcome 6: ETF reports (BTR1, NIR) produced and submitted;

PNG's Third National Communication (NC3), Second Biennial Update Reports (BUR2) and the first Biennial Transparency Report (BTR1) to UNFCCC are to be prepared and submitted within the timeframe of this action plan. Outputs under outcome 6 include:

• Output 6.1: GHG inventory reports on REDD+ results, AFOLU and adaptation produced under the Outcome 3-5 are incorporated in the climate change reports (NC3, BUR2, and BTR1) meeting the ETF standard;

• Output 6.2: Progress of the AFOLU GHG targets in PNG's Enhanced NDC 2020 is assessed and reported using the data produced under outcome 3 & 4;

• Output 6.3: UNFCCC's assessment on ETF reports is conducted.

(vii) Outcome 7: Blue-carbon inventory and policy developed; and

Blue carbon is the carbon stored in coastal and marine ecosystems which includes mangroves, tidal marshes and sea grasses. These ecosystems sequester and store large quantities of blue carbon in both the plants and the sediment below. For example, over 95% of the carbon in sea grass meadows is stored in the soils.

Since PNG has significant sources of blue carbon, CCDA has decided to include blue carbon in future GHG Inventories and consider its incorporation of blue carbon policy. Initial consultation began in 2019 and the implementation is expected in 2020 for the results to be included in the Second Biennial Update Report by early 2021. The inventory will be implemented jointly by CCDA and PNGFA through the support of Blue Carbon Programme funded by AusAID. Outputs under outcome 7 include:

• Output 7.1: Policy and governance for blue carbon are considered;

• Output 7.2: Pathways to incorporate blue carbon ecosystems in the GHG inventory is identified;

• Output 7.3: Inventory of blue carbon is conducted.

(viii) Outcome 8: Other important activities identified and conducted.

Certain new technologies and initiatives will be integrated with PNG's AFOLU MRV to enhance its monitoring function and this is subject to approval from the AFOLU TWC. Outputs under outcome 8 include:

• Output 8.1 High potential AFOLU monitoring activities are considered and tested;

• Output 8.2 Other important monitoring activities on AFOLU are identified.

The primary implementing authorities of PNG Action Plan for Enhanced Transparency Framework on AFOLU and REDD+ National Forest Monitoring System (2022-2025) are the Climate Change Development Authority (CCDA), PNG Forest Authority (PNGFA) and the Department of Agriculture and Livestock (DAL). Several other Government agencies/AFOLU stakeholders and the private sector will deliver substantial portions of the project's outputs, with the aim of transitioning to sustainable, scalable, long-term operational arrangements for climate change -related MRV in the AFOLU sector. The activities in the in this action plan will be implemented according to the ETF roadmap below:

2020

- **PNG's Enhanced NDC 2020 and SDG Goal 13 Roadmap endorsed**

- PNG's SDG 13 Roadmap and PNG's Enhanced NDC documents are finalized.
- NDC Implementation Plan and ETF Action Plan are prepared

2021

- Activity Data on forest and land use is updated.
- FRL is updated and REDD+ results are reported.
- Situation of AFOLU related adaptation is assessed.

- **FRL2, BUR2 and NC3 Submitted to the UNFCCC**

2022

- **Capacity on ETF enhanced**
- **GHG inventory of AFOLU for BTR1 commenced**

- National Forest Inventory to update country specific Emission Factors is completed.
- Permanent Sample Plot re-vitalized to improve the GHG estimation.
- Assessment of forest and land use prior to 2000 is conducted to meet the ETF requirement.
- Near-Real-time Deforestation and Degradation Alerts Monitoring System for PNG fully operational.

2023

- GHG inventory of forest and other land use up to 2022 is conducted using more accurate Activity Data and Emission Factor.
- GHG inventory of agriculture using updated country-specific activity data.
- Blue carbon is incorporated in the GHG inventory.

- **GHG inventory of AFOLU for BTR1 completed**

2024

- **BTR1 submitted to UNFCCC**

- BTR1 is produced through stakeholder consultation process in accordance with MPGs of the ETF under the Paris Agreement.

2025

- UNFCCC's assessment on BTR is conducted and capacity gaps relating to further improve ETF reporting identified.
- ETF action plan is revised based on the assessment reported in the BTR1.
- NDC is reviewed for updating based on the progress reported in the BTR1.

- **NDC reviewed based on the progress reported in the BTR1**
- **Progress of ETF Action Plan assessed and the plan revised**

Introduction

Chapter
1

1.1. Background

Climate change has been at the forefront of Papua New Guinea's agenda. PNG signed the United Nations Framework Convention on Climate Change (UNFCCC) on 13 June 1992 and ratified it 16 March 1993. PNG signed the Kyoto Protocol on 2nd March 1999 and ratified it on 28th March 2002. In addition, PNG has been at the forefront of the process to draft, adopt, ratify, and operationalize the Paris Agreement which formally entered into force on November 4, 2016. PNG has ratified the Paris Agreement on 21 September 2016. As of January 2021, 190 parties have ratified the Paris Agreement. Other countries have continued to become parties to the Paris Agreement as they complete their domestic approval procedures. The agreement as it pertains to developing countries was afforded force of law in PNG by the United Nations Paris Agreement (Implementation) Act of 2016, which is further supported by the Climate Change (Management) Act of 2015.

The agreement aims to strengthen the ability of countries to respond and adapt to climate change. Article 13 of the Paris Agreement describes a planned Enhanced Transparency Framework (ETF) for measurement, reporting, and verification (MRV) associated with UNFCCC commitments. The ETF specifies how parties to the Paris Agreement (such as PNG) must report on progress in climate change mitigation, adaptation measures and support provided or received from all sectors and level of government. Also, the ETF supports a bottom-up approach to climate change monitoring and reporting (M&R) and requires active collaboration from all stakeholders including the public and private sectors.

The reporting requirements set out in the Transparency Framework of the Paris Agreement replace the previous requirements under the UNFCCC. From 2024 onwards, all Parties are expected to submit what is known as Biennial Transparency Reports (BTRs) every two years. With these transparency reports, Parties submit their greenhouse gas inventories and disclose information on progress made in implementing their NDCs. Unlike the reporting requirements under the UNFCCC, when it comes to climate action, the Transparency Framework makes no distinction between industrialized and developing countries and the requirements apply to all states with flexibility given to developing countries with limited capacities.

PNG submitted its Enhanced NDC in December 2020, 1st National Communication under the UNFCCC (NC1) on 27 February 2002, and its 2nd National Communication (NC2) 15 December 2015. PNG is currently drafting its 3rd National Communication (NC3), which it expects to submit in 2022. PNG aims to submit its 2nd Biennial Update Report under the UNFCCC (BUR1) in 2021.

One of the important differences between the current BUR reporting and the BTR reporting under the ETF is the reporting of climate change impacts and adaptation (under Article 7 of the PA) in the BTR. Therefore, this document "PNG Action Plan for ETF and REDD+ NFMS (2022-2025)" will cover the actions to report "climate change impacts and adaptation.

1.2. Objectives

The PNG Action Plan for Enhanced Transparency Framework on AFOLU and REDD+ NFMS (2022-2025) is a five-year plan developed by the Climate Change and Development Authority (CCDA) in consultation with key AFOLU stakeholder (PNGFA, DAL, DLPP, et al) to address the key capacity gaps in the PNG's AFOLU MRV system and the National GHG Inventory Management system to ensure PNG is 'ETF-ready' by 2024. The Action Plan describes the necessary activities to ensure effective compliance with the Katowice Modalities, Procedures and Guidelines (MPGs) for ETF to allow PNG to fulfil its AFOLU Reporting Requirements under the Paris Agreement (for Non-Annex I Parties) on Climate-change Mitigation (required) and Climate-change Adaptation (encouraged). The action plan will play a crucial role in enhancing the coordination among key AFOLU stakeholders to ensure better quality information is reported under the AFOLU sector.

Development Methodology

Chapter 2

The PNG Action Plan for Enhanced Transparency Framework on AFOLU and REDD+ National Forest Monitoring System 2022-2025 is placed in the context of PNG's climate change policies and plans. The activities/actions in this action plan were derived from the following sources:

- PNG Second Biennial Update Report (2022);

- PNG National Inventory Report (2022);

- Updated PNG's ETF readiness assessment (2021);

- Updated AFOLU MRV gap assessment (2021);

- Climate change adaptation gap analysis in AFOLU sector (2021);

- Capacity needs identified during the UNFCCC technical assessment reports of PNG's BUR1 and REDD+ Technical Annex/REDD+ results (2020); and

- Recommendations from PNG UNFCCC QA-QC workshop (2019).

The activities are consistent with the PNG MRV Roadmap and the PNG Enhanced NDC Implementation Plan Roadmap (2021) for the AFOLU sector. Following process was undertaken in the development of this action plan.

1. Establishment of an AFOLU sub-Technical Working Committee

The membership of the sub-TWC comprises technical experts representing diverse fields and stakeholders relevant to climate change in the agricultural and land-use subsectors. AFOLU sub-technical working committee was established by the government to ensuring participation of all relevant stakeholders, including:

- Climate Change and Development Authority (CCDA)

- PNG Forest Authority (PNGFA)

- Department of Agriculture and Livestock (DAL)

- Department of Lands and Physical Planning (DLPP)

- Conservation and Environment Authority (CEPA)
- National Statistical Office (NSO)

- Mineral Resources Authority (MRA)

- National Research Institute (NRI)

- National Agriculture Research Institute (NARI)

- University of Papua New Guinea (UPNG)
- Wildlife Conservation Society (WCS)
- The Natures Conservancy (TNC)

The main objectives of the AFOLU sub-Technical Working Committee are as follows;

- Provide technical inputs to CCDA and its key AFOLU stakeholders in implementing the requirements under the UNFCCC Paris Agreement on the Enhance Transparency Framework (ETF) on improving the country's Greenhouse Gas Inventory (GHGI) and reporting.

- Review initiatives and activities including reports, investigation and studies on the enhancement of the national REDD+ MRV system and the overall AFOLU MRV system.

2. Consultation and drafting

After evaluation of the proposed action plan format, the working committee supported the drafting of the action plan. An initial consultation workshop on the draft action plan was delivered in October 2019, during which break-out groups on Agriculture and LULUCF discussed detailed activities including capacity needs and areas of improvement. The two groups had discussed and agreed on which activities to keep in the document, which are reflected in this final version of the action plan. The second draft of the action plan was shared with all stakeholders for comments on 25 August 2021 and all comments were reviewed and incorporated in the final version.

3. Validation and endorsement

After incorporating stakeholders' comments and following a review of the action plan by independent experts, a validation workshop was delivered on March 2022 that brought together all AFOLU stakeholders and validated the document. The final version of PNG Action Plan for Enhanced Transparency Framework on AFOLU and REDD+ National Forest Monitoring System 2022-2025 was endorsed by the Government of PNG in May 2022.

National Circumstances

Chapter
3

3.1 Overview of the country
3.1.1 Geography and population

Papua New Guinea (PNG) comprises the eastern half of the island of New Guinea which is ranked the 3rd largest Island country in the world[2] after Greenland and contains the third largest tropical rainforest after Amazon Basin and Congo Basin. The total land area of the country is about 46.1 million hectares and it lies between latitudes 0° and 12°S, and longitudes 140° and 160°E. PNG has a coastline of 5,152 kilometres and an exclusive economic zone of 2.4 million km2.

The population of PNG has grown from 3.8 million in 1990 to 7.3 million according to 2011 National Population Census. This is a 40 per cent increase with an average annual growth rate of 3.1 per cent since the 2000 population census. In absolute numbers a total of 2,084, 538 persons were added to the population during the last 11 years. Only 12% of the PNG's population lives in the urban areas.

3.1.2 Biodiversity

PNG is well known centre for biodiversity and endemism. PNG covers less than 1 percent of the world's land mass but host six percent of the world's most biologically diverse ecosystems *(Convention on Biological Diversity Fifth National Report, 2017)*. The flora of PNG is rich and varied, with habitats ranging from tidal swamps at sea level to alpine conditions. PNG also harbours a rich array of animals including an estimated 150,000 species of insects, 314 species of freshwater fishes, 352 species of amphibians and 335 species of reptiles, 813 species of birds, and 298 species of terrestrial mammals. Approximately a third of the species are endemic to PNG.

3.1.3 Agriculture

Agriculture is a central pillar of Papua New Guinea's economy and remains the principal economic activity which provides livelihood for 85% of the rural population who rely directly on subsistence farming for their basic needs, having only little contact with the formal economy. In 2019 it made up 25% of GDP and contributed to the livelihoods of 85% of the population[3]. The country's key crops include cocoa, coffee, copra, palm oil, rubber and tea, most of which are exported and form an important source of foreign exchange (forex) revenues. Production of cash crops is usually centred on plantations but significant smallholder production among rural communities also exists.

The contribution of agriculture to food security, through domestic cultivation for home consumption is estimated at K5.0 billion annually, while its contribution to export trade economy was estimated at K2.9 billion in 2011[4]. By 2050, the population of PNG is projected to be about 17 million with over 60% still heavily dependent on agriculture.

3.1.4 Forest and land use

PNG's forests are highly diverse, including 12 distinct forest types, with carbon-rich lowland tropical forest constituting over 50% of forest area. The forest in PNG is critical to the livelihoods of its people and to its economy. As of 2017, approximately 85% of PNG's population of 8.3 million lived in rural areas[5], with more than 80% of the population depending on subsistence farming and resource extraction from local forests for their livelihoods[6].

Forestry's contribution to the economy of Papua New Guinea is significant. In 2017, it was reported by the Ministry of Forest that the forest industry contributes more than K300 million directly to the Government's revenue every year. The contribution comes in the form of log export tax, log export development levy, and annual payroll taxes, corporate taxes, royalty withholding taxes and goods and services tax. Between 1990 and 2005 such taxes represented an average of around 30 percent of all development expenditure by the national government[7]. The forestry sector employs 10,000 people and provide infrastructure in rural areas, including health and education facilities.

Additionally, the forests play an important role in PNG's effort to climate change mitigation, particular in REDD+ since forests cover about 78 % of PNG's total land area of 46.2 million hectares with about 75% of the forest still remaining intact/undisturbed. However, the forests are coming under increasing pressure from logging, agriculture (commercial and small-scale) and mining activities. The average annual deforestation rate between 2000 and 2010 was 0.03%, but this significantly increased to 0.08% between 2011 and 2015[8] with associated increased level of emissions.
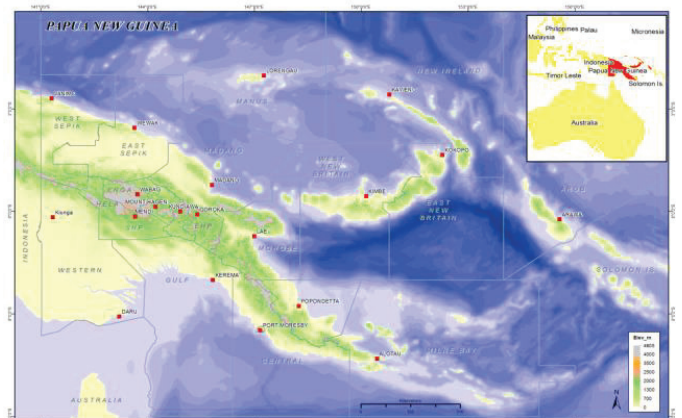
- **Map of PNG**

[2]WorldAtlas.com, 2017 | [3]Oxford Business Group (2021) | [4]BPNG (2011) | [5]World Bank (2018) | [6]GoPNG (2017) | [7]PNG Forest Industries Association Inc. (2006)
[8]PNG Forest Authority (2019) Forest and land use change in Papua New Guinea 2000-2015. 105pp.
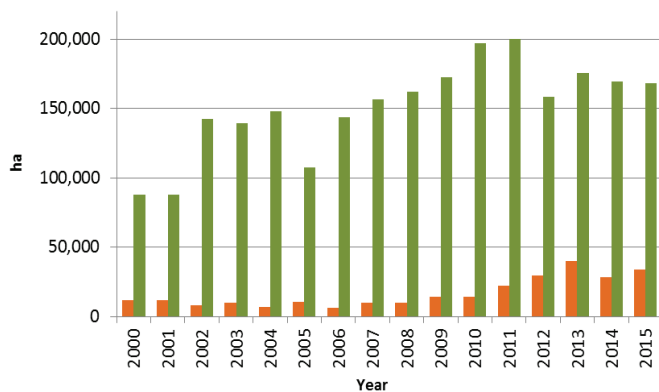
Figure 2: Area of deforested and forest degraded in PNG from 2000 to 2015 (*Source: PNGFA 2019*)

Figure 1: PNG land use in 2015(*Source: PNGFA 2019*)

3.1.5 Emission from the AFOLU sector

According to PNG's BUR1, emissions from the Agriculture sector amounted to 796 Gg CO2 eq in 2015, an increase of 114 Gg CO2 eq when compared with the year 2000.Direct and indirect emissions from managed soils contributed 58% of the total sector emissions in 2015, followed by enteric fermentation and manure management that contributed together 41% and biomass burning of crop residue contributing 1% of the total sectoral emission.

The LULUCF sector has been one of the most significant sector in PNG with both the highest removals and emissions among all sectors. LULUCF sector historically acted as a sink. However the sector has evolved into a smaller sink over time due to the decrease in forest lands over time. The net removals from the LULUCF sector amounted to 1,716.46 Gg CO2eq in 2015 compared to 21,635.94 Gg CO2eq in 2000 which is a total decrease of removals amounting to 19,919.48 Gg CO2.

The main causes of emissions from the LULUCF sector are Deforestation and Forest Degradation due to shifting (family) agriculture, commercial agriculture and commercial logging.

3.1.6 Climate change risks

About 85% of PNG's population lived in rural areas and depend on subsistence farming for living; consequently, most of PNG's population is vulnerable to climate variability and change. CCDA has identified nine priority areas for climate change risk management. Coastal and inland flooding rank amongst the highest level of climate change risk. About 18% of the total landmass in PNG is permanently inundated or regularly flooded[9]. In August 2017, more than 500 people were displaced in Morobe Province following floods which swept away more than 150 homes in a single day.

3.2 Domestic policies, plans and strategies that support climate change mitigation and adaptation activities/actions in PNG.

Climate change adaptation and mitigation remains a high priority for the Government of Papua New Guinea (GoPNG) as PNG is among the most vulnerable countries to the adverse impacts of climate change. Vulner-

ability to the effects cuts across sectors environmentally, socially and economically. Frequent rainfalls causing crop failures, landslides and damage to roads and bridges affecting economic activities; malaria spread in the highlands; and sea-level rise with salt-water intrusion into fresh water system or flooding of coastal villages are emerging challenges experienced and observed by the people across PNG.
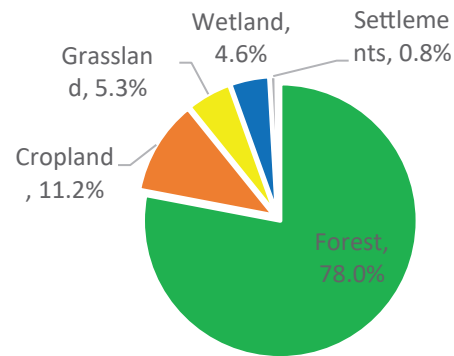
The GoPNG has over the years taken various actions to address the effects of climate change by mainstreaming climate change in its development priorities, as captured in the Vision 2050, the National Development Strategic Plan 2010-2030, National Strategy for Responsible Sustainable Development (StaRS) and the Medium-Term Development Plan III. These strategies are founded on the concepts of helping to strengthen and diversify the foundations of PNG's economic growth. And at the same time taking action to increase the country's resilience to climate change and taking steps to further mitigate carbon emissions. The most recent steps taken by PNG to act on climate change have been the development of PNG's SDG 13 Climate Action Roadmap and the submission of the Second (Enhanced) NDC and the NDC Implementation Plan and Roadmaps (for AFOLU and Energy sectors) to the UNFCCC. The following are some of the notable responsive actions undertaken by the GoPNG to address the effects of climate change in the country.

3.2.1 National Development Goals[10]

PNG Vision 2050 and Papua New Guinea Development Strategic Plan 2010-2030 (DSP)

In 2009 PNG adopted its Vision 2050 – an aspirational statement and set of beliefs and principles on the sort of PNG we want by 2050. The vision 2050 is the overarching development vision of PNG. In the Vision 2050 climate change is captured under Pillar 5 Environmental Sustainability and Climate Change. Specific actions include;

• Reduce greenhouse emission by 90 percent to 1990 levels;

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[9]UNDP, UNEP and GEF. 2018. National Adaptation Plan process in focus : Lessons from Papua New Guinea
[10]All development policies, strategies and plans are available at the Department of National Planning and Monitoring (DNPM) website at http://www.planning.gov.pg/. DNPM is responsible for all development policy and planning and coordination in PNG.

- Assist the majority of Papua New Guineans to become resilient to natural and human disasters and environmental changes;

- Establish a Sustainable Development Policy in all sectors, especially forestry, agriculture, mining, energy and oceans by 2050;

- Develop mitigation, adaptation and resettlement measures in all impacted provinces by 2015;

- Provide 100 percent power generation from renewable energy sources;

- Provide 100 percent of weather and natural disaster monitoring systems in all provinces;

- Integrate environmental sustainability and climate change studies in primary, secondary and national high school curricula; and

- Establish an Institute of Environmental Sustainability and Climate Change

The focus of Vision 2050 is to transform the nation's mind-set and attitude and align the people, institutions and systems into educated, healthy and prosperous society

National Strategy for the Responsible Sustainable Development (StaRs)

The GoPNG, in April 2014 adopted and launched the first version of the National Strategy for Responsible Sustainable Development as the guiding paradigm for the design of all future development policies and plans. In 2015, the second version, now known as StaRS, was published. The StaRS redefines the development road map by prescribing a growth strategy built on the principles of green growth, green economics, ecological economics and sustainable livelihoods and sustainable development.

PNG Medium Term Development Plan III (MTDP III)
The MTDP III which was officially released in 2018 is a five year development plan for Papua New Guinea which will cover the period 2018-2022. This plan builds on the positive gains and lessons learnt from the two previous Medium Term Development Plans, the MTDP I (2011-2015) and the bridging MTDP II (2016-2017).

The overall goal of MTDP III is to secure the future of PNG through inclusive sustainable economic growth. It has given greater prominence to adaptation and mitigation measures as risk aversion to the country's increasing socio-economic potential within the Asia Pacific region. CCDA has incorporated the implementation of the MTDP-III aspiration in its 2018-2022 Corporate Plan.

Papua New Guinea's Sustainable Development Goal 13 Roadmap: 30 actions by 2030

Officially launched in August 2020, the PNG's Sustainable Development Goal 13 Roadmap Outlines a phased cross-sectoral approach to achieving 30 actions by 20130 relating to climate change and related SDG goals.

Papua New Guinea Enhanced Nationally Determined Contribution (NDC) 2020[11]

The PNG's Enhanced NDC was officially submitted to UNFCCC on 15th December, 2020. The enhanced NDC's Mitigation Contribution captures long term low-emission development strategies in the energy sub-sector of electricity generation and transport and AFOLU Sub-sector of Forestry and Other Land Use.

3.2.2 Legal Instruments
Climate Change (Management) Act (2015)[12]

The Climate Change (Management) Act was passed in Parliament on the 28th July 2015 then certified in 20th November, 2015. The Act then sees the establishment of the Climate Change and Development Authority. The Act sets the country on a path to low carbon economy. It establishes the basis for the creation of Institutions, Legal Frameworks and Financing to move towards a low carbon economy. As an Act it provides an overarching legal framework for regulating climate change activities in the country and principally advocates consultations with relevant stakeholders.

United Nations Paris Agreement (Implementation) Act 2016[13]

The United Nations Paris Agreement (Implementation) Act was passed in Parliament in 2016 following the adoption of the Paris Agreement. The Act gives effect to the implementation of the State's obligation under the Paris Agreement.

3.2.3 Key sectoral policies
National Climate Compatible Development Management Policy (NCCDMP)

The National Climate Compatible Development Management Policy (NCCDMP)[14] was officially endorsed by the GoPNG in 2014 is the Government's blue print to achieve a vision in building a climate-resilient and carbon neutral pathway through sustainable economic development for Papua New Guinea. The strategy in achieving Climate-Compatible Development in PNG is through the combination of economic development with climate change mitigation and adaptation. For the mitigation component there are three policies;
i. Carbon Neutrality by 2050: PNG is climate compatible

[11]Available at: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Papua%20New%20Guinea%20Second/PNG%20Second%20NDC.pdf
[12]Available at: http://www.parliament.gov.pg/uploads/acts/15A-19.pdf
[13]Available at: http://www.parliament.gov.pg/index.php/bills-and-legislation/view/united-nations-paris-agreement-implementation-act-2016
[14]Available at: https://www.climatelinks.org/sites/default/files/asset/document/7-PNG-CC-Policy-document_FINAL.pdf

by 2050.

ii. Land Use and Forestry Sector Emissions Abatement: GHG emissions mitigated in the land use, land use change and forestry (LULUFC) sector.

iii. Green Economic Growth: Development is climate-compatible through efficient, low GHG emissions infrastructure and technology.

While for the adaptation component there are two policies:

iv. Adaptation Responses: Resilience to climate change impacts in the natural and built environment is significantly enhanced.

v. Adaptive Capacity: Ability of government and partners to prevent and respond to climate change impacts is maximized.

In achieving these, the NCCDMP has identified actions that will be implemented in the relevant key sectors.

National REDD+ Strategy

The Government of Papua New Guinea officially launched its National REDD+ Strategy (NRS)[15] 2017-2027 in October 2017. The NRS is both a key part of the country's Green Growth Development agenda as laid out in the Strategy for Responsible and Sustainable Development (StaRS) and is central to PNG's approach to addressing climate change. The NRS provides the basis for coordinating actions on REDD+ across government sectors, the private sector and civil society. It contains:

• PNG's Vision for REDD+.
• Information on the drivers of forest-cover change in PNG.
• Policies and measures to address drivers.
• Management arrangements for REDD+ implementation.
• Options for financing REDD+ in PNG.

Policies and measures to strengthen the land use sector and reduce land use change as identified under the PNG National REDD+ Strategy are as follow;

1. Strengthened land-use and development planning;

2. Strengthened environmental management, protection and enforcement; and

3. Enhanced economic productivity and sustainable livelihoods.

National Adaptation Plan (NAP)

PNG's National Adaptation Plan is being formulated with specific focus on addressing climate change adaptation needs in the agriculture, health, transport and infra-structure sectors. The output will aim to tackle the lack of concerted and prioritized actions in those key sectors in PNG.

PNG's Enhanced Nationally Determined Contributions (NDC, 2020) includes a section on adaptation commitments. The priority areas of the NDC on adaptation are aligned with those for the NAP process, and based on the nine priority areas defined in the Climate Change (Management) Act and the Initial (2000) and Second National Communication (2014).The NDC sets its adaptation goal as risk management and the prioritization of climate hazards. The adaptation nine areas are summarized as follow:

• Coastal Flooding and Sea Level Rise
• Inland Flooding
• Food Insecurity caused by crop failures due to droughts and inland frosts
• Cities and Climate Change
• Climate Induced Migration
• Damage to Coral Reefs
• Malaria and Vector Borne Diseases
• Water and Sanitation
• Landslides

National Forest Policy

The NFP was issued in September 1991 by the National Executive Council. It laid the foundations for detailed reform of forestry legislation in PNG. It was designed as PNG's forest management policy, and covers the requirements of the forest industry, research needs, forest training and education, and forest organization and administration. It also requires the Forest Authority to prepare a National Forest Plan to provide a detailed statement of how the national and provincial governments intend to manage and utilize the country's forest resources. In addition, central to the new policy are its concepts of environmental conservation and protection, the decentralization of decision-making, and the full recognition of the people's rights to their natural heritage.

National Sustainable Land Use Policy (NSLUP)

The NSLUP is being developed with an aim to provide an overarching framework that will guide the planned allocation, development, management and best use of land and land resources in Papua New Guinea. Additionally, the policy provides an overview of the current status and issues focus of land use patterns, discuss in critical terms the current approaches of policy and planning that includes, among others, sustainable livelihoods, rural and social development, gender equality, empowerment, sustainable infrastructure, sustainable economic development, biodiversity and wildlife, depletion of finite resources, food security, poverty eradication, social stability, management of best use of land through identification of existing zoning mechanisms, local control of land use management and land tenure conversion that lays the groundwork of the development of NSLUP.

Enhanced Transparency Framework (ETF) of the Paris Agreement

Chapter 4

Paris Agreement

The Paris Agreement represents a commitment by the international community to limit the rise of the global average temperature to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. The Paris Agreement formally entered into force on November 4, 2016. Other countries have continued to become parties to the Paris Agreement as they complete their domestic approval procedures. As of January 2021, 190 parties have ratified the Paris Agreement. PNG has ratified the Paris Agreement on 21 September 2016[16].

Article 13 of the Paris Agreement established and enhanced transparency framework for measurement, reporting, and verification (MRV) associated with UNFCCC commitments. The ETF specifies how parties to the agreement must report on progress in climate change mitigation, adaptation measures and support provided or received.

The Paris Agreement gives much greater emphasis to adaptation than previously under the UNFCCC. Just as parties will submit mitigation contributions in their Nationally Determined Contributions, the agreement requires all parties, "as appropriate," to plan and implement adaptation efforts and encourages all parties to report on their adaptation efforts and/or needs.

Enhanced Transparency Framework

Under enhanced transparency framework countries are requested to provide the following information in the biennial transparency report:

- A national inventory report of emissions by sources and removals by sinks of GHG using the guidance provided by the UNFCCC,

- Information necessary to track progress made in implementing and achieving the Nationally Determined Contributions,

- Information related to climate change impacts and adaptation,

- Information on financial, technology development and transfer and capacity building support needed and received, among other requirements (for developing countries).

These reports will show the progress made by countries in meeting their NDC targets and the countries level of commitments in climate change adaptation and mitigation. PNG is planning to submit its first Biennial Transparency Report (BTR) in 2024 to comply with the MPGs for the ETF (18/CMA. 1, para. 3), which requires parties to submit their first BTR no later than 31 December 2024. Additionally, PNG has submitted its enhanced NDC with an Implementation Plan in December 2020 and will be providing details of this enhanced NDC in the first BTR against which progress made will be tracked in order to comply with the MPGs for the ETF (18/CMA.1, para. 64).

Enhanced Transparency Framework MPGs

Modalities, Procedures, and Guidelines (MPGs) for the transparency framework for actions and support referred to in Article 13 of the Paris Agreement have been adopted on December 2018 during the Katowice Climate Change Conference (COP24). Key guiding principles of the MPGs include:

- Maintaining frequency and quality of reporting, and

- Improved reporting and transparency over time

The MPGs recognises different starting points of parties and give flexibility to those developing country Parties that need it in the light of their capacities. The Katowice outcome also recognizes that developing country Parties will continue to require support (both technical and financial) to implement activities under the ETF.

PNG's Progress on the Enhanced Transparency Framework – Assessment

Chapter 5

Continue efforts to prepare and submit national communications and biennial update reports (BUR), and participate in the international consultation and analysis (ICA) process of the measurement, reporting and verification under the Convention and the Kyoto Protocol will help countries to develop their national capacity for the ETF[17].

Since 2015, PNG has made significant progress in terms of its capacity in moving from the existing MRV arrangements to the enhanced transparency framework. The progress includes submission of the follow reports to the UNFCCC:

(i)   Second National Communication (2015) reports to the UNFCCC;

(ii)   PNG Initial NDC (2016);

(iii)   First Biennial Update Report (BUR1) with a REDD+ Technical Annex to UNFCCC followed by the Technical Analysis of the BUR1 (2019);

(iv)   PNG Enhanced NDC with the NDC Implementation Plan 2021-2030 (2020);

(v)   Revised Enhanced NDC 2020 Implementation Plan (2021-2030) and PNG NDC Implementation Roadmaps for AFOLU and Energy sectors (2021);

(vi)   PNG Second Biennial Update Report (BUR2) with a REDD+ Technical Annex to UNFCCC (2022); and

(vii) PNG National Inventory Report (NIR - 2022).

5.1 Institutional Arrangement of PNG's National GHG Inventory

Overall Institutional Arrangement
The overall coordination and reporting of the national GHG inventory falls under CCDA's mandate. PNG's institutional arrangement for GHG inventory development has improved significantly during the preparation of PNG's first and second BUR to the UNFCCC. This institutional arrangement was also utilised in the preparation of PNG's Enhanced NDC 2020, Enhanced NDC 2020 Implementation Plan (2021-2020), and the PNG NDC Implementation Roadmap for AFOLU sector.

Additionally, CCDA is the single body that has been assigned responsibility to implement the UNFCCC and the Paris Agreement in collaboration with line agencies. It is also responsible implementing methods and data documentation; developing QA/QC plans; developing and managing the Inventory Archive System; Conducting Key Category Analysis; and developing the National Inventory Improvement Plan.

CCDA has enhanced its institutional arrangement by establishing an AFOLU sub-Technical Working Committee (STWC) to be responsible for providing technical inputs for the preparation of the country's second Biennial Update Report (BUR2), the National Inventory Report, and future reporting under the transparency framework. The AFOLU STWC comprises of representatives from key government agencies, the private sector, NGOs, academia and development partners. This institutional arrangement will be further improved under the enhanced transparency framework to cater for climate change impacts and adaptation reporting.
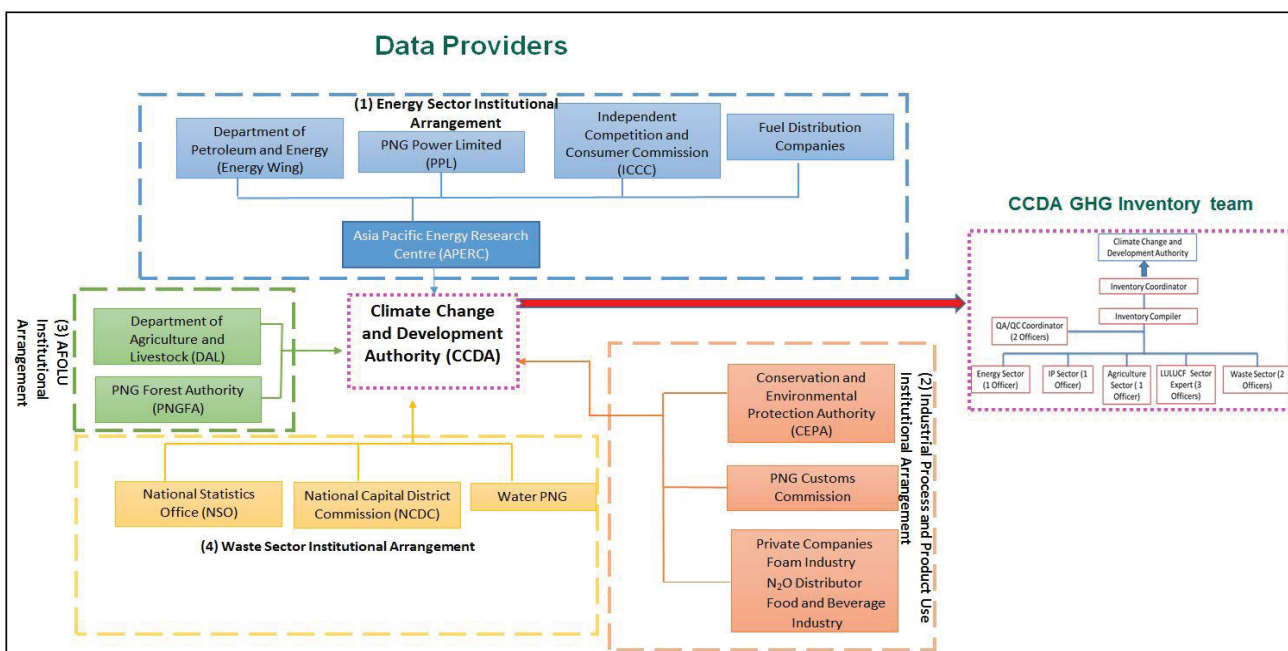
> ➤ PNG's current institutional arrangement for national GHG inventory

Institutional Arrangement for the AFOLU sector

The AFOLU GHGI preparation for PNG employs an institutional arrangement that involves key stakeholders as activity data providers for emission estimation that is coordinated and carried out by the CCDA, specifically under the MRV and National Communications Division. The AFOLU stakeholders are consist of the following organisations;

(i) PNG Forest Authority (PNGFA) – responsible for providing activity data on forest and land use change in PNG through the Collect Earth land use and land use change assessment. PNGFA also provides emissions factors for the different forest types in PNG through the National Forest Inventory (NFI) and the Permanent Sample Plots (PSPs).

(ii) Department of Agriculture and Livestock (DAL) – provides activity data on agriculture and livestock to CCDA through the four DAL regional offices in the country. DAL is also responsible for providing activity data on agricultural expansion in the country through the Special Agriculture Business Lease, which is currently under government moratorium.

(iii) National Statistical Office (NSO) – responsible for providing data on agriculture and livestock through the national agriculture census. Apart from GHG inventory data, NSO also provides auxiliary data on administrative boundaries, national roads, rivers and settlements in PNG.

(iv) Department of Lands and Physical Planning (DLPP)–provide supplementary land use information/data through the National Land Use Information System (currently under development by DLPP and its key stakeholders).

(v) The Private Agri-business Industries (i.e., New Britain Palm Oil Limited (NBPOL), TrukaiAgri- Industries Limited, Ramu Agri-Industries Limited (RAIL), Rumion Piggery & Cattle Farming; Niugini Table Birds, and a few other private agri-business industries) – are formally requested (by an official letter from the CCDA) to also provide agricultural activity data. At the moment DAL does not have control over the private agri-business industries, thus, the approach used for these private sector industries is different, especially in terms of its data collection for the AFOLU sector.

(vi) Extra-governmental partners (i.e. academia, research institutions, CSOs/ NGOs) -reporting of ETF-related data and information to CCDA regarding both mitigation and adaptation at the provincial, regional and national level via dedicated knowledge-management information systems and IT hardware that will be established by CCDA.

Potential data provider(s) for emission estimation are:

• Department of National Planning and Monitoring (DNPM) –provide activity data on AFOLU once they develop the central data repository system. The central repository will also contain data/information relating to climate change adaptation monitoring in the AFOLU sector.

The AFOLU STWC provides technical input on the development of the national GHG inventory to ensure that the entire process (data collection to reporting) is in compliance with the ETF MPGs. The AFOLU STWC is comprised of members of the above mentioned governmental agencies as well as academic/research institutions, private sector (as appropriate),and NGOs/ CSOs who represent small-holders or vulnerable groups.
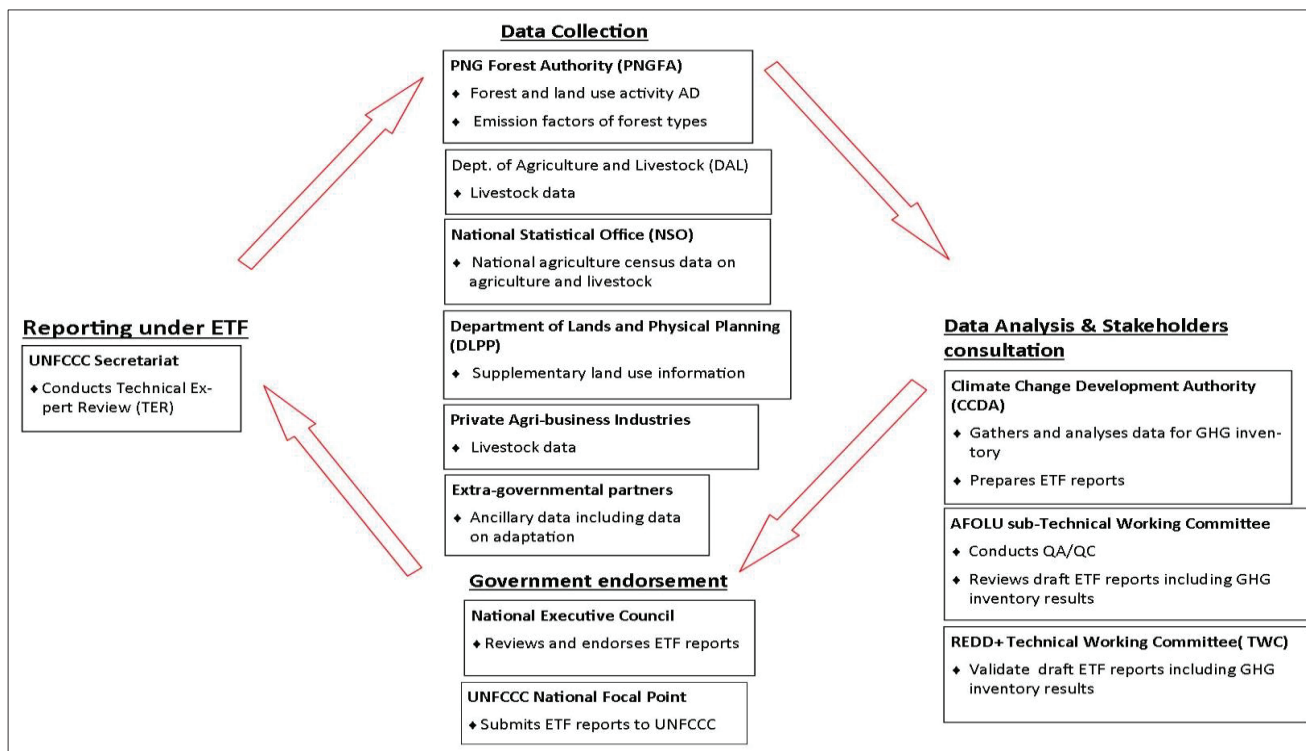
Figure 4: Data-collection and reporting process for the GHG inventory in AFOLU sector

Data Sharing Arrangements

Data collection for the GHGI exercise was carried out previously on an ad-hoc basis for the Initial National Communication Report in 2000 and also for the Second National Communication report in 2015. Using lessons learnt from past experiences with GHGI development and reporting, CCDA now has MoUs/MoAs in place as binding agreements between the key data providers in relation to data sharing and use. CCDA has utilised these MoUs/MoAs and collected activity data for emission estimation in PNG's BUR1 and BUR2 to

UNFCCC. However, there is still room for improvement to ensure data quality is enhanced and readily available for future GHG Inventories and reporting. To address the challenge, CCDA is planning to develop regulation for the different sectors basing on the Climate Change management Act 2015 (CCMA 2015), which will require the data providers to provide activity data for emission estimation on a regular basis and in accordance with established QA/QC protocols.

Current Inventory Management Team

Inventory planning and preparation is a process managed and undertaken by CCDA's MRV and NC Division in close consultation with its key stakeholders. The core inventory management team within CCDA is consisting of the National Inventory Coordinator (NIC); Sectors leads; Archive Manager; IT Officer; QA/QC Coordinator; and Uncertainty Analysis Coordinator. It is crucial for

CCDA to maintain the collaboration with all its key data providers and development partners for sustainability of the national GHG inventory. Table 1 outlines the roles and responsibilities of PNG's GHG inventory management team.

Table 1: PNG's Inventory Management Team

Role	Responsibilities	Name	Organization	Mail	Notes
National Inventory Coordinator (NIC)	- Management of data supply and agreements; - Technical reporting of GHGI data Formal submission of reports	Mr. Alfred Rungol	General Manager-MRV and NC Division, CCDA	kaferinrin@gmail.com /infor@ccda.gov.pg	NIC appointed and was in charge of PNG's BUR1 preparation and submission. The NIC is also the BUR and NC Project Coordinator and PNG NDC Focal Point
Energy Sector Lead		Mr. Jason Paniu	Senior MRV Officer – CCDA	jpaniu@gmail.com	Institutional arrangement for Energy sector established as shown in Figure 3. The Energy sector lead is also the overall GHGi compiler and is responsible for compiling chapters of BUR and coordinating the QA/QC and Uncertainty Analysis in the Energy sector. Institutional Arrangement (IA) has been established with key energy data providers.
Energy (Mobile sources) Sector Lead		Same as above			
IPPU Sector Lead	- data gathering - data compilation - document management - quality control	Ms Jacinta Kull	NC Officer - CCDA	jacinta.kull@gmail.com	Institutional arrangement for IPPU sector established as shown in Figure 3. The Sector lead is responsible for coordinating with the AD providers for the IPPU sector in PNG base on the established IA.
Agriculture Sector Lead		Mr. Larsen Daboyan	Senior NC Officer- CCDA	larsendaboyan@gmail.com	Institutional arrangement for Agriculture sector established as shown in Figure 3. The Sector lead for Agriculture is responsible for coordinating with the AD providers for agriculture and livestock data in PNG base on the established IA.
LULUCF Lead		Mr. Morgan Kai	NC Officer	morgan7kai@gmail.com	Institutional arrangement for LULUCF sector established as shown in Figure 3. The sector lead also participates in the PNGFA Collect Earth (CE) Land use assessments which produce the AD for the LULUCF sector. There is good collaboration with the PNGFA on GHG inventory for the LULUCF sector.
Waste Sector Lead		Mr. Eric Sarut	Senior NC Officer - CCDA	esarut07@gmail.com	Institutional arrangement for Waste sector established as shown in Figure 3. The Sector lead is responsible for coordinating with the AD providers for Waste in PNG base on the established IA.

Role	Responsibilities	Name	Organization	Mail	Notes
Archive (Data and Document) Manager	- design of the archiving system (in collaboration with sector leaders) - assign permissions/access to the info - provide instructions to any new staff of the GHGI team	Mr. Jason Paniu	Senior MRV Officer – CCDA	jpaniu@gmail.com	PNG's archive system will be established before the end of 2021. The archive coordinator/manager is also responsible for compiling chapters of BUR and coordinating the QA/QC and Uncertainty Analysis in the Energy sector. The archive manager, his deputy and the NIC will have access to the final AD and Parameters for all the sector.
	- plan any improvement of the system coordinate with IT specialist				
IT archive specialist	- setting up the archiving system - instruct the GHGI to access the information coordinate with arch. system manager.	Mr. Victor Asipali	IT Officer - CCDA	victorasipali@gmail.com	The CCDA IT Officer works closely with the inventory team. The archive specialist also works as the CCDA systems administrator. He will maintain close communication with archive manager in the management of the AS.
Data Providers	deliver input data in appropriate format	(Refer to Figure 3)			Data providers for all sectors including AFOLU are shown in Figure 3.
QA/QC Coordinator	-assigns and update QA/QC parameters -works with the sector leads and compile QA/QC for all sectors	Mr. Jason Panie	Senior MRV Officer – CCDA	jpaniu@gmail.com	Works closely with the sector leads and BUR/BTR compiler. The QA/QC Coordinator is yet to be appointed. In PNG BUR1 preparation, each of the sector leads was responsible for conducting and documenting QA/QC.
Uncertainty Analysis Coordinator	Gathers and compile information on the uncertainty associated with several [key and non-key] category estimates	Mr. Jason Panie	Senior MRV Officer – CCDA	jpaniu@gmail.com	Works closely with the sector leads and BUR/BTR compiler. The uncertainty analysis coordinator is yet to be appointed. In PNG BUR1 preparation, each of the sector leads was responsible for conducting and documenting UA.

The capacity for CCDA officers/compilers has improved significantly through capacity building trainings and workshops conducted during the prepari ation and reporting of PNG's BUR1, BUR2 and the first NIR. However, specific capacity building would still be required for certain aspects of the GHGI processes as well as other important components such as QA/QC, M&R of adaptation measures, and other important areas to ensure there is compliance with the provisions under the transparency framework of the Paris Agreement.

5.2 National MRV system

PNG understands that the ETF is not something completely new as it enhances/builds on within the current MRV arrangement/transparency system under the UNFCCC. Some current practices are effective and should continue under the enhanced transparency framework of the Paris Agreement, while other practices could be improved or new ones developed. PNG's current MRV system provides good opportunity (and basis) for the country to prepare and implement the enhanced transparency framework under the Paris Agreement.

National REDD+ MRV System

Under the Cancun Agreement, NFMS should have two functions; "Monitoring" function to monitor REDD+ activities and "MRV" function to measure and report the performance of REDD+ activities to UNFCCC; which then undergoes verification. PNG established a robust domestic MRV system, which contains in-country verification using two different methods (point sampling and wall-to-wall mapping) with tools (Collect Earth and Terra-PNG) hosted by different government organizations; PNG Forest Authority (PNGFA) and Climate Change and Development Authority (CCDA).

As part of the monitoring function, PNG established and officially released PNG REDD+ and Forest Monitoring Web-Portal(http://png-nfms.org/portal/) in 2017 by the PNG Prime Minister to disseminate forest and land use information related to REDD+ to the public ensuring transparency of PNG REDD+ progress. This portal is recognized as an achievement by various government and private organizations in PNG to share the REDD+ related information in one single platform for the first time in PNG. Anybody and organizations can utilize this portal to promote the achievements related to REDD+ in PNG.
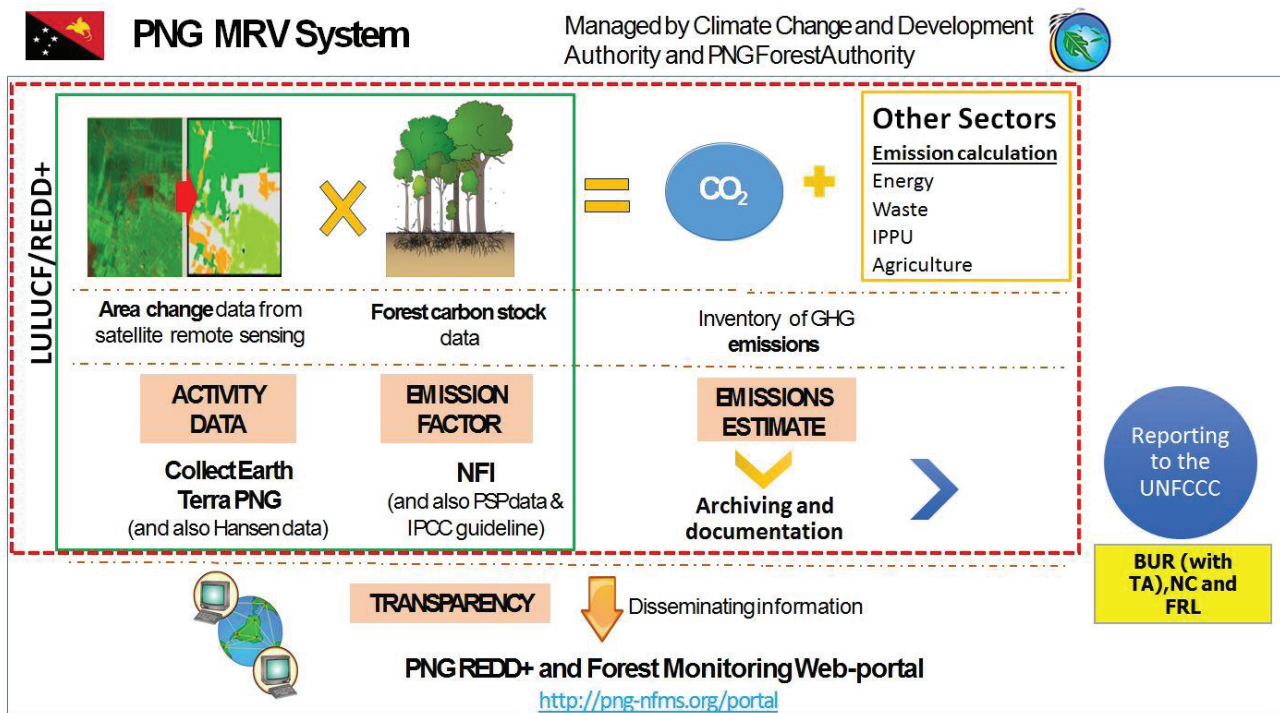
Figure 5: PNG's REDD+ MRV arrangement under the Convention

5.3 Forest Reference Level (technically assessed)

PNG completed and submitted its Forest Reference Level (FRL) to the UNFCCC in 2017. UNFCCC technical assessment process has been completed and the modified FRL was submitted and published on UNFCCC website[18]. The national FRL by Papua New Guinea for the historical reference period 2001–2013 is the values of the carbon dioxide (CO_2) emissions for 2014–2018 projected using an equation based on a linear regression model. The FRL includes the emissions associated with deforestation, defined as the conversion of forest land to non-forest land; forest degradation, defined as the conversion from primary forest to disturbed forest; and forest carbon stock enhancement, defined as the conversion of non-forest land to forest land.

The development of PNG's FRL has been led by the PNGFA with close collaboration from CCDA. The activity data used in the development of PNG's FRL come from PNGFA's Collect Earth land use/change assessment conducted in 2016 while the emission factors have been derived from national literature sources, and the default values provided in the IPCC Guidelines (2006). PNG will update most emission factors when data from the National Forest Inventory (NFI) becomes available.

[18]https://redd.unfccc.int/submissions.html?country=png

Table 2: Main features of PNG technically assessed FRL (Source: PNG FRL 2017)

Main FRL features		Remarks
FREL/FRL (tCO$_2$eq/yr)	• 43.3 million for 2014 • 45.0 million for 2015 • 46.7 million for 2016 • 48.4 million for 2017 • 50.0 million for 2018	This projection was based on the linear regression model: Annual emission (tCO2e) = 1,679,607 x Year -3,339,358,085
Type and duration of FREL/FRL	• FRL based on the historic emissions for 2001-2013	
Scale	• National	Agreement on National scale reached
Activities included	• Deforestation	
	• Forest degradation • Enhancement of forest carbon stocks	
Pools included	• Below and above ground biomass	Not included: dead wood litter, soil organic and HWP pools due to lack of reliable data

5.4 Biennial Update Report (technically assessed)

PNG successfully completed the first cycle of its greenhouse gas inventory (for all the IPCC sectors including AFOLU) basing on the 2006 IPCC Guidelines. The results were reported in the First Biennial Update Report (BUR1)[19], which was submitted to UNFCCC on 18 April 2019. The BUR1 contains information on mitigation actions, needs and support received. PNG also reported its REDD+ results in 2014 and 2015 in the technical annex (REDD+ Technical

Annex) to the BUR1. Both the BUR1 and the REDD+ Technical Annex underwent the Technical Analysis process and the reports[20] of the technical analysis were published on the UNFCCC website.

As of May 2020, only 12 countries out of a total of 78 least developed countries (LDCs) and/or small island developing states (SIDS) have submitted at least one

BUR, and PNG is one of them. PNG was the 9th country globally to submit the REDD+ technical Annex (REDD+ results against the forest reference level).

Additional information and higher standard are required under the ETF comparing to the current MRV under the UNFCCC.

PNG through CCDA has submitted PNG's second BUR to the UNFCCC and is preparing for the UNFCCC technical assessment process.

PNG's BURs are mostly in alignment with the updated requirements under ETF on National GHGi report, as described in Table 3. PNG is planning to commence

preparation of the Biennial Transparency Report (BTR1) in 2022 for submission before the end of 2024 in accordance with the deadline set by the ETF MPGs.

Table 3: Different requirements between BUR and BTR, and how PNG is addressing the BTR requirements

BUR requirement	BTR (ETF) requirement	PNG BUR
1996 IPPC Guidelines.	2006 IPCC Guidelines.	PNG applied 2006 guidelines for BUR1.
Encouraged to provide consistent time series back to the year of the previous NC.	Consistent annual time series starting from 1990. Flexibility given to the developing countries starting 2020 onward.	PNG reported consistent annual time series starting 2000 in BUR1.
Report the inventory for the calendar year no more than four years prior to the date of the submission.	The latest reporting year shall be no more than two years prior to the submission. Flexibility is given to the developing countries for three years prior to the submission.	PNG reported up to 2015 in BUR1 submitted in 2019. PNG will be reporting up to 2019 in BUR2 to be submitted in 2021, which meets the EFT requirement.

[19]PNG BUR1, 2019: https://unfccc.int/documents/209907 | [20]https://redd.unfccc.int/submissions.html?country=png

5.4.1 PNG BUR1 Technical Annex

Countries can report their REDD+ results as an annex of BUR for seeking the results based payment. PNG's REDD+ results[21] was submitted to UNFCCC as an annex to the First Biennial Update Report (BUR1) in April 2019. In line with UNFCCC decisions, these results were measured against the technically assessed FRL, which is a linear regression of historical emissions from deforestation and forest degradation (see Figure 6). The total REDD+ results achieved by PNG in 2014 and 2015 against the technically assessed FRL was 9,003,314 tCO2.

Historical Emissions & Removals 2001-2013 and FRL 2014-2018 and REDD+ Results 2014-2015

$R^2 = 0.8475$

Reduction of emissions from deforestation and forest degradation = 9,003,314 tCO2 equivalent

● Historical emission (2001 – 2013)   ——— FRL
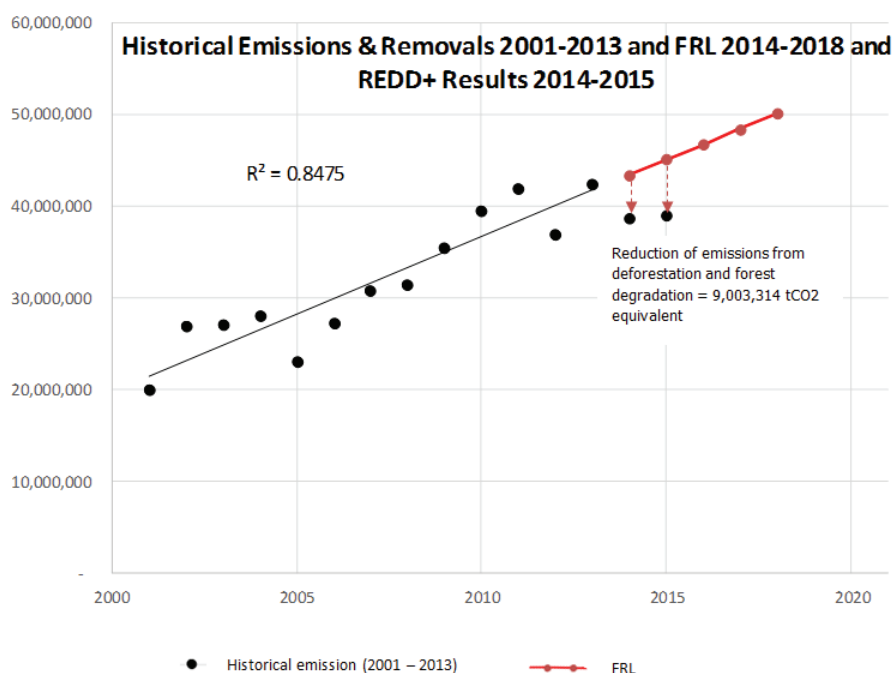
Figure 6: REDD+ Results achieved by PNG from 2014 to 2015 assessed against PNG's technically assessed FRL

5.5 National Communications

PNG submitted its First National Communication under the UNFCCC (NC1) on 27 February 2002 and its Second National Communication report (NC2) on 15 December 2015. The NC1 and NC2 are a summary of important climate change related information in PNG. In fulfilling its commitment to the UNFCCC, it is an important tool in formulating strategies to address climate change issues at an international, regional and national level.

5.6 Nationally Determined Contributions

On 29 March 2016, PNG became the first country to submit NDC under the Paris Agreement. PNG signed the Paris Agreement at the earliest opportunity, 22 April 2016, and ratified the agreement 21 September 2016. The agreement as it pertains to developing countries was afforded force of law in PNG by the United Nations Paris Agreement (Implementation) Act of 2016, which is further supported by the Climate Change (Management) Act of 2015. PNG had submitted its Enhanced NDC for the 2021-2030 reporting period in December

2020 together with the NDC Implementation Plan PNG through CCDA had submitted revised NDC Implementation Plan (2021-2030) and the NDC Implementation Roadmap for the AFOLU and Energy sectors in December 2021. CCDA is also drafting a NDC regulation titled "Climate Change (Management) (Nationally Determined Contribution) Regulation 2021" and is planning to finalise it before the end of 2021.

5.6.1 AFOLU/LULUCF targets

In the PNG's Enhanced NDC[22] 2020, the country aims to reduce 10,000 Gg CO2 eq of the net emission from the LULUCF subsector by 2030 by 25% reduction of annual deforestation; 25% reduction of annual forest degradation; and increase of forest plantation and enhancement of ecosystem restoration. Efforts to achieve these targets are guided and supported by existing national policies and strategies, such as the Vision 2050 Plan, National Strategy for Responsible Sustainable Development for PNG, the National REDD+ Strategy, PNG Climate Change Management Act, and National Climate Compatible Development Management Policy.
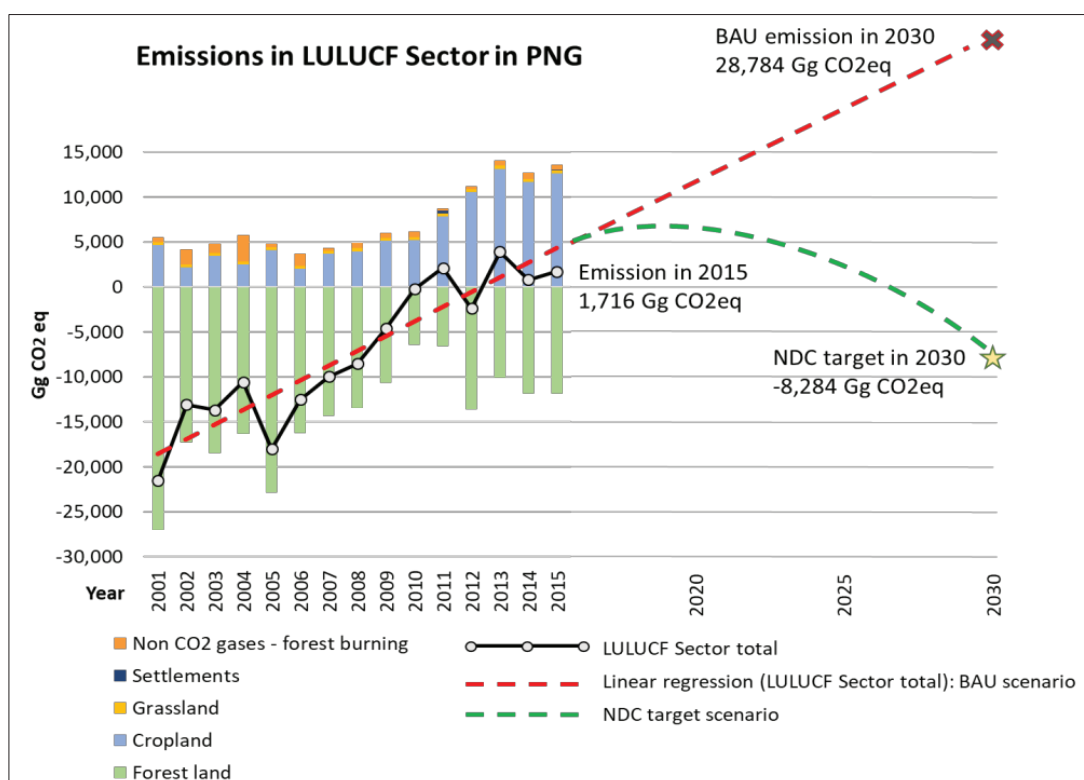
Figure 7: LULUCF target in PNG's Enhanced NDC 2020

5.6.2 Adaptation Targets

PNG aims to broaden and sustain the scope of its NDC to include adaptation in the current and subsequent NDCs. PNG recognizes that the more comprehensively the NDCs are defined, the better the priorities can be integrated into development partner operations and support programs.

The approach for defining PNG's adaptation targets was undertaken by conducting a series of surveys and workshops which included sub-national and sector vulnerability and adaptation assessments, data collection, and multi-criteria analysis. The adaptation targets are measured against beneficiaries for the agriculture and health sectors, and the value and number of assets for the transport and infrastructure sector.

The adaptation targets for the four NAP development sector are provided in Table 4.

Table 4: Adaptation targets in PNG's Enhanced NDC 2020

Priority Development Sector per the NAP	Adaptation Target 2030
Agriculture	10% of the total population (0.8 million beneficiaries (25% are women)) have increased resilience with respect to food and water security, health and well-being in PNG.
Health	100% of the population benefits from improved health measures to respond to malaria and other climate-sensitive diseases in PNG.
Transport	US$1.2b (PGK 4.2b) value of transport (air, sea, and land) infrastructure and assets built/rehabilitated according to climate-resilient codes and standards.
Infrastructure	6 million people (70% of the population) benefit from improved early warning systems/information to respond to extreme climate events. US$172m (PGK 608m) value of building and utility infrastructure assets built/rehabilitated according to climate-resilient codes and standards.

5.7 GHG Inventory Data Archiving system

PNG generally does not have a proper system in place to monitor data collection, validation and management. As such, the CCDA GHGI team have gone through challenges with collecting activity data for the inventory work in PNG's BUR1 and BUR2. Hence, CCDA through support from GEF CBIT PNG project and the GCF Readiness Project (FAO being the GEF and GCF implementing agency), has

been developing its GHGI archiving system for UNFCCC reporting in collaboration with the government stakeholders. The system will allow data collection of all significant sources of GHG emissions in PNG. The need for archiving and documenting the inventory data is important for future use and for ensuring transparency. The archiving system is planned to be operational by 2022.
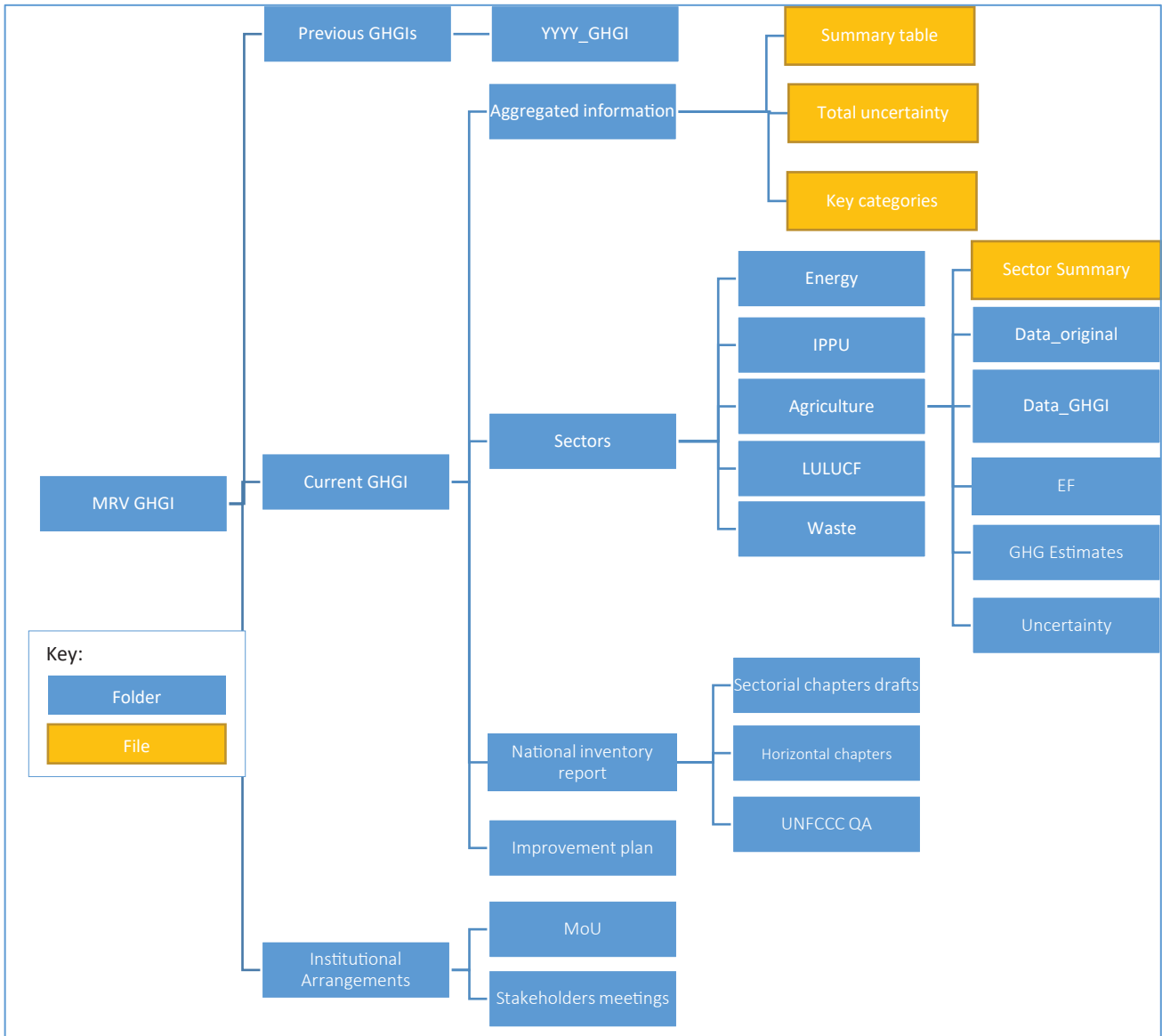
Figure 8: PNG GHGI archiving system structure

5.8 Monitoring and reporting adaptation in the agriculture sector

PNG is developing a framework to track adaptation progress in the agricultural sectors at the provincial level base on the FAO publication ` Tacking adaptation in agricultural sectors'. The main categories and sub-categories of indicators for use to track adaptation in agriculture are shown in Table 5.

Table 5: Framework for adaptation resilience analysis in the agriculture sector

#	Category	Subcategory	Indicator	Unit	Source
1	Natural Resources and Ecosystems	1 - Availability of, and access to, quality water resources for agriculture	Annual average precipitation/Potential	Ration	GoPNG/NWS
		2 - Availability of and access to quality agricultural land and forests	Percentage of land that is degraded over total land area	%	GoPNG/PNGFA
			Proportion of agricultural population that owns arable land	%	GoPNG/DAL/FAO
			Existence of functioning mechanisms at the provincial level to ensure access to agricultural land, forests and fishery resources	Qualitative	Survey
		3 - Status of ecosystems and their functioning	Forest area as a proportion of total land area	%	PNGFA
		4 - Status of diversity of genetic resources in agriculture	Share of the top five dominant crop varieties in total crop production	%	Survey
2	Agricultural Production Systems	1 - Agricultural production and productivity	Proportion of agricultural land under irrigation	% of total agricultural land	GoPNG/DAL
			Total land under agricultural production	Ha	Survey
			Agriculture output	US$	Survey
		2 - Sustainable management of agricultural production systems	Proportion of agricultural area under productive and sustainable agriculture	% of agricultural area	GoPNG/DAL
			Fertilizer nutrient use efficiency on arable and permanent crops Add, if available: ➢ Fertilizer use (kg/ha) ➢ Pesticide/herbicide use (kg/ha) ➢ Percentage of land under organic/climate-smart agriculture	Kg/kg/ha	GoPNG/DAL
		3 - Impact of extreme weather and climate events on agricultural production and	Average amount of natural hazards by province	Annual number	Survey/Provincial Administration
			Annual crop losses	US$ equivalent or % Agriculture output	Survey/Provincial Administration
			Annual livestock losses	US$ equivalent	Survey/Provincial

#	Category	Subcategory	Indicator	Unit	Source
		livelihoods		or % Agriculture output	Administration
			Annual damage to agricultural assets and infrastructure	US$ equivalent or % Agriculture output	Survey/Provincial Administration
		4 - Projected impact of climate change on crops, livestock, fisheries, aquaculture and forestry	Projected water availability in 2050	% change from the baseline	Specific studies/Publications
			Projected livestock production in 2050	% change from the baseline	Specific studies/Publications
			Projected forest primary productivity in 2050	% change from the baseline	Specific studies/Publications
3	Socio-Economics	1 - Food security and nutrition (vulnerability)	Proportion of population in the province experiencing malnutrition	%	Provincial administration, DNPM
		2 - Access to basic services	Rural access to electricity	% of population	Provincial administration, DNPM
			Rural access to improved water source (drinking water)	% of population	Provincial administration, DNPM
			Literacy Rate	%	Provincial administration, DNPM
		3 - Access to credit, insurance and social protection in rural areas	Percent of agricultural population covered by climate risk insurance mechanisms	%	Survey, Provincial administration, DAL, DNPM
		4 - Agricultural value addition, income and livelihood diversification	Percentage of rural labour force employed in agriculture	%	Survey, Provincial administration, DAL, DNPM
4	Institutions	1 - Institutional and technical support services	Percent rural population having access to early warning systems	%	Survey, Provincial administration
		2 - Institutional capacity and stakeholder awareness	Level of coordination on climate change adaptation in agriculture at provincial level	% of agricultural population	Survey, Provincial administration
		3 - Mainstreaming of climate change adaptation priorities in agricultural policies, and vice versa	Level of use of climate change impacts and scenarios in agricultural sectors for adaptation planning	%	Survey, Provincial administration
		4 - Financing for adaptation and risk management	Proportion of Agricultural sector budget allocated for climate change adaptation	% of total budget	Survey, Provincial administration

5.9 Funding Sources of AFOLU MRV

There are instances were CCDA submit requests for counter funding support through the Public Investment Programs (PIPs) within the Department of National Planning and Monitoring (DNPM) through submissions on climate change mitigation or adaptation, for instance like the REDD+ initiatives. This counter funding is usually subject to the National government budget and priorities in the context of development in the country. Thus, domestically, the funding support need is well communicated through relevant government bodies for consideration and for purposes of securing counter funding support. However, CCDA's proposals are not always approved because it depends on the National budget of the government and its priorities at the time.

Internationally, CCDA does its reporting to the UNFCCC and highlights the funding and capacity needs through the BURs, NCs report, and the NDCs. The PNG's Enhanced NDC which was submitted to UNFCCC in December 2020 has a standalone implementation plan (PNG NDC Implementation Plan 2021-2030). The NDC implementation plan contains a detail list of mitigation actions/activities for the AFOLU sector with respective budget, funding sources and the lead implementing agencies. In addition, special technical needs are also highlighted through these reports and support is received accordingly. Generally, CCDA receives funding support only when support is provided internationally from GEF, GCF and others facilitated through development partners like FAO, UNDP, UNEP, JICA, etc.

5.9.1 Current External Support for meeting ETF

PNG through the CCDA as the NDA to the Green Climate Fund (GCF) had developed its GCF Readiness Proposal titled "Readiness for registry and nesting system to facilitate climate-related investments in AFOLU sector in Papua New Guinea" and has been approved. This readiness project on the AFOLU registry and nesting system will be built on the outcomes of previous donor projects, fill the gap, and generate synergies to accelerate PNG's response to climate change issues relating to AFOLU and REDD+. Furthermore, this GCF readiness project establishes systems for robust GHG accounting, benefit sharing and nesting of projects and investments at different administrative and operational levels .The CCDA values the GCF as a potential source of funding and support for the improvement of PNG's reporting and compliance with the ETF requirements. There is support also received from the FAO, EU, GEF, UNDP/FCPF, UNEP, GGGI and JICA in terms of GHGI development and reporting in the BUR1 and BUR2. Capacity development is an important component of the support received from the mentioned development partners. However, CCDA plans to develop more proposals for funding support to achieve climate change provisions under the Paris Agreement (i.e. ETF). CCDA wishes to secure project support for the development of all the mitigation and adaptation initiatives to combat climate change and these are the avenues through which the country can adequately curb emissions and foster climate compatible development in PNG.
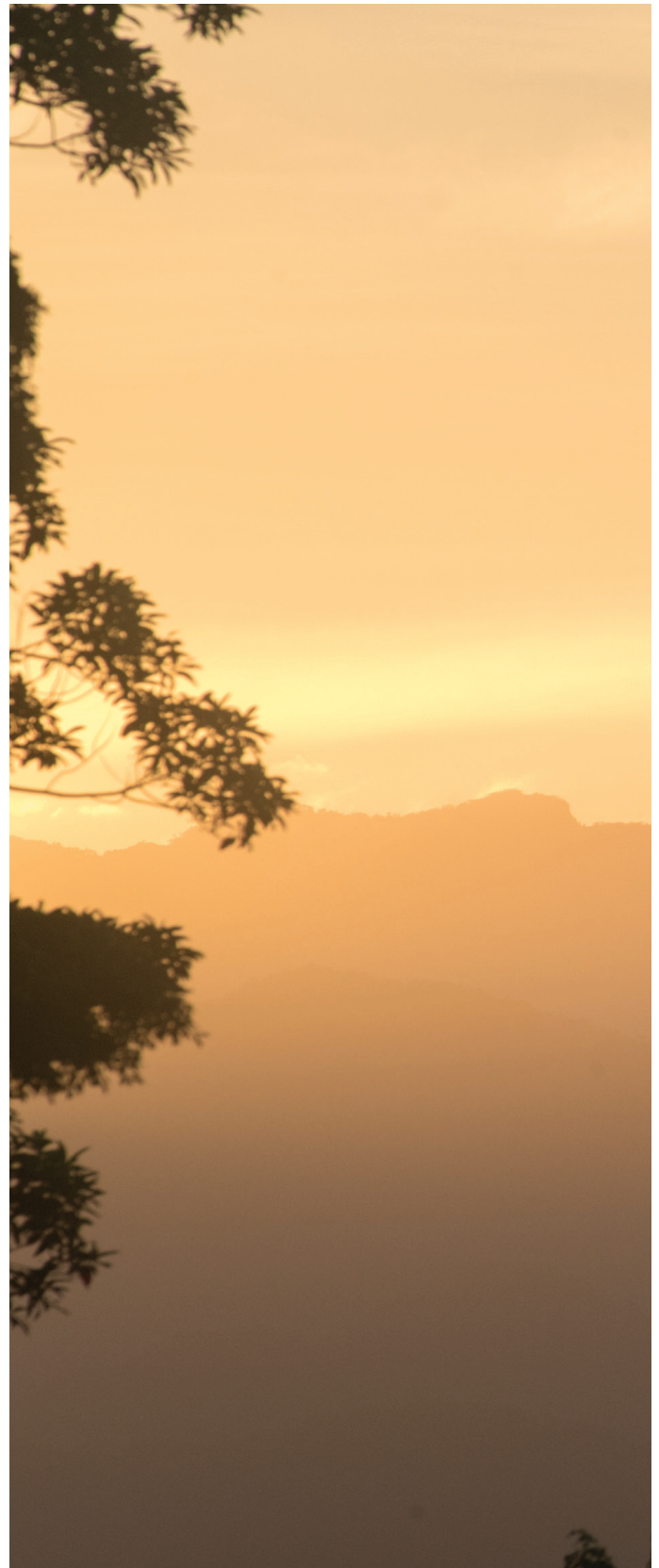
AFOLU MRV Capacity Assessment

Chapter 6

The capacity assessment was done to identify and address the critical gaps relating to sustainability of PNG's AFOLU MRV system (including Adaptation M&R) and the National Greenhouse Gas Inventory Management System in order to meet the objectives of the Enhanced Transparency Framework of the Paris Agreement.

For each of the sub-sectors under AFOLU, this section presents the activities and the available technical and financial resources as well as the current data gaps and needed human capacities and hardware capabilities to implement regular and sustainable MRV system for PNG.

The chapter also presents the required needs for improving and strengthening the existing institutional arrangements to facilitate continuity in meeting the current and future reporting requirements under the UNFCCC MRV Framework and the Enhanced Transparency Framework of the Paris Agreement.

6.1 Information Sources of the Assessment

The capacity needs of the AFOLU MRV system, the GHG inventory management system, and Adaptation M&R for the AFOLU sector were derived from various consultative meetings with the relevant stakeholders and data providers at national and sub-national levels; and qualitative assessment from a Consolidated QA Template provided by UNFCCC after the PNG "Regional Workshop on the Building of Sustainable National Greenhouse Gas Inventory Management Systems, and the Use of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories" in March 2019. Other important sources are; the outcome of PNG BUR1 ICA process; the UNFCCC Technical Analysis of the PNG's BUR1 Technical Annex; PNG's Enhanced NDC 2020;PNG NDC Implementation Plan (2021-2030); National Adaptation Plan (NAP) proposal, and Preparations of PNG BUR2 and the first NIR.

6.2 Current Situation

Cross-cutting
PNG's AFOLU MRV system employs an institutional arrangement that involves key stakeholders as activity data providers for emission estimation that is coordinated and carried out by the CCDA specifically under the MRV and National Communications Division. Data for BUR1 and BUR2 reporting was provided based on MoUs/MoAs and Official Data Request Letters in place between CCDA and the data providers/stakeholders.

CCDA has institutionalized the GHGI function within the MRV and National Communications Division and allocated the reporting tasks to designated officers. Using lessons learnt from past experiences in inventory preparation and reporting, including the PNG

Enhanced NDC 2020 (2nd NDC) preparation, CCDA is developing an NDC regulation based on the Climate Change (Management) Act 2015 to further strengthen the existing MoUs/MoAs with key data providers for effective data sharing and use.

Although there has been significant progress on monitoring and reporting on climate change mitigation and adaptation, there are still important gaps in the AFOLU sector, with respect to sustainability of AFOLU MRV system and the National Greenhouse Gas Inventory Management system. At the moment, it is very challenging for PNG to prepare and report its inventories without external/international assistance due to insufficient government funding for (i) activity data assessment/collection; and (ii) technical capacity development within CCDA. Other challenges of PNG AFOLU MRV are; lack of good collaboration between CCDA and the data providers; awareness on AFOLU MRV in the country; lack of capacity on AFOLU related adaptation monitoring and reporting; limited understanding of uncertainty assessment; and limited capacity in tracking progress of mitigation/adaptation actions.

LULUCF
PNG has established a robust MRV system for REDD+ which contains in-country verification using two different methods (point sampling and wall-to-wall mapping) with tools (Collect Earth and TerraPNG) hosted by different government organizations; PNG Forest Authority and Climate Change and Development Authority Activity data for greenhouse gas inventory and reporting are generated annually or biennially by the REDD+ MRV system. The national greenhouse gas inventory for the LULUCF sector was based on the methodologies and tools in the IPCC 2006 guidelines. Emission factors used in the National Green House Gas Inventory were taken from both the published country specific data and the IPCC 2006 Guideline.

There is a written agreement in place between CCDA and PNGFA in relation to data sharing and use for the GHG Inventory and REDD+ results reporting. However, there is still room for improvement to ensure data quality is enhanced and readily available for future GHG Inventories and reporting.

CCDA has its data and information managed and stored in the SLMS Laboratory within the CCDA's MRV and National Communications Division. As such, there is a need to develop a system of collecting reliable activity data and developing a data base to have the data and information managed and stored using this system to improve and update it from time to time. This information can be made available for policy and decisions makers for planning and development. This also applies to the Agriculture sector.

Agriculture

From the experiences and lessons learnt from the GHG Inventory reported in the Initial National Communication, Second National Communication, First Biennial Update Report, Second Biennial Update Report, and the First National Inventory Report, there is more room for improvement identified as mentioned in those reports to the UNFCCC. Therefore, situation at present permits more support due to existing challenges and gaps in terms of; non-readily available agriculture data and lack of proper management of agriculture data for climate change reporting in the country. Agriculture data in PNG's BUR1 and BUR2 was collected from the DAL regional offices in PNG as well as from the major agriculture business Industry in PNG.

The agriculture sector requires vital human capacity development and provisions for upskilling of inventory compilers and the data providers' representatives from the key stakeholders for the Agriculture sector. UNFCCC IPCC GHG Inventory requirements, procedures and processes needed to be conveyed to the key stakeholders and data providers with emphasis on the importance of the data sharing to help PNG meeting its international reporting obligations under the UNFCCC.

Furthermore, the four (4) DAL regional offices in PNG requires upskilling and resourcing with appropriate tools and equipment to create an enabling environment for them with CCDA Agriculture sector lead for improve coordination and facilitating sharing and smooth flow of data on timely basis. Moreover, to improve on the data sharing/accessibility from the private agriculture business industries with CCDA, there needs to be more data sharing protocols and framework established such as developing MoUs/ MoAs and regulations to ensure all the major agri-business industries including other potential private sector companies provide the required data to CCDA on a timely manner for inventory compilation and reporting.

6.3 Areas of Improvement

As the country is making progress on ETF implementation, it is important that PNG's capacity is enhanced to prepare the national GHGI and respond to its obligations under the UNFCCC addressing the ETF requirements. To achieve this, PNG needs to priorities its resources to address the immediate capacity gaps that will enable the creation of sustainable AFOLU MRV and national greenhouse gas inventory management systems (NGHGIMS). The areas of improvement listed below cover the important capacity needs basing on the different aspects of PNG's NGHGIMS and the AFOLU MRV system.

1: LULUCF

The following are the immediate and specific actions/activities needed to build a sustainable NGHGIMS and improve MRV in the LULUCF sub-sector.

(i) Inventory Arrangement

- CCDA who is the single entity that has main responsibility for the inventory preparation should establish formal arrangement with PNGFA and other relevant national authorities and private sector for the LULUCF data to be provided for required reporting period.

- Inventory compilers, data providers and other key LULUCF stakeholders to gather regularly to share issues that affect inventory compilation and reporting.

- The inventory coordinator to establish common formats and rules for the inventory compilation to be followed by all compilers.

- Data providers to get involve in capacity building programmes organized by CCDA.

- The data providers get involved in the validation of the data and the enhancement of the data.

- CCDA to develop an inventory preparation schedule that is agreed by all LULUCF stakeholders.

- CCDA to develop the regulations within the CCMA 2015 consultation with stakeholders to regularly provide information. MoUs with relevant agencies should be put in place in the absence of regulation.

(ii) Quality Assurance and Quality Control (QA/QC)

- CCDA to 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; and (5) Define roles and responsibilities. The QA/QC plan must be continuously updated in future inventory editions.

- LULUCF inventory compiler must understand the QA/QC process used in acquiring the data.
- LULUCF inventory compiler to report and archive all documentation on QA currently done by FAO.

(iii) Key Category Analysis

- The LULUCF inventory compiler to 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; and

(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).

- The results of the KCA shall be used for prioritising efforts in the improvement plan.
- KCA to be performed following the aggregation level suggested by IPCC.
- The qualitative approach should be used for identifying certain KC, if necessary.

(iv) Uncertainty Analysis

- 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 Good Practice Guidelines; and

(2) Estimating the combined uncertainty using the equations provided by IPCC.

(v) National Inventory Improvement Plan

- The way in which CCDA makes the improvement plan should be improved by:

(1) Identifying the improvement areas of the inventory. The possible areas of improvement will cover all the inventory aspects: institutional arrangements, data collection, 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; and

(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.

(vi) Archiving/Data backup System

- CCDA should 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 a designate a responsible for the archiving.

(vii) Methods and Data Documentation

• An expert judgement protocol should be designed by CCDA to document the expert judgments used for the inventory compilation.

• 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

(viii) Improving awareness on AFOLU and REDD+ monitoring

• To enhance transparency of the AFOLU/REDD+ MRV monitoring and the inventory results, CCDA should increase its capacity in information dissemination for public use.

(ix) Others

• The other areas of improvement for the LULUCF sector include:

(1) Improve country specific emission factor by completing NFI and other inventories;

(2) Updating the National Forest Monitoring System and Forest Reference Level;

(3) Improving the LULUCF GHG inventory and reporting in accordance with the enhanced transparency framework guidelines.

Tables 6 and 7 outline the existing data and skills and the needed data and training needs in the LULUCF sector to contribute to the overall improvement of the PNG AFOLU MRV system.

Table 6: Existing and needed data for LULUCF sector

Reports	Existing data	Needed data/data gaps[23]
◆ PNG First Biennial Transparency Report (BTR1) ◆ REDD+ Technical Annex/REDD+ results ◆ Second National Inventory Report (NIR)	*REFER TO AFOLU GHGI GAP ASSESSMENT TABLE AT ANNEX 3*	*REFER TO AFOLU GHGI GAP ASSESSMENT TABLE AT ANNEX 3*

[23]Existing data gaps within PNG BUR2 GHG inventory to be addressed in the BTR

Table 7: Existing and needed skills/trainings for LULUCF sector

Activities	Existing skills	Needed trainings
Activity data assessment	GIS mapping/sampling	◆ Training for latest tools/technologies ◆ Uncertainty assessment
Emission factor assessment	Forest inventory	◆ Data analysis, carbon stock measurement ◆ Uncertainty assessment
GHG inventory compilation	Excel spreadsheet calculation, IPCC Guidelines knowledge	◆ Knowledge on various IPCC equations applicable in the calculation of C stock changes in the living biomass and DOM. ◆ Use of IPCC software for automatic calculations/emissions estimation

2: Agriculture

The following are the immediate and specific actions needed to build a sustainable NGHGIMS and improve MRV in the Agriculture sub-sector.

(i) Inventory Arrangement

• CCDA who is the single entity that has main responsibility for the inventory preparation should formalised arrangement with DAL and all agriculture business companies for a routinely (annual) delivery of data.

• Inventory compilers, data providers and other key Agriculture stakeholders to gather regularly to share issues that affect inventory compilation and reporting.

• The inventory coordinator to 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.

• CCDA to develop an inventory preparation schedule that is agreed by all Agriculture stakeholders and data providers.

• CCDA to develop the regulations within CCMA 2015 in consultation with stakeholders to regularly provide information. A MoU with relevant agencies should be put in place in the absence of regulation.

(ii) Quality Assurance and Quality Control (QA/QC)

• CCDA to 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; and
(5) Define roles and responsibilities. The QA/QC plan must be continuously updated in future inventory editions.

• Comparing FAOSTAT livestock and synthetic Fertilizer data with national statistics should be done as well as reconciling FAOSTAT data with national statistics.

- Agriculture inventory compiler must replace across time international datasets with country data and to use the first just as comparison tool.

(iii) Key Category Analysis

- The results of the KCA shall be used for prioritising efforts in the improvement plan.
- KCA to be performed following the aggregation level suggested by IPCC.
- The qualitative approach should be used for identifying certain KC, if necessary.

(iv) Uncertainty Analysis

- 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; and

(2) Estimating the combined uncertainty using the equations provided by IPCC.

(v) National Inventory Improvement Plan

- The way in which CCDA makes the improvement plan should be improved 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; and

(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.

(vi)   Archiving System

- CCDA should 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 a designate a responsible for the archiving.

(vii)   Methods and Data Documentation

- An expert judgement protocol should be designed by CCDA to document the expert judgments used for the inventory compilation.

- 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.

- Describing all the process of data collection (what data, how, when) and elaboration, as well as of any quality assessment.

(viii)   Monitoring and reporting on adaptation in the agriculture sector

- There is lack of country data on adaptation in the agriculture sector in PNG
- Current VNA survey template used by CCDA in the NC2 does not include all the relevant categories and (country-specific) indicators for assessing adaptation in the agriculture sector.

(ix) Other areas of improvement in the Agriculture

- The other areas of improvement for the Agriculture sector include:

(1) Standardising formats and rules for the inventory compilation;

(2) Keeping basic livestock population characterisation until strong in-house capacity is built on data collection and data management.

(3) Updating information on Manure Management System regularly, e.g. every 5 years;

(4) Monitoring the change in rice production techniques across time; as an increase in lowland cultivation is a likely expectation.

(5) Using national statistics from PNG Customs on synthetic fertilizers instead of FAOSTAT to estimate Nitrous Oxide (N2O) emissions and updating the calculation to 2006 IPCC GLs methods.

(6) Developing country- specific data for crop residue burning, especially for the more relevant crops (rice, sugar cane, palm oil, corn);

(7) Checking availability of national data on urea and lime imports and use those data to replace FAOSTAT;

(8) Implementation of the 50x2030 Initiative to Close the Agriculture Data Gap

The GoPNG through CCDA will be imposing a new synthetic fertilizer levy as part of the measures to enhance mitigation action in the Agriculture sector. Basing on the GHG Inventory reported in the BUR1 and from the KCA of the Agriculture Sector, significant amount of Non-CO2 Emissions resulted from the use or application of synthetic fertilizers particularly from the booming Palm Oil development in the country. The collected levies will be invested into research and development to promote Organic fertilizers and support climate smart agriculture development and food security in PNG. These initiatives will be coordinated by CCDA in partnership with the National Agriculture Research Institute (NARI) and the DAL with key international development partners like FAO, UNDP, etc.

Tables 8 and 9 outline the existing data and skills and the needed data and training needs in the Agriculture sub-sector to contribute to the overall improvement of the PNG AFOLU MRV system.

Table 8: Existing and needed data for Agriculture sector

Activities	Existing data	Needed data/data gaps
◆ PNG First Biennial Transparency Report ◆ Second National Inventory Report	*REFER TO AFOLU GHGI GAP ASSESSMENT TABLE AT ANNEX 3 (See Agriculture/Livestock section)*	*REFER TO AFOLU GHGI GAP ASSESSMENT TABLE AT ANNEX 3*

Table 9: Existing and needed skills/trainings for Agriculture sector

Activities	Existing skills	Needed trainings
◆ Agriculture activity data collection and compilation for the BTR1 and 2nd NIR. ◆ Conducting QA and QC for the activity data and Inventory results ◆ Key Category analysis and prioritize managed soil(organic and synthetic fertilizer) and livestock to be more county specific thus move to Tier 2 level for these categories to comply with the ETF requirements of the UNFCCC	◆ Designing questioners based on IPCC GL 2006 Vol. 4 targeting different data providers, archiving and compiling of the collected data. ◆ Understanding and sound knowledge on emission calculations for estimating GHGs for the Agriculture Sector ◆ Fair knowledge on the use of recommended UNFCCC IPCC GL 2006 and the processes involved	◆ Further guidance on the use of the UNFCCC Software for emission estimation for the AFOLU Sector ◆ QA/QC processes for the AFOLU sector in general ◆ Any other recommended software that may be available for estimating GHGI for the AFOLU sector in the future.

For the missing data in the Agriculture sub-sector, CCDA uses other international sources like the FAOSTAT data base in the agriculture sector to improving the inventory in terms of completeness and comparability improvements. CCDA also uses expert opinion on specific data that it feels is not consistent with the actual country specific values. CCDA also uses default data and EF values in the IPCC Guidelines for some missing information which we consider relevant and appropriate.

6.4 Adaptation

The capacity assessment on adaptation reporting under the ETF was based on the analysis of PNG's first and second national communications to see the type and extent of information presented against the adaptation reporting provisions under the Convention and to identify the gaps relating to adaptation reporting provisions under the Paris Agreement. The assessment also looks at identifying the key commonalities and differences between reporting provisions under the Convention and the Paris Agreement from various resource materials/publications by the UNFCCC.

Key findings
The key findings made in relation to adaptation reporting under the Convention and the Paris Agreement are as follow.

1. How do the MPGs for the ETF under PA supersede the MRV requirements under the Convention?

The MPGs will supersede reporting of BURs and the international consultation and analysis (ICA) processes for PA Parties (see decision 1/CP.24, para. 39):

• Reporting of the BUR under the Convention will be superseded by reporting of the biennial transparency report for PA Parties.

• Technical analysis of the BUR under the Convention will be superseded by technical expert review (TER) for PA Parties.

• Facilitative sharing of views (FSV) under the Convention will be superseded by the facilitative multilateral consideration of progress (FMCP) for PA Parties.

Parties to the Convention that are not Parties to the PA will continue the current annual GHG inventory and ICA processes, as appropriate (see decision 1/CP.24, para. 44).

The following elements will continue to be reported under the Convention and are not superseded by the MPGs:

• A National Communications must continue to be submitted by developing countries as a

BTR-NC single report or a separate national communications.

- The technical annex on REDD+ (to be reported in BURs per decision 14/CP.19 (para. 7) for those Parties seeking results-based payments) is to be reported as an annex to the BTR and is reviewed during the review of the BTR (paras. 45-46 of 1/CP.24).

2. Relationship between the BTR chapter on Climate Change Impacts and Adaptation and the Adaptation Communication

Parties may submit their Adaptation Communication as a component of, or in conjunction with, a BTR (para. 4 of decision 9/CMA.1). If a Party chooses to do so, then it should clearly identify which part of the BTR is the Adaptation Communication (para. 13 of the annex to decision 18/CMA.1).

Parties may, when submitting an Adaptation Communication as a component of, or in conjunction with, other documents (such as the BTR), tailor the information provided, taking into account the "vehicle" document (i.e. the document in which the Adaptation Communication is included) (para. 9 of decision 9/CMA.1).

The chapter on adaptation in the BTR submitted by developing countries is not subjected to review .

3. Flexibility provisions for least developed countries (LDCs) and small island developing states (SIDS) under the ETF in reporting BTR

In recognition of their national circumstances, LDCs/ SIDS are offered additional discretion in reporting. LDCs and SIDS can choose to submit the information in their BTR at their discretion (i.e. it may be less frequently than biennial) (1/CP.21, para. 90 and 18/CMA.1 para. 4).
No specific justification in the BTR for the Party's use of this discretion is required as it would be for those developing countries that elect to apply a specific flexibility provision.

As with all developing countries that need it in light of their capacities, LDCs and SIDs have the opportunity to apply the flexibility provisions in 18/CMA.1 and highlight their capacity building constraints.

4. Reporting information on adaptation in BTR as opposed to National Communications

Table 10: Reporting on adaptation in BTR vs. NC

Biennial Transparency Report (BTR)	National Communication
Chapter: Information related to climate change impacts and adaptation	Chapter: Climate change impact assessment and adaptation to climate change
• National circumstances, institutional arrangements and legal frameworks • Impacts, risks and vulnerabilities, as appropriate • Priorities and barriers • Adaptation strategies, policies, plans, goals and actions to integrate adaptation into national policies and strategies • Progress on implementation of adaptation • Monitoring and evaluation of adaptation actions and processes • Information related to averting, minimizing and addressing loss and damage associated with climate change impacts • Cooperation, good practices, experience and lessons learned Any other relevant information	• Scope of the V&A assessment • Description of approaches, methodologies and tools used (including scenarios) • Vulnerability to the impacts of, and their adaptation to, climate change • Evaluation of, strategies and measures for adapting to climate change, in key areas • Use of policy framework for developing and implementing adaptation strategies and measures

5. Type of adaptation information in BTR, Adaptation Communication, National Adaptation Plans and National Communications of Non - Annex I Parties.

Table 11: Comparison of adaptation information under various UNFCCC reporting

Type of information	BTR	Adaptation Com.	NAPs	NatComs of NAI Parties
National circumstances, institutions, legal frameworks	✓	✓	✓	✓
Impacts, risks, vulnerabilities	✓	✓	✓	✓
Priorities and barriers related to adaptation	✓	✓	✓	✓
Strategies, policies, plans, goals, steps to integrate adaptation into other policies	✓	✓	✓	✓
Support needed/support received	✓	✓	✓	✓
Progress in implementation of adaptation	✓	✓	✓	✓
Monitoring and evaluation	✓	✓	✓	✓
Information related to averting, minimizing and addressing loss and damage associated with climate change impacts	✓			
Cooperation, good practices, experiences, lessons learned	✓	✓	✓	
Adaptation-related economic diversification/ mitigation co-benefits of adaptation	✓	✓		
Contributions to other international frameworks	✓	✓	✓	
Gender perspective and/or traditional, indigenous and local knowledge	✓	✓	✓	

6.4.1 Current Situation on Adaptation Reporting

Policy gaps on adaptation

The Papua New Guinea Vision 2050 (2009) contains a strong focus on environmental sustainability and climate change. This is a national development strategy to guide PNG's social economic development for the period 2010 2050. The Strategy for Responsible Sustainable Development (StaRs, 2014) focuses on renewable resources rather than extractive activities, and emphasizes mitigation over adaptation .The National Climate Compatible Development Management Policy (NCCDMP, 2014), focuses on sustainable economic development, which is climate resilient and carbon neutral. The Climate Change (Management) Act of 2015 outlines government's immediate and future steps for adaptation to climate change. Very few sectoral development strategies that incorporate climate change adaptation exist in PNG. The National Food Security Policy (2016-2025) is currently the only sectoral strategy to include adaptation concerns. Through a recent Adaptation Fund project (2012-2016), provincial-level adaptation strategies are being developed for five provinces with a focus on riverine and coastal populations.

Gaps on Adaptation Monitoring and Reporting

There is no proper M&R for Adaptation and skilled personnel to carry out important functions including assessments like Vulnerability Need Assessment and the development of Adaptation plans and implementations of the particular forms of adaptation as per the needs and priorities. There is a need for upskilling and capacity building for the highlighted activities and programmes to be realized and for reporting provisions to be met.

Adaptation data gaps

Table 12 outlines the main data gaps identified for the Adaptation Nine (9) priority areas in PNG, which were reported in the PNG's Enhanced NDC 2020.

Table 12: Data gaps in the nine adaptation priority areas

Priority area	Summary of Data Gaps Assessment
1. Coastal flooding and sea-level rise	Weather, atmosphere, ocean current, and tsunami early warning data and information from 4,000 Argo floats from the International Ocean Commission (IOC) project in the Pacific and PNG waters have been available since 2000. Furthermore Australian-funded sea level and climate monitoring from 1991 to 2020, has aided in determining land movements and sea-level changes; and the Comprehensive Hazards and Risk Management (CHARM) Framework for PNG and the Pacific Island States has contributed to planning and management of sea-level rise since 1992. Data gaps exist however in the following ways: ◆ Only four tide gauges exist in Milne Bay, Manus, Madang and Rabaul, scaling up and replication is required across all maritime provinces to improve data collection and determination ◆ Where soft and hard defence structures have been implemented (i.e. Manus Province, East Cape Road in Milne Bay Province – there is not a collation of data that indicates the percentage of coastline prone to coastal flooding or shoreline erosion
2.Inland flooding	◆ Lack of monitoring tools to identify hazard areas in the country for flooding in highlands, coastal regions and islands ◆ Mapping and planning to mitigate flooding is needed using a blended approach of traditional knowledge and modern infrastructure tools and methods ◆ Promote the use of drone GIS mapping, artificial intelligence (AI) and internet of things (IoT) technology to mitigate flooding, both inland and islands. ◆ Insurance and private sector support required
3. Food insecurity	◆ Further data on climate change and variability throughout the entire country to manage food supply is needed ◆ Early warning and forecasting to all communities in the country's required. There is presently a lack of information on disaster impacts on agriculture and water etc. ◆ Disaster risk management in agriculture (agriculture insurance, probing an indemnity insurance framework, weather index setup, linking with multi-hazard early warning systems, etc.) is needed. ◆ Use of satellite forecasting requires further development and application to the planning and agriculture sectors ◆ Need for research to develop climate-adaptive crops/food supply in the islands and hinterland ◆ Application of Sustainable Land Use Policy in the country is needed
4. Cities and climate change	◆ Lack of policies and application in the towns and cities in PNG. city profiling only completed for three cities (Port Moresby, Kokopo and Goroka) ◆ Monitoring and advice on ozone pollution, heat waves and bush fires in cities are needed. ◆ Building codes introduced to mitigate climate change heat waves and cyclones is needed ◆ Better water and waste drainage to be introduced ◆ Greater awareness and development of information and communication strategy in cities on climate change and disaster and heatwaves etc. ◆ Disasters and climate change policies need to be incorporated to support town development and planning in PNG
5. Climate-induced migration	◆ Lack of analysis of data and information on induced migration as a result of climate change ◆ Articulation of induced migration drivers other than climate change to inform policymaking

Priority area	Summary of Data Gaps Assessment
6. Damage to coral reefs	◆ LMMA only covering 159,259 hectares; this requires replication and scaling-up ◆ Lack of awareness on coral reef damage due to climate change versus traditional use of coral/lime budding/planting of corals in pristine water requires implementation; there are presently no programmes on budding/ planting corals in the country; there is an opportunity to introduce communities and schools to support this sector ◆ Mining and waste sectors are causing damage to coral; regulation and awareness-raising need immediate attention
7. Malaria and vector-borne diseases	Department of Health keeps records of incidences of malaria and vector-borne diseases, however, monitoring of these diseases from the coast to the highlands is an issue that needs consideration
8. Water and sanitation	◆ Lack of tools/technology in the country to enable advancements in exploring desalination options ◆ Lack of uptake and application of new technology for water resources in the country ◆ Information and communication strategy is needed country-wide due to water shortage due to El Nino and dry spells ◆ There is a need to introduce large water reservoirs to all isolated provinces/LLG ◆ Supply of medication for water treatment is required country-wide ◆ Application of traditional knowledge in the country requires broader uptake and implementation
9. Landslides	The Geophysical Observatory of the Department of Mineral Policy and Geohazards Management (DMPGM) has seismographs located around the country which measure earthquakes continuously; the DMPGM also has linkages with the Rabaul Volcanological Observatory which monitors earth tremors leading to an eruption. Data gaps exist however in the following area: ◆ While the earthquake and volcanic data exist, there is no linkage to the occurrence of landslides. GIS and Remote Sensing Tools could be used to ensure connectivity and linkages between landslides and rainfall patterns and

Implementation of adaptation action

There is a range of adaptation projects that are being implemented in PNG, which may potentially provide useful information on climate-change impacts, vulnerabilities, and adaptation-related activities in the agricultural and land-use sectors for reporting in the BTR. These adaptation projects include:

• An Adaptation Fund supported project, implemented by UNDP, enhancing adaptive capacity of communities to climate change related floods in the North Coast and Islands Region of Papua New Guinea (CCAF) seeks to enhance the capacity of riverine communities to make informed decisions and to undertake concrete action to manage climate change-driven hazards. This project has been influential in developing a comprehensive hazard profile for the five pilot provinces and in developing provincial level adaptation strategies.

• USAID funded Climate Change Ready project seeks to assist Pacific island countries to incorporate climate change adaptation goals into national policy and support policy implementation, increase access to climate finance and build capacity to implement climate change adaptation projects. PNG is part of the beneficiary countries participating in the project. Despite the main focus area being integration of climate change priority areas into national policy, work done thus far has been centered primarily on implementation of climate change resilience activities in PNG

• Readiness Support to strengthen PNG's engagement with the GCF (Global Green Growth Institute GGGI) aims to build capacity of CCDA in performing its role as the NDA and promote awareness of the GCF, engage stake-holders through consultative processes to develop country programmes on mitigation and adaptation, support direct access to the GCF, and mobilize the private sector in identifying priorities for achieving adaptation and mitigation goals.

• Climate Change Information and Knowledge Management – IKM (Department of Foreign Affairs and Trade, Australia) as part of the Pacific Climate Information (iCLIM) project, aims to enhance regional capacity in cli-mate knowledge management across the Pacific region. Partnered with Griffith University and Secretariat of the Pacific Regional Environment Programme (SPREP), the project since 2017 is identifying climate change and IKM needs and priorities for a regional approach to climate data sharing, including assessment and establishment of a national portal.

• Pilot Programme for Climate Resilience (Climate Investment Fund, 2015-2022) Designed to implement PNG's transition from business as usual to climate-compatible development with participation of various sectors, the Pilot Program for Climate Resilience (PPCR) supports vulner ability assessments and pilot measures for sustainable fishery ecosystems and food security in nine island and atoll communities, and climate proof critical ports, roads and other infrastructure.

Areas for Improvement

Despite the existing policies and frameworks in place, climate change adaptation considerations are not sufficiently integrated into development planning and budgeting processes in PNG. The areas of improvement were identified from stock-taking exercises and have been validated by the national stakeholders in various consultations meetings (Adaptation TWC meetings) and workshops. The areas of improvement listed below cover the policies and strate-gies, institutional arrangements and legal frameworks on adaptation reporting, budget, capacity to measure climate-change impacts, vulnerabilities and adaptation-related activities, and monitoring and evaluation (M&E) of adaptation actions and processes.

(i)   Insufficient technical and institutional capacity to effectively coordinate and implement climate change adaptation across sectors, including limited awareness of impacts of climate change at sub-national levels.

(ii) Very few sectoral development strategies that incorporate climate change adaptation exist in PNG.

(iii) Inadequate climate change adaptation budget allocations to match the needs in adaptation as a result of limited integration of climate change concerns into planning and budgeting.

(iv) Lack of awareness and limited sharing of climate change data, resulting in lack of concerted and prioritized actions in the priority sectors.

(v) Adaptation Technical Working Committees (TWCs) composition to be reviewed to ensure the membership is comprises of skilled personnel to provide input on adaptation reporting.

(vi) Limited technological and technical capacities to monitor and reporting on climate change adaptation.

(vii) Inadequate skilled personnel to carry out important functions, such as a vulnerability needs assessment, the development of adaptation plans, and implementations of the particular forms of adaptation as per the needs and priorities.

(viii) No proper framework in place for monitoring and reporting and assessing adaptation resilience across the sectors.

(ix) CCDA does not have an archiving system for ensuring documentation and archiving of all the necessary adaptation information that has been produced by the various projects in the country.

There is a need for development, up-skilling and capacity building for the highlighted activities and actions to be realized to ensure PNG meets the adaptation reporting requirements under the MGPs on the ETF.

Implementation Plan

Chapter
7

This chapter provides details of the key activities to address the human capacity needs, challenges and gaps identified in the previous chapters. The outputs are aimed at strengthening PNG's capacities for measurement, reporting, and verification in the AFOLU sector as a means to improving the overall quality and accuracy of the National Greenhouse Gas Inventory and prepare PNG to transition to the Enhanced Transparency Framework under the Paris Agreement from the current MRV arrangement. All activities/outputs were validated by the AFOLU sub-TWC as well as the AFOLU wider stakeholders that contribute to the AFOLU MRV in PNG. The activities/outputs are described below.

Outcome 1: Institutional framework on the Enhanced Transparency Framework strengthened

The current institutional arrangements do not fully facilitate meeting PNG's MRV commitments under the Paris Agreement. PNG's commitments under UNFCCC and the Paris Agreement are generally not institutionalized beyond the CCDA/NDA.   For example, obligations for data-collection and reporting are generally not reflected in the mandates and work plan of respective agencies. CCDA has the authority under the CCMA 2015 to issue regulations and reporting requirements in order to fulfill PNG's international climate change commitments. However, drafting of those regulations has stalled due to certain technical and operational challenges.

Output 1.1 Institutional arrangements between CCDA and key AFOLU data providers is strengthened

Well established institutional arrangement between CCDA and key AFOLU data providers is needed to allow smooth flow of essential data to CCDA to facilitate meeting PNG's MRV commitments under the Paris Agreement.

Output 1.2 Sector coordination mechanisms are established (i.e. establishment of AFOLU MRV Sub-Technical Working Committee)

Proper sector coordination mechanism for AFOLU MRV needs to be established to facilitate the broader, deeper, and more systematic engagement of governmental stakeholders across multiple agencies and levels. This strengthened engagement will improve the MRV processes and facilitate meeting the ETF requirements.

Output 1.3 AFOLU ETF readiness assessment is updated

All baseline information related to AFOLU are identified and/or updated where necessary. Work packages are prepared against the outcome of the readiness assessment to meet the ETF requirements with specific focus on priority NDC actions for the agricultural and land-use sectors.

Outcome 2: Transparency and awareness on AFOLU and REDD+ monitoring enhanced

As part of enhancing PNG's capacity on the REDD+ and NDC monitoring/tracking, FAO in collaboration with CCDA, PNGFA and CEPA has developed a Near-real time Deforestation and Forest Degradation Alerts and Monitoring system and upgrading the PNG REDD+ and NFMS Web-Portal. The Near Real-time Deforestation (and Degradation) Alerts and Monitoring System will provide near-real-time deforestation information to the government authorities and the organizations managing agriculture, forestry, conservation, REDD+, and other land development projects. The REDD+ and NFMS Web-Portal will be upgraded for the following reasons; disseminating recent achievements of the country (PNG) related to Land Use and Land Use Change and Forestry through Web-Interface (and API) as a part of National Forest Monitoring System; Stakeholders (government organizations, developing partners, private sectors and NGOs) can understand the information available in the country and publish their achievements/data through one single web-based platform; and Preparing the base information/system for Enhanced Transparency Framework (ETF) under the Paris agreement.

Output 2.1 Web-GIS portal for PNG NFMS are updated and improved

The web portal provides a key role in data and information dissemination and enhances transparency of AFOLU reports to UNFCCC. Much of the data on PNG's NFMS Web-GIS portal is outdated and needs updating. Certain new functions have to be added to the portal to improve and add value to the information provided. The important contents and functions that need to be added to the portal are provided in in the table below.

Table 13: Information needed to update/enhance PNG's NFMS Web-GIS portal

Category	Sector	Type	Source/System
Sector data	Climate Change	Mitigation / REDD+	Terra PNG Analysis from Satellite Land Monitoring System (SLMS)
			Future Deforestation Modeling and Land Suitability Assessment (HCV)
			Spatial Analysis to support REDD+ Land Use Planning (WCMC)
		Adaptation / DRR	Topography/Watershed
			Climate/Weather
			Suitability Analysis
			Adaptation Projects
	Forestry		Collect Earth (CE) Land Use / Land Use Change and Forestry (LULUCF)
			Multi-purpose National Forest Inventory (MP-NFI)
			Forest Resource Information Management System (FRIMS)
	Environment		Environment Management Information System (EMIS)
	Agriculture	Subsistence	Subsistence
		Commercial	Palm Oil
			Coffee
			Rubber
			Others
	Mining		Mining Cadastre Portal
	Base layers	Administrative	Province/District/LLG
		Infrastructure	Road/Track/Settlements/Buildings
		Natural layers	River/Contour/Geology/Soil
Global data	Land Cover /Change		Hansen Treecover loss/gain, Intact Forest Landscape, Mangrove, etc.
	Treecover/Fire Alert		GLAD Alerts, VIIRS Active Fires, MODIS Active Fires
	Landmark /Feature		Airports, Cities, Mountain Peaks, Rivers, Water Bodies, etc.
	Satellite Imagery		Landsat (5/7/8), Sentinel-1/2, Blue Marble, etc.

Functions to be added	Purpose
Time Series Data Analysis	Display historical land use information
Administration of Contents	Regular updating of information
User Feedback Functions	Receive comments and queries from the public
Upload/Download Functions	Accessing downloadable information
Measurement Functions	Measure actual distance on ground (in km)
Statistical Analysis Functions	Generating statistical information of an area of interest.

To effectively implement Output 2.1, CCDA will priorities the following key activities:

- CCDA to include all relevant AFOLU agencies and organizations that collect necessary data for emission/removal estimates in the institutional arrangement for data provision, capacity building, and other related purposes. Agreements will be established with data providers for providing data on a regular basis. The AFOLU inventory compilers will gather regularly to share issues which affect data providers and establish common formats and rules for the inventory compilation to be followed by the respective Agriculture and LULUCF compilers. The data providers to get involved in the validation of the data and the enhancement of the data.

- CCDA to explore new potential data providers, having legal contracts, MoUs, MoAs, or other legal documents to formally establish a channel for data collection from the different data providers within the Government and Industries.

- To develop the regulations within the CCMA 2015 in consultation with stakeholders to regularly provide information. A MoU with relevant agencies should be put in place in the absence of regulation.

Output 2.2 Near-real-time deforestation and forest degradation alert system is established and operationalized

PNG Near Real-time Deforestation and Degradation Alerts and Monitoring System will be oriented in a part of Monitoring function under the NFMS. Figure 9 shows PNG Resource Information Network and the Deforestation Monitoring Alerts System. NFMS with this Deforestation Alerts System is contributing to implementation of Conservation / Environment Protection, Climate Change and Development, and Sustainable Forest Management, by collaborating with existing systems in PNG such as Environment Management Information System (EMIS) under CEPA (Conservation & Environment Protection Authority), Satellite Land Monitoring System (SLMS) under CCDA (Climate Change and Development Authority), and Forest Resource Information Management System (FRIMS) and Decision Support System (DSS) under PNGFA (PNG Forest Authority). The system will collaborate with other existing systems under DAL (Department of Agriculture and Livestock), MRA (Mineral Resource Authority), DLPP (National Department of Lands and Physical Planning), and NSO (National Statistical Office).
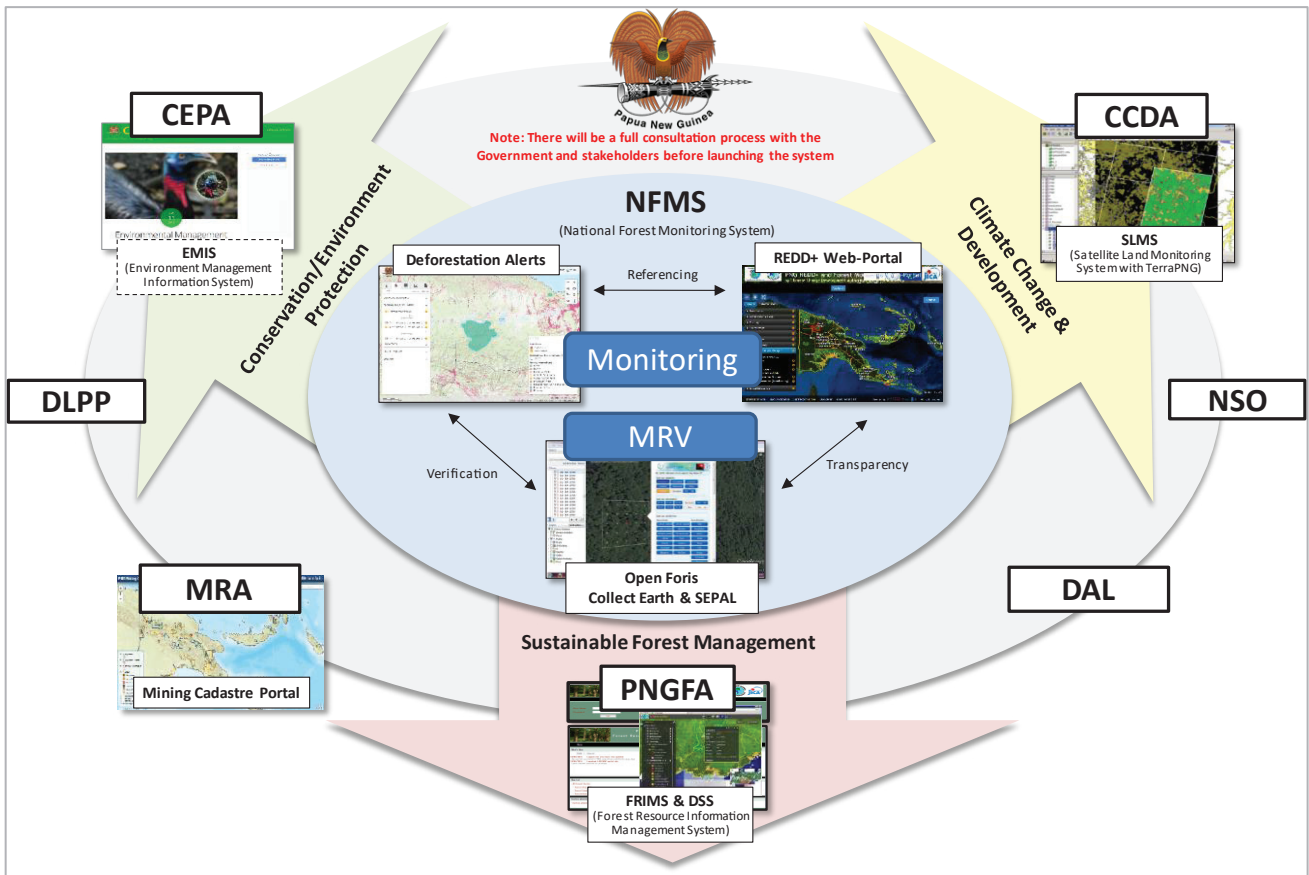
Figure 9: PNG Resource Information Network and the Deforestation Alerts System
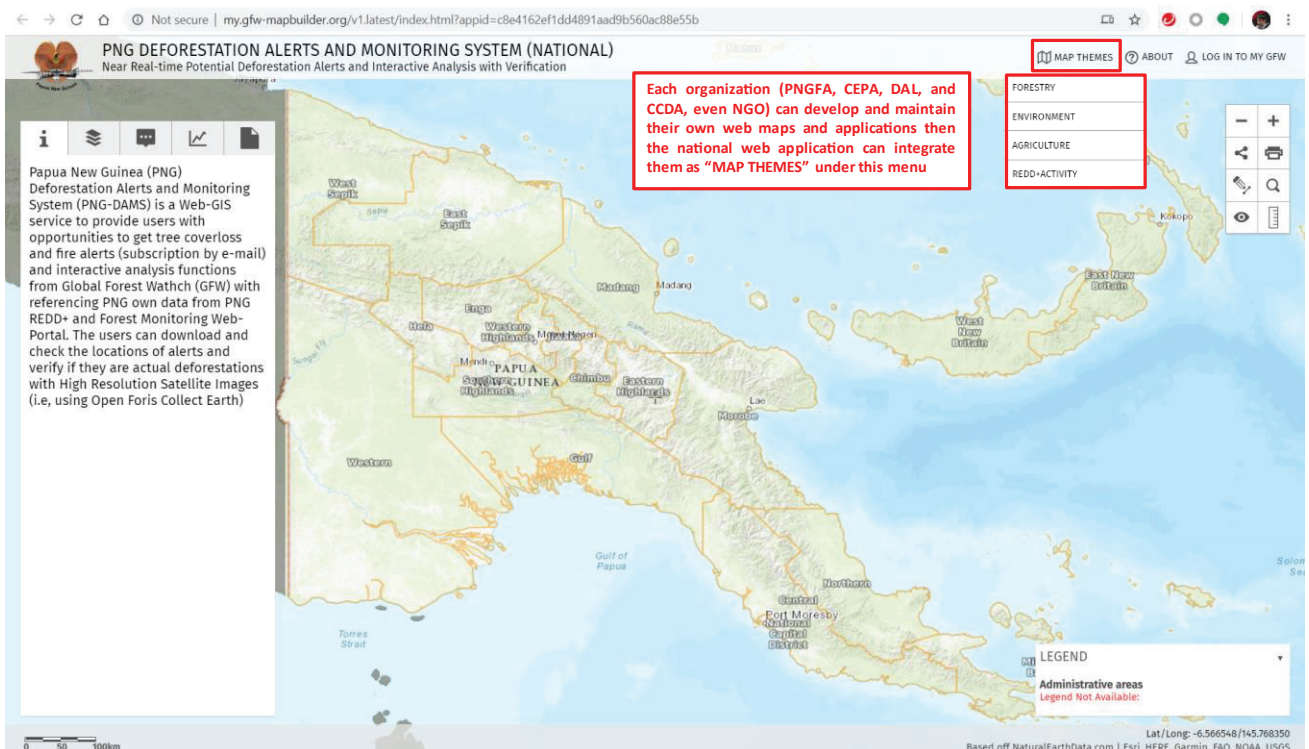
Figure 10: Overview National Application and Map Theme per sector
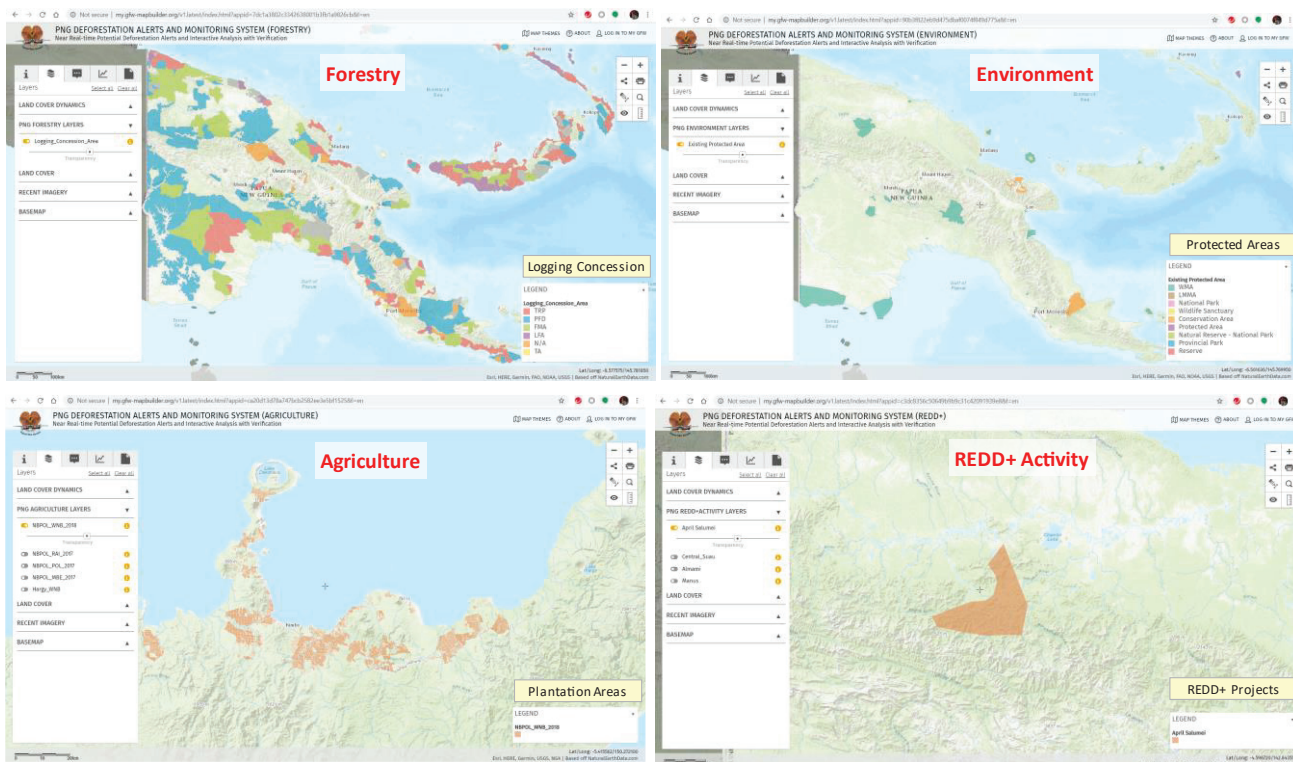
Figure 11: Map Theme per sector for detailed analysis

Output 2.3 Awareness activities and materials on ETF are enhanced

Activities/actions undertaken and ongoing initiatives to address ETF in PNG are not readily available to the public in a single platform. Although relevant information exists, stakeholders have limited awareness of its availability and means of access. Agencies that maintain the relevant information are sometimes uncertain of constraints on sharing the data/information.

Outcome 3: NFMS and REDD+ Forest Reference Level are updated and improved

FRL and NFMS are two important pillars of REDD+; PNG finalised and launched its NFMS in March 2016 and submitted its initial FRL to the UNFCCC for technical assessment in January 2017. Since then PNG had prepared its Results of 2014 and 2015 against the technical assessed FRL and submitted to UNFCCC in April 2019 as a technical annex to the First Biennial Update Report. PNG also completed its national GHG Inventory in the AFOLU sector and reported the results in the BUR1. PNG is now into its next cycle of GHG inventory and reporting; hence it will require the updating of FRL and NFMS to meet the ETF reporting requirement under the Paris Agreement as well as to meet requirements for REDD+ Results-based Payment under GCF. The updating of these two elements is also required in order to effectively monitor the progress of NDC implementation in the country.

Output 3.1 Activity Data on forest and land use is periodically updated in accordance with the ETF reporting interval

Consistent and regular time-series data on forest and land use is needed for BUR and BT reporting. Collect Earth (CE) point sampling method has been proven successful in determining the forest land use change status in PNG. The CE information was used in the PNG's NDC 2015, PNG Forest FRL 2017, PNG BUR1 2019 and PNG's Enhanced NDC 2020.

Output 3.2: Emission Factor (EF) is enhanced with more reliable country specific data

PNG's National Forest Monitoring System will undergo major improvement when data from the multipurpose NFI becomes available. Apart from the forests types' information, the NFMS will be updated with full biodiversity and soils information of PNG when the NFI is completed. Activity data and Emissions Factors for FRL calculation and GHG Inventory will be improved and updated using the NFI data in order to meet ETF reporting requirements under UNFCCC Paris Agreement.

The Permanent Sample Plot (PSP) will be re-measured to improve the accuracy of GHG emission/removals estimation. This will be implemented in parallel with the NFI that is currently being implemented by PNGFA. The overall aim is to improve the quality of data and information that PNG reports under the LULUCF sector.

The final outcome of this activity including the methodology will be published and the results will be made available to the public or certain bodies only when

PNGFA develop the necessary data sharing protocol.

Output 3.3:
NFMS is updated using latest available tools and technology

Many REDD+ developing countries including PNG have made significant progress in National Forest Monitoring (NFM) capacity over 10 years through sustained financial and technical support from development partners. NFM capacities doubled between 2008 and 2015, and then doubled again by 2018, in only three years. The acceleration in capacities and systems can be attributed to the development and deployment of innovative open-source software which enable rapid technology transfer, and allow partner countries to do the work themselves.

Advances in country NFM capacity and systems has resulted in significant progress in countries' ability to measure and report emission reductions or enhancements for REDD+ with 38 Forest Reference Emission Levels/Forest Reference Levels (FREL/FRLs) submitted to the UNFCCC for technical assessment representing 1.4 billion hectares of forest and 36% of global forest area.

Despite the advances in country data and capacity, there remains a gap between current NFM capacity and systems and the accuracy and transparency expected by donors for payment of REDD+ results. Strong NFM capacities and systems is a functional precondition for countries to access results-based payments. Hence, to meet these requirements and to be on par with other countries, CCDA will be implementing the following two major activities:

(i) Registering and using SEPAL and Planet Lab as a new technology and tool for national forest monitoring. This activity is expected to commence in 2022 and will first involve training of users from PNGFA and CCDA follow by pilot testing of the tool in few selected provinces. The results will then undergo QA/QC by experts before SEPAL can replace the current system. SEPAL and Collect Earth online will be PNG's next generation land use, land cover assessment tools and its implementation in the country will be supported by FAO.

(ii) NFMS is updated using the REDD compass Actions and outcomes of Global Forest Observations Initiative (GFOI Country Needs Assessment (CNA) exercise.

PNG is one of the first countries to use the tool to identify and document the data, processes, people and documentation requirements and priorities needed to mature the NFMS. The CNA has assisted CCDA to identify the critical tasks required to operationalise the NFMS in the context of realizing results based payments for REDD+ and for meeting international reporting requirements related to forestry.

The next step is for CCDA AFOLU team to work closely with GFOI to develop an Improvement Plan and to document the identified detailed work requirements in a series of Work Packages with budgets, timelines and responsibilities. This process will aim to support PNG's national work planning and budgetary priority process and to produce a set of documents to use in communication with GFOI partners (and other donors) when seeking support to fill identified budgetary, capacity building or expertise gaps within PNG's NFMS.

Output 3.4: Forest Reference Level is updated in accordance with the UNFCCC guidelines

In order to update the FRL, PNGFA will need new updated time series data (2000-2019) on land use and land use change in PNG. This will require new Collect Earth land use assessment by PNGFA to produce the full time-series/historical data for 2000-2019 which will be used to update the FRL projection from the current 2014-2018 to 2019-2023. Funding for this activity will come primarily from the FAO GCF Readiness Project (GCP/PNG/011/GCR) and the FAO project "Enabling green growth in Papua New Guinea to address climate change and conserve biodiversity" (UNJP/PNG/015/UNJ). This activity is expected to commence in late 2022.

Output 3.5: REDD+ results are reported in accordance with the ETF reporting guidelines

CCDA in collaboration with PNGFA will prepare the second REDD+ results using updated Collect Earth data. The result will be submitted as REDD+ Technical Annex to PNG BUR2 for PNG to claim for potential results-based payment under the GCF RBP Pilot Programme. Future REDD+ results will be reported in the technical annex of the BTRs.

Outcome 4: GHG inventory of AFOLU conducted and improved

The AFOLU sector is an important sector in PNG as it contains significant sources of GHG emission and sink. The sector plays an important role in PNG's effort to climate change mitigation and adaptation as reflected in PNG's Enhanced NDC 2020. As PNG is transitioning to the ETF, it will use country-specific activity data in the GHG emissions/removals estimations.

Output 4.1: 50x2030 Initiative implemented to build strong national agricultural data system

Activity data for Agriculture sector is produced in a time-lier, more disaggregated means and of high quality.

Output 4.2: GHG inventory of forest and other land use is conducted using the Activity Data and Emission Factor developed under Outcome 3

GHG emissions/removals of the LULUCF sector will be estimated using higher tier methods with higher accuracy in all categories of LULUCF sector for reporting in

PNG's first BTR.

Output 4.3: GHG inventory of agriculture sector is conducted using more country-specific activity data and emission factor
GHG emissions/removals of the agriculture sector will be estimated using higher tier methods with higher accuracy in all categories of Agriculture sector for reporting in PNG's first BTR

Output 4.4: GHG inventory reports on AFOLU produced in accordance with the ETF reporting guidelines
Accuracy of AFOLU GHG inventory report will be improved; higher tier method is applied and the net results are highly accurate.

Outcome 5: Monitoring of AFOLU related adaptation conducted
Due to climate change, frequencies of extreme weather events such as floods, droughts and heat waves are expected to increase in the future. Papua New Guinea is of no exception to these threats and exposure to the climate induced vulnerabilities as we are part of the global community. The natural environment already poses significant risks to Papua New Guinea today, and climate change will make it worse. Hazards like coastal flooding; inland flooding; landslides; and droughts take a severe toll on the people and the economy. Climate change is likely to exacerbate some of these event-driven hazards and may also introduce new hazards due to gradual shifts in climatic conditions – most prominently, increased malaria penetration in the highlands, changes in agricultural yields and damage to coral reefs. Hence, effective monitoring and reporting of those climate induced vulnerabilities and hazards, and adaptation needs is crucial for the country to receive financial and technical support from the international community.

Output 5.1 Monitoring of AFOLU related adaptation required for ETF reporting is conducted
Adaptation monitoring and reporting in the AFOLU sector will be conducted according to the ETF MPGs for reporting in the BTR.

Output 5.2 Reports on AFOLU related adaptation monitoring are produced in accordance with the ETF reporting guidelines
Information on climate change impacts, vulnerabilities and adaptation will be produced and reported in PNG's Third National Communication (TNC) and BTR.

Outcome 6: Climate change reports (NC3, BUR2, and BTR1) meeting the ETF standard produced and submitted
PNG's Third National Communication (NC3), Second Biennial Update Reports (BUR2) and the first Biennial Transparency Report (BTR1) to UNFCCC are to be prepared and submitted within the timeframe of this action plan.

To meet the ETF reporting requirements in the AFOLU sector for NC3, BUR2 and BTR1 reporting, the following activities will be implemented by CCDA in close collaboration with key sectoral agencies and data providers.

(i)   LULUCF inventory are updated and report compiled using new Collect Earth data
New and updated activity data from the Collect Earth land use assessment by PNGFA is needed by CCDA to compile inventory and reporting for NC3, BUR 2 and BTR1.

(ii)   Agriculture sector data and report are collected and updated for GHG-inventory
Key activity data and emission factor data are needed to improve inventory and reporting of GHG emissions, removals, emission-reduction activities in the agriculture sector to be collected by CCDA.

(iii)   QA/OC protocols with verification and metadata are endorsed and adopted at TWC
QA/QC protocols are needed to improve quality of the national GHG-Inventory reports to UNFCCC. QC will be integrated in the procedures for estimating emissions/removals. QC will be in place to avoid careless errors and/or inconsistencies in reporting (e.g., within the GHG inventory report or between the report and data file).

(iv)   Monitoring and analysis of emission reduction from REDD+ policies and measures
Monitoring and documenting of the REDD+ policies and measures that lead to emission reduction is one of the key activities to be implemented under this action plan. The results of this will inform the reporting of PNG BUR2 and BTR1 as well as tracking progress towards achieving PNG's NDC targets.
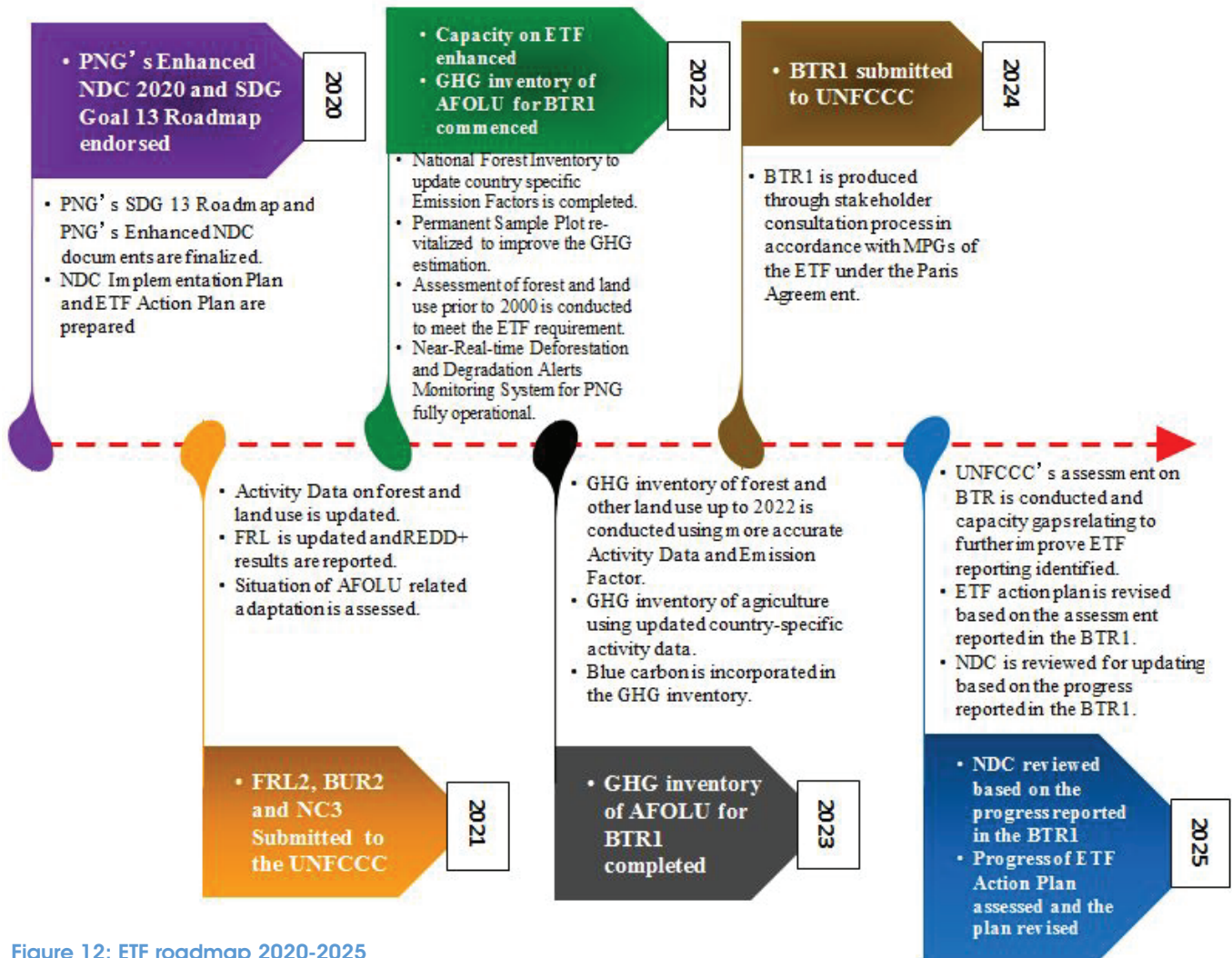
Figure 12: ETF roadmap 2020-2025

Output 6.1 GHG inventory reports on REDD+ results, AFOLU and adaptation produced under the Outcome 3-5 are incorporated in the climate change reports (NC3, BUR2, and BTR1) meeting the ETF standard

CCDA and its key stakeholders are fully capacitated to produce climate change reports (NC3, BUR2, and BTR1) that meet the ETF standard.

Output 6.2: Progress of the AFOLU GHG targets in PNG's Enhanced NDC 2020 is assessed and reported using the data produced under outcome 3 & 4

PNG's progress on achieving its Enhanced NDC 2020 targets is reviewed and reported in the first BTR basing on the ETF roadmap.

Output 6.3: UNFCCC's assessment on ETF reports is conducted

National GHG inventory and BUR sector leads to have a better understanding of the Modalities, procedures and guidelines (MPGs) on ETF reporting. UNFCCC's technical assessments are conducted for PNG's BUR and BTR submissions, and the advice provided is addressed to improve the submissions.

Outcome 7: Blue carbon inventory and policy development

Blue carbon is the carbon stored in coastal and marine ecosystems which includes mangroves, tidal marshes and sea grasses. These ecosystems sequester and store large quantities of blue carbon in both the plants and the

sediment below. For example, over 95% of the carbon in sea grass meadows is stored in the soils.

Since PNG has significant sources of blue carbon, CCDA has decided to include blue carbon in future GHG Inventories and consider its incorporation of blue carbon policy. Initial consultation began in 2019 and the implementation is expected in 2020 for the results to be included in the Second Biennial Update Report by early 2021. The inventory will be implemented jointly by CCDA and PNGFA through the support of Blue Carbon Programme funded by AusAID.

Output 7.1 Policy and governance considerations for blue carbon

There are a range of frameworks relevant to support the protection and restoration of blue carbon (mangroves and sea grasses in PNG). For example, including blue carbon in an NDC has cross-cutting policy implications in PNG. CCDA will consider the best way to reflect mangroves and sea grasses in climate policies, informed also by the development of the inventory and new data.

Output 7.2 Pathways to incorporate blue carbon ecosystems in the GHG inventory is identified

PNG has built strong systems and data for reporting on the forest sector. These systems can be extended to include mangroves. The activities will enable PNG to better understand how blue carbon could nest within and build upon existing AFOLU and REDD+ capabilities.
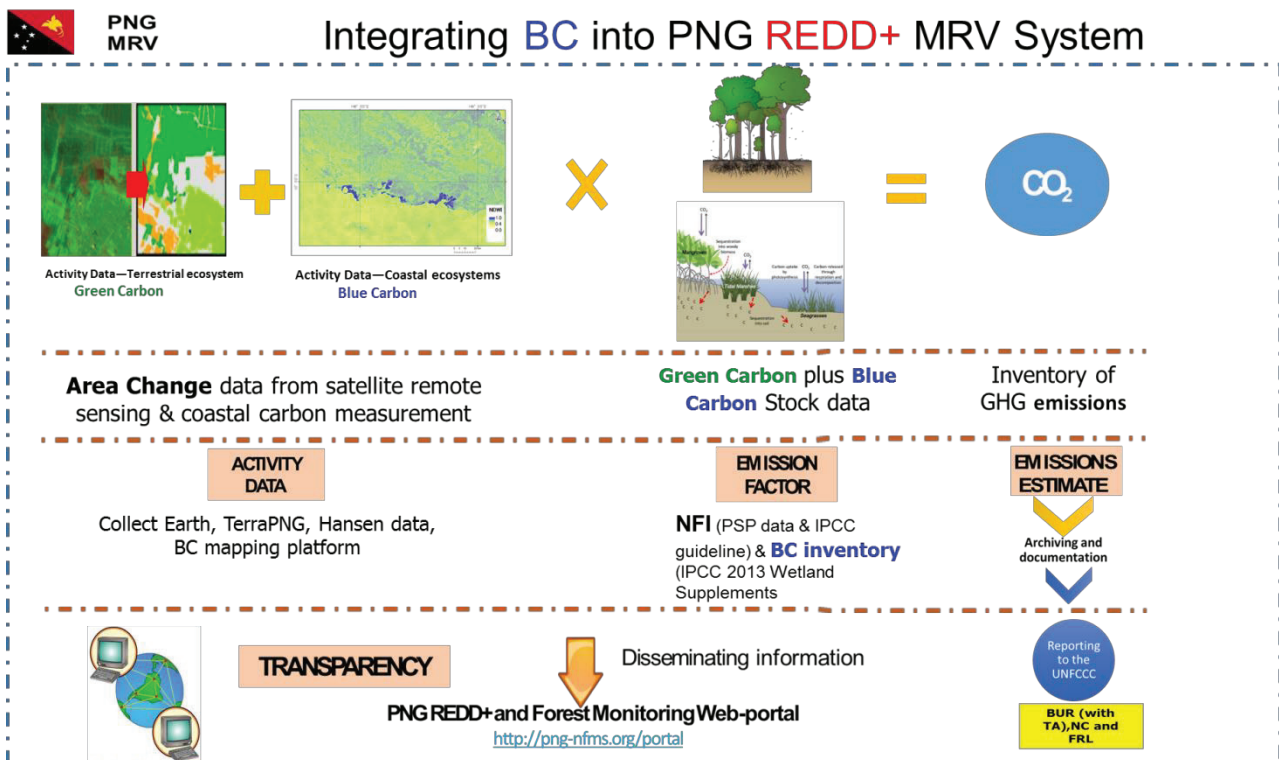
Figure 13: Proposed integration of blue carbon with PNG REDD+ MRV

Methodologies for estimating the activity data on salt marshes and sea grass will be agreed by CCDA and its key stakeholder. Activity data on mangrove is captured under LULUCF GHG inventory. Integration of BC into PNG REDD+ MRV will be based on IPCC Guidelines (IPCC 2013 Wetland Supplements) and international good practices.

Output 7.3 Inventory of blue carbon is conducted

Limited information exists on soil carbon under mangroves and sea grasses in PNG. Soil carbon stocks is where the majority of the carbon is held in coastal ecosystems and is a critical component of improving the accuracy of reporting these ecosystems using the IPCC Wetlands Supplement. The blue carbon inventory will involve the following process: mapping of mangroves and sea grasses; assessment of carbon stocks in mangroves and seagrasses; and modelling and reporting of carbon stock.

Outcome 8: Other important activities identified

Certain new technologies and initiatives will be integrated with PNG's AFOLU MRV to enhance its monitoring function and this is subject to approval from the AFOLU TWC. Some of the potential ones are listed below.

Output 8.1 High potential AFOLU monitoring activities are considered and tested

HCV and HCS assessment will be one of the potential activities to be implemented based on methodology developed and tested during a HCV and HCS Technical training in September 2019. The outcome of the implementation will be used for streamlining environmental safeguards to avoid HCV and HCS clearing and promoting low GHG emissions from agricultural activities (both commercial and subsistence) in PNG.

8.2 Other important monitoring activities on AFOLU are identified

Monitoring function of PNG's NFMS is enhanced through the use of available new technologies. NFMS is linked to certain SIS components and adherence is monitored.

Annexes

Chapter
8

8.1 List of Annex

Annex 1	Logical Framework
Annex 2	Work Plan and Budget
Annex 3	AFOLU MRV Gap Assessment

Annex 1: Logical Framework

Output	Baseline	Target (Milestone)	Means of Verification
Outcome 1: Institutional framework on the Enhanced Transparency Framework strengthened			
Output 1.1: Institutional arrangement between CCDA and key AFOLU data providers is strengthened.	There is limited, ad hoc coordination and information-sharing between CCDA and the AFOLU data providers.	Data sharing and data provision protocols are adopted and enacted. Legislation on the GHG data sharing strengthened.	Official documents describing the data sharing systems, tools and protocol established at CCDA. Legislation enabling adequate GHG data sharing between CCDA and relevant organizations
Output 1.2: Sectoral coordination mechanisms are established (i.e. establishment of AFOLU Sub-Technical Working Committee)	AFOLU Technical Working Committee is not active.	AFOLU Technical Working Committee is established and meetings are held regularly. AFOLU TWC contributes the decision making of the government.	TOR and the member's list of the AFOLU Technical Working Committee AFOLU TWC meeting minutes Number of meetings held
Output 1.3: AFOLU ETF readiness assessment is updated.	AFOLU base line information for the existing MRV framework is outdated.	Update of AFOLU ETF readiness assessment is completed and documented.	AFOLU ETF readiness assessment update report.
Outcome 2: Transparency and awareness on AFOLU and REDD+ monitoring enhanced			
Output 2.1 Web-GIS portal for PNG NFMS updated and improved.	Much of the data on PNG's NFMS Web-GIS portal is outdated and needs updating. The current users' interactive functions are very basic.	Web-portal is updated with the latest and extended information. Interactive functions (data analysis, data download, etc.) are enhanced.	Upgraded PNG REDD+ and NFMS Web-portal
Output 2.2: Near-real-time deforestation and forest degradation alert system is established and operationalized.	PNG REDD+ and NFMS Web-portal does not contain real-time level information to take timely actions addressing deforestation activities.	Near real-time deforestation information is accessible to public. Responsible authorities are informed about deforestation activities for taking appropriate measure against it.	Web-based near-real-time deforeststion alert system Periodical deforestation alert report
Output: Awareness activities and materials on the ETF are enhanced.	Limited activities on the ETF are conducted.	Relevant institutions including private sector and Civil Society Organizations have access to ETF information.	Number of web-based and printed ETF awareness materials Number of advocacy events on ETF.
Outcome 3: NFMS and REDD+ Forest Reference Level updated and improved			
Output 3.1: Activity Data on forest and land use is periodically updated in accordance with the ETF reporting interval.	Annual and consistent Activity Data is available between 2000 and 2015.	Land use change assessment is conducted periodically and GHG inventory for BUR2 and First Biennial Transparency Report (BTR) is prepared using updated land use change assessment results.	Updated FRLs, BUR2, and BTR1 LULUCF assessment reports
Output 3.2: Emission Factor (EF) is enhanced with more reliable country specific data.	Carbon stock of 64% of the forest is estimated based on the reliable published scientific research conducted	Complete and update the NFI and Permanent Sample Plot (PSP) assessment. Emissions Factors are updated using the NFI and	Updated FRLs, BUR2, and BTR1 NFI and PSP reports

Output	Baseline	Target (Milestone)	Means of Verification
	in PNG. NFI data is yet to be used for the EF. Reliable country specific information on GHG removal of both primary and disturbed forest is available.	PSP data and in accordance with the ETF reporting requirements.	
Output 3.3: NFMS is updated using latest available tools and technology.	PNG has an operational but outdated NFMS that needs to be updated to ensure all components are in place and functional and transparency and accuracy improved.	NFMS is updated using the latest available technologies such as SEPAL, Planet Lab and other emerging spatial monitoring tools.	Updated NFMS descriptions in BUR2, BTR1 and other reports.
Output 3.4: Forest Reference Level is updated in accordance with the UNFCCC guidelines.	FRL 2014-2018 and PNG BUR1 GHG inventory uses reference period 2000-2013 and REDD+ results against the FRL was from 2014-2015.	FRL is updated using the latest land use change assessment and updated EF according to guidance under various REDD+ standards.	Updated FLRs validated by national stakeholders and submitted to UNFCCC FRL technical assessment reports produced by the UNFCCC and other certification bodies
Output 3.5: REDD+ results are reported in accordance with the ETF reporting guidelines.	PNG's first REDD+ results for the period between 2014 and 15 were reported in the BUR1.	Updated REDD+ results is reported against updated FRL and submitted as a Technical annex to PNG's BUR2 and/or BTR1.	Submitted REDD+ Technical Annex in BUR2 and BTR1 Technical assessment report of BUR2/BTR1
Outcome 4: GHG inventory of AFOLU conducted and improved			
Output 4.1: 50x2030 Initiative implemented to build strong national agricultural data system	There is unavailability of country-specific activity data for certain key categories of the agriculture sector	Important data gaps of the Agriculture sector are improved and data for all key categories are readily available for subsequent BTR reports.	BTR submissions
Output 4.1: GHG inventory of forest and other land use is conducted using the Activity Data and Emission Factor developed under Outcome 3.	BUR1 was submitted in 2019 and its technical assessment was conducted by the UNFCCC.	GHG emissions/removals of the LULUCF sector are estimated using higher tier methods with higher accuracy in all categories of LULUCF sector.	BUR2 and BTR technical analysis report
Output 4.2: GHG inventory of agriculture sector is conducted using more country-specific activity data and emission factor.	Emissions of agriculture sector reported in BUR1 is incomplete, and the majority of the emissions are estimated using IPCC guideline default values.	GHG emissions/removals of the agriculture sector are estimated using higher tier methods with higher accuracy in all categories of Agriculture sector.	BUR2 and BTR technical analysis report
Output 4.3: GHG inventory reports on AFOLU produced in accordance with the ETF reporting guidelines	Many gaps relating to ETF are present in AFOLU GHG inventory report in BUR1.	Accuracy of AFOLU GHG inventory report is improved; higher tier method is applied and the net results are highly accurate.	BUR2 and BTR submissions BUR 2 and BTR technical analysis report
Outcome 5: Monitoring of AFOLU related adaptation conducted			

Output	Baseline	Target (Milestone)	Means of Verification
Output 5.1: Monitoring of AFOLU related adaptation required for ETF reporting is conducted.	Adaptation measurement was reported in the second National Communications in 2014 that is prior to the ETF modalities established in 2018.	Adaptation measurement is conducted according to the ETF modalities.	3rd National Communication and BTR
Output 5.2: Reports on AFOLU related adaptation monitoring are produced in accordance with the ETF reporting guidelines	Numbers of assessments regarding to adaptation were conducted but not yet reported under the ETF reporting format.	Information on climate change impacts, vulnerabilities and adaptation are produced and reported in PNG's Third National Communication (TNC) and BTR.	3rd National Communication and BTR
Outcome 6: Climate change reports (NC3, BUR2, and BTR1) meeting the ETF standard produced and submitted			
Output 6.1: GHG inventory reports on REDD+ results, AFOLU and adaptation produced under the Outcome 3-5 are incorporated in the climate change reports (NC3, BUR2, and BTR1) meeting the ETF standard.	MRV reports such as NC2 and BUR1 were produced before the establishment of the ETF modalities.	PNG produce climate change reports (NC3, BUR2, and BTR1) meeting the ETF standard.	NC3, BUR2, and BTR1
Output 6.2: Progress of the AFOLU GHG targets in PNG's Enhanced NDC 2020 is assessed and reported using the data produced under outcome 3 & 4	Enhanced NDC was established in 2020. The monitoring of the NDC progress is yet to be commenced.	PNG's progress on NDC targets is reported.	NC3, BUR2, and BTR1
Output 6.3: UNFCCC's assessment on ETF reports is conducted	UNFCCC's technical assessment was conducted for the BUR1.	National GHG inventory and BUR sector leads have a better understanding of the Modalities, procedures and guidelines (MPGs) on ETF reporting. UNFCCC's technical assessments are conducted for PNG's BUR and BTR submissions, and the advice provided is addressed to improve the submissions.	UNFCCC's technical assessment reports
Outcome 7: Blue-carbon inventory and policy developed			
Output 7.1: Policy and governance for blue carbon are considered	PNG has never done inventory on Blue Carbon at the national scale; No blue carbon policy and governance frameworks in place.	Consultation, policy dialogues, governance framework are developed	Results presented at AFOLU Sub-TWG and REDD+ TWC meetings.
Output 7.2: Pathways to incorporate blue carbon ecosystems in the GHG inventory is identified	Only mangrove is captured in PNG's initial GHG inventory which was reported in PNG's BUR1.	Analysis of Drivers of degradation over time for coastal ecosystems in PNG are analyzed; Foundational MRV capacity is built and options for inventory development identified; Technical capacity for blue carbon estimation and reporting strengthened; and Blue carbon cooperation and	Results presented at AFOLU Sub-TWG and REDD+ TWC meetings.

Output	Baseline	Target (Milestone)	Means of Verification
		capacity building is supported.	
Output 7.3: Inventory of blue carbon is conducted	No mapped or activity data on sea grass. Carbon stock in sea grass has not been determined.	Mangroves and sear grasses are mapped; Carbon stocks in mangroves and seagrasses are assessed; and Carbon stocked are modelled and reported.	Results submitted in PNG's BUR2 or BTR1.
Output 8: Other important activities identified			
Output 8.1 High potential AFOLU monitoring activities are considered and tested	HCV and HCS have been applied at pilot scales.	Outcomes of the pilot scale HCV and HCS are reviewed, and the potential of national scale implementation is assessed, and the work plan is developed.	HCV-HCS application reports
8.2 Other important monitoring activities on AFOLU are identified	PNG's NFMS has significant capacity gaps in terms of tracking the progress of AFOLU GHG and Non-GHG targets.	Monitoring function of PNG's NFMS is enhanced NFMS is linked to certain SIS components and adherence is monitored.	NFMS description provided in the PNG's climate change reports

Annex 2: Work Plan and Budget

Output	Target (Milestone)	2021 Q1	Q2	Q3	Q4	2022 Q1	Q2	Q3	Q4	2023 Q1	Q2	Q3	Q4	2024 Q1	Q2	Q3	Q4	2025 Q1	Q2	Q3	Q4	Budget ($ US)
Outcome 1: Institutional framework on the Enhanced Transparency Framework strengthened																						**178,000**
Output 1.1: Institutional arrangement between CCDA and key AFOLU data providers is strengthened	Data sharing and data provision protocols are adopted and enacted.			+	+	+	+	+														50,000
	Legislation on the GHG data sharing strengthened.								+	+	+					+	+	+				100,000
Output 1.2: Sectoral coordination mechanisms are established (i.e. establishment of AFOLU Sub-Technical Working Committee)	AFOLU Technical Working Committee is established and meetings are held regularly.			+	+		+				+		+		+		+		+			23,000
	AFOLU TWC contributes the decision making of the government.																					
Output 1.3: AFOLU ETF readiness assessment is updated.	Update of AFOLU ETF readiness assessment is completed and documented.			+	+					+	+								+	+			5,000
Outcome 2: Transparency and awareness on AFOLU and REDD+ monitoring enhanced																						**399,000**

Output	Target (Milestone)	2021 Q1	Q2	Q3	Q4	2022 Q1	Q2	Q3	Q4	2023 Q1	Q2	Q3	Q4	2024 Q1	Q2	Q3	Q4	2025 Q3	Q4	Budget ($ US)
Output 2.1 Web-GIS portal for PNG NFMS are updated and improved.	· Web-portal is updated with the latest and extended information.	+																		80,000
	· Interactive functions (data analysis, data download, etc.) are enhanced.		+	+						+	+									
Output 2.2: Near-real-time deforestation and forest degradation alert system is established and operationalized.	· Near real-time deforestation information is accessible to public.																			300,000
	· Responsible authorities are informed about deforestation activities for taking appropriate measure against it.					+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Output 2.3: Awareness activities and materials on the ETF are enhanced.	· Relevant institutions including private sector and Civil Society Organizations have access to ETF information.			+	+			+	+			+	+			+	+	+	+	99,000
Outcome 3: NFMS and REDD+ Forest Reference Level updated and improved																				7,050,000
Output 3.1: Activity Data on forest and land use is periodically updated in accordance with the ETF reporting interval.	· Land use change assessment is conducted periodically and GHG inventory for BUR2 and First Biennial Transparency Report (BTR) is prepared using updated land use change assessment results.		+	+					+	+	+							+		400,000
Output 3.2: Emission Factors (EF) are enhanced with more reliable country specific data.	· Complete and update the NFI and Permanent Sample Plot (PSP) assessment. Emissions Factors are updated using the NFI data and in accordance with the ETF reporting requirements.			+	+		+			+	+									6,000,000
Output 3.3: NFMS is updated using latest available tools and technology.	· NFMS is updated using the latest available technologies such as SEPAL, Planet Lab and other emerging spatial monitoring tools.					+											+	+		350,000

Output	Target (Milestone)	2021 Q1	Q2	Q3	Q4	2022 Q1	Q2	Q3	Q4	2023 Q1	Q2	Q3	Q4	2024 Q1	Q2	Q3	Q4	2025 Q3	Q4	Budget ($ US)
Output 3.4: Forest Reference Level is updated in accordance with the UNFCCC guidelines.	· FRL is updated using the latest land use change assessment and updated EF according to guidance under various REDD+ standards.		+	+	+							+	+					+	+	300,000
Output 3.5: REDD+ results are reported in accordance with the ETF reporting guidelines.	· Updated REDD+ results is reported against updated FRL and submitted as a Technical annex to PNG's BUR2 and/orBTR1.			+	+							+	+					+	+	
Outcome 4: GHG inventory of AFOLU conducted and improved																				**1,050,000**
Output 4.1: 50x2030 Initiative implemented to build strong national agricultural data system	· Important data gaps of the Agriculture sector are improved and data for all key categories are readily available for subsequent BTR reports.							+	+	+	+	+	+	+	+					350,000
Output 4.1: GHG inventory of forest and other land use is conducted using the Activity Data and Emission Factor developed under Outcome 3.	· GHG emissions/removals of the LULUCF sector are estimated using higher tier methods with higher accuracy in all categories of LULUCF sector.			+	+						+	+	+					+	+	300,000
Output 4.2: GHG inventory of agriculture sector is conducted using more country-specific activity data and emission factor.	· GHG emissions/removals of the agriculture sector are estimated using higher tier methods with higher accuracy in all categories of LULUCF sector.			+	+						+	+	+					+	+	300,000
Output 4.3: GHG inventory reports on AFOLU produced in accordance with the ETF reporting guidelines	· Accuracy of AFOLU GHG inventory report is improved; higher tier method is applied and the net results are highly accurate.				+												+			100,000
Outcome 5: Monitoring of AFOLU related adaptation conducted																				**5,000,000**
Output 5.1: Monitoring of AFOLU related adaptation required for ETF reporting is conducted.	· Adaptation measurement is conducted according to the ETF modalities.		+	+	+									+	+					5,000,000
Output 5.2: Reports on AFOLU	· Information on climate change				+											+	+			

Output	Target (Milestone)	2021 Q1	Q2	Q3	Q4	2022 Q1	Q2	Q3	Q4	2023 Q1	Q2	Q3	Q4	2024 Q1	Q2	Q3	Q4	2025 Q1	Q2	Q3	Q4	Budget ($ US)
Output 7.2: Pathways to incorporate blue carbon ecosystems in the GHG inventory is identified	· Analysis of Drivers of degradation over time for coastal ecosystems in PNG are analyzed; Foundational MRV capacity is built and options for inventory development identified; Technical capacity for blue carbon estimation and reporting strengthened; and Blue carbon cooperation and capacity building is supported.									+	+											300,000
Output 7.3: Inventory of blue carbon is conducted	· Mangroves and sear grasses are mapped; Carbon stocks in mangroves and sea grasses are assessed; and Carbon stocked are modeled and reported.											+	+	+	+	+						100,000
Output 8: Other important activities identified																						**5,200,000**
Output 8.1 High potential AFOLU monitoring activities are considered and tested	· Work plan for HCV-HCS implementation in PNG developed			+	+	+	+															1,200,000
	· Field manual on HCV-HCS assessment developed																					
	· The methodology developed for HCV-HCS assessment on a pilot scale targeting certain provinces in PNG trialed								+	+	+	+	+									
	· Outputs/results reported																					
	· Full implementation of HCV and HCS in PNG													+	+	+	+					
8.2 Other important monitoring activities on AFOLU are identified	· Monitoring function of PNG's NFMS is enhanced																					4,000,000
	· NFMS is linked to certain SIS components and adherence is monitored.																+	+	+	+		
Total:																						**19,950,000**

Annex 3: AFOLU GHG Inventory Gap Assessment

LAND-USE CATEGORY (V4, CHAPTER)	CATEGORY CODE /B	CATEGORY TITLE /B	SUB-CATEGORIES	COMMENTS/ NOTES	DATA REQUIREMENTS (SEE IPCC, 2006, V4CH13)	ARE TIER 1 DEFAULTS AVAILABLE?	ARE COUNTRY-SPECIFIC DATA AVAILABLE?	FOR KEY SUB-CATEGORIES, ARE CURRENT DATA SUFFICIENT?	HAS UNCERTAINTY BEEN ESTIMATED?	PRIORITY TO ADDRESS IN BTR (L,M,H)
Forest Land (4)	3B1a	Forest land remaining forest land	Above-ground biomass	For AGB country specific is available for primary forest but not available for other forest categories. Uncertainty assessment was conducted for the REDD+ TA but not the GHGI /NIR/BUR2	Area (ha) by subcategory	N	Y	Y	Y	H
					Avg annual above-ground biomass growth (t dry matter/ ha/ yr)	Y	Y & N	N	Y	H
					% C of dry matter	Y	N (Available but not sufficient to apply to estimate forest carbon across the country)	N	Y	L
			Below-ground biomass	Country specific is available for primary forest but not available for other forest categories.	Ratio of below- to above-ground biomass (dry matter)	Y	Y&N	Y	Y	L

LAND-USE CATEGORY (V4, CHAPTER)	CATEGORY CODE /B	CATEGORY TITLE /B	SUB-CATEGORIES	COMMENTS/ NOTES	DATA REQUIREMENTS (SEE IPCC, 2006, V4CH13)	ARE TIER 1 DEFAULTS AVAILABLE?	ARE COUNTRY-SPECIFIC DATA AVAILABLE?	FOR KEY SUB-CATEGORIES, ARE CURRENT DATA SUFFICIENT?	HAS UNCERTAINTY BEEN ESTIMATED?	PRIORITY TO ADDRESS IN BTR (L,M,H)
			Dead organic matter	The estimation files have "NA". Is it because DOM is not applicable for this sub-category		Y	Limited	--		M
			Soil carbon		Area of drained organic soil by FL subcategory	N	Y	Y	N	NA
					Emission factor for climate type, if any	Y	N	N	N	M
			Wood removal	Report under 3D1		Y	N	N	N	L (Not possible)
			Fuelwood removal	Report under 3D1		Y	N	N	N	L
			Loss of C from disturbance	Report under 3D1		Y	Y	Y	Y	NA
			Non-CO2 emissions from burning biomass	Report under 3C1 (grouping/ categorization inconsistent in IPCC Guidance)		Y	N	N	N	M
	3B1b	Land converted to forest land	Above-ground biomass		Area converted to forest (by subcategory) from each other land-use category	N	Y	Y	NA	M to identify small scale

LAND-USE CATEGORY (V4, CHAPTER)	CATEGORY CODE /B	CATEGORY TITLE /B	SUB-CATEGORIES	COMMENTS/ NOTES	DATA REQUIREMENTS (SEE IPCC, 2006, V4CH13)	ARE TIER 1 DEFAULTS AVAILABLE?	ARE COUNTRY-SPECIFIC DATA AVAILABLE?	FOR KEY SUB-CATEGORIES, ARE CURRENT DATA SUFFICIENT?	HAS UNCERTAINTY BEEN ESTIMATED?	PRIORITY TO ADDRESS IN BTR (L,M,H)
					Avg annual above-ground biomass growth (t dry matter/ ha/ yr)	Y	Y but limited	--	NA	tree planting / M
					% C of dry matter	Y	Y but limited	--	N	L
			Below-ground biomass		Ratio of below- to above-ground biomass (dry matter)	Y	N	Y	N	L
			Dead organic matter		Mass of dead organic litter	Y	N	--	N	L
			Soil carbon		Area of drained organic soil by FL subcategory	N	N	Y	N	L
					Emission factor for climate type, if any	Y	N	N	N	L
			Wood removal	Report under 3D1	Not sure if this is applicable for this sub category					
			Fuelwood removal	Report under 3D1	Not sure if this is applicable for this sub category					
			Loss of C from disturbance	Report under 3D1	Not sure if this is applicable for this sub category					
			Non-CO2 emissions from burning biomass	Report under 3C1 (grouping/ categorization inconsistent in IPCC Guidance)	Not sure if this is applicable for this sub category					

LAND-USE CATEGORY (V4, CHAPTER)	CATEGORY CODE /B	CATEGORY TITLE /B	SUB-CATEGORIES	COMMENTS/ NOTES	DATA REQUIREMENTS (SEE IPCC, 2006, V4CH13)	ARE TIER 1 DEFAULTS AVAILABLE?	ARE COUNTRY-SPECIFIC DATA AVAILABLE?	FOR KEY SUB-CATEGORIES, ARE CURRENT DATA SUFFICIENT?	HAS UNCERTAINTY BEEN ESTIMATED?	PRIORITY TO ADDRESS IN BTR (L,M,H)
										tree planting
					Avg annual above-ground biomass growth (t dry matter/ ha/ yr)	Y	Y but limited	--	NA	M
					% C of dry matter	Y	Y but limited	--	N	L
			Below-ground biomass		Ratio of below- to above-ground biomass (dry matter)	Y	N	Y	N	L
			Dead organic matter		Mass of dead organic litter	Y	N	--	N	L
			Soil carbon		Area of drained organic soil by FL subcategory	N	N	Y	N	L
					Emission factor for climate type, if any	Y	N	N	N	L
			Wood removal	Report under 3D1	Not sure if this is applicable for this sub category					
			Fuelwood removal	Report under 3D1	Not sure if this is applicable for this sub category					
			Loss of C from disturbance	Report under 3D1	Not sure if this is applicable for this sub category					
			Non-CO2 emissions from burning biomass	Report under 3C1 (grouping/ categorization inconsistent in IPCC Guidance)	Not sure if this is applicable for this sub category					

LAND-USE CATEGORY (V4, CHAPTER)	CATEGORY CODE /B	CATEGORY TITLE /B	SUB-CATEGORIES	COMMENTS/ NOTES	DATA REQUIREMENTS (SEE IPCC, 2006, V4CH13)	ARE TIER 1 DEFAULTS AVAILABLE?	ARE COUNTRY-SPECIFIC DATA AVAILABLE?	FOR KEY SUB-CATEGORIES, ARE CURRENT DATA SUFFICIENT?	HAS UNCERTAINTY BEEN ESTIMATED?	PRIORITY TO ADDRESS IN BTR (L,M,H)
	3B2b	Land converted to cropland	Above-ground biomass	Key categories of prior land uses: FL	Areas (by CL subcategory) converted from each other land use category	N	Y	Y	Y	NA
					Biomass stock before conversion	Y	Y & N	N	Y	H
					Increase in perennial biomass carbon/ yr	Y	N	N	Y	M
					Loss of biomass carbon/ yr	Y	N	N	Y	M
			Dead organic matter		Dead wood/ litter stock before conversion	Y	N	N	Y	M
					Dead wood/ litter stock under CL	Y	N	N	Y	M
					Time of transition period	Y	N	N	Y	M
			Soil carbon		Sub-categories for combinations of climate, soil type, and soil management regimen	N	N	N	N	H
					Areas (by CL subcategory) converted from each other land use category	N	N	N	N	H
					Initial SOC by climate/ soil combination	Y	Y but limited	N	Y	H
					SOC stock changes (or rates) based on land-use category, land-management practices, or addition of organic matter	Y	N	N	Y	M
					Area of cultivated organic soil by climate type	N	N	N	N	H
					Emission factor by climate type [by subcategory, if possible]	Y	N	N	N	L
			Non-CO2 emissions from burning	Report under 3C1 (grouping/		N/A				

LAND-USE CATEGORY (V4, CHAPTER)	CATEGORY CODE /B	CATEGORY TITLE /B	SUB-CATEGORIES	COMMENTS/ NOTES	DATA REQUIREMENTS (SEE IPCC, 2006, V4CH13)	ARE TIER 1 DEFAULTS AVAILABLE?	ARE COUNTRY-SPECIFIC DATA AVAILABLE?	FOR KEY SUB-CATEGORIES, ARE CURRENT DATA SUFFICIENT?	HAS UNCERTAINTY BEEN ESTIMATED?	PRIORITY TO ADDRESS IN BTR (L,M,H)
			biomass (crop residues)	categorization inconsistent in IPCC Guidance)						
Grassland (6)	3B3a	Grassland remaining grassland	Above-ground biomass			Y	N	N	N	L
			Dead organic matter			Y	N	N	N	L
			Soil carbon		Sub-categories for combinations of climate, soil type, and soil management regiment	N	N	N	N	M
					Areas of each land use sub-category (matched to prior sub-category if possible)	N	N	N	N	M
					Initial SOC by climate/ soil combination	Y	N	N	N	L
					SOC stock changes (or rates) based on land-use category, land-management practices, or addition of organic matter	Y	N	N	N	L
					Area (ha) of cultivated organic soil by climate type	N	Y	N	N	M
					Emission factor by climate type	Y	N	N	N	L
			Non-CO2 emissions from burning biomass	Report under 3C1 (grouping/ categorization inconsistent in IPCC Guidance)		N/A				

LAND-USE CATEGORY (V4, CHAPTER)	CATEGORY CODE /B	CATEGORY TITLE /B	SUB-CATEGORIES	COMMENTS/ NOTES	DATA REQUIREMENTS (SEE IPCC, 2006, V4CH13)	ARE TIER 1 DEFAULTS AVAILABLE?	ARE COUNTRY-SPECIFIC DATA AVAILABLE?	FOR KEY SUB-CATEGORIES, ARE CURRENT DATA SUFFICIENT?	HAS UNCERTAINTY BEEN ESTIMATED?	PRIORITY TO ADDRESS IN BTR (L,M,H)
	3B3b	Land converted to grassland	Above-ground biomass	Collect Earth assessment identified that this category did not exist during the assessment period	Land area converted to grassland by sub-category and type of vegetation (herbaceous or woody)	N	Y	N	N	M
					Biomass stocks after conversion	Y	N	N	N	L
					Biomass stocks before conversion	Y	N	N	N	L
					C% of dry matter	Y	N	N	N	L
					Biomass C growth rate (t C/ yr)	N	N	N	N	H
					Biomass C loss rate (t C/ yr)	N	N	N	N	H
			Dead organic matter		Land area converted to grassland by GL sub-category and type of dead organic matter (dead wood or litter)	N	N	N	N	M
					Dead wood/ litter stocks before conversion	Y	N	N	N	L
					Dead wood/ litter stocks after conversion	Y	N	N	N	L
					Transitional time period	Y	N	N	N	L
			Soil carbon		Sub-categories for combinations of climate, soil type, and soil management regimen	(Needs further investigation)				
					Areas of each land use sub-category (matched to prior sub-category if possible)	(Needs further investigation)				
					Initial SOC by climate/ soil combination	Y	N	N	N	L

LAND-USE CATEGORY (V4, CHAPTER)	CATEGORY CODE /B	CATEGORY TITLE /B	SUB-CATEGORIES	COMMENTS/ NOTES	DATA REQUIREMENTS (SEE IPCC, 2006, V4CH13)	ARE TIER 1 DEFAULTS AVAILABLE?	ARE COUNTRY-SPECIFIC DATA AVAILABLE?	FOR KEY SUB-CATEGORIES, ARE CURRENT DATA SUFFICIENT?	HAS UNCERTAINTY BEEN ESTIMATED?	PRIORITY TO ADDRESS IN BTR (L,M,H)
					SOC stock changes (or rates) based on land-use category, land-management practices, or addition of organic matter	Y	N	N	N	L
					Area of cultivated organic soil by climate type	N	N	N	N	M
					Emission factor by climate type	Y	N	N	N	L
			Non-CO2 emissions from burning biomass	Report under 3C1 (grouping/ categorization inconsistent in IPCC Guidance)		N/A				
Wetlands (7)	3B4ai	Peatlands remaining peatlands	CO2 emissions		Area (ha) of nutrient-rich peat soils managed for peat extraction by subcategory, if any	N	N	N	N	H
					emissions factors (Gg C/ ha/ yr) for CO2 from nutrirent-rich peat soils managed for extraction	Y	N	N	N	M
					Area (ha) of nutrient-poor peat managed for peat extraction by subcategory, if any	N	N	N	N	H
					Emissions factors for CO2 from nutrient-poor peat soils managed for peat extraction	Y	N	N	N	M
			Non-CO2 emissions							

LAND-USE CATEGORY (V4, CHAPTER)	CATEGORY CODE /B	CATEGORY TITLE /B	SUB-CATEGORIES	COMMENTS/ NOTES	DATA REQUIREMENTS (SEE IPCC, 2006, V4CH3)	ARE TIER 1 DEFAULTS AVAILABLE?	ARE COUNTRY-SPECIFIC DATA AVAILABLE?	FOR KEY SUB-CATEGORIES, ARE CURRENT DATA SUFFICIENT?	HAS UNCERTAINTY BEEN ESTIMATED?	PRIORITY TO ADDRESS IN BTR (L,M,H)
		Land converted for peat extraction	CO2 emissions	N/A for Tier 1	Area converted from non-peat to peatlands	N	N	N	N	H
					Biomass stocks before conversion	Y	N	N	N	L
					Biomass stocks after conversion	N	N	N	N	H
					C% of dry matter	Y	N	N	N	L
					Air-dried weight of extracted peat per year by subcategory, if any	N	N	N	N	H
					C% of air-dried peat	Y	N	N	N	L
			Non-CO2 emissions		Area of nutrient-rich peat soils managed for peat extraction (incl. abandoned areas still draining) by subcategory, if any	N	N	N	N	H
					Emission factor for drained nutrient-rich peat soils	Y	N	N	N	L
					Area converted to nutrient-richc peat extraction (by subcategory, if any) from other categories, by category (i.e., FL, CL, GL, SL, OL)	N	N	N	N	M
	3B4aii	Flooded land remaining flooded land	CO2 emissions							
			Non-CO2 emissions		(no worksheet in IPCC 2006 Guidelines)					
	3B4b	Land converted to wetlands/ flooded lands	CO2 emissions		Area converted to flooded wetlands (by subcategory, if any) from other land uses by category	N	Y (There was none in the previous assessment)	N	N	L

LAND-USE CATEGORY (V4, CHAPTER)	CATEGORY CODE /B	CATEGORY TITLE /B	SUB-CATEGORIES	COMMENTS/ NOTES	DATA REQUIREMENTS (SEE IPCC, 2006, V4CH3)	ARE TIER 1 DEFAULTS AVAILABLE?	ARE COUNTRY-SPECIFIC DATA AVAILABLE?	FOR KEY SUB-CATEGORIES, ARE CURRENT DATA SUFFICIENT?	HAS UNCERTAINTY BEEN ESTIMATED?	PRIORITY TO ADDRESS IN BTR (L,M,H)
					Biomass (t dry matter per ha) before conversion	Y	N	N	N	L
					Biomass (t dry matter per ha) after conversion	Y	N	N	N	L
					C% of dry matter	Y	N	N		L
			Non-CO2 emissions							
Settlements (8)	3B5a	Settlements remaining settlements	Above-ground biomass			Y	N	N	N	M
			Dead organic matter			Y	N	N	N	M
			Soil carbon		'Land area of cultivated organic soil (ha) by subcategory	N	N	N	N	M
					Emission factor for climate type	Y	N	N	N	M
	3B5b	Land converted to settlements	Above-ground biomass	The Collect earth assessment done identified forest land converted to settlements	Area converted to settlements by SL subcategory	N	Y	N	N	M
					Biomass stocks before conversion	Y	Y	N	N	L
					C% of dry matter	Y	N	N	Y	L
					Biomass C growth per year (in SL)	N	Y	Y	Y	L
					Biomass C loss per year (in SL)	N	Y	Y	Y	L
			Dead organic matter		Area converted to settlements by SL subcategory	N	Y	Y	Y	L
					Dead wood/ litter stock (t C/ ha) under old land use	Y	N	N	Y	H
					Time period of the transition from old to new land use	Y	N	N	Y	H

LAND-USE CATEGORY (V4, CHAPTER)	CATEGORY CODE /B	CATEGORY TITLE /B	SUB-CATEGORIES	COMMENTS/ NOTES	DATA REQUIREMENTS (SEE IPCC, 2006, V4&H3)	ARE TIER 1 DEFAULTS AVAILABLE?	ARE COUNTRY-SPECIFIC DATA AVAILABLE?	FOR KEY SUB-CATEGORIES, ARE CURRENT DATA SUFFICIENT?	HAS UNCERTAINTY BEEN ESTIMATED?	PRIORITY TO ADDRESS IN BTR (L,M,H)
			Soil carbon	For mineral soils	Area (ha) of mineral soils changed to SL subcategory (climate/ soil combination) by previous land use (i.e., FL, CL, GL, WL, OL)	N	N		N	H
					C stock from prior land use	Y	N	N	N	M
					Time dependence of C stock-change or transition period	Y	N	N	N	M
					C stock-change factor for current or latest land-use system	Y	N	N	N	M
					C stock-change factor for current or latest management regime	Y	N	N	N	M
					C stock-change factor for previous management regime	Y	N	N	Y	M
					C stock-change factor for C inputs	Y	N	N	Y	M
				For organic soils	Area (ha) of organic soils converted to SL subcategory	N	Y	N	Y	M
					Emission factor by climate type (t C/ha/ yr)	Y	N	N	N	L
Other Land (9)	3B6b	Land converted to other land	Above-ground biomass	This category wasn't estimated in the current cycle as there wasn't any	Area (ha) converted to OL subcategory from other land-uses by category (e.g., FL, CL, GL, etc.)	N	Y (there was none in the previous assessment)	N	N	L

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				land conversion to other land.	Biomass stocks (t C dry matter/ ha) before conversion	Y	NA	N	N	L
					C% of dry matter	Y	NA	N	N	L
					Biomass growth (t C/ yr in OL)	N	NA	N	N	L
					Biomass loss (t C/ yr in OL)	N	NA	N	N	L
			Dead organic matter	N/A for Tier 1	N/A for Tier 1	N/A				
				For mineral soils	Area (ha) of mineral soils changed to OL subcategory (climate/ soil combination) by previous land use (i.e., FL, CL, GL, WL, SL)	N	N	N	N	L
					C stock from prior land use	Y	N	N	N	L
					Time dependence of C stock-change or transition period	Y	N	N	N	L
					C stock-change factor for current or latest land-use system	Y	N	N	N	L
					C stock-change factor for current or latest management regime	Y	N	N	N	L
			Soil carbon		C stock-change factor for previous management regime	Y	N	N	N	L
					C stock-change factor for C inputs	Y	N	N	N	L
				For organic soils	Area (ha) of organic soils converted to OL subcategory	N	N	N	N	L
					Emission factor by climate type (t C/ha/ yr)	Y	N	N	N	L

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Livestock (10)	3A1	Enteric fermentation	CH4 emissions		Avg # head/ category/ year	N	N	N	Y(using tier 1 or approach 1)	H
					Emission factor for enteric fermentation	Y	N	N	Y(using tier 1 or approach 1)	L
	3A2	Manure management	Direct CH4 emissions		Avg # head/ category/ year	N	N	N	Y(using tier 1 or approach 1)	H
					Emission factor for manure mgt (mass manure CH4/ head/ yr)	Y	N	N	Y (using tier 1 or approach 1)	L
			Direct N2O emissions		Avg # head/ category/ year	N	N	N	Y (using tier 1 or approach 1)	H
					N excretion per ton animal live weight per day	Y	N	N	N	M
					Avg animal mass per category	Y	N	N	N	M

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					% of manure managed per manure management system (MMS) per year	Y	N	N	N	M
					Emission factor for direct N2O-N emissions per kg N per MMS per year	Y	N	N	Y (using tier 1 or approach 1)	L
Managed Soils (11)	3C1	Biomass burning	3C1a - forest lands		Area burned (ha) by initial land use (FL or non-FL) and by current FL subcategory	N	N	N	N	H
					Mass of fuel available for combustion (t dry matter/ ha)	Y	N	N	N	M
					Combustion factor (% of available fuel burned)	Y	N	N	N	M
					Emission factor (g GHG/ kg dry matter burned) by GHG (CH4, CO, N2O, NOx)	Y	N	N	N	L
			3C1b – croplands		Area burned (ha) by initial land use (CL or non-CL) and by current CL subcategory	N	N	N	N	H
					Mass of fuel available for combustion (t dry matter/ ha)	Y	N	N	N	M
					Combustion factor (% of available fuel burned)	Y	N	N	N	M
					Emission factor (g GHG/ kg dry matter burned) by GHG (CH4, CO, N2O, NOx)	Y	N	N	N	L
			3C1c – grasslands		Area burned (ha) by initial land use (GL or non-GL) and by current GL subcategory	N	N	N	N	H

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					Mass of fuel available for combustion (t dry matter/ ha)	Y	N	N	N	M
					Combustion factor (% of available fuel burned)	Y	N	N	N	M
					Emission factor (g GHG/ kg dry matter burned) by GHG (CH4, CO, N2O, NOx)	Y	N	N	N	L
			3C1d - other lands		Area burned (ha) by initial land use (OL or non-OL) and by current OL subcategory	N	N	N	N	H
					Mass of fuel available for combustion (t dry matter/ ha)	Y	N	N	N	M
					Combustion factor (% of available fuel burned)	Y	N	N	N	M
					Emission factor (g GHG/ kg dry matter burned) by GHG (CH4, CO, N2O, NOx)	Y	N	N	N	L
	3C2	Liming	CO2 emissions		Applied mass of calcic limestone/ calcium carbonate (CaCO3)	N	N	N	N	H
					Emission factor for calcic limestone (t C/ t CaCO3)	Y	N	N	N	L
					Applied mass of dolomite (CaMg(CO3)2)	N	N	N	N	H
					Emission factor for dolomite (t C/ t CaMg(CO3)2)	Y	N	N	N	L
	3C3	Urea application	CO2 emissions		Applied mass of urea (t/ yr)	N	N	N	N	H
					Emission factor for urea (t C/ t urea)	Y	N	N	N	L
	3C4	Direct N2O emissions	N2O	Other than for flooded	Applied mass of synthetic N fertilizers	N	N	N	Y (using	H

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		from managed soils	emissions	rice cultivation					tier 1 or approa ch 1)	
					Applied mass of animal manure, compost, sewage sludge	N	N	N	Y (using tier 1 or approa ch 1)	H
					Applied mass of crop residues	N	N	N	Y (using tier 1 or approa ch 1)	H
					Mass of N mineralized in mineral soils in association with loss of SOC from SOM due to changes in land management	N	N	N	N	H
					Area of managed/ drained organic soils disaggregated by CL-GL/ FL, Temperate/ Tropical, and nutrient-rich/ -poor (for FL temperate only)	N	N	N	Y (using tier 1 or approa ch 1)	M
					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)	N	N	N	Y (using tier 1 or approa ch 1)	H

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					Emissions factors for the preceding N sources	Y	N	N	Y (using tier 1 or approach 1)	L
					Applied mass of synthetic N fertilizers	N	N			H
				Specifically for flooded rice cultivation	Applied mass of animal manure, compost, sewage sludge	N	N			H
				(Not reported in BUR2;	Applied mass of crop residues	N	N			H
				Needs investigations on whether this exist in PNG or not)	Mass of N mineralized in mineral soils in association with loss of SOC from SOM due to changes in land management	N	N			H
					Emissions factors for the preceding N sources	Y	N			L
	3C5	Indirect N2O emissions from managed soils	N2O emissions		N mass from applied synthetic fertilizers	N	N	N	N	H
					% of synthetic N fertilizer that volatizes	Y	N	N	N	M
					N mass from applied animal manure, compost, sewage sludge	N	N	N	N	H
					N mass from urine and dung deposited by grazing animals on pasture, range, and paddock	N	N	N	N	H
					% of applied and deposited organic N fertilizers that volatizes	Y	N	N	N	M
					Emission factor for N2O emission from atmospheric deposition of	Y	N	N	N	L

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					N and soils and water					
					N mass returned to soils (above and below ground) via applied crop residues, N-fixing crops, forest/ pasture renewal	N	N	N	N	H
					% of N additions to managed soils that is lost to leaching and run-off	Y	N	N	N	M
					N2O emissions factor for N leaching and run-off	Y	N	N	N	L
	3C6	Indirect N2O emissions from manure management	N2O emissions		Excreted N by manure management system (MMS) and by livestock species/ category	N	N	N	N	H
					% of excreted N that volatizes by MMS and livestock species	Y	N	N	N	M
					% of excreted N that is lost in the MMS by MMS and livestock species	Y	N	N	N	M
					# of animals per livestock species per MMS	N	N	N	N	H
					% of total excreted N managed in MMS per livestock species	Y	N	N	N	M
					N from bedding per MMS per livestock species	Y	N	N	N	M
					N2O emission factor for atmospheric deposition of N on soils and water	Y	N	N	N	L

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	3C7	Rice cultivation	CH4 emissions	Report here, though IPCC sometimes groups under 3B2a	Production area (ha) by subcategory for irrigated, rainfed and deepwater, and upland	N	N	--		H
				(Not reported in BUR2; Needs investigation on whether rice cultivation occur in PNG)	Growing period (days)	N	N	--		H
					Baseline emission factor for continuously flooded fields without organic amendments	Y	N			M
					Scaling factor for differences in water regime during growing period	Y	N			M
					Scaling factor for differences in water regime prior to growing period	Y	N			M
					Applied organic amendment (t/ ha, fresh weight)	N	N			H
					Conversion factor for organic amendment	Y	N			M
					Scaling factor for soil type, rice cultivar, etc., if available	N	N			H
Harvested Wood Products (12)	3D1	Harvested wood products	CO2 emissions		Volume of harvested wood per year	N	N	N	N	H
					Ratio of harvested wood to harvested biomass	Y	N	N	N	L
					Ratio of harvested below-ground wood to harvested above-ground wood	Y	N	N	N	L
					% C of dry matter	Y	N	N	N	L
					Volume of harvested fuelwood per year	Y	N	N	N	L
					Avg fuelwood density	Y	N	N	N	L

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					Area affected by disturbance type (e.g., pest, disease)	N	N	N	N	H
					Biomass (dry matter) per area	Y	N	N	N	L
					Portion of biomass lost to disturbance	N	N	N	N	H

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