FIRST BIENNIAL TRANSPARENCY REPORT

TO

THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE

2025

CLIMATE CHANGE AND DEVELOPMENT AUTHORITY

Climate Change and Development Authority
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Minister's Foreword

Hon. Simon Kilepa, MP
Minister for Environment, Conservation and Climate Change

As the Minister for Environment, Conservation, and Climate Change, it is my distinct honor to present Papua New Guinea's First Biennial Transparency Report (BTR1). This document marks a historic milestone in our nation's climate journey and reaffirms our unwavering commitment to the Paris Agreement and the Enhanced Transparency Framework (ETF).

Our nation is home to the world's third-largest tropical rainforest and some of the most diverse marine ecosystems on the planet. These are not just national assets; they are global lungs and carbon sinks. However, we are also on the frontlines of climate change. From the rising sea levels threatening our coastal communities to the shifting rainfall patterns affecting our subsistence farmers, the impacts are real and escalating.

This BTR provides a clear, data-driven account of our progress in implementing climate action. It showcases our efforts in implementing our Enhanced Nationally Determined Contribution, which was submitted in 2020. This includes mitigation contributions from the Energy sector and Land Use, Land Use Change, and Forestry sector. As well as adaptation by embedding climate resilience into our agriculture, health, transport, and infrastructure sectors. Additionally, it outlines the amount of support we have received from the international community and the support we will require to implement climate action.

For Papua New Guinea, this report serves two critical purposes. Internally, it strengthens our domestic evidence-based policy-making. Externally, it signals to our international partners that Papua New Guinea is a transparent, accountable, and investment-ready partner.

The transition to a low-carbon, climate-resilient future is a task too great for any one department or nation to tackle alone. I wish to extend my deepest gratitude to the Climate Change and Development Authority (CCDA), our line agencies and departments, provincial governments, and development partners.

This report is more than a collection of tables and statistics; it is a testament to the resilience of the People of Papua New Guinea. It is our roadmap in data, guiding us as we strive to protect our home for the generations yet to come.

I invite our global partners to review this report and join us in the urgent work of turning transparency into transformative action.

Hon. Simon Kilepa, MP

Minister for Environment, Conservation and Climate Change

Message from the Managing Director

Ms Debra Sungi
Acting Managing Director
Climate Change and
Development Authority

It is with great pride and a sense of profound responsibility that I present Papua New Guinea's First Biennial Transparency Report (BTR1). This document marks a significant milestone in our nation's climate journey, signalling our transition into the Enhanced Transparency Framework (ETF) of the Paris Agreement.

For Papua New Guinea, transparency is not merely a reporting obligation; it is the bedrock of trust and the catalyst for climate action. As one of the most disaster-prone nations in the world, ranked 10th globally for climate risk, we understand that accurate, timely, and accessible data is essential for protecting our communities, our biodiversity, and our future.

The preparation of this BTR1 has been an intensive, country-driven process. Under the mandate of the Climate Change (Management) Act 2015, the CCDA has worked tirelessly to harmonize our data collection across key sectors.

We have focused on refining our Measurement, Reporting, and Verification (MRV) systems to ensure we meet the ETF requirements of the Paris Agreement. This includes:

- Updating our Greenhouse Gas Inventory;
- Tracking progress toward our Enhanced Nationally Determined Contributions (NDCs), including our targets for 78% renewable energy and 10,000 Gg CO_2 eq absolute reduction from the Land Use Land Use Change and Forestry sector by 2030;
- Enhancing Adaptation Reporting, ensuring that the resilience-building efforts in our agriculture, health, transport, and infrastructure sectors; and
- Tracking progress on the support received and needed for climate action in Papua New Guinea.

This report is the result of a collaborative effort involving other national government agencies, provincial governments, development partners, the private sector, and civil society. I wish to extend my sincere gratitude to the dedicated team at CCDA and our stakeholders who have contributed to this landmark achievement.

As we move forward, the data contained within these pages will guide our policy decisions, inform our investments, and ensure that no community in Papua New Guinea is left behind. We remain steadfast in our mission to transform climate challenges into opportunities for climate resilience, low-carbon growth, and sustainable development.

OFFICE OF THE MANAGING DIRECTOR
MS. DEBRA SUNGI
Acting Managing Director

Ms. Debra Sungi
Acting Managing Director, Climate Change and Development Authority

Acknowledgement

The Government of Papua New Guinea, through the Climate Change and Development Authority (CCDA), extends its profound gratitude to the various development partners, donor agencies, and national stakeholders whose invaluable support and technical contributions have culminated in the successful preparation of Papua New Guinea's First Biennial Transparency Report (BTR1). This comprehensive submission includes the National Inventory Document (NID) and the REDD+ Technical Annex.

The CCDA formally acknowledges the strategic cooperation and financial assistance provided by the following international partners:

- The NDC Partnership: For their pivotal role and for engaging the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) to provide dedicated capacity building, technical expertise, and financial support;
- CBIT-Global Support Programme for capacity building support provided;
- Expertise France: For funding support rendered through the second component of the European Union Forest, Climate Change and Biodiversity (EU FCCB) Programme; and
- The Food and Agriculture Organization of the United Nations (FAO): For their sustained partnership and technical guidance, made possible through the generous funding of the European Union (EU), the Global Environment Facility (GEF), AIM4Forests, and the UN-REDD Programme.

The preparation of this report relied heavily on the collaborative efforts and data sharing of various domestic institutions and private sector entities. We express our sincere appreciation to the following:

- National Energy Authority (NEA);
- Papua New Guinea Forest Authority (PNGFA);
- Conservation and Environment Protection Authority (CEPA);
- National Statistical Office (NSO);
- Water PNG (WPNG);
- National Capital District Commission (NCDC);
- Asia Pacific Energy Research Centre (APERC); and
- Private Sector Partners

CCDA remains committed to the principles of the Paris Agreement and appreciates the collective dedication of all parties involved in enhancing our national climate transparency framework.

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List of Acronyms

ADB	Asian Development Bank
APERC	Asia Pacific Energy Research Centre
BUR	Biennial Update Report
CCDA	Climate Change Development Authority
CEPA	Conservation and Environment Protection Agency
CSO	Civil Society Organizations
DAL	Department of Agriculture and Livestock
DMPGM	Department of Mineral Policy and Geohazards Management
DNPM	Department of National Planning and Monitoring
DoH	Department of Health
DPLGA	Department of Provincial and Local Government Affairs
DSP	Development Strategic Plan
FAO	United Nations Food and Agriculture Organisation
FPDA	Fresh Produce Development Agency
FREL	Forest Reference Emission Level
FRL	Forest Reference Level
GDP	Gross Domestic Product
GEF	Global Environment Facility
Gg	Giga gram
GGGI	Global Green Growth Institute
GHG	Greenhouse Gas
GHGi	Greenhouse Gas inventory
ha	Hectare
ICAO	International Civil Aviation Organization
IPP	Independent Power Producers
IPPU	Industrial Processes and Other Product Use
JICA	Japan International Cooperation Agency
K	Kina, monetary unit of Papua New Guinea
KCA	Key Category Analysis

km	Kilometer
ktoe	Kilo-tonne of oil equivalent
LNG	Liquefied Natural Gas
LULUCF	Land use, Land-Use Change and Forestry
MP-NFI	Multi-Purpose National Forest Inventory
MRA	Mineral Resources Authority
MRV	Monitoring, Reporting and Verification
MW	Megawatt
NC	National Communication
NCCDMP	National Climate Compatible Development Management Policy
NCDC	National Capital District Commission
NDA	National Designated Authority
NDC	National Disaster Centre
NEC	National Executive Council
NFA	National Fisheries Authority
NFI	National Forest Inventory
NSO	National Statistical Office
PGRD	Partners for Global Research & Development
PNG	Papua New Guinea
PNGFA	Papua New Guinea Forest Authority
QA/QC	Quality Assurance and Quality Control
REDD+	Reducing Emissions from Deforestation and forest Degradation and the role of Conservation, Sustainable management of forest and enhancement of carbon stocks
STaRS	National Strategy for Responsible Sustainable Development
SWDS	Solid Waste Disposal Site
UNEP	United Nations Environment Programme
UPNG	University of Papua New Guinea

Executive Summary

The Government of Papua New Guinea submits the country's First Biennial Transparency Report (BTR1) and National Inventory Document (NID), as a standalone document, under the Enhanced Transparency Framework of the Paris Agreement. The reports were prepared in accordance with decision 18/CMA1.

The NID outlines the inventory of anthropogenic emissions by sources and removals by sinks from 2000 to 2022. While the BTR1 presents an overview of progress made in implementing the NDC including mitigation actions, adaptation efforts, and support needed and received. The BTR1 also includes the REDD+ Technical Annex referred to in decision 14/CP.19, paragraph 7, containing the results achieved from REDD+ activities by PNG.

1. National Circumstances

Papua New Guinea is a constitutional monarchy with a three-tier government system where climate action is coordinated by the Climate Change and Development Authority (CCDA) under the Climate Change (Management) Act 2015. The 2024 National Population Census estimates the population at 10,185,363, reflecting a significant 40% increase since 2011 and an annual growth rate of 2.6%. This rapid demographic expansion, combined with an average household size of five, underscores the mounting pressure on the country's vast natural resources, including its 35.95 million hectares of forest cover, and highlights the urgent need for integrated sustainable development planning.

Economically, Papua New Guinea is driven by a dominant extractive sector (Mining and Quarrying) and a vital Agriculture, Forestry, and Fishing sector, which together account for nearly half of the national GDP. While the energy sector benefits from a 41.6% renewable share in its primary supply, the nation remains vulnerable to climate projections of rising temperatures and sea levels. Institutional efforts are currently focused on addressing low agricultural yields and improving waste management frameworks to meet Paris Agreement obligations. This involves mainstreaming climate transparency and mitigation strategies across all levels of government to balance economic growth with environmental resilience.

2. GHG Inventory

Papua New Guinea's National Inventory Report of anthropogenic emissions by sources and removals by sinks of greenhouse gases for the period 2000-2022 was submitted as a stand-alone document, consistent with Decision 18/CMA1. (Annex I.E, paragraph 12).

PNG's GHG inventory from 2000 to 2022 illustrates a transition from a significant net carbon sink to a net emitter, driven by rising industrial activity and fluctuating sequestration levels. In 2000, the nation maintained a net-negative profile of approximately -23,405.24 Gg CO_2 eq, as the LULUCF sector effectively offset all anthropogenic outputs; however, a surge in Energy sector emissions eventually led to a peak net positive of 10,503.69 Gg CO_2 eq in 2015. More recent figures show a decline to approximately 3,900 Gg CO_2 eq in 2022.

The total GHG emissions, without the LULUCF, increased from 9,159.47 Gg CO_2 eq in 2000 to 18,178.90 Gg CO_2 eq in 2022, an increase of 98%. The energy sector contributed the highest in 2022 with 86%, followed by the waste sector with 9%, Agriculture with 4%, and IPPU with 1%.

Emissions from the energy sector amounted to 15,660.99 Gg CO_2 eq in 2022, an increase of 7,571.55 Gg CO_2 eq (94%) when compared to 2000. CO_2 emissions from Fuel Combustion (CRT Category 1A) contributed 40 % of the total GHG emissions in 2022, followed by CH_4 emissions from Fugitive emissions from fuel (CRT Category 1B) (38 %), CO_2 emissions from Fugitive emissions from fuel (CRT

Category 1B) (10 %), CH_4 emissions from Fuel Combustion (CRT Category 1A) (4 %) while N_2O emissions from Fuel Combustion (CRT Category 1A) contributed 1%.

The total GHG emissions in the IPPU sector in 2022 were 144.17 Gg CO_2eq, which is about 1% of the total emissions (excluding LULUCF). The relative contributions of individual GHGs are as follows: CO_2 (1%), HFCs (98%), and N_2O (1%). This ratio remains consistent over time, except for HFCs, which were estimated only for the years 2015 to 2022.

GHG emissions from the agriculture sector amounted to 764.03 Gg CO_2 eq in 2022, which is approximately 4% of the country's overall emissions that year (excluding LULUCF). Total emissions increased by 285.76 Gg CO_2 eq (37%) when compared to the year 2000. The highest emitting category in 2022 was Agricultural soils (CRT category 3.D), which contributed 37% of the total sector emissions. After this is the Enteric Fermentation (CRT Category 3.A), which contributed 33%, followed by Manure Management (CRT Category 3.A) with 30%.

The net emissions from the LULUCF sector amounted to -14,269.79 Gg CO_2 eq in 2022 compared to -32,564.71 Gg CO_2 eq in 2000. The net emissions from the LULUCF sector has flactuated over the timeseries which was mainly influenced by the Forest land (CRT Category 4.A) and Cropland (CRT Category 4.B). In 2022, Forest Land (CRT Category 4.A) contributed -24,678.97 Gg CO_2 eq which had a huge impact on the net emissions from the sector. Cropland (CRT Category 4.B) contributed 9,715.13 Gg CO_2 eq followed by, Other Non-CO_2 gases - Forest Burning (CRT Category 4.H) with 326.76 Gg CO_2 eq, then Grassland (CRT Category 4.C) with 323.36 Gg CO_2 eq and Settlements (CRT Category 4.E) with 43.93 Gg CO_2 eq.

In 2022, emissions from the Waste sector resulted in 1415.60 Gg CO_2 eq and accounted for 9% of PNG's total greenhouse gas emissions (excluding LULUCF). The emissions of the waste sector have increased over the whole time series (2000- 2022), which is influenced by population growth, development, consumption rate, and rural-to-urban drift. Breakdown of 2022 emissions of the Waste sector by category shows that Wastewater treatment and discharge (CRT Category 5.D) contributed 68% to total sector emissions in 2022, followed by solid waste disposal (CRT Category 5.A) (29%), Incineration and open burning of waste (CRT Category 5.C) (3%) and Biological treatment of solid waste (CRT Category 5.B) (1%).

3. Mitigation

Papua New Guinea's climate transparency framework is governed by the Climate Change (Management) (Nationally Determined Contribution) Regulation, which mandates the Climate Change and Development Authority (CCDA) to coordinate NDC implementation, monitoring, and data archiving. This legal arrangement is supported by a Technical Advisory Committee (TAC) that facilitates multi-sectoral data collection and provides technical oversight for the national NDC Implementation Plan.

PNG's initial NDC (2016) focused on mitigation opportunities in the electricity, forestry, and transport sectors, headlined by a goal of 100% renewable energy by 2030 and the implementation of REDD+. While specific quantitative targets were initially limited by data availability, the contribution prioritized adaptation across nine key climate hazards to address the nation's high vulnerability. Realizing these objectives and establishing robust Measurement, Reporting, and Verification (MRV) systems remains contingent upon significant international financial and technical support.

Papua New Guinea's NDC 2.0 (2021–2030) outlines a comprehensive climate strategy aimed at achieving 50% carbon neutrality by 2030 and full neutrality by 2050. The energy sector focuses on non-GHG targets, specifically increasing the renewable energy mix from 30% to 78% for on-grid

connections and implementing energy efficiency policies. In the LULUCF sector, PNG has set ambitious GHG targets to reduce annual net emissions from deforestation and degradation by 10,000 Gg CO2 eq compared to 2015 levels. The ultimate goal is to transform the LULUCF sector from a net emission source into a net sink of -8,284 Gg CO2 eq by 2030, supported by a 25% reduction in the total area of annual deforestation and forest degradation.

To track this progress, the Climate Change and Development Authority (CCDA) utilizes a rigorous monitoring framework based on 2006 IPCC Guidelines. Progress is measured through specific indicators, including the percentage of renewable energy in the national grid, the number of climate policies developed, and total net CO_2 eq emissions. For the LULUCF sector, PNG employs a Business-as-Usual (BAU) baseline and assumes instantaneous oxidation for harvested wood products, given the high volume of raw log exports. While energy sector tracking focuses on installed renewable capacity and policy milestones, the LULUCF tracking incorporates periodic recalculations to ensure consistency with previous Biennial Update Reports.

Implementation data from 2020 to 2022 indicates steady progress, particularly within the LULUCF sector, where net emissions have already reached sink levels, though fluctuations in annual deforestation and degradation areas persist. In the energy sector, the renewable mix remains near 28–30%, highlighting the need for accelerated action to meet the 78% target. As all NDC 2.0 targets are 100% conditional on international assistance, PNG intends to utilize Internationally Transferred Mitigation Outcomes (ITMOs) under Article 6 of the Paris Agreement to finance these efforts. While bilateral agreements have been established with three parties, no ITMOs have been authorized to date, emphasizing the critical role of future international support in achieving the more ambitious targets slated for NDC 3.0.

To achieve its ambitious NDC 2.0 energy targets, Papua New Guinea has established a comprehensive strategic framework centered on the National Energy Policy 2017–2027 and the SDG 13 Roadmap, which together prioritize climate-compatible development and institutional capacity building. Central to this effort is the NDC Implementation Roadmap for the Electricity Sector, which identifies 37 specific renewable energy projects across short, medium, and long-term horizons to shift the on-grid mix toward 78% renewables by 2030. This transition is further bolstered by a suite of technology-specific policies slated for 2025–2030 covering Wind, Solar, Hydro, Geothermal, and Bioenergy, designed to create an enabling regulatory environment for both on-grid and decentralized off-grid solutions. Collectively, these instruments aim to provide 70% of households with electricity access by 2030 while ensuring a just transition, though PNG maintains a request for flexibility in reporting specific GHG emission reductions due to current technical capacity constraints.

To achieve the targets set within the Land Use, Land-Use Change, and Forestry (LULUCF) sector, Papua New Guinea is implementing two primary strategic instruments: the National REDD+ Strategy (2017–2027) and the NDC Implementation Roadmap for the AFOLU Sector. The National REDD+ Strategy focuses on three action areas: strengthening land-use planning, enhancing environmental management and enforcement, and promoting sustainable economic productivity in agriculture. This strategy has already demonstrated significant mitigation results, with achieved emission reductions rising from approximately 3.9 million tCO2eq/year in 2014 to over 23 million tCO2eq eq/year by 2018 against the national Forest Reference Level (FRL). Complementing this, the AFOLU Roadmap identifies 15 priority actions to be delivered by 2030, including enhanced timber legality monitoring, reforestation, and the establishment of a national sustainable land-use planning framework. These integrated efforts, coordinated by the CCDA alongside the PNG Forest Authority and other key agencies, are essential for transitioning the LULUCF sector into a net carbon sink and ensuring the sustainable management of the nation’s forest resources.

4. Adaptation

Papua New Guinea's climate resilience is defined by a complex interplay between its immense natural wealth and its high socio-economic vulnerability. As home to the world's third-largest tropical rainforest and a vital portion of the Coral Triangle, the nation manages ecosystems of global significance that support the livelihoods of a population largely dependent on subsistence agriculture and fisheries. However, these systems are under escalating threat from climate-induced hazards, including sea-level rise, ocean acidification, and extreme weather events. The country's rugged geography and 155th-place ranking on the Human Development Index further complicate adaptation efforts, making the conservation and sustainable management of its biological heritage a fundamental requirement for national survival and economic stability.

To address these challenges, the government has established a multi-tiered governance architecture anchored by the Climate Change (Management) Act 2015. This framework facilitates a "whole-of-government" approach, led by the National Executive Council and the CCDA, which coordinates action across key sectors such as agriculture, health, and transport. By integrating the National Adaptation Plan (NAP) into the Medium-Term Development Plan IV and utilizing Provincial Climate Change Committees, Papua New Guinea ensures that high-level policy is translated into community-level action. This structure emphasizes gender responsiveness and social inclusion, allowing for iterative reviews of climate risks and the mobilization of finance to protect the nation's most vulnerable regions and populations.

Papua New Guinea's current climate is characterized by high temperatures, extreme humidity, and a monsoonal rainfall pattern that makes it one of the wettest nations globally. However, data from the World Bank's Climate Change Knowledge Portal reveals a concerning shift toward intensified heat and precipitation variability. The El Niño-Southern Oscillation (ENSO) continues to drive severe year-to-year fluctuations, with El Niño phases triggering devastating droughts and La Niña phases causing extreme flooding and landslides. Projections across all Representative Concentration Pathways (RCPs) indicate a consistent warming trend, with temperatures expected to rise by up to 3.2°C to 3.4°C under high-emission scenarios (RCP8.5) by the end of the century, particularly impacting inland regions.

The sectoral and economic impacts of these trends are already profound, with agriculture and health bearing the greatest burden. Increased precipitation variability and extreme heat are undermining food security by reducing crop yields and facilitating pest outbreaks, while changing vector ecology threatens to expand the reach of malaria and water-borne diseases. These disruptions carry high economic costs, as damaged transport infrastructure and reduced export commodity yields such as coffee and cocoa strain the national budget and rural livelihoods. Furthermore, the degradation of marine ecosystems through coral bleaching and ocean acidification threatens the fisheries and tourism sectors, which are vital to the nation's coastal economy.

Socially, climate change acts as a risk multiplier, disproportionately affecting Papua New Guinea's most vulnerable and marginalized populations. Rising sea levels and intensified storm surges are already forcing coastal displacement in provinces like Milne Bay and Central, leading to the loss of ancestral lands, cultural identity, and traditional livelihoods. These social disruptions exacerbate existing gender inequalities and deepen poverty cycles as communities lose the terrestrial and marine assets they depend on for survival. Without the rapid implementation of targeted adaptation measures, the escalating frequency of climate-induced hazards threatens to leave these rural and remote communities further behind in the nation's development progress.

Papua New Guinea's adaptation strategy centers on nine high-priority areas ranging from flooding and food insecurity to climate-induced migration, integrated across the four critical sectors of Agriculture, Health, Transport, and Infrastructure. While the National Adaptation Plan (NAP) and NDC 2.0 provide a clear roadmap for addressing these vulnerabilities, implementation is hindered by systemic barriers, including limited subnational institutional capacity, inadequate access to international and domestic climate finance, and significant gaps in localized climate data. Furthermore, the country's rugged geography and remote island clusters create immense logistical challenges that weaken inter-governmental coordination and increase the cost of resilience projects. Overcoming these hurdles requires a concerted effort to harmonize scientific projections with traditional indigenous knowledge, ensuring that adaptation initiatives gain the community ownership and cultural relevance necessary for long-term sustainability.

Papua New Guinea's adaptation strategy is built upon a whole-of-government approach that aligns climate resilience with the national development goals of Vision 2050 and the Medium-Term Development Plan IV. Coordinated by the CCDA, the strategy focuses on mainstreaming climate risk into the core functions of the four priority sectors: Agriculture, Health, Transport, and Infrastructure. Under the NAP, significant progress has been made in establishing sector-specific policies, such as the National Climate Change and Health Action Plan and the Climate Change Resilient Infrastructure Policy. Current efforts are focused on the phased rollout of Provincial Adaptation Plans across pilot provinces, including Morobe and the Autonomous Region of Bougainville, to ensure that national policy effectively translates into localized, community-based action despite persistent funding and technical constraints.

The strategic objectives of the NAP are centered on strengthening institutional capacity, enhancing public awareness, and mobilizing climate finance to achieve ambitious, time-bound targets. Key goals include increasing the climate resilience of 10% of the total population regarding food and water security, ensuring 100% coverage of improved health measures for climate-sensitive diseases like malaria, and implementing early warning systems for 70% of the population. To meet these targets, the NAP outlines a comprehensive roadmap of actions through 2030, which includes scaling up climate-smart agriculture, rehabilitating infrastructure to resilient codes, and protecting coastal ecosystems. These sectoral initiatives are bolstered by cross-cutting priorities in gender responsiveness, ecosystem management, and the development of a national strategy for climate-induced relocation, ensuring a comprehensive and equitable transition toward a climate-resilient future.

Papua New Guinea has made significant progress in implementing adaptation actions, although the absence of a fully operational national Monitoring and Evaluation (M&E) system currently limits comprehensive reporting to a selection of verifiable, high-impact programs. Key achievements include the Building Resilience to Climate Change (BRCC) project, which pioneered climate-proofed maritime infrastructure with the Alotau Wharf and established vulnerability assessments for 21 island communities, and the Western Province Partnership (WPP), which has delivered climate-resilient water and sanitation systems to drought- and flood-prone districts. To bridge the adaptation funding gap, the Climate FIRST initiative was launched to mobilize up to USD 400 million by embedding technical experts within seven priority provinces to develop "bankable" resilience projects. Concurrently, efforts to safeguard food security are being advanced through the ASSA and Enhancing Disaster Resilient Agriculture projects, which transition subsistence farmers toward climate-smart practices, drought-tolerant crops, and community-led early warning systems. Together, these initiatives demonstrate a robust, multi-sectoral shift toward proactive resilience, ensuring that infrastructure, water security, and agricultural livelihoods are increasingly protected from the escalating impacts of climate change.

5. Support Needed and Received

To implement the actions required to achieve its climate targets between 2021 and 2030, Papua New Guinea estimates a total financial requirement exceeding USD 1 billion. This funding is split into USD 750 million for mitigation efforts in the energy and AFOLU sectors and USD 250 million for critical adaptation initiatives. While these figures represent preliminary estimates that require further in-depth analysis to determine exact implementation costs, this report focuses specifically on the disaggregated financial needs for mitigation within the Energy and LULUCF sectors, as specific cost breakdowns for individual adaptation actions under the National Adaptation Plan (NAP) remain challenging to isolate at this stage.

Between 2020 and 2022, Papua New Guinea received a total of USD 324,712,271 in climate-related financial support, encompassing both ongoing legacy programs and new initiatives across the energy, LULUCF, and agriculture sectors. This funding, primarily delivered through multilateral and bilateral grants and loans from partners such as the Asian Development Bank (ADB), European Union (EU), and United Nations agencies, has been instrumental in advancing critical projects, including the Town Electrification Investment Program, the Forest Carbon Partnership Facility, and the National Adaptation Plan. While PNG faces persistent challenges in disaggregating climate-specific funds from broader regional support, the documented finance has directly strengthened national and provincial capacities for climate governance, disaster resilience, and renewable energy infrastructure, although a significant portion of the country's NDC implementation remains dependent on the continued scaling of such international financial and technical assistance.

Chapter 1: National Inventory Report of anthropogenic emissions by sources and removals by sinks of greenhouse gases

Papua New Guinea's National Inventory Report of anthropogenic emissions by sources and removals by sinks of greenhouse gases for the period 2000-2022 was submitted as a stand-alone document, consistent with Decision 18/CMA1. (Annex I.E, paragraph 12).

Chapter 2: Information necessary to track progress made in implementing and achieving nationally determined contributions under Article 4 of the Paris Agreement

2.1. National circumstances and institutional arrangement

2.1.1. Government Structure

Papua New Guinea is a federal constitutional monarchy with three government layers: National, Provincial, and Local. The National Government consists of three principal arms as per the Constitution of Papua New Guinea. This includes the National Parliament, which has the powers of law-making; the National Executive, which is responsible for the administration and implementation of laws and policies at the national level; and the National Judicial System, which is responsibleble for interpreting and upholding the law, ensuring justice, and maintaining the rule of law in the country.

The Provincial and Local-Level Governments (LLGs) in Papua New Guinea, under the Organic Law on Provincial Governments and Local-level Governments, are responsible for delivering basic services such as health, education, infrastructure, and water at the community level. They plan and implement local development projects, maintain law and order, promote customary practices, and manage local resources.

In terms of how climate change issues are addressed through the government structure, the Climate Change (Management) Act was passed by Parliament in 2015, establishing the Climate Change and Development Authority (CCDA), a national-level entity that is responsible for coordinating the implementation of climate change actions in the country. This is done through the mainstreaming of climate actions into sectoral policies, at the national level, and Provincial plans at the provincial and local government levels.

Furthermore, CCDA is responsible for ensuring that Papua New Guinea meets its obligations under the international climate change treaties, including the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris Agreement. In 2016, Parliament passed the United Nations Paris Agreement Implementation Act, which ensures that Papua New Guinea will meet its obligations under the Paris Agreement.

2.1.2. Population Profile

Based on the data from the 2024 National Population Census, Papua New Guinea has experienced a significant demographic shift over the last thirteen years. The national population is now estimated at 10,185,363, marking a substantial 40% increase—equivalent to approximately 2,910,039 additional people—since the 2011 census count of 7,275,324. This trajectory reflects a robust average annual growth rate of 2.6% throughout the intercensal period. Furthermore, the 2024 data indicates a steady social structure across the country, with an average household size of five persons per household. This growth highlights the evolving socio-economic requirements of the nation and the increasing demand for sustainable development and infrastructure.

2.1.3. Geographical Profile

Papua New Guinea is an independent state located in the equatorial region of Maritime Southeast Asia. It occupies the eastern part of the world's second-largest island and is the third-largest island country. Papua New Guinea shares a mainland border with Indonesia and maritime borders with Australia, the Federated States of Micronesia, the Solomon Islands, and New Caledonia.

Papua New Guinea's total land area is 461,388 km^2, and its Exclusive Economic Zone is 3,120,000 km^2. It has a coastline of 21,000 km, more than 5,000 lakes, extensive river systems, and wetlands. The species-rich mainland coastline includes more than 8,000 km of mangrove swamps, lagoons, wetlands, coral reefs and atolls, as well as archipelagos and many offshore islands. Papua New Guinea's geography is diverse, which enables diversity in species, landscapes, and ecosystems. The New Guinea Highlands extend the length of the main island of New Guinea and are predominantly tropical highland rainforest and alpine grassland. Dense rainforests, savannahs, and grassland are in the lowland and coastal regions, as well as large wetland systems associated with the Sepik and Fly rivers.

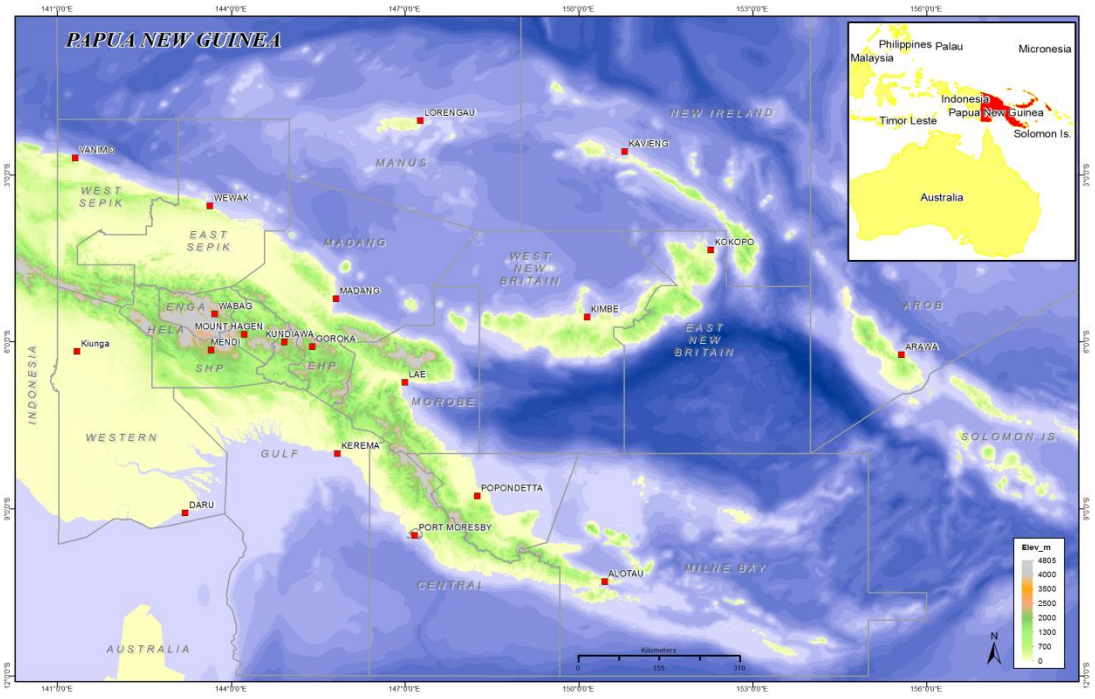

Figure 1: Map of Papua New Guinea

2.1.4. Economic Profile

Papua New Guinea's economy combines traditional subsistence agriculture with an expanding modern sector that depends largely on natural resources. In 2023, Papua New Guinea's GDP at current prices was USD 27.08 billion. The Mining and Quarrying industry, which includes the extraction of crude petroleum and natural gas, contributed the highest with 28.76%, followed by Agriculture, Forestry, and Fishing with 17.80%, and Wholesale and Retail Trade with 10.8%. Contribution from other industries was below 10%. The table below provides an overview of the share of gross value added at the current price by each industry.

Table 1: Industry Share Of Gross Value Added, Current Price- Percentage (%) (source: Papua New Guinea National Accounts (GDP) 2017 -2023, National Statistical Office)

Industry	Industry Share of Gross Value Added at Current Price (%) in 2023
Agriculture, Forestry, and Fishing	17.80%
Mining and Quarrying	28.76%
Manufacturing	1.74%
Electricity, Gas, Steam, and Air Conditioning Supply	0.71%
Water Supply, Sewage, Waste Management	0.24%
Construction	6.64%
Wholesale and Retail Trade	10.08%
Transport and Storage	2.18%
Accommodation and Food Service Activity	1.68%
Information and Communication	1.97%
Financial and Insurance Activities	2.27%
Real Estate Activities	6.20%
Professional, Scientific, and Technical Activities	0.95%
Administrative and Support Service Activities	8.05%
Public Administration and Defence, Compulsory Social Security	5.41%
Education	2.64%
Human Health and Social Work Activities	2.07%
Arts, Entertainment, and Recreation	0.04%
Other Service Activities	0.55%
Activities Of Households As Employers	0.04%

2.1.5. Climate Profile

The “Climate Risk Country Profile of Papua New Guinea” (World Bank, 2021) states that Papua New Guinea has a hot, humid tropical climate, characterised by high temperatures and humidity throughout the year. Papua New Guinea has two monsoonal seasons, namely the north-west monsoons, which occur from December to March, and the south-west monsoons, which occur from May to October. Papua New Guinea is known to possess one of the wettest climates in the world, and rainfall in many areas can exceed 2,500mm per annum, with the heaviest events occurring in the highland regions. While Papua New Guinea recognizes a wet season from November to April and drier months in July, August, and September, precipitation takes place all year round, typically in the range of 200-400mm/month.

In terms of climate projections for Papua New Guinea, the “ Climate Variability, Extremes and Change in the Western Tropical Pacific: New Science and Updated Country Reports” (Australian Bureau of Meteorology and Commonwealth Scientific and Industrial Research Organisation (CSIRO) 2014) outlines the following:

- Annual mean temperatures and extremely high daily temperatures will continue to rise;
- Average rainfall is projected to increase in most areas, along with more extreme rain events;
- Droughts are projected to decline in frequency;
- Ocean acidification is expected to continue;

- The risk of coral bleaching will increase in the future; and
- Sea level will continue to rise

2.1.6. Major Sectors

2.1.6.1. Energy

According to the Asia-Pacific Economic Cooperation (APEC) energy balance table for Papua New Guinea, in 2021, the natural gas production was 11,118 Kiloton of oil equivalent (ktoe), with 10,281 Ktoe exported. Most crude oil produced in Papua New Guinea is exported, and to meet domestic demand, crude oil is imported. The total primary energy supply in 2021 was estimated to be 4670 ktoe, of which oil and petroleum products accounted for 26.5%, natural gas 31.9%, and 41.6% was from renewable.

A total of 1257 ktoe of Crude Oil, comprising both imports and domestic production, was refined in 2021, producing about 1328 ktoe of petroleum products. From this, 39 ktoe was motor gasoline, 644 ktoe was naphtha, 69 ktoe was jet kerosene, 57 ktoe was kerosene, 440 ktoe was Gas/diesel oil, 65 ktoe was fuel oil, and 14 ktoe was LPG.

In 2021, the total final energy consumption was 3419 ktoe, of which 51.1% was solid biomass, 29.2% was petroleum products, and 19.7% was electricity. The other subsector (residential and commercial) was the largest energy-consuming subsector with 1919 ktoe. This is followed by the manufacturing industries and construction subsector with 912 ktoe and the transport subsector with 588 ktoe.

2.1.6.2. Forestry

Papua New Guinea's definition of forest is derived from the definition approved by the National Executive Council (NEC) in 2014 and is " Land spanning more than 1 hectare, with trees higher than 3 meters and the canopy cover of more than 10 percent".

According to the PNG Forest Authority (2023), Papua New Guinea has about 35.95 million hectares (ha) of forest, covering 77.89% of the total land mass. More than 75.13 % of the forest has not been disturbed by anthropogenic activities. The three most dominant forest types, which comprise more than three-quarters of the country, are: low-altitude forest on uplands (30.91%), low-altitude forest on plains and fans (24.77%), and lower montane forest (22.29%).

2.1.6.3. Agriculture

Papua New Guinea's favorable climate and fertile soil provide ideal conditions for the cultivation of a range of cash crops. These cash crops are largely managed in large plantations, but there is also smallholder production in rural communities. Cocoa, coffee, copra, palm oil, rubber, and tea are the main exports. Smallholder farmers play a dominant role in the production of the major industrial crops in the country; however, productivity or yield performance has been stagnant for many years (Department of Agriculture and Livestock, 2024). The table below provides an overview of smallholder yield performance.

Table 2: Smallholder yield performance (source: National Agriculture Sector Plan 2024-2033)

Crop	Estimated Current Yield (kg/ha)	Genetic potential (kg/ha)	Yield below genetic potential (%)
Coffee	600	2,000	70
Cocoa	366	2,500	85.4
Copra	900	1,200	25
Palm Oil	11,720	23,000	49
Rubber	500	3,000	83.3

Subsistence gardeners cultivate about 0.01 to 0.1 ha of land, and smallholder farmers cultivate less than 5 ha. Most gardens are planted with crops continuously for one or two years, then followed for 5-15 years to allow the development of soil fertility. Garden sites are cleared of vegetation by the slash and burn method, without land cultivation and the use of purchased inputs. Sweet potato, potato, banana, sago, taro, yam, cassava, and sugarcane are the main crops harvested.

Papua New Guinea has a major mismatch in its domestic meat consumption and its livestock farming and meat production. This perception is based on the fact that the country produces up to 16,000 tonnes of meat per year, all of which is consumed domestically. However, to meet the local demand, Papua New Guinea imports approximately 67,307 tonnes of meat annually(Department of Agriculture and Livestock, 2024). The rural economy is supplemented by local livestock production that is consumed by the rural community, including pigs, chicken, ducks, and occasionally fish.

2.1.6.4. Industry

Mining industry is the main industry in Papua New Guinea. Since the 1970s, the mining industry has played a central role in shaping Papua New Guinea's economy, serving as one of its primary drivers of economic growth and revenue. The country is rich in mineral resources, with key exports including gold, copper, silver, nickel, and cobalt. These valuable commodities have contributed significantly to government income, employment opportunities, and foreign exchange earnings. Mining operations are geographically dispersed across the country, reflecting the widespread presence of mineral deposits. Some of the most prominent and productive mining sites include the Ok Tedi Copper and Gold Mine, Porgera Gold Mine, Lihir Gold Mine, Hidden Valley Gold Mine, Simberi Gold Mine, Tolukuma Gold Mine, and the Ramu Nickel Mine. These projects have supported regional development and infrastructure, although they have also raised concerns related to environmental degradation and social impacts.

Looking ahead, Papua New Guinea's mining sector is poised for further expansion, with several major resource projects currently under consideration or in the early stages of development. Among the most notable are the Wafi-Golpu and Frieda River projects, both of which have the potential to significantly boost the country's mineral output and economic standing. These ventures are expected to attract substantial foreign investment, generate local employment, and enhance government revenues through royalties and taxes. However, they also present challenges related to land rights, environmental management, and community engagement, which will require careful planning and regulation. As the sector continues to grow, balancing economic benefits with sustainable development and environmental protection will be essential for Papua New Guinea's long-term prosperity.

2.1.6.5. Waste

Waste management practices in Papua New Guinea differ significantly between urban and rural areas. In urban centers, some communities benefit from waste collection services provided by private companies. However, in most rural regions where such services are unavailable, waste is typically managed through dumping, burning, or burying. Waste recovery efforts are mainly led by the private sector, focusing on materials like scrap metals, e-waste, used oil, lead-acid batteries, and PET plastics, which are mostly exported for recycling. Informal waste pickers at Port Moresby's Baruni landfill also retrieve recyclable materials such as metals and plastics. Additionally, larger waste items—including vehicles at the end of their life cycle, scrap steel, tires, ceramic tiles, e-waste, glass, gas cylinders, and household appliances—are collected and stored. Some major retailers and wholesalers have also introduced basic product stewardship programs, accepting printer cartridges, mobile phones, and e-waste for export recycling.

The waste management framework in Papua New Guinea involves both government and private sector entities. The country's three levels of government—national, provincial, and local (urban and district)—each play roles in waste management through various legislative measures and supporting regulations.

A number of key legal instruments are in place to guide environmental protection and waste management responsibilities across these different levels of government.

2.2. Legal, institutional, administrative, and procedural arrangements for domestic implementation, monitoring, reporting, archiving of information, and stakeholder engagement related to the implementation and achievement of Papua New Guinea's Nationally Determined Contribution under Article 4

Papua New Guinea has an NDC-specific regulation known as the Climate Change (Management) (Nationally Determined Contribution) Regulation. This regulation sets out procedures on how Papua New Guinea will prepare and implement its NDCs. CCDA is in charge of making sure the NDCs are prepared and effectively implemented across the country. This includes working with both national and provincial governments to ensure everyone is doing their part. It can also gather information from organisations involved in climate-related sectors and take the necessary actions to fulfill its duties.

Under this regulation, CCDA is required to prepare an Implementation Plan to guide the implementation of the NDCs. The plan will include the list of actions for achieving the targets, the implementing institution, the timeframe for implementing these actions, and the required resources, such as finance. The implementing institutions are required to collect and record information and data relevant to the actions identified in the Implementation Plan. This information and data will be provided to CCDA to track the progress of the NDC targets.

The Regulation also establishes a Technical Advisory Committee (TAC) to support CCDA by monitoring how Papua New Guinea is meeting the NDC targets. Additionally, the TAC is also responsible for providing technical advice to CCDA, including coordinating the data collection process for tracking the implementation of the NDC targets.

2.3. Description of Papua New Guinea's Nationally Determined Contribution under Article 4 of the Paris Agreement, including updates

Papua New Guinea submitted its first Nationally Determined Contribution (INDC) to the UNFCCC in 2016, outlining its approach to reducing greenhouse gas (GHG) emissions. However, there were no qualitative or quantitative targets, including reference year, reference level, and to some extent, target level for the forestry sectors, due to the unavailability or unreliable data during the preparation of the first NDC.

Mitigation opportunities are centered around the electricity, forestry, energy efficiency, and transport sectors. The electricity sector presents the greatest immediate opportunity, with a national target to become 100% renewable by 2030. This goal is supported by existing hydro capacity, potential for additional hydro and geothermal development, and solar photovoltaic (PV) systems. Biomass resources also present potential, although their use must be balanced with land-use considerations.

Forestry is another key area, with Papua New Guinea aiming to reduce emissions through the implementation of REDD+ (Reducing Emissions from Deforestation and Forest Degradation) under the UNFCCC framework. Energy efficiency is highlighted as a cost-effective strategy but has not been widely implemented due to financial constraints. The transport sector poses greater challenges due to growing

urbanization and rising vehicle use, although future improvements to public transport could contribute to emission reductions.

Furthermore, Papua New Guinea also included adaptation in its first NDC, which outlines critical focus due to Papua New Guinea's high vulnerability to climate impacts. Nine key hazards ranging from coastal and inland flooding to food insecurity, climate-induced migration, and public health risks have been prioritized under the national adaptation policy, reflecting the urgent need to build climate resilience across sectors.

Papua New Guinea emphasizes the need for significant international support both financial and technical to realize its mitigation goals. This includes funding for renewable energy projects, assistance with REDD+ implementation, and capacity building for data collection and monitoring. Tracking and monitoring will follow IPCC 2006 guidelines, with efforts underway to improve national systems for Measurement, Reporting, and Verification (MRV).

In 2020, Papua New Guinea submitted its NDC 2.0 in line with Article 4 of the Paris Agreement. It contains mitigation contributions from the energy sector and the Land-Use, land-use change, and forestry sector (LULUCF), covering the period 2021-2030. Contributions from the LULUCF sector are GHG targets, while the energy sector is non-GHG targets. Detailed descriptions are provided in the table below.

In addition to the mitigation contributions, the NDC 2.0 also includes adaptation actions for four priority sectors, namely agriculture, health, transport, and infrastructure. Details of these actions are outlined in Chapter 3. However, the NDC 2.0 does not capture the mitigation co-benefits of these actions or the country's economic diversification plan.

All targets and actions in Papua New Guinea's NDC 2.0 are fully (100%) conditional on international support such as technology, technical assistance, and capacity building. Progress on the support that Papua New Guinea has received for the implementation of its NDC 2.0 is captured in Chapter 4. Papua New Guinea is in the process of preparing its NDC 3.0, which will outline more ambitious mitigation targets.

Table 3: Description of Papua New Guinea's NDC 2.0

Description	
Target(s) and description, including target type(s), as applicable	To be 50 percent carbon neutral by 2030, and be entirely carbon neutral by 2050. The targets for the energy sector include **a. <u>Non-GHG quantitative target</u>** • Enhancing levels of renewables in the energy mix from 30% in 2015 to 78% by 2030 for on-grid connection b. **<u>Non-GHG action-based target</u>** • Reducing electricity demand through energy efficiency • Fossil fuel offsetting from the energy industries subsector through nature-based solutions The targets for the LULUCF sector include **1. <u>GHG Absolute target</u>** • This target outlines that by 2030, annual net emission from deforestation and forest degradation due to agriculture

	expansion and commercial logging is reduced by 10,000 Gg CO_2 eq compared to the 2015 level **2. <u>GHG Relative target</u>** • This target outlines that the LULUCF sector will be converted from a net GHG source (1,716 Gg CO_2 eq) in 2015 to a net GHG sink (-8,284 Gg CO_2 eq) by 2030 to mitigate emissions from other sectors **3. <u>Non-GHG Quantitative targets</u>** • The area of annual deforestation is reduced by 25 % of 2015 level by 2030 (equating to a reduction of 8,300 ha of annual deforestation); • The area of forest degradation is reduced by 25% of the 2015 levels by 2030 (equating to a reduction of 43,300ha of annual degradation); and • The area of planted forest and forest restoration is increased
Target year(s) or period(s), and whether they are single-year or multi-year target(s), as applicable	2030
Reference point(s), level(s), baseline(s), base year(s) or starting point(s), and their respective value(s), as applicable	Energy sector • 30% Renewable Energy mix in 2015 • No energy efficiency policy in 2020 • No fossil fuel offsetting framework in 2020 LULUCF sector • 1,716 Gg CO_2 eq in 2015 • 33,566 hectares of deforestation in 2015 • 168,266 hectares of forest were degraded in 2015
Time frame(s) and/or periods for implementation, as applicable	2020-2030
Scope and coverage, including, as relevant, sectors, categories, activities, sources and sinks, pools and gases, as applicable	Energy sector • Energy industries sub-category (as per 2006 IPCC guideline) LULUCF sector • Forest land category (as per 2006 IPCC guideline) • Crop land category (as per 2006 IPCC guideline) • Pools include above-ground and below-ground biomass
Intention to use cooperative approaches that involve the use of ITMOs under Article 6 towards NDCs under Article 4 of the Paris Agreement, as applicable	Papua New Guinea's NDC is fully conditional on the provision of international support, including finance, technology development and transfer, and capacity-building. In this context, Papua New Guinea recognizes that cooperative approaches under Article 6 of the Paris Agreement may represent a potential means to support the implementation and achievement of its NDC in the future. As of the reporting period, Papua New Guinea has not authorized the use of internationally transferred mitigation outcomes (ITMOs) pursuant to Article 6, and no mitigation outcomes have been transferred or used towards the achievement of its NDC

2.4. Information necessary to track progress made in implementing and achieving its nationally determined contribution under Article 4 of the Paris Agreement

Papua New Guinea used the indicators described in the table below to track the progress and achievement of Papua New Guinea's NDC targets, as mentioned in the previous section.

Table 4: Indicators to track the progress and achievement of Papua New Guinea's NDC 2.0

Indicators	Details
% of renewable energy mix	Indicator that measures the achievement of increasing the share of renewable energy that will be achieved by 2030
Number of policies developed	Indicator that measures the achievement of non-GHG action-based targets by 2030 for the energy sector, which are policy instruments
Total net CO_2 emissions	Indicator that measures the achievement of LULUCF target from a net source in 2015 to net sink by 2030
Reduction of CO_2 emissions	Indicator that measures the achievement of LULUCF absolute target of the total amount of CO_2 emissions reduced from the LULUCF sector by 2030
Area of deforestation	Indicator that measure the decrease in the area of deforestation by 2030
Area of forest degradation	Indicator that measure the decrease in the area of forest degraded by 2030

In terms of the methodologies and accounting approaches, the LULUCF sector used the methodology outlined in the 2006 IPCC guidelines, utilizing both Tier 1 and Tier 2 methods, which is consistent with the methodologies used for the BUR1 and BUR2. These methods help estimate emissions or removals and account for various land-use changes in the sector. However, it should be noted that for this submission (BTR1 and NID) there were some recalculations made for the LULUCF sector as outlined in the NID. Although, the similar methodologies for the BUR1 and BUR2 were used to track progress of implementation, as reported in the table below.

Emissions from harvested wood products are considered zero since instantaneous oxidation is assumed during the time primary forest is converted to a degraded forest. Thus, HWP instantaneous oxidation (IPCC default approach) was applied. Papua New Guinea's major long logs are exported, and very few to no logs are processed on shore.

Additionally, the Business-as-Usual (BAU) scenario was used to establish the baseline for the LULUCF sector, providing a reference point for evaluating future emissions and assessing the effectiveness of various mitigation strategies.

Energy sector targets are all non-GHG.Thus, the methodology and/or accounting approach for the renewable energy target will include the total installed capacity of renewable energy sources installed on the on-grid system. This data will be provided by the regulator of the electricity sector. As for the action-based targets, the accounting approach will involve monitoring the preparation and implementation of the identified policies.

In terms of the progress of the implementation of the NDC 2.0, Papua New Guinea has made significant progress in both the energy and LULUCF sectors between 2020 and 2022. This is as outlined in the table below. This progress is due to the amount of support that has been provided

Table 5: Tracking progress in implementing and achieving the NDC

Indicators	Unit	Reference year	Reference level	Target year	Target level	Level in 2020	Level in 2021	Level in 2022
Share of renewable energy mix	%	2015	30	2030	78	28%	30%	28%
Number of policies developed		2020	0	2030	2 policies developed	0	0	0
Total net CO_2 emissions	Gg CO_2 eq	2015	1,716	2030	-8,284	-11,283	-7,993	-6,895
Reduction of CO_2 emissions	Gg CO_2 eq	2000	NA	2030	10,000	12,999	9,709	8,611
Area of deforestation	Ha	2015	33,566	2030	25,175	14,740	25,996	21,526
Area of forest degradation	Ha	2015	168,266	2030	126,200	120,998	114,424	142,081

2.5. Mitigation policies and measures, actions and plans, including those with mitigation co-benefits resulting from adaptation actions and economic diversification plans, related to implementing and achieving Papua New Guinea's NDC under Article 4 of the Paris Agreement

This section provides information on the mitigation policies and measures, actions, and plans that will be implemented to achieve Papua New Guinea's NDC 2.0 are under the energy and LULUCF sector as per Papua New Guinea's mitigation contribution. The main sectors are energy and LULUCF as per Papua New Guinea's mitigation contribution in the NDC 2.0 outlined in the previous section.

2.5.1. Energy Sector

The mitigation policies and measures, actions, and plans that will be implemented to achieve the energy targets in the NDC 2.0 include;

i. Papua New Guinea's Sustainable Development Goal 13 Roadmap;

ii. National Energy Policy 2017-2027;

iii. NDC Implementation Roadmap for the Electricity Sector;

iv. Wind Energy Policy 2025-2030;

v. Solar Energy Policy 2025-2030;

vi. Hydro Energy Policy 2025-2030;

vii. Geothermal Energy Policy 2025-2030;

viii. Bioenergy Policy 2025-2030;

2.5.1.1. Papua New Guinea's Sustainable Development Goal 13 Roadmap

The table below provides an overview of Papua New Guinea's Sustainable Development Goal Roadmap.

Table 6: Overview of Papua New Guinea's Sustainable Development Goal 13 Roadmap

Desciption	The Roadmap consists of a set of 30 actions that need to be achieved by 2030. The timeline outlines four phases of milestones that will act as the foundation for Papua New Guinea to achieve the 30 actions of the Roadmap by 2030 and, therefore, the key targets of SDG13 and Papua New Guinea's NDC. Critically, the 30 actions of the Roadmap are intended not only address the challenges of climate change but also help set Papua New Guinea on a pathway to a truly climate-smart, healthy, and prosperous nation.
Objective	The Roadmap maps out a path towards climate-compatible development, which will reduce Papua New Guinea's vulnerability to climate change and contribute to global action on reducing greenhouse emissions
Type of Instrument	Policy
Status	Under Implementation
Sectors affected	Energy, Forestry, Infrastructure, Agriculture, Minerals, Fisheries, and Tourism
Gases affected	CO_2, CH_4, N_2O
Implementing Entity or Entities	Climate Change and Development Authority
Start year of implementation	2020
Expected GHG emissions reductions (CO_2 eq)	The policy does not provide an estimate of expected GHG emission reductions. Thus, for this reporting item, the country needed flexibility due to limited capacities.
Achieved GHG emissions reductions (CO_2 eq)	The country will also need flexibility for this reporting item due to limited capacities.

2.5.1.2. National Energy Policy 2017 – 2027

The table below provides an overview of the National Energy Policy.

Table 7: Overview of the National Energy Policy

Desciption	The vision of the National Energy Policy is to improve the quality of life for every citizen and provide a platform for strong economic growth through sustainable development. The goal is to provide sufficient, accessible, reliable, and affordable energy in a manner that is competitive, sustainable, and environmentally friendly. The key focus areas include: i. Strengthen institutional capacity and recruit appropriate human resources to manage the energy sector; ii. Develop an integrated planning process for sustainable energy supply and utilization; iii. All energy resources will be developed by the State for the betterment of all citizens;

	iv. Promote a conducive environment for long-term sustainable economic solutions in the supply of all energy sources v. Encourage involvement of the private sector in the development and provision of energy infrastructure and services. vi. Ensure energy resources are developed and delivered in an environmentally sustainable manner; vii. Promote efficient systems and safety in energy supply in all sectors; viii. Diversify the cost-effective development and utilization of energy resources for the nation's well-being and economic prosperity; and ix. Promote energy efficiency and conservation measures and wise use of energy
Objective	The general objective of the energy policy is to ensure an affordable, competitive, sustainable, and reliable supply of energy to meet national and provincial development needs at the least cost while protecting and conserving the environment.
Type of Instrument	Policy
Status	Under Implementation
Sectors affected	Energy
Gases affected	CO_2, CH_4, N_2O
Implementing Entity or Entities	National Energy Authority
Start year of implementation	2017
Expected GHG emissions reductions (CO_2 eq)	The policy does not provide an estimate of expected GHG emission reductions. Thus, for this reporting item, the country needed flexibility due to limited capacities.
Achieved GHG emissions reductions (CO_2 eq)	The country will also need flexibility for this reporting item due to limited capacities.

2.5.1.3. NDC Implementation Roadmap for the Electricity Sector

The table below provides an overview of the NDC Implementation Roadmap for the Electricity Sector

Table 8: Overview of NDC Implementation Roadmap for the Electricity sector

<table>
<tr><td></td><td></td></tr>
<tr><td>Desciption</td><td>The goal of the Roadmap is to support Papua New Guinea's aspiration for a 78% share of renewable energy in the on-grid system by 2030. The Roadmap identifies 37 projects that are to be implemented in the period 2021 to 2030. This includes planned projects and proposed projects. Planned projects are projects that are under implementation, pre-feasibility, feasibility, or being built. Proposed projects are at the earlier planning stage, generally do not have a business case, and require substantial preparatory work to build a business case and implement.
<table>
<tr><th></th><th>Short term (2021-2023)</th><th>Medium term (2021-2023)</th><th>Long term (2021-2023)</th></tr>
<tr><td>Planned Projects</td><td>2 Solar, 7 hydro</td><td>4 hydro, 1 biomass</td><td>1 hydro</td></tr>
</table>
</td></tr>
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	Proposed Projects	6 Solar	4 solar, 3 hydro	8 hydro, 1 biomass
Objective	The objectives of the roadmap includes • Establish a temporal and spatial pathway to implementing targets set on in the NDC 2.0; • Prioritize types of electricity generation plants based on technology; • Catalogue any newly emerging programs or activities; and • Articulate challenges and barriers to implementing activities and establish the next steps			
Type of Instrument	Other (Roadmap of NDC 2.0)			
Status	Implemented			
Sectors affected	Energy (electricity)			
Gases affected	CO_2, CH_4, N_2O			
Implementing Entity or Entities	National Energy Authority, PNG Power Limited, Independent Power Producers			
Start year of implementation	2020			
Expected GHG emissions reductions (CO_2 eq)	The roadmap does not provide an estimate of expected GHG emission reductions since it will be an instrument used to guide the implementation of the renewable energy target in the NDC. Thus, for this reporting item, the country needed flexibility due to limited capacities.			
Achieved GHG emissions reductions (CO_2 eq)	The country will also need flexibility for this reporting item due to limited capacities.			

2.5.1.4. Wind Energy Policy 2025-2030

The table below provides an overview of the Wind Energy Policy.

Table 9: Overview of the Wind Energy Policy

Desciption	This Policy focuses on creating an enabling framework to promote in investment in the wind energy subsector, contributing to the nation's renewable energy mix. This Policy aims to establish the platform that drives investments in harnessing wind energy potential that can contribute to achieving national electrification goals, by providing 70% of the households with access to electricity by 2030 and 100% by 2050, primarily from renewable sources. This policy addresses technical, regulatory, and socio-economic aspects, aligning with international climate commitments and national development plans to ensure sustainable and inclusive growth in Papua New Guinea's energy sector. This Policy recognizes that achieving electrification targets in Papua New Guinea requires both on-grid and off-grid solutions. By supporting the development of large-scale, on-grid wind energy projects and promoting smaller, off-grid power systems in rural areas, this Policy aims to ensure that all households and businesses across the country have access to reliable, affordable, and sustainable electricity. Furthermore, this Policy encourages the integration of decentralized off-grid systems into the

	national grid where feasible, by facilitating a seamless transition for rural and isolated areas as the grid expands.
Objective (s)	i. To establish effective regulatory frameworks that promote the sustainable development of wind energy projects; ii. To establish mechanisms that support public and private investment in wind energy projects; iii. To contribute to achieving Papua New Guinea's renewable energy targets under its enhanced Nationally Determined Contributions (NDC) while promoting Just Transition; iv. To contribute to Papua New Guinea's energy needs by ensuring an accessible, reliable, and affordable electricity supply; v. To promote sustainable growth and improve the socio-economic well-being of our people through partnerships.
Type of Instrument	Policy
Status	Under Implementation
Sectors affected	Energy
Gases affected	CO_2, CH_4, N_2O
Implementing Entity or Entities	National Energy Authority
Start year of implementation	2025
Expected GHG emissions reductions (CO_2 eq)	The policy does not provide an estimate of expected GHG emission reductions. Thus, for this reporting item, the country needed flexibility due to limited capacities.
Achieved GHG emissions reductions (CO_2 eq)	The country will also need flexibility for this reporting item due to limited capacities.

2.5.1.5. Solar Energy Policy 2025-2030

The table below provides an overview of the Solar Energy Policy.

Table 10: Overview of the Solar Energy Policy

Desciption	This policy focuses on creating an enabling framework to promote investment in the solar energy subsector, contributing to the nation's renewable energy mix. This Policy aims to harness Papua New Guinea's abundant solar energy potential to achieve national electrification goals, by providing 70% of the households with access to electricity by 2030 and 100% by 2050, primarily from renewable sources. It addresses technical, regulatory, and socio-economic aspects, aligning with international climate commitments and national development plans to ensure sustainable and inclusive growth in Papua New Guinea's energy sector. This Policy recognizes that achieving electrification targets in Papua New Guinea requires both on-grid and off-grid solutions. By supporting the development of large-scale, on-grid solar energy projects and promoting smaller, off-grid power systems in rural areas, this Policy aims to ensure that all households and businesses across the country have access to reliable, affordable, and sustainable electricity. Furthermore, this Policy encourages the integration of decentralized off-

	grid systems into the national grid where feasible, facilitating a seamless transition for rural and isolated areas as the grid expands.
Objective	i. Establishment of an effective regulatory framework that promotes sustainable development of Solar energy projects. ii. To establish mechanisms that support public and private investment in Solar energy projects. iii. To contribute to achieving Papua New Guinea's renewable energy targets under its enhanced Nationally Determined Contributions (NDC) while promoting Just Transition. iv. To contribute to Papua New Guinea's energy needs by ensuring accessible, reliable and affordable electricity supply. v. To promote sustainable growth and improve the socio-economic well-being of our people through partnerships.
Type of Instrument	Policy
Status	Under Implementation
Sectors affected	Energy
Gases affected	CO_2, CH_4, N_2O
Implementing Entity or Entities	National Energy Authority
Start year of implementation	2025
Expected GHG emissions reductions (CO_2 eq)	The policy does not provide an estimate of expected GHG emission reductions. Thus, for this reporting item, the country needed flexibility due to limited capacities.
Achieved GHG emissions reductions (CO_2 eq)	The country will also need flexibility for this reporting item due to limited capacities.

2.5.1.6. Hydro Energy Policy 2025-2030

The table below provides an overview of the Hydro Energy Policy.

Table 11: Overview of the Hydro Energy Policy

Desciption	This Policy focuses on creating an enabling framework to promote investment in the hydro energy subsector, contributing to the nation's renewable energy mix. This Policy aims to establish the platform that drives investments in harnessing Papua New Guinea's abundant hydropower potential to achieve national electrification goals by contributing to providing 70% of the households with access to electricity by 2030 and 100% by 2050. This policy addresses technical, regulatory, and socio-economic aspects, aligning with international climate commitments and national development plans to ensure sustainable and inclusive growth in Papua New Guinea's energy sector. This Policy recognizes that achieving electrification targets in Papua New Guinea requires both on-grid and off-grid solutions. By supporting the development of large-scale, on-grid hydropower projects and promoting smaller, off-grid power systems in rural areas, the Policy aims to ensure that all households and businesses across the country have access to reliable, affordable, and sustainable electricity. Furthermore, this Policy encourages the integration of decentralized off-grid systems into the

	national grid where feasible, facilitating a seamless transition for rural and isolated areas as the grid expands.
Objective	i. To establish an effective regulatory framework that promotes sustainable development of hydro energy projects. ii. To establish mechanisms that support public and private investment in hydro energy projects. iii. To contribute to achieving Papua New Guinea's renewable energy targets under its enhanced Nationally Determined Contributions (NDC) while promoting a Just Transition. iv. To contribute to Papua New Guinea's energy needs by ensuring an accessible, reliable, and affordable electricity supply. v. To promote sustainable growth and improve the socio-economic well-being of our people through partnerships.
Type of Instrument	Policy
Status	Under Implementation
Sectors affected	Energy
Gases affected	CO_2, CH_4, N_2O
Implementing Entity or Entities	National Energy Authority
Start year of implementation	2025
Expected GHG emissions reductions (CO_2 eq)	The policy does not provide an estimate of expected GHG emission reductions. Thus, for this reporting item, the country needed flexibility due to limited capacities.
Achieved GHG emissions reductions (CO_2 eq)	The country will also need flexibility for this reporting item due to limited capacities.

2.5.1.7. Geothermal Energy Policy 2025-2030

The table below provides an overview of the Geothermal Energy Policy.

Table 12: Overview of the Geothermal Energy Policy

Desciption	This Policy focuses on creating an enabling framework to promote investment in the geothermal energy subsector, contributing to the nation's renewable energy mix. This Policy aims to harness Papua New Guinea's abundant geothermal energy potential to achieve national electrification goals, by providing 70 per cent of the households with access to electricity by 2030 and 100 per cent by 2050, primarily from renewable energy sources. It addresses technical, regulatory, and socio-economic aspects, aligning with international climate commitments and national development plans to ensure sustainable and inclusive growth in Papua New Guinea's energy sector. This Policy recognizes that achieving electrification targets in Papua New Guinea requires both on-grid and off-grid solutions. By supporting the development of geothermal energy, this Policy aims to ensure that all households and businesses across the country have access to reliable, affordable, and sustainable electricity. Furthermore, this Policy encourages the integration of decentralized off-grid systems into the national grid where

	feasible, facilitating a seamless transition for rural and isolated areas as the grid expands.
Objective	i. The establishment of an effective regulatory framework that promotes sustainable development of Geothermal energy projects. ii. To establish mechanisms that support public and private investment in Geothermal energy projects. iii. To contribute to achieving Papua New Guinea's renewable energy targets under its enhanced Nationally Determined Contributions (NDC) while promoting Just Transition. iv. To contribute to Papua New Guinea's energy needs by ensuring accessible, reliable and affordable electricity supply. v. To promote sustainable growth and improve the socio-economic well-being of our people through partnerships.
Type of Instrument	Policy
Status	Under Implementation
Sectors affected	Energy
Gases affected	CO_2, CH_4, N_2O
Implementing Entity or Entities	National Energy Authority
Start year of implementation	2025
Expected GHG emissions reductions (CO_2 eq)	The policy does not provide an estimate of expected GHG emission reductions. Thus, for this reporting item, the country needed flexibility due to limited capacities.
Achieved GHG emissions reductions (CO_2 eq)	The country will also need flexibility for this reporting item due to limited capacities.

2.5.1.8. Bioenergy Policy 2025-2030

The table below provides an overview of the Bioenergy Policy.

Table 13: Overview of the Bioenergy Policy

Description	This Policy focuses on creating an enabling framework to promote investment in the bioenergy energy subsector, contributing to the nation's renewable energy mix. This Policy aims to establish the platform that drives investments in harnessing Papua New Guinea's abundant bioenergy energy potential to achieve national electrification goals, by providing 70% of the households with access to electricity by 2030 and 100% by 2050. It addresses technical, regulatory, and socio-economic aspects, aligning with international climate commitments and national development plans to ensure sustainable and inclusive growth in Papua New Guinea's energy sector. This Policy also recognizes that achieving electrification targets in Papua New Guinea requires both on-grid and offgrid solutions. By supporting the development of bioenergy projects, this Policy aims to ensure that all households and businesses across the country have access to reliable, affordable, and sustainable electricity. Furthermore, this Policy encourages the integration of decentralized off-

	grid systems into the national grid where feasible, facilitating a seamless transition for rural and isolated areas as the grid expands.
Objective	i. The establishment of an effective regulatory framework that promotes sustainable development of bioenergy projects. ii. To establish mechanisms that support public and private investment in bioenergy projects. iii. To contribute to achieving Papua New Guinea's renewable energy targets under its enhanced Nationally Determined Contributions (NDC) while promoting Just Transition. iv. To contribute to Papua New Guinea's energy needs by ensuring accessible, reliable, and affordable electricity supply. v. To contribute to Papua New Guinea's energy needs by ensuring accessible, reliable, and affordable electricity supply.
Type of Instrument	Policy
Status	Under Implementation
Sectors affected	Energy
Gases affected	CO_2, CH_4, N_2O
Implementing Entity or Entities	National Energy Authority
Start year of implementation	2025
Expected GHG emissions reductions (CO_2 eq)	The policy does not provide an estimate of expected GHG emission reductions. Thus, for this reporting item, the country needed flexibility due to limited capacities.
Achieved GHG emissions reductions (CO_2 eq)	The country will also need flexibility for this reporting item due to limited capacities.

2.5.2. LULUCF Sector

The mitigation policies and measures, actions, and plans that will be implemented to achieve the LULUCF targets in the NDC 2.0 include;

i. National REDD+ Strategy; and

ii. NDC Implementation Roadmap for the AFOLU Sector

2.5.2.1. National REDD+ Strategy

The table below provides an overview of the National REDD+ Strategy

Table 14: Overview of National REDD+ Strategy

Description	The National REDD+ Strategy outlines three action areas, each with specific actions to be undertaken during the implementation period from 2017 to 2027. The first action area is strengthening Land-Use and Development Planning. Under this action area, the two specific actions to be implemented are: (1) Strengthened and Coordinated National Level Development and Land Use Planning; and (2) Integrated Subnational planning.

	The Second Action Area is Strengthened Environmental Management, Protection and Enforcement. Under this area, there are four specific actions: (1) Strengthening climate change legislation, financing and management; (2) Strengthening Forest management and enforcement practices; (3) strengthening conservation and environmental management; and (4) Strengthening access to information and resource mechanisms (multistakeholder action). The Third Action Area is Enhanced Economic Productivity and Sustainable Livelihoods. Under this area, there are two specific actions to be implemented: (1) Development of a sustainable commercial agriculture sector; and (2) Strengthened food security and increase productivity of family agriculture (lead agencies are DAL and Fresh Produce Development Agency (FPDA).
Objective	To catelyse transformational change within the forest and land use sector towards a new responsible economy with lower GHG emissions, stronger long term economic growth and community livelihoods and the effective conservation of biodiversity and ecosystem services while ensuring that Papua New Guinea's forest resources are used in a sustainable and equitable manner for the benefit of current and future generations.
Type of Instrument	Policy
Status	Under Implementation
Sectors affected	LULUCF
Gases affected	CO_2
Implementing Entity or Entities	CCDA, PNGFA, CEPA, and DAL, DNPM, DLPP, DPLGA, Fresh Produce Development Agency (FPDA)
Start year of implementation	2017
Expected GHG emissions reductions (CO2 eq)	Papua New Guinea submitted its first Forest Reference Level to the UNFCCC in 2015. The FRL is based on linear projections for the period 2014 to 2018. • 2014 - 43,369,737 t CO_2 eq/year • 2015 - 45,049,344 t CO_2 eq/year • 2016 - 46,728,951 t CO_2 eq/year • 2017- 48,408,557 t CO_2 eq/year • 2018 - 50,088,164 t CO_2 eq/year In 2023, Papua New Guinea submitted an updated FRL to the UNFCCC. The updated FRL was based on the historical average of 40,518,579 tCO_2 eq for the period 2019 to 2027.
Achieved GHG emissions reductions (CO2 eq)	The results achieved against the first FRL for the period 2014 to 2018, as reported in the REDD+ Technical annexes of the BUR1 and BUR2, are as follows: • 2014 - 3,957,412 t CO_2 eq/year • 2015 - 5,045,902 t CO_2 eq/year • 2016 - 13,777,302 t CO_2 eq/year • 2017 - 24,394,158 t CO_2 eq/year • 2018 - 23,169,695 t CO_2 eq/year

	Results achieved against the updated FRL for the period 2019 to 2022, which are captured in Annex I: REDD+ technical annex of this report, are as follows: • 2019 - 22,270,381 t CO_2 eq/year • 2020 - 18,643,620 t CO_2 eq/year • 2021 - 15,189,751 t CO_2 eq/year • 2022 - 13,455,063 t CO_2 eq/year

2.5.2.2. NDC Implementation Roadmap for the AFOLU Sector

The table below provides an overview of the NDC Implementation Roadmap for the AFOLU Sector

Table 15: Overview of NDC Implementation Roadmap for the AFOLU Sector

Desciption	The goal of the Roadmap is to enhance coordinated action and investment towards the delivery and further enhancement of Papua New Guinea's targets within the AFOLU sector. The Roadmap identifies 15 direct actions that will be implemented from 2021 to 2030, depending on the support that will be provided. This includes: • Enhanced monitoring and enforcement of timber legality • Regulation of small-scale timber (>500m^3 pa) • Enhance the supply of planted timber and reforestation • Establish an enhanced environment for forestry governance • Establish a transition package for old timber concessions • Strengthened application of environmental safeguards • Enhanced protected area development and management • Establish a national sustainable land use planning framework • Establish a national sustainable land use planning information system • Develop spatially explicit subnational development plans • Strengthen the agricultural planning and policy framework and its application • Strengthen access to and quality of extension systems • Strengthen framework for sustainable palm oil development • Strengthen framework for sustainable coffee development
Objective	The objective of the Roadmap is to provide a clear AFOLU NDC Implementation Roadmap around which action and investment can be mobilized.
Type of Instrument	Other (Roadmap of NDC 2.0)
Status	Under Implementation
Sectors affected	LULUCF
Gases affected	CO_2
Implementing Entity or Entities	CCDA, PNGFA, CEPA, and DAL, DNPM, DLPP
Start year of implementation	2020
Expected GHG emissions reductions (CO2 eq)	Refer to the NDC 2.0 target
Achieved GHG emissions reductions (CO2 eq)	Refer to table 5: Tracking progress in implementing and achieving the NDC

2.6. Summary of greenhouse gas emissions and removals

As mentioned in Chapter 1, Papua New Guinea decided to submit a stand-alone national inventory report, that is, the NID. Thus, as per Decision 18/CMA 1, this section provides a summary of Papua New Guinea's GHG emissions and removals for the years 2000 to 2022 in table format, which corresponds with the information in the NID.

PNG's GHG inventory from 2000 to 2022 illustrates a transition from a significant net carbon sink to a net emitter, driven by rising industrial activity and fluctuating sequestration levels. In 2000, the nation maintained a net-negative profile of approximately -23,405.24 Gg CO_2 eq, as the LULUCF sector effectively offset all anthropogenic outputs; however, a surge in Energy sector emissions eventually led to a peak net positive of 10,503.69 Gg CO_2 eq in 2015. More recent figures show a decline to approximately 3,900 Gg CO_2 eq in 2022.

The total GHG emissions, without the LULUCF, increased from 9,159.47 Gg CO_2 eq to 18,178.90 Gg CO_2 eq, an increase of 98%. The energy sector contributed the highest in 2022 with 15,660.99 Gg CO_2 eq (86%) followed by the waste sector with 1,608.72 Gg CO_2 eq (9%), Agriculture with 764.03 Gg CO_2 eq (4%), and IPPU with 145.17 Gg CO_2 eq (1%). The table below also provides total GHG emissions and removals, excluding and including LULUCF, for each inventory year 2000 to 2022.

Table 16:Total annual GHG emissions by sectors

	Sector`	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	Energy	$Gg\ CO_2\ eq$	8,089.83	7,858.72	7,655.46	7,905.16	7,547.00	7,926.07	9,551.15	7,574.31	7,747.68	7,744.76	6,952.51	7,359.67
2	IPPU		0.82	0.82	0.82	1.58	2.38	2.41	2.50	2.45	2.38	2.39	2.40	2.59
3	Agriculture		478.27	474.32	483.83	476.36	509.38	500.76	525.20	538.58	539.56	596.23	675.32	585.48
4	LULUCF		-32,564.71	-31,738.46	-22,943.93	-23,449.65	-19,843.56	-27,480.50	-21,764.90	-18,977.69	-17,260.61	-13,070.80	-8,363.11	-5,632.14
5	Waste		590.55	614.48	639.27	669.57	697.22	722.99	749.26	776.78	807.53	835.13	863.65	892.33
Total including LULUCF		$Gg\ CO_2\ eq$	-23,405.24	-22,790.12	-14,164.55	-14,396.98	-11,087.57	-18,328.26	-10,936.79	-10,085.56	-8,163.47	-3,892.29	130.76	3,207.93
Total excluding LULUCF		$Gg\ CO_2\ eq$	9,159.47	8,948.34	8,779.38	9,052.67	8,755.98	9,152.24	10,828.11	8,892.13	9,097.15	9,178.51	8,493.87	8,840.06

	Sector	Unit	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
1	Energy	$Gg\ CO_2\ eq$	7,665.85	8,035.83	11,129.39	13,587.94	14,881.42	15,435.68	14,716.72	15,591.90	15,484.61	15,306.23	15,660.99
2	IPPU		2.35	2.22	2.15	164.96	186.51	179.32	192.04	275.57	230.08	141.53	145.17
3	Agriculture		664.97	691.38	656.27	605.01	697.22	736.56	734.79	729.45	729.74	730.30	764.03
4	LULUCF		-9,836.27	-3,106.78	-6,072.59	-4,868.32	-11,360.66	-20,429.70	-17,129.53	-23,459.11	-19,550.14	-15,810.55	-14,269.79
5	Waste		921.73	953.93	983.94	1,014.11	1,045.03	1,075.95	1,105.58	1,137.50	1,169.78	1,406.62	1,608.72
Total including LULUCF		$Gg\ CO_2\ eq$	-581.37	6,576.58	6,699.16	10,503.69	5,449.51	-3,002.18	-380.40	-5,724.70	-1,935.93	1,774.13	3,909.10
Total excluding LULUCF		$Gg\ CO_2\ eq$	9,254.90	9,683.36	12,771.75	15,372.01	16,810.17	17,427.51	16,749.13	17,734.42	17,614.21	17,584.68	18,178.90

2.7. Projections of greenhouse gas emissions and removals, as applicable

Due to capacity limitations, Papua New Guinea will use flexibility for this section.

Chapter 3: Information related to climate change impacts and adaptation under Article 7 of the Paris Agreement

3.1. National circumstances, institutional arrangements, and legal frameworks

3.1.1. National circumstances

Papua New Guinea's national circumstances are defined by an extraordinary confluence of biogeophysical diversity and socio-economic vulnerability. The nation is home to the world's third-largest tropical rainforest, covering approximately 77.8% of its landmass and spanning over thirty-six million hectares. This geomorphically diverse landscape, which includes over 5,000 kilometers of coastline and 40,000 square kilometers of coral reef, supports a unique array of ecosystems ranging from alpine grasslands and montane rainforests to deltaic floodplains and savannahs. These environments harbor immense biodiversity, characterized by high levels of endemism including 813 bird species and 10% of the world's total fish diversity. As a leading member of the Coral Triangle, PNG protects 76% of the world's coral species and six of the seven marine turtle species, while managing the South Pacific's largest fisheries area across 2.4 million square kilometers.

Despite this natural wealth, the country faces significant developmental hurdles, ranking 155th out of 189 countries in the 2020 UNDP Human Development Report. The population is highly susceptible to climate-induced hazards such as landslides, soil erosion, and recurrent floods, which are exacerbated by the country's steep terrain and tropical climate. Because many communities rely directly on these terrestrial and marine ecosystems for their livelihoods and food security, the integrity of these systems is vital for national resilience. However, climate change is already causing considerable impact through ocean acidification, coral bleaching, and sea-level rise, threatening the very biodiversity that supports human society.

The nation's adaptive capacity is fundamentally tied to the conservation, restoration, and sustainable management of its natural resources. Infrastructure and economic stability are increasingly at risk from extreme weather events, including tropical cyclones and king tides, which lead to sedimentation and the loss of agricultural land. Addressing these vulnerabilities requires integrating climate adaptation into the country's legal and institutional frameworks, though PNG continues to face challenges in technical data collection and infrastructure maintenance due to its rugged geography. Ultimately, the survival of PNG's unique social systems and biological heritage depends on mitigating the susceptibility of its diverse ecosystems to the escalating threats of a warming world.

3.1.2. Institutional arrangement and governance

Papua New Guinea has established a multi-tiered governance architecture designed to transition climate policy from high-level strategy into verifiable sectoral action. This framework is legally anchored by the Climate Change (Management) Act 2015, which mandates a whole-of-government approach to climate resilience.

At the apex of Papua New Guinea's climate governance is the National Executive Council (NEC), which serves as the ultimate authority for policy approval and the declaration of climate emergencies. The NEC provides the political mandate for the National Adaptation Plan (NAP) and ensures that climate objectives are integrated into the Medium-Term Development Plan (MTDP IV). Below the NEC, the National Climate Change Board (NCCB) performs a critical oversight function, reviewing the performance of CCDA and ensuring that climate finance and projects align with national interests.

The CCDA acts as the central hub for coordination, serving as the National Designated Authority (NDA) for the Green Climate Fund and the UNFCCC focal point. To manage the cross-cutting nature of climate change, which impacts health, security, and the economy, the Adaptation Technical Working Committee (ATWC) facilitates horizontal coordination between government line agencies, the private sector, and civil society. This committee is responsible for:

- Periodically reviewing climate risks to pivot resources toward the most vulnerable regions; and
- Ensuring that the voices of customary landholders and women's groups are included in the planning process through a Gender-Responsive and Social Inclusion approach.

Implementation is delegated to sectoral lead entities, which include the Department of Agriculture, Department of Transport, National Department of Health, and Department of Works and Highways. At the subnational level, the Provincial Climate Change Commitee bridge the gap between national policy and community needs, allowing for bottom-up identification of adaptation projects.

The iterative nature of PNG's governance allows for the continuous adjustment of activities based on monitoring results. Every five years, the NAP undergoes a formal review process where the Department of Treasury and CCDA assess the cost-effectiveness of adaptation measures.

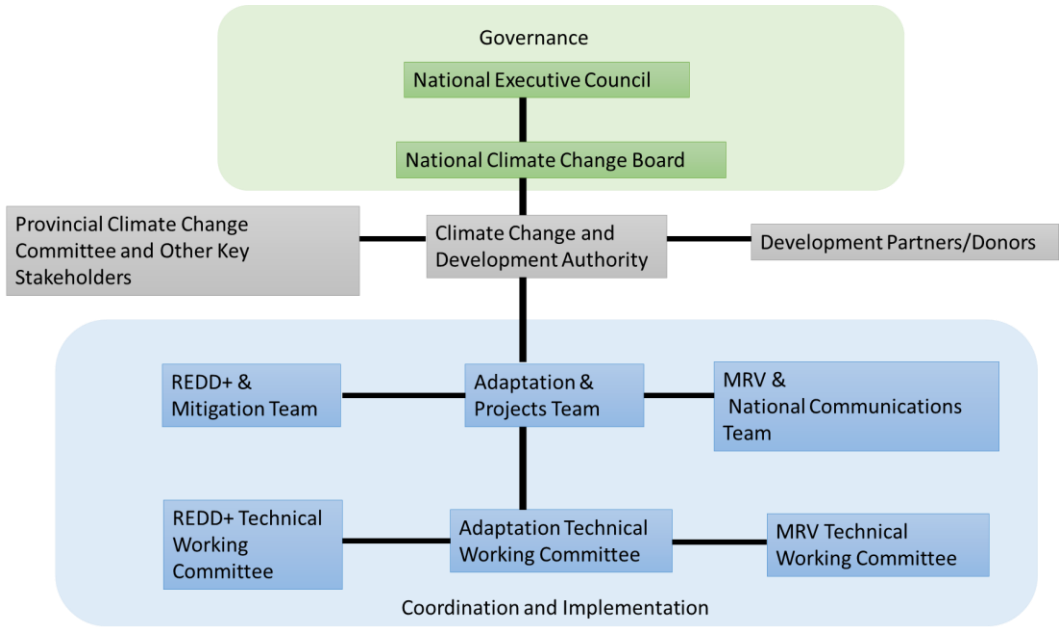

Figure 2: Structure for Governance, Coordination and Implementation of the National Adaptation Plan

3.1.3. Legal and policy frameworks and regulations

Papua New Guinea's commitment to building climate resilience has been a central pillar of national dialogue and political commitment for over a decade, culminating in a robust legislative architecture. The primary legal instrument is the Climate Change (Management) Act (CCMA) 2015, which provides the foundational institutional and operational framework to foster climate-compatible development. Under this Act, CCDA is established as the sole mandated entity responsible for managing climate matters, overseeing the implementation of the National Adaptation Plan, and coordinating stakeholder participation. The Climate Change (Management) Act (CCMA) 2015 specifically empowers the CCDA to promote mitigation and adaptation activities, implement international obligations under the Paris Agreement, and serve as the National Designated Authority (NDA) for international climate finance mechanisms.

The Climate Change (Management) Act Amendment 2022 marks a significant evolution in PNG's regulatory landscape by explicitly mandating all regulated sectors to develop and implement climate change adaptation action plans. These regulated sectors, defined under Section 53 of the Climate Change (Management) Act, encompass the pillars of the national economy: agriculture and livestock, energy (including petroleum and gas), transport (road, sea, and air), infrastructure and manufacturing, forestry and land use (LULUCF), mining, fisheries, and waste management. This amendment ensures that the National Adaptation Plan (NAP) 2022–2030 is not merely a strategy but a legally binding framework that requires priority agencies to mainstream climate risks into their annual planning and budgeting processes. By providing a clear mandate for sector-specific adaptation, the Act bridges the gap between high-level international commitments and domestic implementation.

The NAP provides a strategic framework to support country-driven efforts to effectively mainstream adaptation to climate-induced risks within sectoral planning processes. The NAP takes a phased approach to implementation that considers the institutional frameworks and the NAP priority sectors, including agriculture, health, transport, and infrastructure.

Sectoral integration is operationalized through a suite of supporting policies and specialized agencies that align with the NAP's objectives. In the Agriculture and Livestock sector, the Department of Agriculture and Livestock (DAL) and the National Agriculture Research Institute (NARI) utilize the National Food Security Policy and the (Draft) Climate Smart Agriculture Policy to manage food security under changing climatic conditions. Similarly, the National Department of Health (NDoH) administers the health system through the (Draft) National Strategy and Action Plan on Climate Change and Health, focusing on waterborne illnesses and sustainable environmental health. The coordination of these efforts is facilitated by the Department of National Planning and Monitoring (DNPM), which ensures that cross-sectoral thematic plans are integrated into the broader Medium-Term Development Plans (MTDP) and Vision 2050.

For physical resilience, the Department of Works and Highways (DoWH) and the Department of Transport (DoT) enforce standards through the Building Act (1971) and the Physical Planning Act, which prescribe environmental performance for all new infrastructure. These legal instruments are complemented by the DoWH Climate Change Policy and Action Plan (2022) and the 2030 Transport Policy, which identify climate change as a cross-cutting issue requiring mandatory integration into road, sea, and air transport investment plans. Furthermore, the National Weather Service (NWS) provides the essential regulatory function of climate monitoring and near-term forecasting, which informs the scale of vulnerability and risk assessments at the provincial level. Collectively, this integrated legal and policy network ensures that climate initiatives are harmonized across all levels of government, from the National Executive Council to the ward-level development plans.

3.2. Impacts, risks, and vulnerabilities, as appropriate

The information outlined in this section was extracted from the World Bank Report on Climate Risk of Papua New Guinea. Since there were no national reports on climate-related risks and vulnerabilities.

The core data presented in the report was sourced from the database sitting behind the World Bank Group's Climate Change Knowledge Portal (CCK), incorporating climate projections from the Coupled Model Inter-comparison Project Phase 5 (CMIP5). This provided estimates of future temperature and precipitation.

Four Representative Concentration Pathways (RCP2.6, RCP4.5, RCP6.0, and RCP8.5) were selected and defined by their total radiative forcing pathway and level by 2100. In this analysis, RCP2.6 and RCP8.5, the low and high emissions pathways, were the primary focus. RCP2.6 represents a very strong mitigation scenario, whereas RCP8.5 assumes a high-emissions scenario.

3.2.1. Current climate trends

Papua New Guinea has a monsoonal climate characterised by high temperatures and humidity throughout the year. Mean temperatures in Port Moresby range between 26 °C to 28 °C, with maximum temperatures of 30°C to 32 °C year-round. Two monsoon seasons recognised are: the northwest monsoon, which occurs from December to March, and the southwest monsoon, which occurs from May to October. The climate in Papua New Guinea is governed by various factors, such as the movement of the South Pacific Convergence Zone (SPCZ).

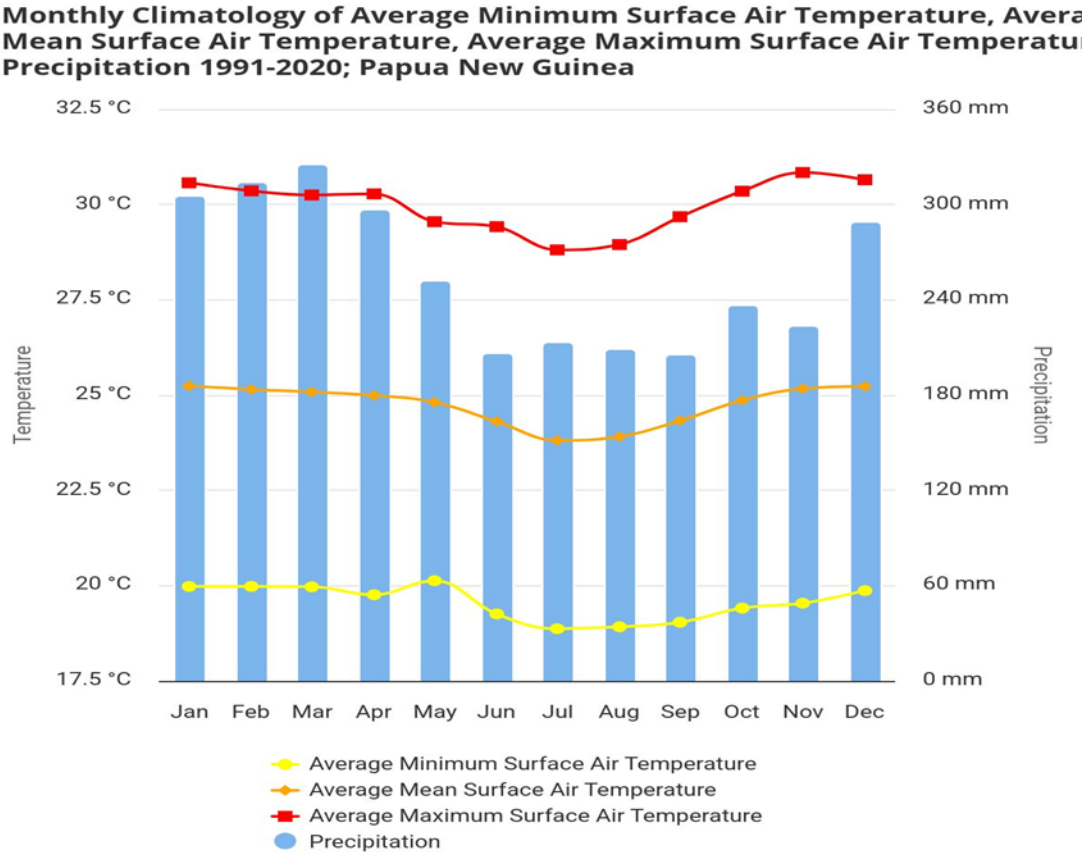

Figure 3: Average monthly mean, max, and minimum temperature and precipitation in Papua New Guinea. Source: World Bank 2021.

Papua New Guinea has one of the wettest climates in the world, and annual rainfall in many areas of the country exceeds 2,500mm, with the heaviest events occurring in the highlands. Precipitation takes place all year round, in the range of 200-400 mm/month. Year-to-year variability in precipitation and climate in Papua New Guinea is influenced by the El Niño-Southern Oscillation (ENSO). El Niño conditions in the southeast Pacific bring drought conditions to Papua New Guinea. Equally, the cool phase of ENSO (La Niña) often causes extreme precipitation, flooding, and landslides. Current trends have been shifting towards much hotter temperatures, with a greater concentration of extreme heat days evident from the year 2000 onwards.

3.2.2. Projected climate trend

The projected trend for Papua New Guinea shows consistent warming that will be more significant for inland regions as compared to coastal areas. Rainfall projections are less certain. The table below provides information on temperature projections and anomalies for the four RCPs over two distinct time horizons, presented against the reference period of 1986-2005.

Table 17: Projected anomaly (changes ^{o}C) for maximum, minimum, and average daily temperatures in PNG for 2040-2059 and 2080-2099, from the reference period of 1986-2005.

Scenario	Average Daily Maximum Temperature		Average Daily Temperature		Average Daily Minimum Temperature	
	2040-2059	2080-2099	2040-2059	2080-2099	2040-2059	2080-2099
RCP 2.6	0.8 (0.1,1.8)	0.8 (0.0, 1.8)	0.9 (0.3, 1.6)	0.9 (0.2,1.6)	0.9 (0.3, 1.5)	0.9 (0.2, 1.6)
RCP 4.5	1.1 (0.4,2.0)	1.5 (0.7,2.6)	1.1 (0.6, 1.8)	1.6 (1.0,2.4)	1.2 (0.6, 1.8)	1.6 (1.0, 2.4)
RCP 6.0	1.0 (0.2,2.3)	1.9 (1.0, 3.3)	1.0 (0.5, 1.8)	2.0 (1.3,3.0)	1.1 (0.5, 1.7)	2.1 (1.3, 2.9)
RCP 8.5	1.5 (0.7,2.5)	3.2 (2.1,4.7)	0.5 (0.9, 2.3)	3.3 (2.4, 4.5)	1.6 (1.0, 2.3)	3.4 (2.5, 4.5)

Table 18: Projections of average temperature change (^{o}C) in Papua New Guinea for different seasons (3 monthly time slices) over different time horizons and emissions pathways, showing the median estimates of the full CCKP model ensemble and the 10th and 90th percentiles in brackets.

Scenario	2040-2059		2080-2099	
	Jun-Aug	Dec-Feb	Jun-Aug	Dec-Feb
RCP 2.6	0.9 (0.1,1.7)	0.8 (0.4, 1.4)	0.9 (0.0, 1.8)	0.8 (0.3, 1.4)
RCP 4.5	1.2 (0.5,1.9)	1.1 (0.6, 1.7)	1.6 (0.8, 2.5)	1.5 (1.0, 2.3)
RCP 6.0	1.1 (0.3, 1.8)	1.0 (0.6, 1.7)	2.1 (1.1, 3.0)	1.9 (1.3, 2.9)
RCP 8.5	1.5 (0.8, 2.5)	1.5 (0.9, 2.2)	3.5 (2.3, 4.6)	3.1 (2.5, 4.3)

While most models project an increase in the average annual precipitation in Papua New Guinea, uncertainty remains high, as indicated by the range and interquartile ranges shown in the figure below. Lafale et al. (2018) suggest medium confidence should be placed in the projected future trend of increased annual precipitation. In contrast, the projections which sugges the frequency and intensity of extreme rainfall events will increase are associated with high confidence.

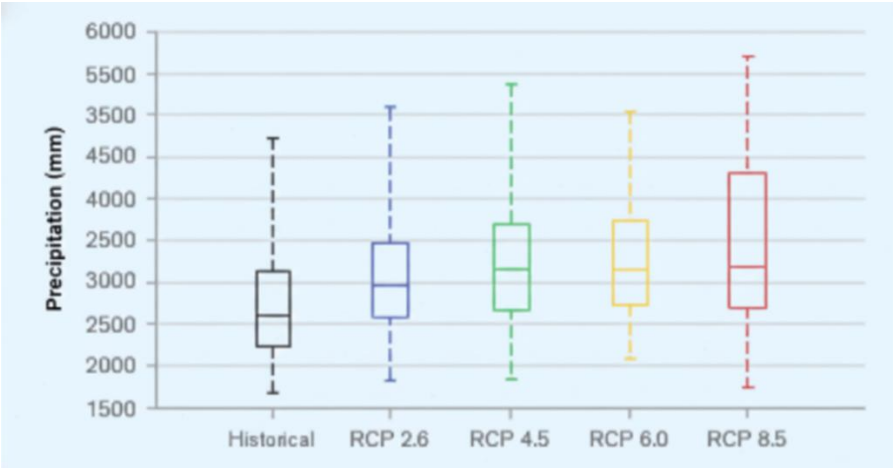

Figure 4: Boxplots showing the projected averag annual precipitation for PNG in the period 2080-2099

3.2.3. Observed and potential impacts

3.2.3.1. Sectoral impacts

Climate change is already disrupting key sectors in Papua New Guinea, especially agriculture, health, transport, Infrastructure and fisheries . The agricultural sector in Papua New Guinea is highly susceptible to a combination of hydrological and atmospheric hazards, including drought, tropical cyclones, and floods. As precipitation variability increases, the sector faces significant threats to productivity. These climate drivers lead to reduced crop and livestock yields, which directly undermine national food security. Furthermore, changing climatic conditions facilitate the introduction or outbreak of new pests and diseases, creating an environment of heightened agricultural risk.

Climate change also poses a multi-faceted threat to public health through both direct environmental shifts and indirect socio-economic disruptions. Increased temperatures and altered rainfall patterns drive changes in vector ecology, potentially expanding the reach of diseases like malaria and dengue. Extreme weather events, such as floods and tropical cyclones, increase the risk of water-borne diseases and physical injuries, while also placing immense strain on health infrastructure. These health challenges are compounded by climate-induced migration and increased poverty, which exacerbate existing gender inequalities and reduce general access to clean water and essential services.

The nation’s infrastructure and natural ecosystems are under mounting pressure from rising sea levels and intensified storm surges. Transport networks, including roads and bridges, face accelerated depreciation and higher maintenance costs due to heatwaves and flooding. Concurrently, both terrestrial and marine ecosystems are undergoing profound physical changes. Ocean acidification and coral bleaching are destroying vital marine habitats, leading to a decline in biodiversity and the destruction of fisheries. On land, increased drought and landslides are causing a loss of terrestrial biodiversity and the invasion of non-native species, threatening the ecological balance that many local communities rely upon.

3.2.3.2. Economic impacts

The economic repercussions of climate change in Papua New Guinea are far-reaching. Decreasing crop yields are not only threatening food security but also undermining the livelihoods of rural farmers, especially those engaged in the production of export commodities like coffee and cocoa. At the same time, climate-induced hazards such as floods and cyclones are damaging critical infrastructure, roads, ports, and schools, particularly in vulnerable coastal zones. Rebuilding costs are a significant burden on the national economy, and even more so in remote areas where infrastructure is limited. Tourism, another important economic contributor, is also under threat. Coastal erosion, storm damage, and degradation of marine ecosystems may reduce tourist arrivals, leading to income loss for communities dependent on this sector.

3.2.3.3. Social impacts

Socially, climate change is intensifying challenges for Papua New Guinea's most vulnerable populations. Rising sea levels and severe weather events are forcing communities in low-lying coastal provinces such as Central and Milne Bay to abandon their homes, resulting in displacement and the loss of cultural ties, property, and livelihoods. Many of these communities rely heavily on fishing and small-scale farming, making them particularly susceptible to climate shocks. As extreme weather becomes more frequent, the cycle of asset loss and displacement deepens poverty, especially in rural and marginalized groups. Without targeted support and long-term adaptation measures, these communities risk being left further behind in the country's development progress.

3.3. Adaptation priorities and barriers

3.3.1. Adaptation priorities

The NDC 2.0 and NAP identify 9 priority areas, which include: 1. Coastal flooding and sea level rise; 2. Inland flooding; 3. Food insecurity; 4. Cities and climate change: 5. Climate-induced migration; 6. Damage to coral reefs; 7. Malaria and vector-borne diseases; 8. Water and sanitation; and 9. Landslides. These priority areas are further classified under 4 priority sectors, namely: 1. Agriculture; 2. Health; 3. Transport, and 4. Infrastructure. The table below provides an overview of the priority areas and links to sectors in Papua New Guinea.

Table 19: Key priority adaptation areas and sectors in Papua New Guinea

Adaptation priority areas	Priority sectors			
	Agriculture	Health	Transport	Infrastructure
Coastal flooding and sea level rise	●	●	●	●
Inland flooding	●	●	●	●
Food insecurity	●	●		
Cities and climate change		●		●
Climate-induced migration	●	●	●	●
Damage to coral reefs			●	●
Malaria and vector-borne diseases		●		
Water and sanitation		●		●
Landslides		●	●	●

3.3.2. Barriers to adaptation

Despite the clear strategic priorities outlined by the government, the journey toward a climate-resilient Papua New Guinea is obstructed by several deeply rooted barriers. These challenges are not merely technical but are woven into the country's institutional, financial, and geographic fabric.

Institutional capacity at the subnational level remains a significant bottleneck, as provincial and district-level offices often lack the specialized technical expertise required to translate national climate policies into local action. While the NAP provides a high-level roadmap, the personnel responsible for implementation on the ground frequently operate with limited resources and minimal training in climate risk assessment. This gap results in a "compliance-only" approach where climate considerations are often sidelined in favor of immediate development needs, leaving local governments ill-equipped to design or oversee complex adaptation projects.

Financing remains arguably the most persistent hurdle, characterized by a substantial gap between the country's needs and the available resources. Papua New Guinea is largely dependent on international climate finance, yet the rigorous and often bureaucratic requirements of global funds like the Green Climate Fund (GCF) can be difficult to navigate. Domestically, climate change often competes with other urgent priorities like education and healthcare for a share of the national budget, leading to inconsistent funding for long-term adaptation. Without stable, dedicated financing mechanisms that reach the local level, many vital resilience projects such as climate-proofing rural infrastructure remain stuck in the planning phase.

Effective planning is further paralyzed by significant data gaps and a lack of localized climate information services. While global models provide broad temperature and rainfall projections, Papua New Guinea's incredibly diverse topography means that a one-size-fits-all projection is rarely accurate for specific valleys or islands. The lack of historical weather stations in remote areas makes it difficult to produce the high-resolution risk mapping necessary for evidence-based decision-making. Consequently, planners often rely on anecdotal evidence or generalized data, which can lead to poorly designed interventions that do not accurately account for local hazards like specific landslide zones or coastal erosion patterns.

The country's complex geography creates geographic limitations that physically and logistically hinder adaptation efforts. Papua New Guinea's rugged mountain ranges and 600 islands make the delivery of services and materials to remote communities both expensive and time-consuming. These geographic hurdles often lead to weak coordination between the various levels of government, as communication and monitoring in isolated areas are difficult. This fragmentation often results in overlapping mandates or missed opportunities for synergy, where different agencies might unknowingly duplicate efforts in the same region while leaving other high-risk areas completely underserved.

Finally, the success of adaptation is frequently limited by low community engagement and the difficulty of integrating traditional and scientific knowledge. Many rural communities in PNG have utilized indigenous strategies to cope with environmental changes for generations, yet these insights are often overlooked by top-down scientific approaches. Conversely, low awareness of modern climate science can prevent communities from taking ownership of new resilient practices. When scientific models and traditional wisdom are treated as mutually exclusive rather than complementary, the resulting strategies often lack local cultural relevance and fail to gain the community buy-in essential for long-term sustainability.

3.4. Adaptation strategies, policies, plans, goals, and actions to integrate adaptation into national policies and strategies

3.4.1. Adaptation strategy

Papua New Guinea's adaptation strategy focuses on building resilience across key sectors such as agriculture, health, transport, and infrastructure. The National Climate Compatible Development Management Policy (NCCDMP) and the Climate Change (Management)(Amendment) Act provide the legislative foundation for adaptation efforts. The country's adaptation strategy aligns with its Vision 2050 and the Medium-Term Development Plan IV, ensuring coherence between climate resilience and socio-economic development.

3.4.2. Policies and institutional framework

The Climate Change and Development Authority is the primary institution responsible for coordinating national climate action. Through the implementation of the NAP and NDC, Papua New Guinea is working to mainstream climate resilience into all sectoral and sub-national policies. The NAP process is supported by guidelines that foster integration of climate risk assessments and adaptation planning into local government planning and budgeting. Key policies supporting adaptation integration include:

- National Disaster Risk Reduction Framework;
- National Agriculture Development Plan;
- National Climate and Health Action Plan, Water and Sanitation (WASH Policy); and
- Climate Change Resilient Infrastructure Policy.

3.4.3. Plans and Programs

Papua New Guinea is currently implementing its NAP in collaboration with the key sectors as a phased approach to implement Climate Change Adaptation actions through the support of development partners, which outlines priority actions for addressing vulnerabilities and reducing climate risks.

Additionally, the CCDA, as the National Designated Authority, is coordinating and encouraging the sectors to come up with sector-specific adaptation plans that will be aligned with the NAP framework to ensure consistency and collaboration across sectors. For instance, the National Department of Health has developed the National Climate Change and Health Action Plan, and the Department of Works and Highways (DoWH) under the infrastructure sector has developed the Climate Change Resilient Policy, but for other sectors, the work is in progress. In the second phase of NAP implementation, CCDA is conducting consultations and awareness at the provinces to roll out the Provincial Adaptation Plan. 6 pilot provinces (Morobe, East and West Sepik, Jiwaka, Autonomous Region of Bougainville, and New Ireland Province) have been identified under our current program, but due to funding constrains CCDA hasn't done much.

3.4.4. Objectives and Goals

The NAP supports the government's efforts to build a climate-resilient and compatible development pathway through increased social, environmental, and economic resilience to climate-induced risks through three objectives:

- Strengthen institutional capacities and the ability to effectively mainstream climate change adaptation and disaster risk reduction;
- Build resilience at the national, subnational, and sectoral levels through information and awareness-raising, education, and capacity building, as well as the provision of early warning systems; and
- Facilitate resource mobilisation and foster public and private investment in climate change adaptation priority areas.

The NAP will also operationalise the implementation of the adaptation goals contained within the Enhanced NDC, which includes:

- 10% of the total population (0.8 million beneficiaries (25% are women)) have increase resiience with respect to food and water security, health, and well-being in Papua New Guinea;
- 100% of the population benefits from improved health measures to respond to malaria and other climate-sensitive diseases in Papua New Guinea;
- USD 172 Million value of building and utility infrastructure assests built/rehabilitated according to climate-resilient codes and standards; and
- 6 million people (70% of the population) benefit fro improved early warning systems/information to respond to extreme climate events.

3.4.5. Actions

To achieve the adaptation objectives and goals, the NAP has outlined strategic actions for the 4 priority sectors previously mentioned above (agriculture, health, transport, and infrastructure) as well as 6 cross-cutting areas. This includes: 1. Mainstreaming adaptation and resilience; 2. Climate and adaptation governance; 3. Information, education, capacity building, and awareness; 4. Gender Responsive; 5. Climate Resilient Terrestrial, Coastal & Marine Ecosystems; and 6. Early warning systems and response measures to climate-induced events.

The table below outlines the strategic actions and timeframe for implementation as contained in the NAP.

Table 20: Adaptation, Strategic Actions, and timeframe for implementation

Priority Sector	Strategic Action	Timeframe
Agriculture	Scale-up climate-smart agriculture best practice and action in vulnerable regions of Papua New Guinea	2023-2026
	Implement climate-resilient water management & conservation strategies	2026-2028
	Develop climate-resilient agricultural value chains and value chain/market infrastructure, market information, and business support services to enhance food security and resilience of vulnerable farmers	2026-2028
	Increase sustainable income-generating opportunities for women and diversify economies to reduce risks of climate impacts and improve access to food for children and families	2023-2026
Infrastructure	Develop climate-resilient codes and standards for the construction/rehabilitation of buildings and transport and utility infrastructure	2026-2028
	Build/rehabilitate urban and coastal infrastructure according to climate-resilient codes and standards for increased resilience of physical assets, communities, and livelihoods	2028-2030
	Improve water and sanitation infrastructure and services to meet demand, considering expected climate impacts	2026-2028
Transport	Develop climate resilient codes and standards for the construction/rehabilitation of buildings and transport and utility infrastructure	2026-2028
	Build/rehabilitate transport infrastructure according to climate-resilient codes and standards	2028-2030
Health	Evidence-based planning and decision-making to develop climate change adaptation strategies in the health sector	2023-2026
	Improve environmental health services, promoting climate change adaptation and reduction of climate risks	2026-2028
	Improve the climate resilience of health infrastructure	2026-2028
	Scale-up measures for the prevention and control of malaria and other climate-sensitive diseases	2023-2026
Mainstreaming adaptation and resilience	Mainstreaming climate change adaptation into sectoral and provincial plans	2023-2030
	Strengthen Papua New Guinea's regulatory framework	
	Improve financing planning	
Climate and adaptation governance	Strengthen and operationalise decision-making and coordination arrangements	2023-2030
Information, education, capacity building, and awareness	Increase institutional and technical capacities for climate change adaptation	
	Awareness raising and education at the local level	
	Strengthen climate information research and knowledge generation	
Gender Responsive	Conduct sector-specific gender gap assessments	2023-2026

Priority Sector	Strategic Action	Timeframe
Climate Resilient Terrestrial, Coastal & Marine Ecosystems	Improve the management of coastal and inland fisheries and support the development of sustainable value chains	2026-2028
	Coastal rehabilitation and protection to enhance the resilience of coastal communities and ecosystems	2026-2028
	Protection, restoration, and sustainable management of biodiversity to reduce vulnerability and enhance natural capital	2026-2028
	Green urban development	2028-2030
Early warning systems and response measures to climate-induced events	Improve information for adaptation planning and management of climate risks	2023-2026
	Enhance adaptation and resilience through impact-based forecasting and early warning systems	2023-2030
	Develop a strategy for relocation/resettlement/retreat	2028-2030

3.5. Progress on implementation of adaptation

Papua New Guinea has made significant strides in implementing climate adaptation actions across its diverse landscape. However, because a formal Monitoring and Evaluation (M&E) system is not yet operational as detailed in the section 3.6 below, a comprehensive national account of these achievements remains a challenge, and much of the progress on the ground cannot be formally reported at this time. Consequently, this section focuses exclusively on specific projects and programs for which verifiable data and documentation were available during the reporting period.

1. **Building Resilience to Climate Change in Papua New Guinea Project**

The Building Resilience to Climate Change (BRCC) Project serves as a cornerstone of Papua New Guinea's efforts to safeguard its most isolated and vulnerable coastal and island communities. Funded by the Strategic Climate Fund and administered by the Asian Development Bank (ADB), the project operates across five pilot provinces: Manus, Milne Bay, Morobe, East New Britain, and the Autonomous Region of Bougainville. Its primary objective is to mainstream climate resilience into development planning while providing communities with the tools and infrastructure necessary to withstand the impacts of a changing climate.

A significant achievement of the BRCC project is the completion of comprehensive Climate Change Vulnerability Assessments (CCVAs) for 21 target islands and atolls. These assessments have led to the development of localized adaptation plans that empower communities to manage their own risks. Key outputs include the implementation of ecosystem-based adaptation measures, such as mangrove reforestation and the promotion of drought-resilient agriculture, alongside the installation of early warning systems and emergency radio networks to improve disaster preparedness in remote areas.

Furthermore, the project has pioneered the integration of climate resilience into large-scale infrastructure. A primary example is the rehabilitation of the Alotau Provincial Government Wharf in Milne Bay, which has been designed with specific engineering features to withstand rising sea levels and intensified storm surges. By treating this wharf as a "climate-proofing" pilot, the BRCC project establishes a technical standard for future maritime infrastructure across the country, ensuring that critical transport links remain operational despite the increasing frequency of extreme weather events.

Figure 5: PACRES WASH PROJECT- This sentiment was echoed during the launch of activities to address the impacts of climate change in Kerema district in Karama situated in the Malaula District in Papua New Guinea's Gulf Province on 31 March 2023.

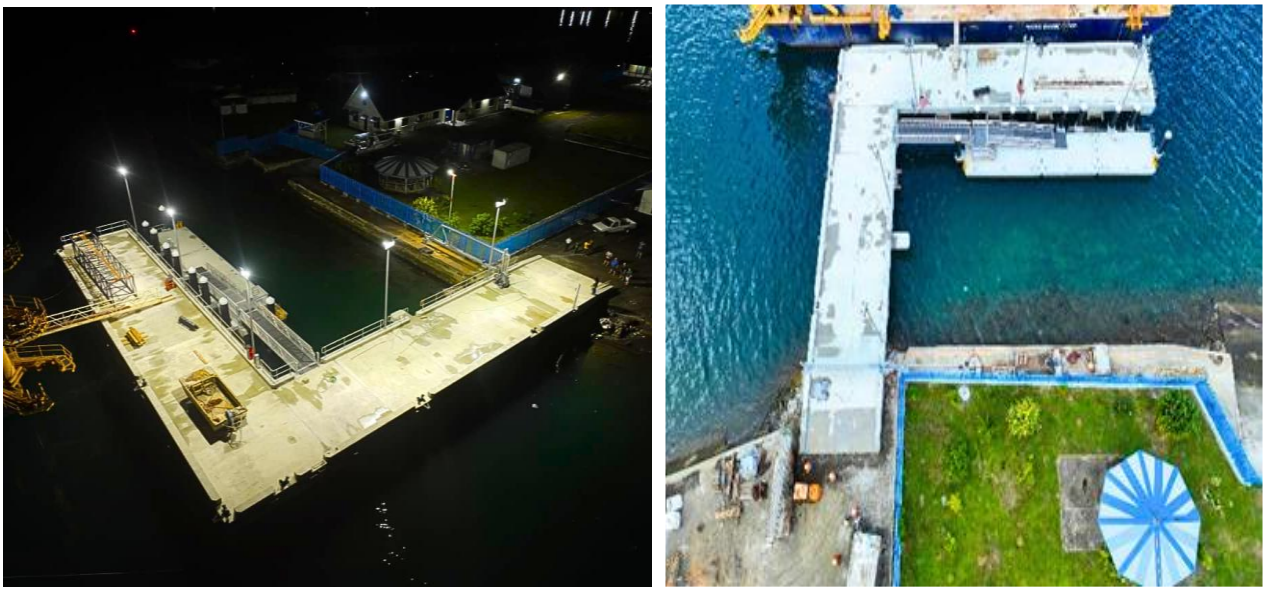

Figure 6: Building Resilience to Climate Change (BRCC) sub-project. Climate proofing of the Alotau Wharf. The replacement facility comprises a 40m wharf on tubular steel piles, precast headstocks and concrete deck. The design caters for sea level rise that has already occurred and for a further 0.5m to be added to the deck level in future if circumstances require it. The civil works contract was undertaken by Pacific Marine Group Pty Ltd and completed in July 2023.

2. Papua New Guinea Western Province Partnership (WPP)

The Western Province Partnership (WPP) is a strategic subnational initiative supported by the Australian Government that integrates climate change resilience into the development framework of one of Papua New Guinea's most geographically challenging regions. Guided by the Western Province Strategy (2022–2030), the partnership addresses the province's unique vulnerability to extreme hydrological cycles, including severe seasonal flooding and prolonged droughts. By aligning provincial goals with the NAP, the WPP ensures that climate risk is not treated as an isolated environmental issue but as a core component of sustainable service delivery and infrastructure planning.

A primary focus of the partnership's adaptation efforts is the enhancement of water security and sanitation in highly vulnerable areas like the South Fly and Delta Fly districts. In collaboration with

partners such as World Vision, the WPP has implemented climate-resilient Water, Sanitation, and Hygiene (WASH) infrastructure, including deep-water boreholes and elevated latrines designed to remain functional during major flood events. These interventions are critical for preventing the outbreak of water-borne diseases and ensuring a reliable supply of clean water when traditional surface sources are contaminated or dried up by climate extremes.

Beyond immediate service delivery, the WPP emphasizes institutional strengthening and resilient infrastructure to secure long-term connectivity and governance. This includes supporting the Western Provincial Administration in establishing a Provincial Climate Change Committee to mainstream climate risk into local budgeting and the five-year development plan. Concurrently, the partnership works to "climate-proof" essential hubs, such as the Daru Port and local energy grids, to protect them against rising sea levels and storm surges. By combining these structural upgrades with community-based resource management, the WPP builds a multi-layered defense against climate impacts in the Western Province.

3. **Papua New Guinea Climate FIRST (Finance Initiative for Resilience and a Sustainable Transition)**

The Papua New Guinea Climate FIRST (Finance Initiative for Resilience and a Sustainable Transition) project is a catalytic initiative specifically designed to transition PNG from climate adaptation planning to actionable, large-scale results. Launched in 2024 and funded by an AUD 20 million grant from the Australian Government, the project's primary focus is to dismantle the financial and institutional barriers that prevent the country from securing the estimated USD 1.5 billion required for its National Adaptation Plan (NAP). By mobilizing up to USD 400 million in international and domestic climate finance, the project aims to turn "bankable" adaptation concepts into funded realities—targeting critical areas like climate-resilient agriculture, water security, and protected infrastructure.

At its core, Climate FIRST addresses adaptation at the subnational level by embedding technical experts in seven priority provinces Eastern Highlands, Enga, Manus, Milne Bay, Morobe, New Ireland, and Simbu. These experts work directly with provincial administrations to mainstream adaptation priorities into local development plans and budgets, ensuring that resilience is built into the very fabric of local governance. Furthermore, the initiative places a high priority on Gender Equality, Disability, and Social Inclusion (GEDSI), ensuring that adaptation investments reach and benefit the most vulnerable populations, such as women and marginalized groups who are disproportionately affected by climate hazards like flooding and food insecurity.

4. **Adaptation of Small-Scale Agriculture for Improved Food Security of Resilient Communities in Papua New Guinea (ASSA)**

The Adaptation of Small-Scale Agriculture for Improved Food Security of Resilient Communities in Papua New Guinea (ASSA) is a significant climate-resilience project aimed at safeguarding the livelihoods of subsistence farmers who comprise over 80% of the nation's population. Funded by a USD 10 million grant from the Adaptation Fund and implemented by The Pacific Community (SPC) in partnership with the Department of Agriculture and Livestock (DAL), the project targets highly vulnerable rural areas, including provinces like Enga, Milne Bay, and New Ireland. Its primary goal is to shift smallholder farming from traditional, weather-dependent methods toward Climate-Smart Agriculture (CSA) to combat the increasing frequency of droughts, frosts, and floods that threaten national food security.

The project is structured around three critical adaptation pillars: climate-proofed production, post-harvest solutions, and capacity building. On the production side, ASSA introduces drought-tolerant crop varieties and improved water management systems to ensure yields remain stable despite rainfall variability. To address the economic aspect of resilience, the project invests in solar-powered processing

and climate-resilient storage facilities, which reduce post-harvest losses and improve the quality of produce for market. Furthermore, a heavy emphasis is placed on social inclusion, specifically targeting women and youth through specialized training and the creation of "green jobs," ensuring that adaptation benefits are equitably distributed and that local communities have the technical knowledge to sustain these resilient practices independently.

5. **Enhancing disaster and climate resilient agriculture in vulnerable communities**

The Enhancing Disaster and Climate Resilient Agriculture in Vulnerable Communities initiative is a targeted adaptation project designed to address the high vulnerability of Papua New Guinea's agrarian population to climate-induced shocks. Historically supported by partnerships with organizations like the World Bank, FAO, and the United Nations Development Programme (UNDP), this project focuses on the intersection of Disaster Risk Management (DRM) and agricultural sustainability. Since approximately 85% of PNG's population relies on rain-fed subsistence farming, the project's primary goal is to shift communities away from reactive disaster recovery toward proactive, climate-smart resilience.

The project operates through a multi-pronged approach that combines technical innovation with community-based planning. Key activities include the introduction of drought and frost-tolerant crop varieties, the establishment of community-led Early Warning Systems (EWS), and the improvement of local food storage facilities to prevent post-disaster food shortages. By integrating climate risk information into the provincial and district agricultural extension services, the project ensures that farmers have the technical knowledge to adjust their planting cycles in response to unpredictable weather patterns. Furthermore, the initiative emphasizes agroforestry and soil conservation to mitigate the impacts of inland flooding and landslides, protecting both the land and the primary source of income for rural households.

3.6. Monitoring and evaluation of adaptation actions and processes

As of the date of this report, Papua New Guinea does not have a fully established national Monitoring and Evaluation (M&E) system dedicated to tracking the progress and effectiveness of climate change adaptation actions. While the NAP outlines the strategic intent to implement a robust reporting framework, the country is currently in a transitional phase, working to build the institutional and technical foundations necessary for such a system. CCDA is leading the process to establish a formal M&E mechanism that will allow for the systematic collection of data and the assessment of adaptation outcomes across the four priority sectors as well as cross-cutting areas. This ongoing development is a critical component of PNG’s commitment to the ETF under the Paris Agreement, ensuring that future reporting can provide evidence-based insights into the nation’s climate resilience progress.

3.7. Information related to averting, minimizing and addressing loss and damage associated with climate change impacts

This BTR does not capture information related to averting, minimizing, and addressing loss and damage associated with climate change impacts, as Papua New Guinea will require further guidance. The Executive Committee of the Warsaw International Mechanism for Loss and Damage has been given the mandate to prepare guidelines for this section to assist developing country Parties. These guidelines were not available during the preparation of this BTR. Once these guidelines are available, Papua New Guinea will use them to report on country-specific information related to averting, minimizing, and addressing loss and damage associated with climate change impacts in future BTRs.

3.8. Cooperation, good practice, experience, and lessons learned

3.8.1. Efforts to collaborate or share knowledge

Papua New Guinea actively participates internationally in adaptation forums, particularly through its commitment under the UNFCCC and as a Non-Annex 1 Party. Papua New Guinea also participates in adaptation forums within the Asia-Pacific region to share its adaptation planning experiences, learn from other countries, and strengthen its resilience to climate change impacts. Papua New Guinea has engaged in initiatives like the Asia-Pacific Climate Change Adaptation Forum, Coral Triangle Initiative, and Pacific Adaptation Climate Change (PACC) program to enhance its capacity for adaptation and resilience.

3.8.2. Efforts to strengthen scientific research and knowledge systems

Papua New Guinea is involved in various forums and projects and emphasizes capacity building within government agencies, research institutions, and the community to implement climate change measures. Papua New Guinea's National Agriculture Research Institute actively works on developing and sharing knowledge to build resilience, particularly in agriculture.

Chapter 4: Information on finance, technology development and transfer and capacity-building support needed and received under Article 9-11 of the Paris Agreement

4.1. National circumstances, institutional arrangements, and country-driven strategies

In a developing country like Papua New Guinea, climate change policies and strategies compete with other national priorities, such as health, education, and road infrastructure development. Thus, Papua New Guinea has heavily depended on external bilateral and multilateral support to implement climate change actions. One of CCDA's roles is to mobilise support through bilateral and multilateral arrangements to implement climate actions in the country.

CCDA identifies the support needed for implementing climate actions in Papua New Guinea through the preparation process of climate-related policies and plans, such as the NDC and NAP. The information is gathered through the technical working committee, as outlined in chapters 2 and 3, as well as the stakeholder consultation process. This approach was used to identify the support needed to implement the NDC 2.0, which is fully conditional on the external support provided. Information on the support needed to implement the NDC 2.0 is captured in the NDC 2.0 Implementation Plan (2021-2030) as well as the NAP. Details of support in terms of financial, technology, and capacity building are captured in the sections below.

In terms of the support that is received from external sources, there is no established institutional arrangement to track the support received. CCDA gathers this information on an ad hoc basis mainly for the preparation of climate change reporting under the UNFCCC, such as BURs and National Communications. There are plans to establish a system, including institutional arrangements, to track the support that is received from external sources for the implementation of climate actions in the country.

4.2. Underlying assumptions, definitions, and methodologies

This chapter was prepared in accordance with Decision 18/CMA1 and Annex III of Decision 5/CMA 3 and presents information support that is needed by Papua New Guinea from the period 2020 to 2030. It also presents information on resources committed to Papua New Guinea entities through multilateral institutions and bilateral channels from 2020 to 2022. Despite the difficulties and restrictions inherent in

this exercise, Papua New Guinea has endeavored to provide the most disaggregated information possible in the common tabular format.

The local currency for Papua New Guinea is Kina (PGK), and at the time of reporting, the conversion rate used to convert from the local currency to United States dollar (USD) was USD 1 = PGK 4.14. Some of the support that was received was reported in Euro, and thus the conversion rate used to convert Euros to USD at the time of reporting was USD1 = EUR 0.87.

4.3. Information on financial support needed by Papua New Guinea under Article 9 of the Paris Agreement

According to the NDC 2.0 Implementation Plan, the total financial resources required to implement the actions to achieve the NDC targets over the 10-year implementation period (2021-2030) are estimated to be in excess of USD 1 billion. The estimated financial support needed to achieve the energy and AFOLU mitigation targets is USD 750 million. The estimated support needed to achieve the adaptation targets is USD 250 million. These figures are based on preliminary estimates thus, a more in-depth analysis needs to be carried out to determine the real cost of implementing the activities in the NDC 2.0 Implementation Plan.

It should also be noted that while the finance needed by the adaptation targets is estimated to be USD 250 million, it is difficult to disaggregate this amount into specific actions in the NAP for this report. Thus, this report only captures the financial needs for specific mitigation actions of the Energy and LULUCF sector.

Currently, there is no information on the financial support needed for the actions outside of the NDC 2.0 Implementation Plan. Thus, this cannot be captured in this report. A thorough financial needs assessment needs to be carried out to understand the financial support needed to implement climate actions in Papua New Guinea.

Table 21: Financial support needed for mitigation actions of the Energy Sector in NDC 2.0

Sub-sector	Title of activity, programme, project or other	Programme/ project description	Estimated amount		Expected timeframe	Expected financial instrument	Contribution to technology development and transfer objectives (Yes/No)	Contribution to capacity-building objectives (Yes/No)	Whether the activity is anchored in a national strategy and/or an NDC (Yes/No)
			Domestic currency	USD					
Energy Industries (Electricity)	Kavieng Solar PV & ESS project	To install 1.5MW solar power plant New Ireland Province	8,000,000	1,932,367	2023-2025	Grant	Yes	Yes	Yes
Energy Industries (Electricity)	Maprik Solar PV & ESS project	To install 0.2MW solar power plant in East Sepik Province	1,100,000	265,700	2022-2024	Grant	Yes	Yes	Yes
Energy Industries (Electricity)	Murua Hydro project	To install 3MW hydro power plant in Gulf Province	64,000,000	15,458,937	2025-2028	Grant	Yes	Yes	Yes
Energy Industries (Electricity)	Gumini hydro project	To install 1.5MW hydro power plant in Milne Bay	12,000,000	2,898,551	2023-2026	Grant	Yes	Yes	Yes
Energy Industries (Electricity)	Damar/Mabam hydro project	To install 3MW hydro power plant in East Sepik province	64,000,000	15,458,937	2025-2028	Grant	Yes	Yes	Yes
Energy Industries (Electricity)	Daundo hydro project	To install 1.5MW hydro power plant in West Sepik province	12,000,000	2,898,551	2025-2028	Grant	Yes	Yes	Yes
Energy Industries (Electricity)	Lawes hydro project	To install 2MW hydro power plant in Manus province	24,000,000	5,797,101	2025-2028	Grant	Yes	Yes	Yes
Energy Industries (Electricity)	Kereu 1 hydro project	To install 0.6MW hydro power plant in AROB	4,800,000	1,159,420	2022-2025	Grant	Yes	Yes	Yes

Sub-sector	Title of activity, programme, project or other	Programme/ project description	Estimated amount		Expected timeframe	Expected financial instrument	Contribution to technology development and transfer objectives (Yes/No)	Contribution to capacity-building objectives (Yes/No)	Whether the activity is anchored in a national strategy and/or an NDC (Yes/No)
			Domestic currency	USD					
Energy Industries (Electricity)	Butaweng hydro power project	To install 0.2MW hydro power plant in Morobe province	1,600,000	386,473	2024-2026	Grant	Yes	Yes	Yes
Energy Industries (Electricity)	Kimadan hydro power project	To install 1.5MW hydro power plant in New Ireland province	12,000,000	2,898,551	2025-2027	Grant	Yes	Yes	Yes
Energy Industries (Electricity)	Sohun hydro power project	To install 0.3MW hydro power plant in New Ireland province	2,400,000	579,710	2023-2025	Grant	Yes	Yes	Yes
Energy Industries (Electricity)	Mavelo hydro power project	To install 10MW hydro power plant in East New Britain province	80,000,000	19,323,671	2025-2029	Grant	Yes	Yes	Yes
Energy Industries (Electricity)	Kavieng biomass plant	To install 2MW biomass power plant in New Ireland province			2026-2030	Grant	Yes	Yes	Yes

Table 22: Financial Support Needed for mitigation actions of the LULUCF Sector in NDC 2.0

Sub-sector	Title of activity, programme, project or other	Programme/ project description	Estimated amount		Expected timeframe	Expected financial instrument	Contribution to technology development and transfer objectives (Yes/No)	Contribution to capacity-building objectives (Yes/No)	Whether the activity is anchored in a national strategy and/or an NDC (Yes/No)
			Domestic currency	USD					
Forest Land	Enhanced monitoring and enforcement of timber legality standard	50% of all concessions fully legal (including FCA timber) by 2025. 100% of concessions fully legal by 2030(including FCA timber)	409,860,000	99,000,000	2021-2030	Grant	No	Yes	Yes
Forest Land	Regulation of small-scale timber (>500m3 pa)	Quantification of impacts of small-scale timber in place by 2022. Measures identified to enhance management of small-scale timber harvesting by 2025.	10,350,000	2,500,000	2021-2030	Grant	No	Yes	Yes
Forest Land	Enhance supply of planted timber and reforestation	"110,000 ha of land by 2025 and 220,000 ha of land by 2030"	27,324,000	6,600,000	2021-2030	Grant	No	Yes	Yes
Forest Land	Establish enhanced environment	Draft forest policy by 2023. Updated forest policy by 2025	8,280,000	2,000,000	2021-2030	Grant	No	Yes	Yes

Sub-sector	Title of activity, programme, project or other	Programme/ project description	Estimated amount		Expected timeframe	Expected financial instrument	Contribution to technology development and transfer objectives (Yes/No)	Contribution to capacity-building objectives (Yes/No)	Whether the activity is anchored in a national strategy and/or an NDC (Yes/No)
			Domestic currency	USD					
	for forestry governance								
Forest Land	Establish a transition package for old timber concessions	60% reduction on number of old concession types and 90% reduction in old concession types by 2030		TBC	2021-2030	Grant	No	Yes	Yes
Forest Land	Strengthened application of environmental safeguards	Documents for 50% of projects updated and publicly available by 2025, documents for 100% of projects by 2030. By 2025 3 and by 2030 6 subnational jurisdictions operating with designated authority on environmental monitoring and enforcement	70,380,000	17,000,000	2021-2030	Grant	No	Yes	Yes
Forest Land	Enhanced protected area development and management	"i.Enhanced terrestrial Protected Area coverage	165,600,000	40,000,000	2021-2030	Grant	No	Yes	Yes

Sub-sector	Title of activity, programme, project or other	Programme/ project description	Estimated amount		Expected timeframe	Expected financial instrument	Contribution to technology development and transfer objectives (Yes/No)	Contribution to capacity-building objectives (Yes/No)	Whether the activity is anchored in a national strategy and/or an NDC (Yes/No)
			Domestic currency	USD					
		ii.Protected Area effectiveness Enhanced iii.Protected Area sustainably financed"							
Forest Land	Establish national sustainable land use planning framework	NSLUP approved by National Executive Council (NEC) by 2022. 2 regulations supporting implementation developed by 2023. Draft national land use plan (LUP) developed by 2025. Updated NSLUP and regulations approved by 2030. Full national LUP in place by 2030	4,554,000	1,100,000	2021-2030	Grant	No	Yes	Yes
All LULUCF subsectors	Establish national sustainable land use planning information system	i.Central LU Information system in place by 2025 ii.System integrated with systems at	12,834,000	3,100,000	2021-2030	Grant	Yes	Yes	Yes

Sub-sector	Title of activity, programme, project or other	Programme/ project description	Estimated amount		Expected timeframe	Expected financial instrument	Contribution to technology development and transfer objectives (Yes/No)	Contribution to capacity-building objectives (Yes/No)	Whether the activity is anchored in a national strategy and/or an NDC (Yes/No)
			Domestic currency	USD					
		provincial level in four provinces by 2025 iii. System with interim links with other sector systems by 2025 iv. System fully operational with fully linked with other sector systems by 2030 v.System operational within all provinces							
All LULUCF subsectors	Develop spatially explicit subnational development plans	Spatially explicit land use plans in place for 5 provinces by 2025	82,800,000	20,000,000	2021-2030	Grant	Yes	Yes	Yes
Crop land	Strengthen agricultural planning and policy framework and its application	Spatially explicit land use plans in pace for all provinces 2030	4,140,000	1,000,000	2021-2030	Grant	No	Yes	Yes

Sub-sector	Title of activity, programme, project or other	Programme/ project description	Estimated amount		Expected timeframe	Expected financial instrument	Contribution to technology development and transfer objectives (Yes/No)	Contribution to capacity-building objectives (Yes/No)	Whether the activity is anchored in a national strategy and/or an NDC (Yes/No)
			Domestic currency	USD					
Crop land	Strengthen access to and quality of extension systems	Climate smart national agricultural development policy by 2023. Passage of agriculture sector legislation by 2025	132,480,000	32,000,000	2021-2030	Grant	No	Yes	Yes
Crop land	Strengthen framework for sustainable palm oil development	Framework for extension financing agreed and in place by 2025. Full financing in place for extension by 2030. 30% increase in number of extension offices by 2025. 296 agriculture extension officers operating in all LLG in the country by 2030	372,600,000	90,000,000	2021-2030	Grant	No	Yes	Yes
Crop land	Strengthen Framework for sustainable cocoa development	Palm oil action plan agreed by 2022. Palm oil policy by 2023. 90% of palm oil exports sustainably certified in 2025 and in 2030	372,600,000	90,000,000	2021-2030	Grant	No	Yes	Yes
Crop land	Strengthen Framework for	Cocoa action plan agreed by 2022. Cocoa	372,600,000	90,000,000	2021-2030	Grant	No	Yes	Yes

Sub-sector	Title of activity, programme, project or other	Programme/ project description	Estimated amount		Expected timeframe	Expected financial instrument	Contribution to technology development and transfer objectives (Yes/No)	Contribution to capacity-building objectives (Yes/No)	Whether the activity is anchored in a national strategy and/or an NDC (Yes/No)
			Domestic currency	USD					
	sustainable coffee development	policy by 2023. 30% of cocoa exports sustainably certified by 2025. 60% of cocoa exports sustainably certified by 2030							

4.4. Information on financial support received by Papua New Guinea under Article 9 of the Paris Agreement

This section provides an overview of the financial support received by Papua New Guinea for the timeframe of 2020 to 2022. The total amount of financial support received as reported within this period is USD 324,712,271. This also includes projects/programs implemented prior to 2020 and ended within the aforementioned reporting timeframe (2020 to 2022). As well as projects/programs that have started within the reporting timeframe (2020 to 2022) and will end after 2022.

The list of financial support does not capture regional support, as there were challenges faced in disaggregating the financial support received by Papua New Guinea from the other countries. Furthermore, there were also challenges faced in disaggregating financial support specifically for climate change from projects/programs that have climate change as a component or output. Thus, the list only captures those projects in which the climate change component or output was able to be disaggregated.

The table below provides a summary of the financial support that has been received by Papua New Guinea.

Table 23: List of financial support received by Papua New Guinea between 2020 and 2022

Title of activity, programme, project or other	Channel	Recipient entity	Implementing entity	Amount Received		Timeframe	Financial instrument	Status of support	Type of support	Sector	Status of activity
				Domestic currency (Kina)	USD						
Strengthening NDA Capacity on the Project Evaluation and Development of Climate Finance Strategy to Enhance Papua New Guinea's Access to Climate Finance	Multilateral	Climate Change and Development Authority	Global Green Growth Institute	1,203,804	290,774	2022-2023	Grant	Received	Cross-cutting	Cross-cutting	Completed
Readiness for registry and nesting system to facilitate climate-related investments in agriculture, forest and land use (AFOLU) sector in Papua New Guinea	Multilateral	Climate Change and Development Authority	Food and Agriculture Organization	4,069,744	983,030	2022-2023	Grant	Received	Mitigation	Agriculture, Forestry and Other Land Use	Completed
Building Resilience to Climate Change	Multilateral	Climate Change and Development Authority	ADB	133,432,200	32,230,000	2016-2026	Grant	Received	Adaptation	Cross-cutting	Ongoing

Title of activity, programme, project or other	Channel	Recipient entity	Implementing entity	Amount Received		Timeframe	Financial instrument	Status of support	Type of support	Sector	Status of activity
				Domestic currency (Kina)	USD						
in Papua New Guinea											
Town Electrification Investment Program	Multilateral	PAPUA NEW GUINEA Power Limited	ADB	496,800,000	120,000,000	2016-2021	Loan	Received	Mitigation	Energy	Completed
Port Moresby Power Grid Development Project	Multilateral	PAPUA NEW GUINEA Power Limited	ADB	276,138,000	66,700,000	2013-2025	Loan	Received	Mitigation	Energy	Ongoing
Papua New Guinea Western Province Partnership (WPP)	Bilatral	Western Provincial Government	Abt associates pty ltd and International food policy research institute	55,627,123	13,436,503	2021-2030	Grant	Received	Adaptation	Food Security, Water and Sanitation	Ongoing
Papua New Guinea Climate FIRST (Finance Initiative for Resilience and a Sustainable Transition)	Bilatral	Climate Change and Development Authority	Global Green Growth Institute	53,737,320	12,980,029	2021-2028	Grant	Received	Mitigation and Adaptation	Energy, Water and Sanitation	Ongoing
EU 'Strengthening Integrated Sustainable Landscape	Bilateral	Enga Provincial Government	United Nations Development Programme	18,700,000	4,516,908	2021-2025	Grant	Received	Cross-cutting	Land Use	Ongoing

Title of activity, programme, project or other	Channel	Recipient entity	Implementing entity	Amount Received		Timeframe	Financial instrument	Status of support	Type of support	Sector	Status of activity
				Domestic currency (Kina)	USD						
Management in Enga Province											
European Union 'Forestry, Climate Change and Biodiversity Programme (EU-FCCB)	Bilateral	National Government, Provincial Governments	Expertise France (EF), the Center for International Forestry Research – International Council for Research in Agroforestry (CIFOR-ICRAF), and the Food and Agriculture Organization of the United Nations (FAO).	210,000,000	50,724,638	2022-2027	Grant	Received	Cross-cutting	Cross-cutting	Ongoing
Capacity development project for reducing carbon emissions from forest degradation	Bilateral	PNG Forest Authority	Japan International Cooperation Agency	-	-	2022-2025	Grant	Received	Mitigation	LULUCF	Ongoing

Title of activity, programme, project or other	Channel	Recipient entity	Implementing entity	Amount Received		Timeframe	Financial instrument	Status of support	Type of support	Sector	Status of activity
				Domestic currency (Kina)	USD						
through commercial logging in Papua New Guinea by improving monitoring systems of forest logging operations											
Adaptation of Small-Scale Agriculture for Improved Food Security of Resilient Communities in Papua New Guinea (ASSA)	Multilateral	Department of Agriculture and Livestock	The Pacific Community	41,400,000	10,000,000	2022-2025	Grant	Received	Adaptation	Agriculture	Ongoing
Inclusive Green Finance Policy for Papua New Guinea's Banking sector	Bilateral	Bank of PAPUA NEW GUINEA	GGGI	2,773,800	670,000	2021-2025	Grant	Received	Cross-cutting	Cross-cutting	Ongoing
Environment policy shaped for sustainable action of climate change	Bilateral	CCDA	UNDP	2,029,254	490,158	2019-2020	Grant	Received	Cross-cutting	Cross-cutting	Completed

Title of activity, programme, project or other	Channel	Recipient entity	Implementing entity	Amount Received		Timeframe	Financial instrument	Status of support	Type of support	Sector	Status of activity
				Domestic currency (Kina)	USD						
in Papua New Guinea											
Facilitating Renewable Energy & Energy Efficiency Applications for Greenhouse Gas Emission Reduction (FREAGER)	Multilateral	CCDA	UNDP	11,760,250	2,840,640	2017-2024	Grant	Received	Mitigation	Energy	Completed
Forest Carbon Partnership Facility II	Multilateral	CCDA	UNDP	21,528,000	5,200,000	2018-2020	Grant	Received	Mitigation	LULUCF	Completed
Advancing Papua New Guinea's National Adaptation Plan	Multilateral	CCDA	UNDP	7,215,155	1,742,791	2020-2021	Grant	Received	Adaptation	Cross-cutting	Completed
Enhancing disaster and climate resilient agriculture in vulnerable communities	Multilateral	Provincial Governments (Hela and Southern Highlands)	FAO	1,171,620	283,000	2020-2022	Grant	Received	Adaptation	Agriculture	Completed
Capacity building on national forest	Multilateral	CCDA and PNG Forest Authority	FAO	612,720	148,000	2019-2021	Grant	Received	Mitigation	LULUCF	Completed

Title of activity, programme, project or other	Channel	Recipient entity	Implementing entity	Amount Received		Timeframe	Financial instrument	Status of support	Type of support	Sector	Status of activity
				Domestic currency (Kina)	USD						
information analysis and reporting for enhancing credibility of national climate change and REDD+ implementation											
Capacitiesfor NFMS and FREL management and development in Papua New Guinea	Multilateral	CCDA	FAO	3,312,000	800,000	2018-2020	Grant	Received	Mitigation	LULUCF	Completed
Enabling green growth in Papua New Guinea to address climate change and conserve biodiversity	Multilateral	CCDA	FAO	2,499,732	603,800	2022-2023	Grant	Received	Mitigation	LULUCF	Completed
Technology Needs Assessment	Multilateral	CCDA	UNEP	298,080	72,000	2020-2025	Grant	Received	Cross-cutting	Cross-cutting	Ongoing

4.5. Information on technology development and transfer support needed by Papua New Guinea under Article 10 of the Paris Agreement

Technology development and transfer support is considered a high priority in Papua New Guinea in order to implement climate action in the country. While there has been progress made with technology development and transfer, there is still a need for support in this area. This section outlines the technology development and transport support that is currently needed by Papua New Guinea to implement mitigation actions within the energy and LULUCF sectors, as well as adaptation actions. The main technology development and transfer needed in the energy sector are solar power plants and hydro power plants, while the LULUCF sector is IT infrastructure. As for the adaptation actions, the main technology development and transfer is IT infrastructure, climate-resilient infrastructure and nature-based solutions.

Table 24: Technology development and transfer support are needed for the mitigation actions of the energy sector

Subsector	Title of activity, programme, project, or other	Programme/ project description	Type of technology	Expected timeframe
Energy Industries (Electricity)	Kavieng Solar PV & ESS project	To install 1.5MW solar power plant New Ireland Province	Solar PV and battery storage	2023-2025 (proposed timeframe)
Energy Industries (Electricity)	Maprik Solar PV & ESS project	To install 0.2MW solar power plant in East Sepik Province	Solar PV and battery storage	2022-2024 (proposed timeframe)
Energy Industries (Electricity)	Murua Hydro project	To install 3MW hydro power plant in Gulf Province	Hydropower plant	2025-2028 (proposed timeframe)
Energy Industries (Electricity)	Gumini hydro project	To install 1.5MW hydro power plant in Milne Bay	Hydro power plant	2023-2026 (proposed timeframe)
Energy Industries (Electricity)	Damar/Mabam hydro project	To install 3MW hydro power plant in East Sepik province	Hydropower plant	2025-2028 (proposed frame)
Energy Industries (Electricity)	Daundo hydro project	To install 1.5MW hydro power plant in West Sepik province	Hydro power plant	2025-2028 (proposed timeframe)
Energy Industries (Electricity)	Lawes hydro project	To install 2MW hydro power plant in Manus province	Hydro power plant	2025-2028 (proposed timeframe)
Energy Industries (Electricity)	Kereu 1 hydro project	To install 0.6MW hydro power plant in AROB	Hydro power plant	2022-2025 (proposed timeframe)
Energy Industries (Electricity)	Butaweng hydro power project	To install 0.2MW hydro power plant in Morobe province	Hydro power plant	2024-2026 (proposed timeframe)

Subsector	Title of activity, programme, project, or other	Programme/ project description	Type of technology	Expected timeframe
Energy Industries (Electricity)	Kimadan hydro power project	To install 1.5MW hydro power plant in New Ireland province	Hydro power plant	2025-2027 (proposed timeframe)
Energy Industries (Electricity)	Sohun hydro power project	To install 0.3MW hydro power plant in New Ireland province	Hydro power plant	2023-2025 (proposed timeframe)
Energy Industries (Electricity)	Mavelo hydro power project	To install 10MW hydro power plant in East New Britain province	Hydro power plant	2025-2029 (proposed timeframe)
Energy Industries (Electricity)	Kavieng biomass plant	To install 2MW biomass power plant in New Ireland province	Biomass power plant	2026-2030 (proposed timeframe)
Energy Industries (Electricity)	Kavieng Solar PV & ESS project	To install 1.5MW solar power plant New Ireland Province	Solar PV and battery storage	2023-2025 (proposed timeframe)

Table 25:Technology development and transfer support that are needed for the mitigation actions of the LULUCF sector

Subsector	Title of activity, programme, project, or other	Programme/ project description	Type of technology	Expected timeframe
All LULUCF Subsector	Establish a national sustainable land use planning information system	-Central LU Information system in place by 2025 -System integrated with systems at the provincial level in four provinces by 2025 -System with interim links to other sector systems by 2025 -System fully operational with fully linked with other sector systems by 2030 - System is operational within all provinces	IT infrastructure	2021-2030

All LULUCF Subsector	Develop spatially explicit subnational development plans	Spatially explicit land use plans in place for 5 provinces by 2025	IT infrastructure	2021-2030

Table 26: Technology development and transfer support that are needed for the adaptation actions

Sector	Subsector	Title of activity, programme, project, or other	Programme/ project description	Type of technology	Expected timeframe
Infrastructure	Building and roads	Build/rehabilitate urban and coastal infrastructure according to climate-resilient codes and standards for increased resilience of physical assets, communities, and livelihoods	This programme involves: -Coastal defence structure (including construction of seawalls) -Include climate change considerations in urban development plans to restrict development and redevelopment in risk-prone areas	Climate resilient infrastructure	2028-2030
Infrastructure	Waste and sanitation	Improve water and sanitation infrastructure and services to meet demand, considering expected climate impacts	This programme involves -Develop long-term assessments of potential water supply threats (such as droughts, saltwater intrusion, and flooding) and implement strategies to increase resilience to these threats and ensure long-term availability of water -Improve water and sanitation infrastructure to enhance access to safe water supply and sanitation facilities -Improvement in stormwater and drainage systems	Climate resilient infrastructure	2026-2028
Infrastructure	Infrastructure	Build/rehabilitate transport infrastructure according to climate-resilient codes and standards	This programme involves: -Design and/or management of the 4 wharves in partnership with development partners -Construction and/or rehabilitation of climate-resilient roads, bridges, and culverts according to climate-resilient standards	Climate resilient infrastructure	2028-2030

Sector	Subsector	Title of activity, programme, project, or other	Programme/ project description	Type of technology	Expected timeframe
			-Design and/or manage the rehabilitation of airports to international and climate-resilient standards		
Health	Infrastructure	Improve the climate resilience of health infrastructure	This programme involves: -Develop detailed investment plans informed by sound economic analyses, inclusive of existing resources, costs and gaps to increase resilience of health-care facilities -Rehabilitate and refurbish priority health infrastructure identified to meet the National Health Services Standards	Climate resilient infrastructure	2026-2028
Land	Coastal	Coastal rehabilitation and protection to enhance the resilience of coastal communities and ecosystems	This project is to create, protect and manage systems of green infrastructure (e.g., urban forests, parks and open spaces, natural drainage systems) in towns	Nature-based solution	2023-2026
Land	Coastal	Protection, restoration, and sustainable management of biodiversity to reduce vulnerability and enhance natural capital	This programme involves: -Protection and restoration of terrestrial landscapes, biodiversity and degraded ecosystems through ecosystem-based adaptation (EbA) approaches. -Develop strategies to protect forests from climate-related risks such as pest, disease, and forest fires. -Development of terrestrial protected areas to enhance ecosystem services and community resilience and livelihoods. -Reforestation and soil stabilization. -Promote the adoption of sustainable and climate resilient natural resource management practices.	Nature-based solution	2023-2026

Sector	Subsector	Title of activity, programme, project, or other	Programme/ project description	Type of technology	Expected timeframe
Urban Planning	Infrastructure Urban	Improve information for adaptation planning and management of climate risks	This project is to create, protect and manage systems of green infrastructure (e.g., urban forests, parks and open spaces, natural drainage systems) in towns	IT infrastructure	2023-2026
		Enhance adaptation and resilience through impact-based forecasting and early warning systems	This programme involves: -the development vulnerability assessments and climate change scenarios at the sectoral level and integrate these into provincial and national planning tools and instruments. -Consolidate updated information on climate risks in a centralized instrument (e.g. climate risk atlas, web platform, sectoral risk profiles)	IT infrastructure	2023-2026

4.6. Information on technology development and transfer support received by Papua New Guinea under Article 10 of the Paris Agreement

This section provides a summary of the list of technology development and transfer support received by Papua New Guinea under Article 10 of the Paris Agreement.

Table 27: List of technology development and transfer support received by Papua New Guinea within the timeframe 2020 to 2022

Title of activity, programme, project or other	Type of technology	Timeframe	Recipient entity	Implementing entity	Type of support	Sector	Status of activity
Building Resilience to Climate Change in Papua New Guinea	Infrastructure	2016-2026	Climate Change and Development Authority	ADB	Adaptation	Cross-cutting	Ongoing
Town Electrification Investment Program	Infrastructure	2016-2021	PNG Power Limited	ADB	Mitigation	Energy	Completed
Port Moresby Power Grid Development Project	Infrastructure	2013-2025	PNG Power Limited	ADB	Mitigation	Energy	Ongoing
Papua New Guinea Western Province Partnership (WPP)	Infrastructure	2021-2030	Western Provincial Government	Abt associates pty ltd and International food policy research institute	Adaptation	Food Security, Water and Sanitation	Ongoing
Papua New Guinea Climate FIRST (Finance Initiative for Resilience and a Sustainable Transition)	Infrastructure	2021-2028	Climate Change and Development Authority	Global Green Growth Institute	Mitigation and Adaptation	Energy, Water and Sanitation	Ongoing

Title of activity, programme, project or other	Type of technology	Timeframe	Recipient entity	Implementing entity	Type of support	Sector	Status of activity
Adaptation of Small-Scale Agriculture for Improved Food Security of Resilient Communities in Papua New Guinea (ASSA)	Infrastructure	2022-2025	Department of Agriculture and Livestock	The Pacific Community	Adaptation	Agriculture	Ongoing
Facilitating Renewable Energy & Energy Efficiency Applications for Greenhouse Gas Emission Reduction (FREAGER)	Infrastructure	2017-2024	CCDA	UNDP	Mitigation	Energy	Completed

4.7. Information on capacity-building support needed by Papua New Guinea under Article 11 of the Paris Agreement

As a SIDS, capacity-building support is needed in Papua New Guinea to implement climate actions in Papua New Guinea. This section outlines the capacity-building support needed in Papua New Guinea to implement mitigation actions within the LULUCF sector and adaptation actions. Papua New Guinea has faced some challenges in fully reporting on the capacity building needed in the country, mainly at the community level. This will be addressed in future reports once improvements have been made in institutional capacity.

Table 28: Capacity-building support needed for mitigation actions of the LULUCF sector

Sub-sector	Title of activity, programme, project or other	Programme/ project description	Expected time frame
Forest Land	Regulation of small-scale timber (>500m3 pa)	Quantification of impacts of small-scale timber in place by 2022. Measures identified to enhance management of small-scale timber harvesting by 2025.	2021-2030
Forest Land	Enhance supply of planted timber and reforestation	"110,000 ha of land by 2025 and	2021-2030
Forest Land	Establish enhanced environment for forestry governance	220,000 ha of land by 2030"	2021-2030
Forest Land	Establish a transition package for old timber concessions	Draft forest policy by 2023. Updated forest policy by 2025	2021-2030
Forest Land	Strengthened application of environmental safeguards	60% reduction on number of old concession types and 90% reduction in old concession types by 2030	2021-2030
Forest Land	Enhanced protected area development and management	i.Enhanced terrestrial Protected Area coverage ii.Protected Area effectiveness Enhanced iii.Protected Area sustainably financed	2021-2030
Forest Land	Establish a national sustainable land use planning framework	Spatially explicit land use plans in pace for all provinces 2030	2021-2030
Crop land	Strengthen the agricultural planning and policy framework and its application	Climate smart national agricultural development policy by 2023. Passage of agriculture sector legislation by 2025	2021-2030
Crop land	Strengthen access to and quality of extension systems	Framework for extension financing agreed and in place by 2025. Full financing in place for extension by 2030. 30% increase in number of extension offices by 2025. 296 agriculture extension officers operating in all LLG in the country by 2030	2021-2030

Sub-sector	Title of activity, programme, project or other	Programme/ project description	Expected time frame
Crop land	Strengthen the framework for sustainable palm oil development	Palm oil action plan agreed by 2022. Palm oil policy by 2023. 90% of palm oil exports sustainably certified in 2025 and in 2030	2021-2030
Crop land	Strengthen the Framework for sustainable cocoa development	Cocoa action plan agreed by 2022. Cocoa policy by 2023. 30% of cocoa exports sustainably certified by 2025. 60% of cocoa exports sustainably certified by 2030	2021-2030
Crop land	Strengthen the Framework for sustainable coffee development	Spatially explicit land use plans in pace for all provinces 2030	2021-2030
Crop land	Scale-up climate-smart agriculture best practice and action in vulnerable regions of Papua New Guinea	Climate smart national agricultural development policy by 2023. Passage of agriculture sector legislation by 2025	2021-2030

Table 29: Capacity-building support needed for adaptation actions

Sector	Sub-sector	Title of activity, programme, project or other	Programme/ project description	Expected time frame
Agriculture	Cash Crop	Scale-up climate-smart agriculture best practice and action in vulnerable regions of Papua New Guinea	This programme involves: -Finalisation of the Climate Smart Agriculture Policy -Encourage implementation of conservation agriculture and integration farming systems -Training, improving information and knowledge management and agricultural extension -Improve extension services and dissemination of information -Establishment of seed banks -Research and development of resilient varieties -Promote and implement Indigenous coping strategies to drought and introduce new crop varieties that can extend the tolerance range of crop growing conditions (e.g. drought, excess moisture, saline soil conditions and higher temperatures)	2023-2026

Agriculture	Water	Implement climate resilient water management & conservation strategies	This programme involves: -Protect and enhace water sources and strengthen water and soil use management -Water efficient irrigation and improved water use -Improve water access (digging of wells, water collection, rainwater harvesting, kitchen gardens with recycling of water, etc.)	2026-2028
Agriculture	Infrastructure	Develop climate-resilient agricultural value chains and value chain/market infrastructure, market information and business support services to enhance food security and resilience of vulnerable farmers	This programme involves: -Development of climate-resilient infrastrucutre (e.g. supporting linkages between farmers to markets) -Expend climate resilient post-harvest processing/storage techniques and facilities and improve supply and market access -Build capacity in small scale food processing, preservation and storage at household and community levels -Encourage and support the formation of small and medium enterprises (SME) in the food sector -Establishment of farmer co-ooperatives and microcredit facilities -Incorporation of agriculture risk insurance into all production, supply and value adding, transportation and marketing systems	2026-2028
Agriculture	Cash Crop	Increase sustainable income generating opportunities for women and diversify economices to reduce risks of climate impacts and improve access to food for children and families	This programme involves -Diversify and implement climate resilient livelihoods practices/strategies, focusing on women -Improve women's access to extension services, technology, inputs, markets and information -Expand microfinance access and small enterprise creation, mentoring and support programs for women	2023-2026
Infrastructure	Buildings	Develop climate-resilient codes and standards for construction/rehabilitation of buildings and transport and utility infrastructure	This programme involves: -Conduct a rigorous risk and vulnerability assessment including inland road network, coastal roads, and buildings -Develop an asset-at-risk inventory and management plans	2026-2028

			-Update road design standards including climate change considerations -Develop/update building codes to address the variety of hazards that are likely to result from climate change	
Infrastructure	Buildings	Develop climate resilient codes and standards for the construction/rehabiitation of buildings and transport and utility infrastructure	This programme involves: -Conduct a rigorous risk and vulnerability assessment including inland road network, coastal roads, and buildings -Develop an asset-at-risk inventory and management plans -Update road design standards including climate change considerations -Develop/update building codes to address the variety of hazards that are likely to result from climate change	2026-2028
Health	Public Health	Evidence-based planning and decision-making to develop climate change adaptation strategies in the health sector	This programme involves: -Develop standardized assessment tools to assess health impacts of environment and climate change to obtain comparable data for planning, evaluations, and reporitng -Conduct vulnerability and adaptation assessments using standardized approaches to develop a national climate change and health profile -Develop strategies and systems to improve monitoring of health impacts of climate change to set priorities for Papua New Guinea based on evidence -Establish climate-heath information system -Assess and estimate the cost of climate change impacts on health	2023-2026
Health	Environmental Health	Improve environmental health services promoting climate change adaptation and reduction of climate risks	This programme involves: -Strengthen environmental health programs to include primary health care and preventive health services, environmental health in emergencies, disaster risk management in health, communicable and non-communicable diseases -Develop investment case for climate-health resilience building on evidence-based information	2026-2028

			-Strengthen public health systems and climate related disaster preparedness and response capacities	
Governance	Cross-cutting	Mainstreaming climate change adaptation into sectoral and provincial plans	This programme involves: -Prepare sectoral climate change adaptation plans according to the "Sectoral Guidelines for Planning for climate change adaptation" -Prepare provincial climate change adaptation plans consistent with Council Wards and Districts and facilitated by Provincial Authorities	2023-2030
Governance	Cross-cutting	Strengthen Papua New Guinea's regulatory framework	This programme involves: -Streamline climate change in relevant sectoral policies (e.g, review, finalise, adopt, and enforce the draft Climate Smart Agriculture Policy; develop a dedicated climate resilience policy in the infrastructure and transport sectors; finalise and enact the draft National Environmental Health Policy and Papau New Guinea's Strategy and Action Plan on Climate Change and Health) -Strengthen and/or develop regulations and standards (e.g,. Integrate climate change adaptation standards within EIAs, developing Climate Resilient Infrastructure Standards Reguation, sectoral climate compatible standards)	2023-2030
Governance	Cross-cutting	Increase institutional and technical capacities for climate change adpatation	This programme involves: -Implement the NAP's capacity development plan, with a focus on priority sectors and consider provinces at the Ward and District level and other state agencies that will be supporting the sectors with the implementation, such as Conservation, Environment and Protection Authority. -Strenthen CCDA's institutional capacities to foster its ability to lead the implementation of NAP and oversee the coordinated design and implementation of sectoral climate change adaptation plans in application of the Sectoral planning guidelines.	2023-2030

			-Facilitate high-level dialogue across sectors to foster and accelerate climate change adaptation action	
Education	Research	Strengthen climate information research and knowledge generation	This programme involves: -Facilitate coordinated, interdisciplinary, and continuous research that provides information on climate related impacts, technologies and potential solutions to adapt to climate change to inform policy decision-making and implementation in priority sectors -Establish a climate research and information working committee under the NCCB to facilitate	2023-2030
Fisheries	Coastal and Inland	Improve the management of coastal and inland fisheries and support the development of sustainable value chains	This programme involves: -Develop and implement ecosystem-based approaches for the management of fisheries. " -Support the development of sustainable aquaculture and the value chains for their outputs." -Improve research, extension services and marketing capacities to support vulnerable fishers and SMEs manage climate risks.	2023-2026
Governance	Planning	Develop a strategy for relocation/resettlement/retreat	This programme involves: -Establish effective early warning systems and communication networks that provides alerts on nutrition and food insecurity which may be precipitated by emergencies such as drought and floods or unfavourable food market conditions. -Scale up climate information and early warning systems (including community-based flood simulation exercises and early warning systems for coastal flooding)	2028-2030

4.8. Information on capacity-building support received by Papua New Guinea Parties under Article 11 of the Paris Agreement

This section provides a summary of the list of capacity-building support received by Papua New Guinea under Article 11 of the Paris Agreement.

Table 30: List of capacity-building support received by Papua New Guinea from 2020 to 2022

Title of activity, programme, project or other	Timeframe	Recipient entity	Implementing entity	Type of support	Sector	Status of activity
Strengthening NDA Capacity on the Project Evaluation and Development of Climate Finance Strategy to Enhance Papua New Guinea's Access to Climate Finance	2022-2023	Climate Change and Development Authority	Global Green Growth Institute	Cross-cutting	Cross-cutting	Completed
Readiness for registry and nesting system to facilitate climate-related investments in agriculture, forest and land use (AFOLU) sector in Papua New Guinea	2022-2023	Climate Change and Development Authority	Food and Agriculture Organization	Mitigation	Agriculture, Forestry and Other Land Use	Completed
EU 'Strengthening Integrated Sustainable Landscape Management in Enga Province	2021-2025	Enga Provincial Government	United Nations Development Programme	Cross-cutting	Land Use	Ongoing
European Union 'Forestry, Climate Change and Biodiversity Programme (EU-FCCB)	2022-2027	National Government, Provincial Governments	Expertise France (EF), the Center for International Forestry Research – International Council for Research in Agroforestry (CIFOR-ICRAF), and the Food and Agriculture Organization of the	Cross-cutting	Cross-cutting	Ongoing

Title of activity, programme, project or other	Timeframe	Recipient entity	Implementing entity	Type of support	Sector	Status of activity
			United Nations (FAO).			
Capacity development project for reducing carbon emissions from forest degradation through commercial logging in Papua New Guinea by improving monitoring systems of forest logging operations	2022-2025	PNG Forest Authority	Japan International Cooperation Agency	Mitigation	LULUCF	Ongoing
Inclusive Green Finance Policy for Papua New Guinea's Banking sector	2021-2025	Bank of Papua New Guinea	GGGI	Cross-cutting	Cross-cutting	Ongoing
Environment policy shaped for sustainable action of climate change in Papua New Guinea	2019-2020	CCDA	UNDP	Cross-cutting	Cross-cutting	Completed
Forest Carbon Partnership Facility II	2018-2020	CCDA	UNDP	Mitigation	LULUCF	Completed
Advancing Papua New Guinea's National Adaptation Plan	2020-2021	CCDA	UNDP	Adaptation	Cross-cutting	Completed
Enhancing disaster and climate resilient agriculture in vulnerable communities	2020-2022	Provincial Governments (Hela and Southern Highlands)	FAO	Adaptation	Agriculture	Completed
Capacity building on national forest information analysis and reporting for enhancing credibility of national climate change and REDD+ implementation	2019-2021	CCDA and PNG Forest Authority	FAO	Mitigation	LULUCF	Completed
Capacitiesfor NFMS and FREL management and development in Papua New Guinea	2018-2020	CCDA	FAO	Mitigation	LULUCF	Completed
Enabling green growth in Papua New Guinea to address climate change and conserve biodiversity	2022-2023	CCDA	FAO	Mitigation	LULUCF	Completed

Title of activity, programme, project or other	Timeframe	Recipient entity	Implementing entity	Type of support	Sector	Status of activity
Technology Needs Assessment	2020-2025	CCDA	UNEP	Cross-cutting	Cross-cutting	Ongoing

4.9. Information on support needed and received by Papua New Guinea for the implementation of Article 13 of the Paris Agreement and transparency-related activities, including for transparency-related capacity-building

Papua New Guinea is committed to meeting its obligation under Article 13 of the Paris Agreement. However, as an SIDS, Papua New Guinea will require support in areas in which it lacks capacity. This section provides information on the support that Papua New Guinea will need to implement Article 13 of the Paris Agreement. Furthermore, it also provides information on the support that Papua New Guinea has received so far to implement Article 13 of the Paris Agreement.

In terms of the support needed, Papua New Guinea practitioners will need more capacity building to understand the reporting requirements of Article 13 of the Paris Agreement. The table below outlines the areas that will need capacity building.

Table 31: Support needed by Papua New Guinea for the implementation of Article 13 of the Paris Agreement

Title of activity, programme, project, or other	Objectives and description	Expected timeframe	Recipient entity	Channel	Amount		Status of Activity
					Domestic Currency	USD	
Enhance the capacity of the GHG Inventory and reporting requirements under ETF	This support should be focused on enhancing the understanding of Papua New Guinea practitioners of the GHG inventory and reporting requirements, as well as IPCC guidelines.	2026-2027	Climate Change and Development Authority and lead sector agencies (PNGFA, NEA, CEPA, DAL)	Bilateral/Multilateral	2,415	10,000	Planned
Enhance the capacity of the NDC tracking and reporting requirements under ETF	This support should be focused on enhancing the understanding of Papua New Guinea practitioners of the NDC tracking and reporting requirements, including modelling tools used to make projections of emissions	2026-2027	Climate Change and Development Authority and lead sector agencies (PNGFA, NEA, CEPA, DAL)	Bilateral/Multilateral	2,415	10,000	Planned

Title of activity, programme, project, or other	Objectives and description	Expected timeframe	Recipient entity	Channel	Amount		Status of Activity
					Domestic Currency	USD	
Enhance the capacity of the Adaptation reporting requirements under ETF	This support should be focused on enhancing the understanding of Papua New Guinea practitioners of the Adaptation reporting requirements, including vulnerability needs assessment tools	2026-2027	Climate Change and Development Authority and lead sector agencies	Bilateral/Multilateral	2,415	10,000	Planned
Enhance the capacity of the Loss and Damage reporting requirements under ETF	This support should be focused on enhancing the understanding of Papua New Guinea practitioners on how to report on Loss and Damage	2026-2027	Climate Change and Development Authority and lead sector agencies	Bilateral/Multilateral	2,415	10,000	Planned
Enhance the capacity of the support needed and received reporting requirements under ETF	This support should be focused on enhancing the understanding of Papua New Guinea practitioners how to report on support needed and received	2026-2027	Climate Change and Development Authority and lead sector agencies	Bilateral/Multilateral	2,415	10,000	Planned

As for the support received for the implementation of Article 13 of the Paris Agreement, Papua New Guinea has received a total of four financial and capacity-building supports from 2020 to 2024. This information is outlined in the table below

Table 32: Support received by Papua New Guinea for the implementation of Article 13 of the Paris Agreement

Title of activity, programme, project, or other	Objectives and description	Expected timeframe	Recipient entity	Channel	Amount		Status of Activity
					Domestic Currency	USD	
Strengthening capacity in the agriculture and land-use sectors for the enhanced transparency framework (CBIT)	This project, funded by the Capacity-Building Initiative for Transparency (CBIT) of the Global Environment Facility, aims to strengthen capacity in the Agriculture, Forestry, and Other Land Use (AFOLU) sectors for enhanced transparency in implementing Papua New Guinea's Nationally Determined Contribution (NDC).	2018-2021	Climate Change and Development Authority	Multiateral	3,573,822	863,242	Completed
GHG Inventory Training on IPCC software	ESCAP, CBIT GSP, and IPCC provided a 4 days training. The main objective of the training was to train Papua New Guinea practitioners on the use of the IPCC Software	2024	Climate Change and Development Authority	Bilateral	10,000	2,415	Completed
Forestry and Land Use Assessment	The Food and Agriculture Organisation provided support for updating the forestry and land use assessment for the years 2019 to 2022. This data was used to estimate GHG emissions and removals from the LULUCF sector. The funding source was European Union (EU), the Global Environment Facility (GEF), AIM4Forests,	2023-2025	PNG Forest Authority	Bilateral			Ongoing

Title of activity, programme, project, or other	Objectives and description	Expected timeframe	Recipient entity	Channel	Amount		Status of Activity
					Domestic Currency	USD	
	and the UN-REDD Programme.						
Training of LEAP Modelling Tool	The CBIT-GSP provided a 3 days training on the use of the LEAP modelling tool	2024	Climate Change and Development Authority	Multiateral	12,420	3,000	Completed
Support for the preparation of Papua New Guinea's First BTR	The national component of the European Union Programme on Forestry, Climate Change and Biodiversity, which is implemented by Expertise France, provided support for the preparation of Papua New Guinea's First Biennial Transparency Report	2024-2025	Climate Change and Development Authority	Bilateral	752,489	81,761	Ongoing

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Annex I: Technical annex for REDD+

Papua New Guinea has submitted a Technical annex for REDD+ as captured below.

Annex II: Common reporting tables

As the common reporting tables will be reported electronically, please refer to the relevant reporting on the UNFCCC website.

Annex III: Common tabular formats

Similar to the common reporting tables, which will be reported electronically, please refer to the relevant reporting on the UNFCCC website.

Annex IV: Information in relation to the Party's participation in cooperative approaches

Since Papua New Guinea will be participating in the cooperative approaches, the submission of the Initial report no later than the authorization of ITMOs in accordance with Paragraph 18 of Annex to Decision 2/CMA.3. Thus, please refer to the relevant reporting on the UNFCCC website for this report.

Papua New Guinea's REDD+ Technical Annex for REDD+

Pursuant to Decision 14/CP.19

Submitted to the First Biennial Transparency Report, which includes the REDD+ results achieved from Reducing Emissions from Deforestation and Forest Degradation for REDD+ Results-based payment for 2019– 2022.

December 2025

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List of Abbreviations

AD	Activity Data
AFOLU	Agriculture, Forestry and Other Land Use
ART	Architecture for REDD+ Transactions
BTR	Biennial Transparency Report
BUR	Biennial Update Report
CCDA	Climate Change and Development Authority
CO_2e	Carbon dioxide equivalent
COP	Conference of the Parties
EF	Emission Factor
FCPF	Forest Carbon Partnership Facility
FRL	Forest Reference Level
GCF	Green Climate Fund
GHG	Greenhouse Gas
HFLD	High Forest, Low Deforestation
IPCC	Intergovernmental Panel on Climate Change
LULUCF	Land Use, Land Use Change and Forestry
MRV	Measurement, Reporting, and Verification
NDC	Forest Carbon Partnership Facility
NFMS	National Forest Monitoring System
NFI	Nationally Determined Contribution
NIR	National Forest Inventory
PNG	Papua New Guinea
PNGFA	Papua New Guinea Forest Authority
QA/QC	Quality Assurance / Quality Control
REDD+	Reducing Emissions from Deforestation and Forest Degradation, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks
RBP	Results-Based Payments
SABL	Special Agriculture and Business Lease
tCO_2e	Tonnes of carbon dioxide equivalent
TREES	The REDD+ Environmental Excellence Standard
TWC	Technical Working Committee

Executive summary

This Technical Annex on REDD+ Results is submitted by Papua New Guinea (PNG) as part of its Biennial Transparency Report (BTR) under the United Nations Framework Convention on Climate Change (UNFCCC). The Annex presents REDD+ results achieved during the period 2019–2022, expressed in tonnes of carbon dioxide equivalent (tCO_2e per year), relative to PNG's technically assessed Second Forest Reference Level (FRL). It is prepared in accordance with relevant UNFCCC decisions, including decisions 4/CP.15, 12/CP.17, 13/CP.19 and 14/CP.19, and provides transparent and sufficient information to enable the reconstruction of reported results.

Papua New Guinea has progressively developed the key elements required under the Warsaw Framework for REDD+, including a National Forest Monitoring System (NFMS), measurement, reporting and verification (MRV) arrangements, national greenhouse gas inventories for the LULUCF sector, Biennial Update Reports (BURs), and forest reference levels. PNG submitted its Second Forest Reference Level based on a historical average approach using the reference period 2009–2018, with a results period of 2019–2027. The Second FRL was technically assessed and published by the UNFCCC, confirming its consistency with IPCC guidance and UNFCCC methodological requirements.

Given PNG's national circumstances as a High Forest Cover, Low Deforestation (HFLD) country, an upward adjustment was applied in the construction of the Second FRL in accordance with the ART TREES 2.0 standard, which represented the most robust guidance available at the time of FRL development. Based on an average historical emission level of 35,299,202 tCO_2e per year and an average national forest carbon stock of 14,748,195,755 tCO_2e, the HFLD adjustment resulted in an assessed FRL of 40,518,579 tCO_2e per year for the period 2019–2027. This FRL constitutes the primary benchmark for assessing REDD+ results in this Technical Annex.

Using activity data and emission factors consistent with those applied in the assessed Second FRL, PNG achieved positive REDD+ results in each year from 2019 to 2022. When assessed against the technically assessed Second FRL, total emission reductions achieved over the period amount to 69,558,815 tCO_2e, reflecting sustained reductions in emissions from deforestation and forest degradation relative to the historical baseline.

To enhance transparency, this Technical Annex also presents supplementary and indicative results using an updated HFLD adjustment benchmark derived from the Green Climate Fund (GCF) REDD+ Results-Based Payments (RBP) Mainstreaming Scorecard. Applying the more conservative constraint of "10% above historical average emissions," the updated benchmark corresponds to an annual reference level of 38,829,122 tCO_2e. When assessed against this benchmark, PNG continues to demonstrate positive REDD+ results for all years from 2019 to 2022, with cumulative emission reductions of 62,800,986 tCO_2e. These supplementary calculations do not modify the technically assessed Second FRL and are presented solely for transparency.

This Technical Annex further demonstrates that the reported REDD+ results are methodologically consistent with the assessed Second FRL, the national greenhouse gas inventory for the LULUCF sector, and previously submitted REDD+ information, while transparently explaining and justifying any differences in scope, pools and gases. Detailed information on activity data, emission factors, calculation methods, uncertainty assessment, institutional arrangements and data availability is provided to enable the reconstruction of results.

Overall, the REDD+ results presented in this Technical Annex are robust, transparent and consistent with UNFCCC methodological guidance, demonstrating Papua New Guinea's continued progress in reducing emissions from deforestation and forest degradation and providing a credible basis for consideration under results-based finance mechanisms.

1. Introduction

This Technical Annex on REDD+ Results is submitted as part of Papua New Guinea (PNG)'s Biennial Transparency Report (BTR), in accordance with decisions 4/CP.15, 13/CP.19 and relevant guidance under the Paris Agreement transparency framework. It provides information necessary for the reconstruction, transparency and assessment of REDD+ results relative to the technically assessed Second Forest Reference Level (2nd FRL).

1.1 Overview of REDD+ Activities in PNG

PNG submitted its 1st FRL to the UNFCCC in January 2017 which was technically assessed by UNFCCC, and the revised version of the first FRL was officially published by UNFCCC in early 2018. The 2nd FRL was successfully finalised with the support from the Food and Agriculture Organization of the United Nations (FAO) in 2023. It went through the process of Technical Assessment by UNFCCC and the revised version was publiched on the UNFCCC website in 2023 as well. The projection methodology for the 2nd FRL was based on historical average with a reference period of 10 years (2009-2018) and FRL results period of 9 years (2019-2027). This decision was reached as a result of the broader stakeholder consultations. Considering PNG's HFLD (High Forest, Low Deforestation) status over the reference period, PNG proposes an upwards HFLD adjustment to its 2nd FRL.

Since the submission of the Technical Annex with REDD+ results is voluntary as clearly stated in decisions 13/CP.19, paragraph 2, and 14/CP.19, paragraphs 7 and 8, PNG would like to use this opportunity to submit this document primarily for the purpose of obtaining and receiving its REDD+ result-base payments.

This Technical Annex reports results obtained by PNG in reducing emissions from deforestation, forest degradation, and enhancement of forest carbon stock for the results period 2019, 2020, 2021, and 2022 against the Technically Assessed 2nd FRL with reference period of 2019 - 2027.

These REDD+ activities form the basis for the estimation and reporting of emissions reductions presented in this Technical Annex, and are reflected in the scope and coverage of the assessed 2nd FRL.

1.2 National Circumstances in the Context of REDD+

The government of PNG (GoPNG) together with Costa Rica submitted the REDD+ agenda to the UNFCCC COP in 2005, until then PNG has been in the forefront of international negotiations on reducing emissions from deforestation and forest degradation (REDD+). This concept of REDD+ was first recognized and accepted at the 2007 UNFCCC Conference of Parties (COP) in Bali and later adopted under the Paris Agreement in 2015.

PNG's first and the 2nd FRLs cover the following REDD+ activities:

1. Deforestation,
2. Forest degradation, and
3. Enhancement of forest carbon stocks.

The REDD+ activities not currently covered are:

4. Sustainable management of forest
5. Conservation of carbon stocks

However, when the forest land use assessment using the Collect Earth tool was carried out, there was no trace of activity on carbon stock enhancement detected during the historical reference period (2000-2018). Yet, the GoPNG has set the policy for targeting of 800,000 ha tree planting with

the expectation that tree planting would become one of the major REDD+ activities in the near future. Thus, carbon stock enhancement is included in REDD+ activities although it has been negligible amount of carbon removed by increase of forest area.

Additionally, the PNG's Enhanced NDC 2020 outlines that afforestation and reforestation activities could contribute up to 10,000 $GgCO_2e$ in cumulative removals by 2030 if implemented effectively. This represents a substantial mitigation opportunity, particularly as PNG has over 10 million hectares of degraded forest and grasslands (PNGFA 2019) with potential for restoration. Tree planting is therefore expected to become a major component of PNG's REDD+ strategy moving forward, not only for enhancing carbon stocks, but also for delivering co-benefits such as biodiversity conservation, livelihood support, and increased climate resilience.

While carbon removals from increased forest area have been negligible to date, carbon stock enhancement remains a prioritised REDD+ activity under PNG's national REDD+ strategy. For this submission, due to the lack of reliable data, PNG decided not to broaden the scope of the FREL/FRL by including other activities as mentioned above.

These national circumstances underpin PNG's classification as a High Forest Cover, Low Deforestation (HFLD) country, which is relevant for the application of an HFLD adjustment to the FRL, as discussed in Chapter 2.

1.3 Objectives of the Technical Annex on REDD+

The objectives of this Technical Annex are to:

(a) present REDD+ results for PNG for the period 2019–2022, expressed in tonnes of CO_2 equivalent per year, relative to the technically assessed the 2nd FRL;

(b) demonstrate that the results are consistent with the assessed FRL, the national greenhouse gas inventory, and previously submitted REDD+ information;

(c) provide transparent and sufficient information to enable the reconstruction of results, in accordance with decision 4/CP.15;

(d) present supplementary information illustrating the effect of updated external guidance on the HFLD adjustment, without modifying the assessed FRL.

2. Summary Information from the Assessed 2nd FRL

This section summarises key elements of the technically assessed the 2nd FRL as submitted to the UNFCCC, and does not constitute a revision or re-assessment of the FRL. The information presented in this chapter provides the basis for the calculation and interpretation of REDD+ results reported in Chapter 3.

2.1 Summary of Main Features of PNG's 2nd FRL

The FRL of PNG provides a baseline for reducing greenhouse gas emissions from deforestation and forest degradation. PNG's FRL outlines the country's historical rates of deforestation and forest degradation and sets a target for future emissions reductions. This serves as a crucial aspect of PNG's commitment to sustainable forest management and environment conservation. The UNFCCC has defined FREL/FRLs as benchmarks for assessing each country's performance in implementing and reducing emissions and increasing removals associated with the implementation of REDD+ activities. The country submitted its 1st FRL to UNFCCC in January 2017. Technical Assessment by UNFCCC had

been conducted throughout 2017 and the revised FRL was officially published by UNFCCC at early 2018.

With support of the Food and agriculture Organisation of the United Nations (FAO), PNG has finalised its 2nd FRL. The projection methodology for the 2nd FRL is based on historical average with a reference period of 10 years (2009-2018) and FRL results period of 9 years (2019-2027). This decision was reached as a result of the broader stakeholder consultations.

Carbon pools covered in the 2nd FRL include above-ground biomass and below-ground biomass. Litter, deadwood, and soil-organic carbon are not covered due to limited availability of data.

The REDD+ activities covered are deforestation, forest degradation and carbon stock enhancement. The REDD+ activities covered in the 2nd FRL are deforestation, forest degradation and enhancement of forest carbon stocks. Sustainable management of forests and conservation of forest carbon stocks are not included, as emissions and removals associated with these activities are captured through the selected activities and methodological approaches applied. PNG would measure if they resulted in the area increased of deforestation, forest degradation and carbon stock enhancement.

The activity data used is from the Collect Earth land use/land use change assessment conducted by the PNG Forestry Authority (PNGFA) for the results period 2000-2018 which was supported by FAO with funding support from the FAO-Global Environment Facility-Capacity Building Initiative for Transparency and the Global Green Growth Institute through the NDC Partnership/ Climate Action Enhancement Package.

The emission factors used were Tier 1 and Tier 2 emission factors. Tier 1 emission factors were taken from the 2006 IPCC Guidelines for National GHG inventories while tier 2 emission factors were taken from different research carried out in the country's forest including peer-reviewed studies conducted in PNG (e.g. Fox et al.). Both the activity data and emission factors went through a wider stakeholder consultation process before the estimation of the 2nd FRL.

Considering PNG's HFLD (High Forest, Low deforestation) status over the reference period, PNG proposes an upwards HFLD adjustment to the 2nd FRL. At the time of FRL development, the ART TREES 2.0 standard provided the most robust and scientifically rigorous guidance available for HFLD adjustments. While the GCF RBP Scorecard criteria have since been updated, PNG retains the technically assessed FRL based on ART TREES as the primary reference, while providing supplementary calculations based on the GCF Scorecard to demonstrate sensitivity and transparency.

2.2 Forest Definition and Land Tenure System in PNG

For the purposes of establishing and applying the FRL, PNG applies a nationally defined forest definition consistent with IPCC guidance. Prior to determining whether deforestation, afforestation or reforestation is occurring, and to define the areas within which degradation and other REDD+ activities may occur, it is paramount that the forest has to be defined first. As part of the guidelines for submission of information on FRLs, country Parties should provide the definition of forest used. Under the IPCC 2003 GPG the forest includes "all land with woody vegetation consistent with thresholds used to define forest land in the national GHG inventory, subdivided into managed and unmanaged, and also by ecosystem type as specified in the IPCC Guidelines. It also includes systems with vegetation that currently fall below, but are expected to exceed, the threshold of the forest land category." The 2006 Guidelines make reference to threshold values for the forestland definition. This indicates that the IPCC anticipates countries to define their forest with quantitative thresholds.

PNG's national forest definition is "land spanning more than 1 hectare, with trees higher than 3 meters and the canopy cover of more than 10 percent (%)". This excludes land that is predominantly

under agricultural or urban land use. This national definition was endorsed by the PNG National Executive Council in Decision #256 of Meeting #07/2014.

2.3 UNFCCC Modalities Relevant to PNG's 2nd FRL

The FRL of PNG is relevant within the framework of UNFCCC, specifically concerning modalities related to measuring, reporting and verifying (MRV) emissions reductions from forestry activities. Under the UNFCCC, countries like PNG are encouraged to establish FRLs as part of their efforts to reduce greenhouse gas emissions from deforestation and forest degradation. The modalities for setting and implementing FRLs are outlined in the UNFCCC's guidance for developing countries, providing a framework for measuring progress in reducing emissions and enhancing forest conservation efforts.

PNG's FRL is crucial for demonstrating the country's commitment to mitigating climate change through sustainable forest management. By adhering to the UNFCCC modalities, PNG can accurately track and report on its progress in reducing emissions from deforestation and forest degradation, thereby contributing to global efforts to combat climate change.

Decision 1/COP 16 provides guidance and requirements for countries participating in REDD+ initiatives, including the development and implementation of FRLs. COP 16 made significant decisions related to REDD+ implementation and monitoring, which impacts how countries like PNG established their FRLs.

2.4 Methodology Used for 2nd FRL Development

FRL Construction

The construction of PNG's 2nd FRL, as well as the associated REDD+ technical annexes and national greenhouse gas inventory for the LULUCF sector, is based on methodologies consistent with the 2006 IPCC Guidelines and the IPCC Good Practice Guidance for LULUCF. Anthropogenic greenhouse gas emissions and removals were estimated for deforestation (forest land converted to other land uses), forest degradation (forest land remaining forest land), and carbon stock enhancement (non-forest land converted to forest land).

Forest land was stratified by forest type and disturbance type. Historical annual emissions were estimated by combining activity data derived from the national forest and land use assessment using Collect Earth with emission factors appropriate to each forest stratum, drawing on peer-reviewed literature and IPCC default values.

Reference Period

Following national stakeholder consultations, PNG selected the period 2009–2018 as the historical reference period for the 2nd FRL, with a corresponding results period of 2019–2027. This period was chosen based on the availability and consistency of national land-use data and its suitability for representing business-as-usual emissions trends. Potential impacts of recent REDD+ policies and measures on emissions are acknowledged; however, the 2009–2018 period was considered the most appropriate basis for constructing a robust historical reference.

Application of an HFLD adjustment

Given PNG's status as a High Forest Cover, Low Deforestation (HFLD) country, an upward adjustment was applied to the 2nd FRL. At the time of FRL development, the most reliable and applicable guidance for HFLD adjustments was provided by the ART TREES 2.0 standard. Consistent with TREES

2.0, the FRL was constrained such that the HFLD adjustment did not exceed the product of the national HFLD score and 0.05% of total forest carbon stock.

PNG calculated annual HFLD scores over the reference period and derived an average score of 0.71, exceeding the applicable threshold. Using an average historical emission level of 35,299,202 tCO_2e per year for 2009–2018 and an average national forest carbon stock of 14,748,195,755 tCO_2e, the allowable upward adjustment amounted to 5,219,378 tCO_2e per year. Accordingly, the 2nd FRL was established at **40,518,579 tCO_2e per year** for the results period 2019–2027. This value was subsequently subject to, and confirmed through, the UNFCCC technical assessment process.

2.5 Update of the HFLD Adjustment under the 2nd FRL

Following the submission and technical assessment of the 2nd FRL, the GCF REDD+ Results-Based Payments (RBP) Mainstreaming Scorecard introduced updated constraints for the application of HFLD adjustments. Specifically, the scorecard stipulates that any upward adjustment shall not exceed:

(i) 10% of the average annual historical emissions (FREL/FRL), and
(ii) 0.1% of the total forest carbon stock over the relevant period.

These constraints differ from the TREES 2.0-based approach applied in the technically assessed 2nd FRL. To enhance transparency and facilitate understanding of how updated external guidance would affect the HFLD adjustment component, PNG presents a supplementary and indicative application of the GCF RBP Mainstreaming Scorecard constraints.

Scope of the supplementary application

This supplementary application:

- does not modify the reference period (2009–2018), activity data, emission factors, national definitions, or scope;
- does not alter the estimated emissions from deforestation and forest degradation; and
- only applies the scorecard-defined caps to the HFLD adjustment component.

Consistent with scorecard requirements and good practice, PNG applies the more restrictive of the two caps. For the 2009–2018 reference period, the application of the 10% cap above historical average emissions results in a value of **38,829,122 tCO_2e per year**, while the application of a carbon-stock-based cap equivalent to 0.05% of total forest carbon stock yields **42,673,300 tCO_2e per year**. The former represents the more conservative constraint and is therefore used as the **updated HFLD adjustment benchmark** for supplementary reporting purposes.

This supplementary benchmark does not modify the technically assessed 2nd FRL and is presented solely for transparency, to illustrate the implications of applying updated GCF RBP Mainstreaming Scorecard constraints.

3. Results Consistent with the Assessed 2nd FRL

This chapter presents the REDD+ results of PNG expressed in tons of carbon dioxide equivalent (tCO_2e per year), consistent with the technically assessed the 2nd FRL.

The results are reported for the years 2019–2022 and are based on emissions from deforestation and forest degradation estimated using the same activity data, emission factors, national definitions, scope, and methodologies as those applied in the construction of the assessed 2nd FRL.

To enhance transparency, this chapter presents REDD+ results calculated using both:
(i) the HFLD adjustment approach applied in the technically assessed 2nd FRL **(Original assessed 2nd FRL = 40,518,579 tCO_2e per year)**; and
(ii) a supplementary HFLD adjustment benchmark reflecting updated constraints under the GCF REDD+ Results-Based Payments (RBP) Mainstreaming Scorecard **(Updated benchmark = 38,829,122 tCO_2e per year)**.

Emissions from deforestation and forest degradation are identical under both approaches; differences in results arise exclusively from the treatment of the HFLD adjustment component. For the avoidance of doubt, the presentation of supplementary results using the updated benchmark does not imply a revision, replacement, or re-assessment of the technically assessed 2nd FRL.

The tables and figures in this chapter are used to present annual emissions, reference levels, and resulting emission reductions in a transparent and comparable manner to support interpretation of the reported REDD+ results.

3.1 Emissions from Deforestation and Forest Degradation

Emissions from deforestation and forest degradation constitute the basis for calculating REDD+ results in PNG. For the purposes of this Technical Annex, emissions are reported for the results period 2019–2022 and are fully consistent with the activity data, emission factors, scope, forest definitions, and methodologies applied in the construction of the technically assessed 2nd FRL.

Deforestation refers to the conversion of forest land to non-forest land. Forest degradation refers to anthropogenic disturbances that reduce forest carbon stocks on forest land remaining forest land (e.g., selective logging and associated infrastructure). Emissions from both activities are estimated using activity data derived from PNG's national forest and land-use assessment and emission factors consistent with IPCC guidance, as documented in the 2nd FRL, Biennial Update Reports, and the national greenhouse gas inventory.

For the results period 2019–2022, annual emissions from deforestation and forest degradation were estimated using the same methodological framework and parameters as those applied for the historical reference period (2009–2018). No changes were made to activity data sources, emission factors, forest thresholds, or the scope of activities for the calculation of emissions in the results period.

Table 3.1 summarises the annual emissions and removals from deforestation and forest degradation for the years 2019–2022. These values constitute the basis for calculating REDD+ results under both the HFLD adjustment approach applied in the technically assessed 2nd FRL and the supplementary HFLD adjustment benchmark reflecting updated constraints under the GCF REDD+ Results-Based Payments (RBP) Mainstreaming Scorecard.

Table 3.1: Annual emissions from deforestation and forest degradation (2019–2022) (tCO_2e/year)

Year	Emissions from deforestation	Emissions from forest degradation	Total emissions and removals
2019	1,495,115	16,753,083	18,248,198
2020	967,534	20,907,426	21,874,959

2021	4,972,846	20,355,981	25,328,828
2022	2,701,134	24,362,382	27,063,516

Note: Emissions are estimated using the same activity data, emission factors, scope, and methodologies as applied in the assessed 2nd FRL. Values are identical for all REDD+ results presented in this chapter; differences in results arise exclusively from the treatment of the HFLD adjustment.

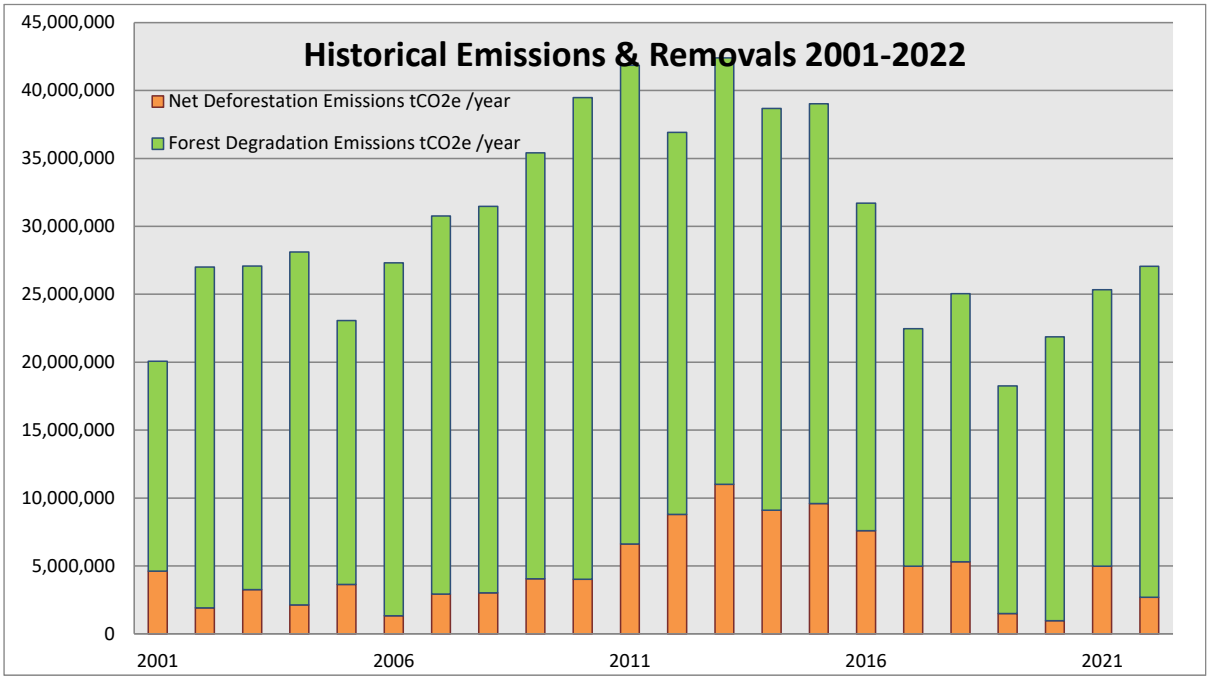


Figure 3.1: Historical emissions from deforestation and forest degradation in PNG (2001–2022)

The figure illustrates annual emissions from deforestation (net of post-deforestation regrowth) and forest degradation, based on activity data and emission factors consistent with those used in the construction of the technically assessed 2nd FRL Forest degradation has remained the dominant source of emissions throughout the period.

3.2 REDD+ Results Using the Original HFLD Adjustment

3.2.1 Purpose and basis

This section presents REDD+ results for PNG for the years 2019–2022 calculated relative to the technically assessed 2nd FRL, including the HFLD adjustment approach applied at the time of FRL submission and technical assessment (hereafter, the Original assessed 2nd FRL).

In accordance with Decision 14/CP.19, paragraph 3, REDD+ results are reported in a manner that is transparent and consistent over time and consistent with the established FRL. The emissions used to derive results (Section 3.1) are identical for all approaches presented in this chapter.

3.2.2 Reference level applied

The Original assessed 2nd FRL applicable to the results period 2019–2027 is:

FRL = 40,518,579 tCO_2e per year

This FRL value is based on the historical average emissions over 2009–2018 and the HFLD adjustment approach applied in the technically assessed 2nd FRL. (The construction of the assessed FRL and the HFLD adjustment approach are summarised in Chapter 2.)

3.2.3 Calculation of REDD+ Results

For each year *t* in the results period, REDD+ results are calculated as the difference between the FRL and the observed emissions and removals from deforestation and forest degradation:

REDD+ Results (t) = FRL – Observed emissions and removals (t)

Observed emissions and removals for 2019–2022 are those presented in Table 3.1. The resulting annual REDD+ results are presented in Table 3.2.

Table 3.2: REDD+ results using the Original assessed 2nd FRL (2019–2022) (tCO_2e/year)

Year	FRL (tCO_2e/yr)	Observed emissions and removals (tCO_2e/yr)	REDD+ results (tCO_2e/yr)
2019	40,518,579	18,248,198	22,270,381
2020	40,518,579	21,874,959	18,643,620
2021	40,518,579	25,328,828	15,189,751
2022	40,518,579	27,063,516	13,455,063

3.2.4 Total results for 2019–2022

The total REDD+ results achieved by PNG over the period 2019–2022, relative to the Original assessed 2nd FRL, are calculated as the sum of annual results in Table 3.2:

Total (2019–2022) = 22,270,381 + 18,643,620 + 15,189,751 + 13,455,063 = 69,558,815 tCO_2e

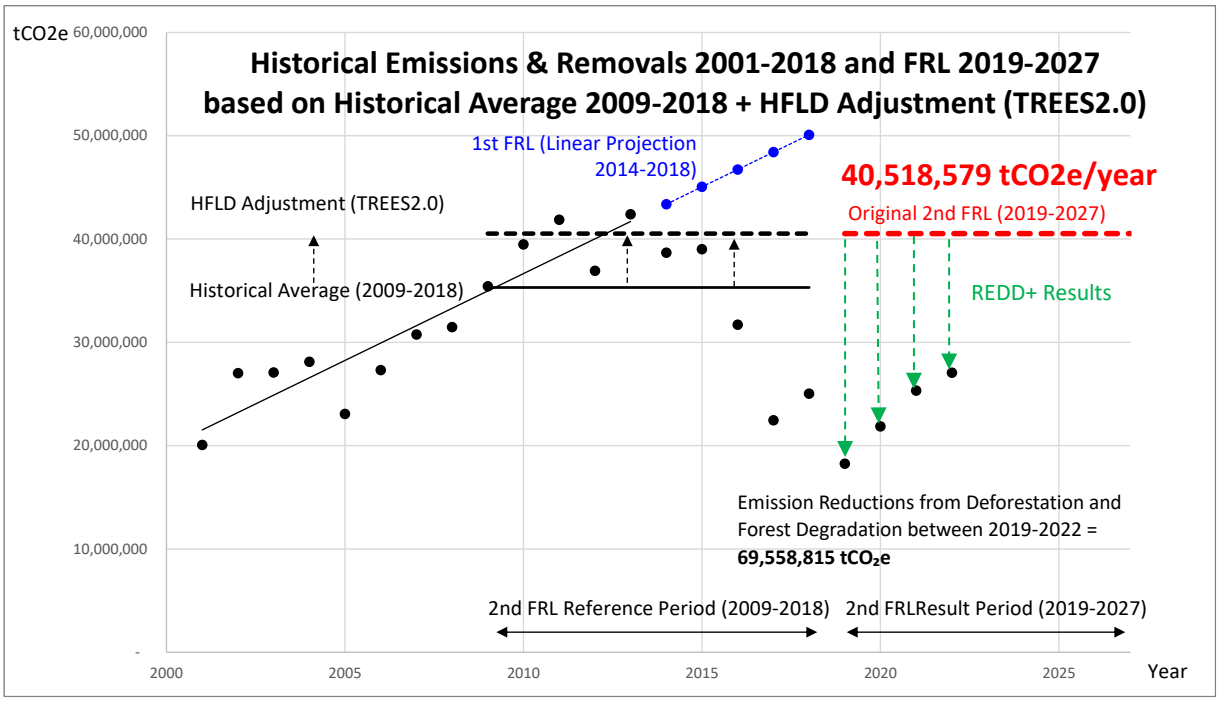


Figure 3.2: Observed emissions and FRL (2019–2022) using the original HFLD adjustment

Figure 3.2 *showing the FRL as a horizontal line (40,518,579 tCO_2e/yr) and observed emissions as annual points/bars for 2019–2022.* Across 2019–2022, observed emissions and removals from deforestation and forest degradation remained below the Original assessed 2nd FRL, resulting in positive emission reductions for each year of the results period.

3.3 REDD+ Results Using the Updated HFLD Adjustment

3.3.1 Purpose and basis

This section presents REDD+ results for PNG for the years 2019–2022 calculated using an updated HFLD adjustment benchmark reflecting the constraints introduced under the GCF REDD+ Results-Based Payments (RBP) Mainstreaming Scorecard.

The purpose of this section is to enhance transparency by illustrating how the application of updated external guidance on HFLD adjustments would affect the magnitude of REDD+ results, without altering the technically assessed 2nd FRL.

For the avoidance of doubt, the updated HFLD adjustment presented in this section:

- does not constitute a revision, replacement, or re-assessment of the technically assessed 2nd FRL;
- does not alter activity data, emission factors, forest definitions, scope, or methodologies;
- affects only the treatment of the allowable upward adjustment associated with PNG's HFLD status.

Observed emissions used to derive results in this section are identical to those presented in Section 3.1 and Section 3.2. Differences in results arise exclusively from the application of a more conservative HFLD adjustment benchmark.

3.3.2 Reference level applied (updated HFLD adjustment benchmark)

Under the GCF RBP Mainstreaming Scorecard, upward adjustments for countries with consistently high forest cover and low deforestation rates are subject to explicit caps. In particular, an upward adjustment:

- shall not exceed **10 per cent of the average annual historical emissions**; and
- shall not exceed **0.1 per cent of total forest carbon stock over the eligibility period**.

For the historical reference period 2009–2018, PNG assessed both constraints and applied the **more conservative limit**, consistent with good practice and PNG's prior approach in analogous recalculations for results-based payments.

As a result, the **updated HFLD adjustment benchmark** applicable for illustrative purposes in this Technical Annex is:

Updated reference level = 38,829,122 tCO_2e per year

This value is lower than the technically assessed 2nd FRL and reflects the application of the GCF RBP Mainstreaming Scorecard constraints to the HFLD adjustment component only.

3.3.3 Calculation of REDD+ results

For each year *t* in the results period, REDD+ results under the updated HFLD adjustment benchmark are calculated using the same formula applied in Section 3.2:

REDD+ Results (t) = Updated reference level − Observed emissions and removals (t)

Observed emissions and removals for 2019–2022 are those presented in Table 3.1 and remain unchanged.

The resulting annual REDD+ results calculated using the updated HFLD adjustment benchmark are presented in Table 3.3.

Table 3.3: REDD+ results using the updated HFLD adjustment (2019–2022) (tCO_2e/year)

Year	Updated reference level (tCO_2e/yr)	Observed emissions and removals (tCO_2e/yr)	REDD+ results (tCO_2e/yr)
2019	38,829,122	18,248,198	20,580,924
2020	38,829,122	21,874,959	16,954,162
2021	38,829,122	25,328,828	13,500,294
2022	38,829,122	27,063,516	11,765,606

3.3.4 Total results for 2019–2022

The total REDD+ results achieved by PNG over the period 2019–2022, calculated using the updated HFLD adjustment benchmark, are obtained by summing the annual results presented in Table 3.3:

Total (2019–2022) = 20,580,924 + 16,954,162 + 13,500,294 + 11,765,606 = 62,800,986 tCO_2e

These results are lower than those calculated using the technically assessed 2nd FRL (Section 3.2), reflecting the more conservative treatment of the HFLD adjustment under the updated benchmark.

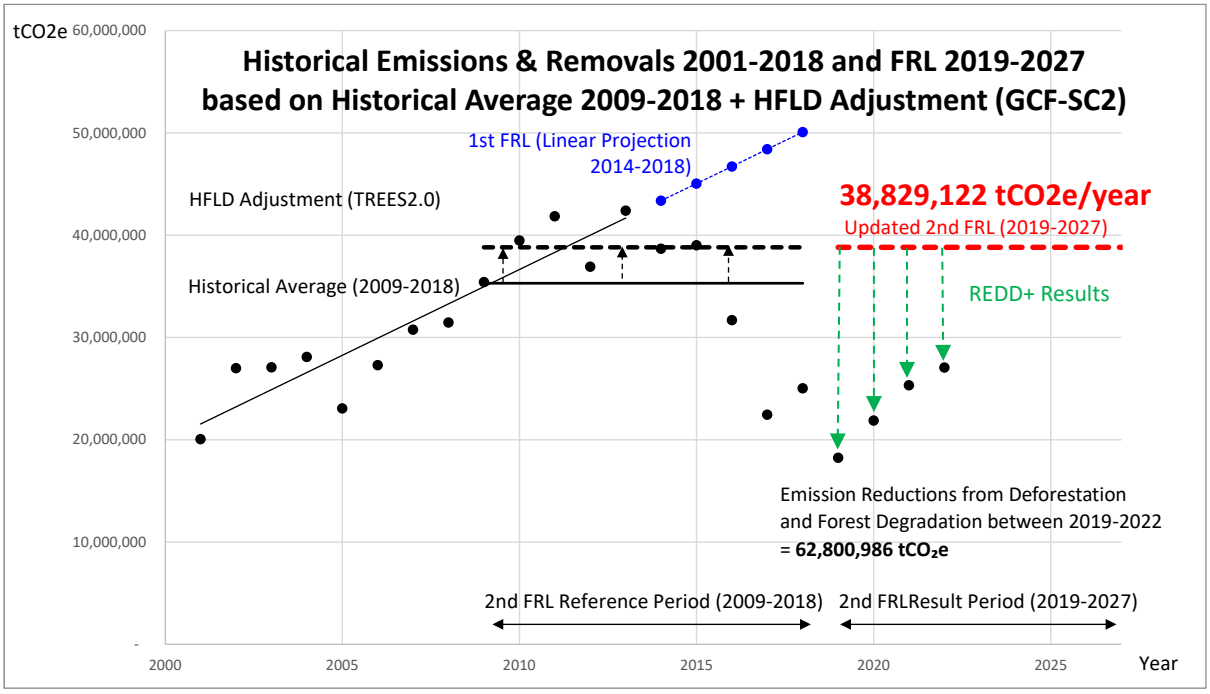


Figure 3.3: Observed emissions and FRL (2019–2022) using the updated HFLD adjustment

Figure 3.3 illustrates observed emissions from deforestation and forest degradation for the years 2019–2022 relative to the updated HFLD adjustment benchmark (38,829,122 tCO_2e/year).

The figure highlights that:

- observed emissions remain below the updated benchmark in all years of the results period; and
- positive REDD+ results are achieved for each year, notwithstanding the application of a more conservative HFLD adjustment.

3.4 Comparison of Results under Different HFLD Adjustment

3.4.1 Purpose and scope of the comparison

This section provides a comparative assessment of REDD+ results calculated using:

- the HFLD adjustment approach applied in the technically assessed 2nd FRL (Section 3.2); and
- the updated HFLD adjustment benchmark reflecting constraints under the GCF REDD+ Results-Based Payments (RBP) Mainstreaming Scorecard (Section 3.3).

The purpose of this comparison is to clearly demonstrate that differences in REDD+ results arise exclusively from the treatment of the HFLD adjustment, while all other elements remain unchanged.

For clarity, the comparison presented in this section:

- does not constitute a revision or reassessment of the technically assessed 2nd FRL;
- does not modify activity data, emission factors, forest definitions, scope, or methodologies; and
- uses identical observed emissions for deforestation and forest degradation in all cases.

3.4.2 Summary of reference levels applied

Table 3.4 summarizes the reference levels used in Sections 3.2 and 3.3.

Table 3.4: Reference levels applied under different HFLD adjustment approaches (tCO_2e/year)

Reference level	Basis	Value
Original assessed 2nd FRL	Technically assessed FRL (TREES 2.0-based HFLD adjustment)	40,518,579
Updated HFLD adjustment benchmark	GCF RBP Mainstreaming Scorecard constraints	38,829,122

The updated benchmark is lower than the assessed FRL, reflecting the application of more conservative caps on the allowable upward adjustment associated with PNG's HFLD status.

3.4.3 Comparison of annual REDD+ Results (2019–2022)

Using the identical observed emissions presented in Table 3.1, annual REDD+ results under each reference level are compared in Table 3.5.

Table 3.5: Comparison of REDD+ results under different HFLD adjustments (tCO_2e/year)

Year	REDD+ results using assessed FRL	REDD+ results using updated benchmark	Difference
2019	22,270,381	20,580,924	1,689,457
2020	18,643,620	16,954,162	1,689,458
2021	15,189,751	13,500,294	1,689,457

2022	13,455,063	11,765,606	1,689,457

The difference in annual results is constant across years, reflecting the fact that:

- observed emissions are identical in all calculations; and
- the difference between reference levels is constant at 1,689,457 tCO_2e/year.

3.4.4 Comparison of total results for 2019–2022

Over the full results period 2019–2022, total REDD+ results under each approach are compared in Table 3.6.

Table 3.6: Total REDD+ results under different HFLD adjustment approaches (2019–2022) (tCO_2e)

Approach	Total REDD+ results
Using assessed 2nd FRL	69,558,815
Using updated HFLD adjustment	62,800,986
Difference	6,757,829

The lower total results under the updated benchmark reflect the application of a more conservative HFLD adjustment, consistent with the GCF RBP Mainstreaming Scorecard constraints.

3.4.5 Interpretation and implications

The comparison confirms that:

- PNG achieves positive REDD+ results for all years in the results period 2019–2022 under both the technically assessed FRL and the updated HFLD adjustment benchmark;
- the magnitude of results differs solely due to the treatment of the HFLD adjustment; and
- the underlying emissions performance remains unchanged.

Results calculated using the updated HFLD adjustment benchmark are presented for transparency and informational purposes only, in light of updated external guidance under the GCF RBP Mainstreaming Scorecard. The technically assessed 2nd FRL remains the sole reference level underpinning results reported as consistent with the UNFCCC technical assessment.

4. Methodological Consistency with the Assessed FRL

This chapter demonstrates the methodological consistency between the REDD+ results reported in this Technical Annex and the technically assessed 2nd FRL, in accordance with the transparency and consistency requirements of decision 4/CP.15, decision 12/CP.17 and related UNFCCC guidance for forest reference levels and biennial reporting.

It further explains and justifies any methodological differences between the FRL-based REDD+ results and the national greenhouse gas (GHG) inventory for the LULUCF sector submitted in the Biennial Transparency Report (BTR), and provides transparent and sufficient information to enable the reconstruction of the reported REDD+ results.

4.1 Description of How the Results Were Achieved

The REDD+ results reported for the years 2019, 2020, 2021 and 2022 are derived by comparing observed emissions from deforestation and forest degradation with the technically assessed 2nd FRL, using the same activity data, emission factors, scope, forest definition and methodological approaches as those applied in the construction of the FRL (see Chapter 2).

These results are not attributed to individual policies or measures, as quantifying the contribution of specific policies or actions to observed emission reductions would require dedicated impact assessments beyond the scope of this Technical Annex. Rather, the results reflect observed changes in emissions relative to the FRL, calculated in a manner that is methodologically consistent, transparent and reproducible.

For contextual understanding, PNG has implemented a range of national policies, strategies and measures over the reference and results periods that aim to reduce deforestation and forest degradation, promote sustainable forest management, and support climate change mitigation. These include, inter alia:

- The Government's declaration of a moratorium on the issuance of Special Agriculture and Business Leases (SABLs) in 2011 and the subsequent suspension and review of SABLs in 2014. Following investigations into irregular land acquisition processes, a substantial proportion of issued SABLs were revoked.
- PNG's National REDD+ Strategy (2017), which provides the national framework for reducing emissions from the forest and land-use sector while conserving biodiversity and supporting community benefits.
- The Forestry Policy (1991) and Forest Plan (1996), which establish principles and planning mechanisms for sustainable forest management, including limits on allowable timber harvesting.
- The Climate Compatible Development Management Policy (2014), which supports the development of national systems for information management, GHG inventory preparation, monitoring, reporting and verification.
- The Protected Areas Policy (2014), which provides a framework for the conservation of areas within naturally forested landscapes.
- The Forestry and Climate Change Framework for Action (2009–2015), which identifies afforestation, reforestation and reduced deforestation as climate change mitigation measures.
- Implementation of national development strategies, including the Medium-Term Development Plans, the PNG Development Strategic Plan (2010–2030) and Vision 2050, which discourage deforestation while promoting reforestation and afforestation.
- Ongoing awareness-raising and education activities on climate change and REDD+, particularly following the establishment of the Climate Change and Development Authority (CCDA) in 2010.

While these policies and measures provide important context for understanding national circumstances, the REDD+ results reported in this Technical Annex are based exclusively on observed emissions data and the application of the assessed FRL, consistent with UNFCCC guidance.

4.2 Consistency with National GHG Inventory

The FRL-based REDD+ results and the national greenhouse gas (GHG) inventory for the LULUCF sector are prepared using the same underlying land-use change activity data derived from the national Collect Earth assessment covering the results period 2000–2022. Both reporting frameworks apply methodologies consistent with the 2006 IPCC Guidelines. However, certain methodological differences exist between the two, reflecting their distinct objectives and applicable UNFCCC requirements.

The most significant difference relates to the treatment of biomass regrowth in forests that were degraded prior to the reference period. For the purposes of the FRL and REDD+ results, removals associated with regrowth of forests degraded before the year 2000 are excluded. This exclusion is due to limitations in identifying repeated degradation events and quantifying degradation intensity prior to the reference period. Excluding these removals represents a conservative approach, ensuring that emission reductions are not overestimated.

In contrast, the national GHG inventory for the LULUCF sector includes removals from regrowth of forests degraded prior to 2000, using growth factors for forests older than 20 years as provided in the 2006 IPCC Guidelines, in order to meet completeness requirements. In 2022, removals associated with regrowth of forests degraded prior to 2000 were included in the LULUCF inventory but excluded from the FRL/REDD+ results. This difference constitutes the main driver of the divergence in net emissions reported under the two frameworks.

For forests degraded after 2000, consistent approaches are applied in both the LULUCF inventory and the FRL/REDD+ results. Carbon losses due to degradation and subsequent gains from recovery are estimated using stock-difference methods based on the average biomass of primary and logged-over forests by forest type.

Additional methodological differences between the national GHG inventory and the FRL/REDD+ results include the treatment of greenhouse gases, carbon pools and specific activities. The national GHG inventory includes CO_2, CH_4 and N_2O emissions and removals, as well as litter and soil organic carbon pools, using default IPCC methodologies where country-specific data are not available, in order to ensure completeness of reporting. In contrast, the FRL and REDD+ results include only CO_2 emissions and removals from above ground and below ground biomass, reflecting data availability and the scope of selected REDD+ activities.

These methodological differences are summarized in Table 4.1 They are consistent with UNFCCC guidance, which allows countries to apply a step-wise approach to the development of FRLs, as encouraged by decision 12/CP.17, and recognizes that completeness requirements applicable to national GHG inventories under decision 15/CP.17 do not apply in the same manner to FRELs/FRLs. PNG continues to improve its capacity for land-use change assessment and data availability, and the differences between the national GHG inventory and FRL-based REDD+ results are expected to diminish in future BTR submissions and FRL updates.

Table 4.1: Methodological differences between the LULUCF sector in BTR and FRL/REDD+ results

Aspect	**LULUCF sector in BTR**	**FRL / REDD+ results**
Greenhouse gases	CO_2, CH_4 and N_2O included	CO_2 only
Carbon pools	Above- and belowground biomass, litter and soil	Above- and belowground biomass only

Regrowth of forests degraded prior to 2000	Included	Excluded

4.3 Consistency with National 1st FRL and BUR1/BUR2

The methodologies applied in the development of PNG's 2nd FRL and in the calculation of REDD+ results are consistent with those used in the First FRL and in the REDD+ technical annexes submitted with BUR1 and BUR2. Across these submissions, emission estimates have been derived using methodologies consistent with the 2006 IPCC Guidelines for LULUCF and based on the same national land-use change assessment framework.

Continuity is maintained in the estimation of activity data for deforestation and forest degradation, which relies on the national Collect Earth assessment of land-use change. While the temporal coverage and resolution of the activity data have been expanded over successive submissions, the underlying methodological approach has remained consistent, ensuring time-series consistency and comparability of reported emissions and results.

Improvements observed between the First FRL, subsequent BUR submissions and the 2nd FRL reflect a step-wise approach to methodological development, as encouraged by decision 12/CP.17. These improvements include the extension of the historical time series, refinements in land-use change detection, and enhanced availability of national data, rather than fundamental changes in methods or scope.

Ongoing implementation of the national forest carbon inventory is expected to further improve the accuracy and national specificity of emission factors in future submissions. These enhancements are intended to strengthen the consistency and robustness of future FRLs, REDD+ results and national GHG inventory submissions, without undermining comparability with previously reported information.

5. Uncertainty Analysis

This chapter provides qualitative and quantitative information on uncertainties associated with activity data and emission factors used in the construction of the 2nd FRL and the calculation of REDD+ results. While uncertainty analysis is not a mandatory requirement under decision 4/CP.15, this information is provided to enhance transparency, support the reconstruction of results, and demonstrate consistency with the methodologies applied in the technically assessed FRL.

5.1 Qualitative Uncertainty Analysis

5.1.1 Uncertainty related to Activity Data

In terms of activity data, several major sources of error in estimating past land-use trends from the Collect Earth exercise are expected.

- Classification error (random and systematic error)
- Sampling error (random error)

To reduce the uncertainty of "classification error", PNG defines the land use subdivision based on the existing classification system described in "Emission Factors" and "Historical land use" sections of the FRL report (see http://unfccc.int/8414). The stratification based on the carbon stock amount will be considered in future based on the progress and result of current ongoing NFI.

The major potential sources contributing to uncertainty of the sampling assessment such as Collect Earth are the "sampling error" such as unrepresentative samples and variability resulting from the use of samples and the human error such as misinterpretation of historical land use and land use change and forest.

5.1.2 Uncertainty related to Emission Factors

In terms of emission factors, there are several most important error sources to be considered in estimating carbon stocks for PNG's land-use types. The set of emission factors used is taken from literature and only little direct information is available on the error. Nonetheless, PNG expects a set of typical errors to occur for the emission factors:

- Measurement error (random and systematic error) since the literature values were all derived from primary measurements, usually plot-based measurements where measurements can have an error.
- Sampling error (random and systematic error) since the plot-based measurements that underlie estimates reported in literature and in the IPCC guidelines only sample the forests.
- There is representation error from using IPCC default values that might be imperfectly suitable for PNG's forests (systematic error).
- There is a representation error from approximating forest carbon stocks in all of PNG's Forest types from literature values developed only for the most abundant types of forests (systematic error).
- There is model error from inferring on forest degradation carbon stocks from measurements in one type of forest only (systematic error).

5.2 Quantitative Uncertainty Analysis

This chapter provides information on uncertainties associated with activity data and emission factors used in the construction of the 2nd FRL and the calculation of REDD+ results.

While uncertainty analysis is not a mandatory requirement under decision 4/CP.15 for the submission of REDD+ results, this information is provided to enhance transparency, support the reconstruction of results, and demonstrates consistency with the methodologies applied in the assessed FRL.

This uncertainty analysis is consistent with the stepwise approach to the development of FRELs/FRLs encouraged by decision 12/CP.17 and reflects current data availability and methodological capacity.

Uncertainty analysis for Activity Data

In terms of activity data, the "sampling error" was estimated by using the spreadsheet developed by FAO for the Land Use Category and Conversion during the assessment (updated) by Collect Earth. The standard error of an area estimate is obtained as A*sqrt (pi* (1-pi)/(n-1)) (equation; taken from Chapter 3, volume 4 (AFOLU), of 2006 IPCC Guidelines, pp 3.33-3.34).

In the initial design stage, the sampling number was 25,279, however through the assessment, 70 plots were identified and confirmed as "no data" (such as sea/outside-of-land, and cloud). Those data were excluded for the analysis (both previous assessment and new assessment). Therefore, the final sampling number is 25,209.

<u>2009-2018 (FRL Reference Period 2: 10 years from the latest reported year: 2018)</u>

The uncertainties of Stable Forest, Stable Non-Forest, Deforestation, and Forest Degradation from 2009 to 2018 are respectively 0.74%, 2.41%, 15.71%, and 6.07%. After QA/QC process, it is confirmed that removals associated with Forest Restoration in this period are assessed at zero. Aggregated uncertainty for stable forest and stable non-forest for the same period is 0.79% and for deforestation and forest degradation is 5.66%

Land Use Change Stratification	Plot Count	Area	pi	Area [Ai] (mil. ha) [A*pi]	Standard Error (proportion)	Standard Error (mil. ha)	Confidence Intervals (mil. ha)	Uncertainty %	Aggregated Uncertainty (%)
Stable Forest	18,365	34,151,026	0.729	33,612,607	0.002801	129,238	± 253,307	± 0.74%	0.79%
Stable Non-Forest	5,780	9,955,019	0.229	10,578,865	0.002648	122,160	± 239,434	± 2.41%	
Deforestation	144	273,312	0.006	263,556	0.000475	21,900	± 42,925	± 15.71%	5.66%
Forest Degradation	920	1,759,504	0.036	1,683,833	0.001181	54,493	± 106,806	± 6.07%	
Forest Restoration	0		0.000	0	0.000000	0	± 0	N/A	N/A

2019-2022 (REDD+ Results Period 1 included in 1st BTR)

The uncertainties of Stable Forest, Stable Non-Forest, Deforestation, and Forest Degradation from 2019 to 2022 are respectively 0.69%, 2.36%, 30.19%, and 11.79%. After QA/QC process, it is confirmed that removals associated with Forest Restoration in this period are assessed at zero. Aggregated uncertainty for stable forest and stable non-forest for the same period is 0.76% and for deforestation and forest degradation is 10.99%.

Land Use Change Stratification	Plot Count	Area	pi	Area [Ai] (mil. ha) [A*pi]	Standard Error (proportion)	Standard Error (mil. ha)	Confidence Intervals (mil. ha)	Uncertainty %	Aggregated Uncertainty (%)
Stable Forest	18,990	35,352,347	0.753	34,756,515	0.002715	125,275	± 245,539	± 0.69%	0.76%
Stable Non-Forest	5,924	10,228,332	0.235	10,842,422	0.002670	123,213	± 241,499	± 2.36%	
Deforestation	47	81,375	0.002	86,021	0.000272	12,536	± 24,570	± 30.19%	10.99%
Forest Degradation	248	476,807	0.010	453,902	0.000622	28,681	± 56,215	± 11.79%	
Forest Restoration	0		0.000	0	0.000000	0.0	± 0	N/A	N/A
All Classes	25,209	46,138,863							

Uncertainty analysis for Emission Factors

In terms of emission factors, there is incomplete quantitative information available on error in estimating forest carbon stocks and emission factors. Those estimates of forest carbon stocks taken from Fox et al. (2010) are used for a bit more than half of PNG's forests and come with a quantification of sampling error. These sampling errors amount to around 20-30%, and for the exact value used from Fox et al, the sampling error amounts to 28.3% and 21.4% for degraded and primary forest respectively (see Table 3 in Fox et al, 2010, the values for lowland forest). There is no information on other error sources available there. Those estimates taken from the IPCC guidelines do not come with detail quantitative information on errors.

Based on the situation and understanding described above, the following causes were considered for the uncertainty analysis of Emission (and Removal) Factors.

a. Uncertainty of AGB due to the use of Fox et al. (2010) and IPCC default values (2006 IPCC guidelines)
b. Uncertainty of Root-to-Shoot ratios due to the use of IPCC default values (2006 IPCC guidelines)
c. Uncertainty of Carbon Fraction value due to the use of IPCC default values (2006 IPCC guidelines)

Estimation method for multiple uncertainties

After the uncertainty of each parameter is assessed, the total uncertainty of carbon stock was calculated through 'propagation of error approach' and by using the following generic equations given in the 2006 IPCC Guidelines.

EQUATION 3.1
COMBINING UNCERTAINTIES – APPROACH 1 – MULTIPLICATION

$$U_{total} = \sqrt{U_1^2 + U_2^2 + \ldots + U_n^2}$$

Where:

U_{total} = the percentage uncertainty in the product of the quantities (half the 95 percent confidence interval divided by the total and expressed as a percentage);

U_i = the percentage uncertainties associated with each of the quantities.

EQUATION 3.2
COMBINING UNCERTAINTIES – APPROACH 1 – ADDITION AND SUBTRACTION

$$U_{total} = \frac{\sqrt{(U_1 \bullet x_1)^2 + (U_2 \bullet x_2)^2 + \ldots + (U_n \bullet x_n)^2}}{|x_1 + x_2 + \ldots + x_n|}$$

Where:

U_{total} = the percentage uncertainty in the sum of the quantities (half the 95 percent confidence interval divided by the total (i.e., mean) and expressed as a percentage). This term 'uncertainty' is thus based upon the 95 percent confidence interval;

x_i and U_i = the uncertain quantities and the percentage uncertainties associated with them, respectively.

Uncertainty of carbon stock for forest class

The following table shows the total uncertainty of carbon stock for each forest class estimated through the propagation of error approach. For AGB error for Fox et al. (2010), the values 18.8/66.3 = 28.3% and 22.7/106.3 = 21.4% in table 3 of Fox et al. were assigned for degraded and primary forest respectively. All the other values are based on the 2006 IPCC guidelines. "a" "b" "c" in the Table 5.1 refer to the following:

Cause of Uncertainty:

a. Uncertainty of growing stock (AGB) due to the use of IPCC default values (IPCC GL 2006)

b. Uncertainty of Root-to-Shoot ratios due to the use of IPCC default values (IPCC GL

2006)

c. Uncertainty of Carbon Fraction value due to the use of IPCC default values (IPCC GL 2006)

Table 5.1: Total uncertainty of carbon stock for each forest class

LU	STR	Land Use Subdivision	Global Ecological Zone	Source	tC/ha	tCO2 /ha	Area(ha) 2013	a	b	c	Uncertainty (%)
Forest	Primary	Low altitude forest on plains and fans	Tropical rain forest	Fox et al. (2010)	305.5	526.5	5,817,288	21.4%	7.4%	2.7%	22.8%
		Low altitude forest on uplands			305.5	526.5	8,872,771	21.4%	7.4%	2.7%	22.8%
		Lower montane forest	Tropical mountain system	IPCC GL (2006)	177.8	306.4	6,671,087	30.0%	0.9%	2.7%	30.1%
		Montane forest			177.8	306.4	361,131	30.0%	0.9%	2.7%	30.1%
		Montane coniferous forest			177.8	306.4	3,995	30.0%	0.9%	2.7%	30.1%
		Dry seasonal forest	Tropical dry forest		166.4	286.8	2,064,756	30.0%	0.9%	2.7%	30.1%
		Littoral forest	Tropical rain forest	Fox et al. (2010)	305.5	526.5	130,533	21.4%	7.4%	2.7%	22.8%
		Seral forest			305.5	526.5	287,277	21.4%	7.4%	2.7%	22.8%
		Swamp forest			305.5	526.5	2,209,544	21.4%	7.4%	2.7%	22.8%
		Savanna	Tropical dry forest	IPCC GL (2006)	166.4	286.8	339,379	30.0%	0.9%	2.7%	30.1%
		Woodland			166.4	286.8	687,956	30.0%	0.9%	2.7%	30.1%
		Scrub	Tropical shrubland		98.0	168.9	178,511	30.0%	0.6%	2.7%	30.1%
		Mangrove	Tropical wet Mangrove		286.1	493.0	226,989	30.0%	5.6%	2.7%	30.6%
	Degraded	Low altitude forest on plains and fans	Tropical rain forest	Fox et al. (2010)	200.0	344.7	3,150,143	28.4%	14.9%	2.7%	32.1%
		Low altitude forest on uplands			200.0	344.7	2,272,738	28.4%	14.9%	2.7%	32.1%
		Lower montane forest	Tropical mountain system	IPCC GL (2006)	116.4	200.6	1,335,164	30.0%	0.9%	2.7%	30.1%
		Montane forest			116.4	200.6	29,684	30.0%	0.9%	2.7%	30.1%
		Montane coniferous forest			116.4	200.6	0	30.0%	0.9%	2.7%	30.1%
		Dry seasonal forest	Tropical dry forest		108.9	187.7	286,554	30.0%	0.9%	2.7%	30.1%
		Littoral forest	Tropical rain forest	Fox et al. (2010)	200.0	344.7	15,693	28.4%	14.9%	2.7%	32.1%
		Seral forest			200.0	344.7	33,263	28.4%	14.9%	2.7%	32.1%
		Swamp forest			200.0	344.7	255,234	28.4%	14.9%	2.7%	32.1%
		Savanna	Tropical dry forest	IPCC GL (2006)	108.9	187.7	296,410	30.0%	0.9%	2.7%	30.1%
		Woodland			108.9	187.7	369,765	30.0%	0.9%	2.7%	30.1%
		Scrub	Tropical shrubland		64.2	110.6	41,650	30.0%	0.6%	2.7%	30.1%
		Mangrove	Tropical wet Mangrove		187.3	322.8	54,860	30.0%	5.6%	2.7%	30.6%
	Plantation	Eucalyptus Plantation	Tropical rainforest (plantation)	IPCC GL (2006)	205.5	354.1	17,637	30.0%	14.9%	2.7%	33.6%
		Balsa Plantation			205.5	354.1	3,922	30.0%	14.9%	2.7%	33.6%
		Araucaria Plantation			205.5	354.1	9,764	30.0%	14.9%	2.7%	33.6%
		Pinus Plantation			205.5	354.1	7,809	30.0%	14.9%	2.7%	33.6%
		Acacia Plantation			205.5	354.1	5,964	30.0%	14.9%	2.7%	33.6%
		Terminalia Plantation			205.5	354.1	3,913	30.0%	14.9%	2.7%	33.6%
		Rubber Plantation			205.5	354.1	11,697	30.0%	14.9%	2.7%	33.6%
Non--Forest		Cropland	-	-	0.0	0.0	5,080,707	N/A	N/A	N/A	0.0%
		Grassland	-	-	0.0	0.0	2,436,667	N/A	N/A	N/A	0.0%
		Wetlands	-	-	0.0	0.0	2,128,512	N/A	N/A	N/A	0.0%
		Settlements	-	-	0.0	0.0	384,545	N/A	N/A	N/A	0.0%
		Other lands	-	-	0.0	0.0	55,352	N/A	N/A	N/A	0.0%

Uncertainty of Emission / Removal Factors

For the uncertainty analysis which will be estimated per REDD+ activity (e.g. Deforestation, Forest Degradation etc.), the land use subdivisions were stratified into simple strata; Forest (Primary), Forest (Degraded/Plantation) and Non-Forest. The uncertainty for each stratum was calculated by using a weighted value based on area proportion. The following table shows the uncertainty for each stratum.

Uncertainty in carbon stock/ha by stratum

Strata	Mean tCO_{2e}/ha	Uncertainty (tCO_{2e}/ha)	Uncertainty (%)
Forest (Primary)	441.7	52.1	11.8%
Forest (Degraded)	301.2	53.6	17.8%
Non-Forest	0.0	0.0	0.0%

Strata Change and REDD+ Activity

		Current		
		Forest (Primary)	**Forest (Degraded)**	**Non-Forest**
Previous	Forest (Primary)	Stable Forest (SF)	Forest Degradation (DG)	Deforestation (DF)
	Forest (Degraded)	Forest Restoration (RS)	Stable Forest (SF)	Deforestation (DF)
	Non-Forest	Reforestation (RF)	Reforestation (RF)	Stable Non-Forest (SNF)

Emission/Removal Factors (tCO_{2e}/ha)

		Current		
		Forest (Primary)	**Forest (Degraded)**	**Non-Forest**
Previous	Forest (Primary)	0.0	-140.5	-441.7
	Forest (Degraded)	140.5	0.0	-301.2
	Non-Forest	441.7	301.2	0.0

Emission/Removal Factor Uncertainty (%)

		Current		
		Forest (Primary)	**Forest (Degraded)**	**Non-Forest**
Previous	Forest (Primary)	0.00%	53.23%	11.80%
	Forest (Degraded)	53.23%	0.00%	17.80%
	Non-Forest	11.80%	17.80%	0.00%

Aggregated / Total Uncertainty Analysis

Based on the uncertainty assessment of Activity Data (AD) and Emission Factors (EF), the uncertainty of the emissions and removals through changes among the REDD+ activities using propagation of error approach. The following tables show the results of the calculation. EF Uncertainty does not have time series analysis, so the same information is used for all the periods.

2009-2018 (FRL Reference Period 2: 10 years from the latest reported year: 2018)

	SF	**SNF**	**DF**	**DG**	**RF**	**RS**
AD Uncertainty	0.74%	2.41%	15.71%	6.07%	N/A	N/A
EF Uncertainty	N/A	N/A	10.07%	53.23%	10.07%	53.23%
Total Uncertainty	N/A	N/A	18.65%	53.58%	N/A	N/A

2019-2022 (REDD+ Results Period 1 included in 1st BTR)

	SF	**SNF**	**DF**	**DG**	**RF**	**RS**
AD Uncertainty	0.69%	2.36%	30.19%	11.79%	N/A	N/A
EF Uncertainty	N/A	N/A	10.07%	53.23%	10.07%	53.23%
Total Uncertainty	N/A	N/A	31.83%	54.52%	N/A	N/A

Finally, the uncertainty in emissions from deforestation and emissions from forest degradation are combined by using the 2006 IPCC Equation 3.2. These results in the following uncertainty estimates:

	95% CI (%)
Uncertainty FRL (2009-2018)	13.24%
Total uncertainty results (2019-2022)	16.25%

Note: The calculation errors (figures) in the table above reported in BUR1, BUR2, and 2nd FRL were corrected in this BTR.

5.3 Summary of Uncertainty Analysis

- Total uncertainty associated with emissions during the FRL reference period (2009–2018) is estimated at **13.24% (95% confidence interval)**.
- Total uncertainty associated with REDD+ results for the period 2019–2022 is estimated at **16.25% (95% confidence interval)**.
- Higher uncertainty in the results period reflects increased sampling uncertainty due to lower observed deforestation areas.
- The exclusion of certain removals and pools in the FRL and REDD+ results represents a conservative approach.

Overall, the treatment of uncertainty in the FRL and REDD+ results reflects a conservative approach, as certain removals, pools and gases are excluded where data limitations exist, and uncertainties are transparently quantified in accordance with IPCC good practice.

6. Description of the NFMS and Institutional Roles for MRV

This chapter describes PNG's National Forest Monitoring System (NFMS) and the institutional arrangements supporting MRV of REDD+ activities and results. The NFMS provides the institutional and operational foundation for the estimation and reporting of emissions reductions presented in this Technical Annex, and underpins the transparency, consistency and reliability of the reported REDD+ results.

In accordance with decision 4/CP.15, this chapter focuses on the national systems and institutional roles that support the generation, management and verification of activity data and information used for REDD+ reporting. Detailed methodological descriptions of emission estimation, application of emission factors and uncertainty analysis are presented in Chapters 3 and 5. Accordingly, this chapter concentrates on governance, operational arrangements and institutional responsibilities rather than on the quantification of results.

6.1 Summary of NFMS and MRV Efforts to Date

PNG has progressively developed and operationalised its NFMS to support the implementation of REDD+ and the MRV of emissions and removals from the forest and land-use sector, in accordance with UNFCCC guidance.

The NFMS has provided the technical and institutional basis for the preparation and submission of key REDD+ and transparency-related outputs, including the 1st and 2nd FRL, Biennial Update Reports (BUR1 and BUR2), the Biennial Transparency Report (BTR), and associated REDD+ technical annexes submitted to the UNFCCC.

The development and operation of the NFMS has been led by the PNG Forest Authority (PNGFA), in close collaboration with the Climate Change and Development Authority (CCDA), with technical support from FAO, JICA and other development partners. Extensive stakeholder consultations and capacity-building activities have informed the design and implementation of the NFMS, including the preparation of a national NFMS Roadmap.

Significant progress has been achieved in strengthening national forest monitoring capacity through the application of remote sensing, geospatial analysis and statistically robust sampling approaches. Key milestones include the completion of national forest and land-use change assessments using the Open Foris Collect Earth tool in 2015 and 2019, which form the basis for the activity data used in FRL development and REDD+ reporting.

To enhance transparency and public access to forest monitoring information, PNG has established a national forest and climate monitoring web platform. The platform provides access to forest monitoring datasets, land-use assessment results and REDD+ information, and supports transparency and stakeholder engagement. The platform is accessible at: https://png-nfms.org/portal/

In parallel, PNG has developed complementary wall-to-wall land-use and forest monitoring through the TerraPNG system hosted by CCDA. The coexistence of statistically based assessments and spatially explicit wall-to-wall mapping strengthens quality assurance, supports internal verification, and enhances the credibility of the NFMS.

6.2 Operational NFMS and MRV System in PNG

PNG developed and has been improving NFMS including MRV function using FAO developed Open Foris Tool (Collect Earth, Collect, Collect Mobile and Calc) as well as mapping function using TerraAmazon as TerraPNG. PNG developed the 1st FRL using the data from NFMS and submitted it to UNFCCC in January 2017. Technical Assessment by UNFCCC had been conducted throughout 2017 and the revised 1st FRL was officially published by UNFCCC at early 2018. The Reference Level shows the historical annual emissions from deforestation and forest degradation of 31,000 Gg CO_2 eq per annum, and it predicts an ongoing increase in the emissions levels. PNG had also prepared National REDD+ Strategy (NRS) and officially released it in 2017. The NRS[12] outlines the key action areas across the sectors and also uses information from the NFMS and FRL.

PNG has made great progress on the REDD+ readiness and is now moving to its implementation and the results-based payment. As a base for implementation and monitoring, PNG had prepared GHG-Inventories and 1st and 2nd BUR with technical annexes on REDD+ and submitted the reports to UNFCCC in April 2019 and May 2022. Technical Assessment by UNFCCC had been conducted for 1st BUR and its Technical Annex on REDD+ from August to the end of 2019 followed by a technical assessment report which had been released by UNFCCC in early 2020. Technical assessment of the 2nd BUR and its REDD+ technical annex was conducted in October 2022 and the technical assessment report was published on 25 January 2024.

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 TerraPNG) hosted by different government organizations; PNGFA and CCDA.

As part of the monitoring function, PNG established and officially released PNG Climate Change and Forest Monitoring Web-Portal (http://png-nfms.org/portal/) in 2017 by 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.

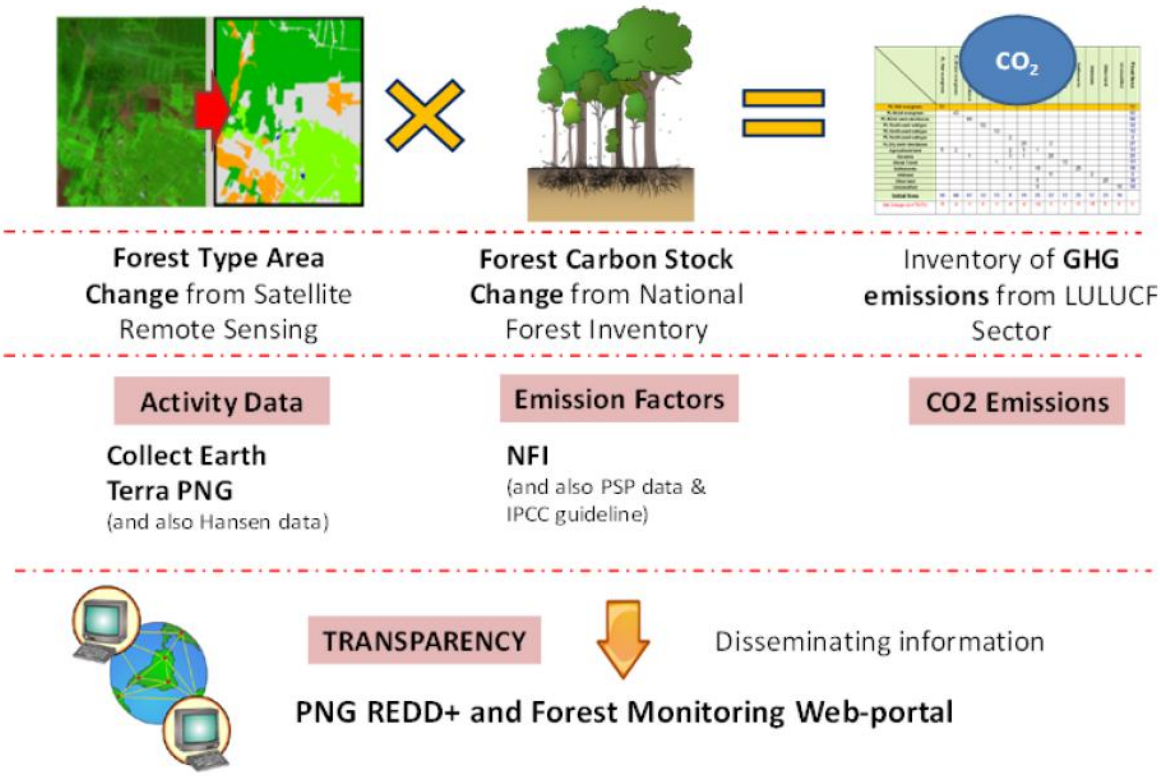


Figure 6.1: Papua New Guinea (PNG)'s NFMS for REDD+ under the UNFCCC

PNG's REDD+ and Forest Monitoring Web-Portal was established for disseminating forest and land use information to the public for ensuring the transparency of PNG REDD+ process. The web portal was developed jointly by CCDA and PNGFA. Other government agencies and private sectors (Conservation and Environmental Protection Authority, Mineral Resources Authority, National Statistics Office, etc) are responsible for providing all the necessary data needed for the web-portal. The web-portal is managed by CCDA who is responsible for publishing and updating the online information.

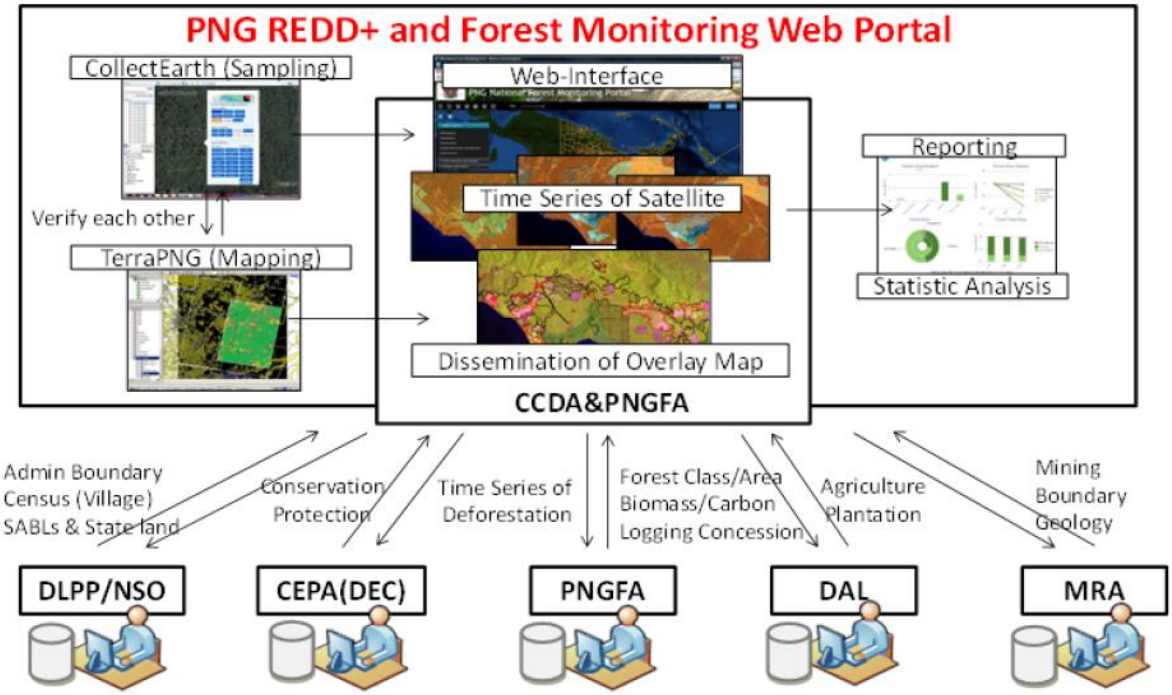


Figure 6.2: PNG REDD+ and Forest Monitoring Web-Portal (Source: CCDA)

After the Web-Portal was launched in 2017, PNG had made a lot of new achievements (products with publications) related to the forest and land use in PNG, such as "Forest and Land Use Change in Papua New Guinea 2000 - 2015", which explains the results and method of Collect Earth assessment in PNG, also used as a base data for FRL and BUR. There are also several new achievements related to REDD+ and land use in PNG initiated by CCDA with support from the Forest Carbon Partnership Facility/United Nations Development Programme. The updating and enhancement of the Web-Portal were completed in 2021 and released as "PNG Climate Change and Forest Monitoring Web-Portal" in 2022.

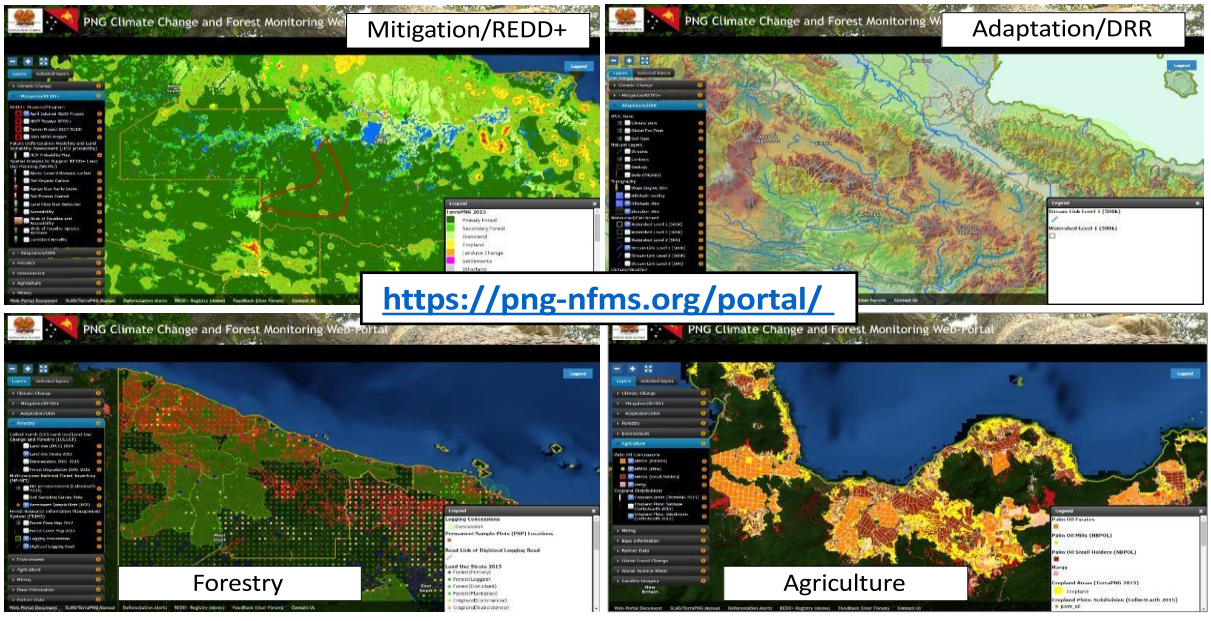
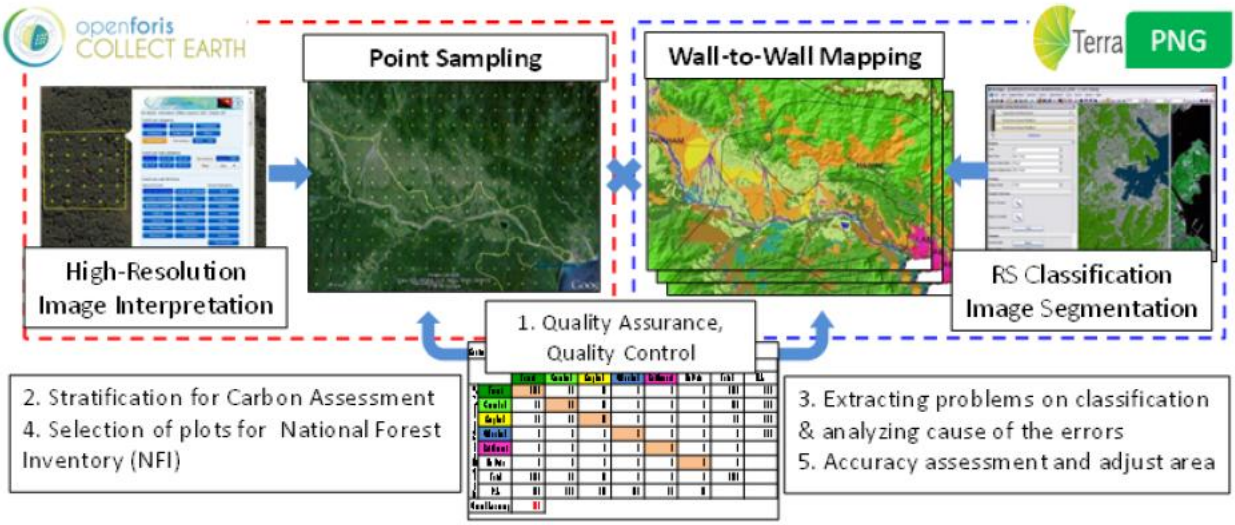


Figure 6.3: Updated PNG Climate Change and Forest Monitoring Web-Portal (Source: CCDA)

Regarding MRV system, PNG was the first country to use Collect Earth for LULUCF assessment and FRL then some of the other countries followed afterwards. On the other hand, many other countries use Wall-to-Wall mapping assessment. Based on the outcomes, challenges and lesson learnt from forest and land use change assessment in PNG 2000-2015, PNGFA organized the advantages and limitations of Collect Earth point sampling method compared with other methods (wall-to-wall mapping, such as TerraPNG). The overview of two different methods is illustrated in Figure 6.4.



	Point Sampling	Wall-to-Wall Mapping
Spatial Coverage	Sampling Plots	Segmented polygons
Area Calculation	Statistical	Geographical
Boundary	No	Yes
Statistical Analysis	Ample	Limited
Driver Analysis	Ample	Limited

Figure 6.4: Collect Earth Point Sampling and Wall-to-Wall Mapping Method (Source: PNGFA)

In terms of "MRV", measurement frequency is annual based (by Collect Earth), and reporting is biannual based (for BUR). Such national reports need to be produced with great care, based on accurate and scrutinized data. The assessment and analysis require substantial time and resources. Consequently, there will be a considerable time lag before information such as deforestation is announced. In terms of "Monitoring", the needs to monitor the potential deforestation areas in the national protected areas, REDD+ project areas and logging constraints areas more frequently such as monthly or even weekly have been raised by the stakeholders including the government agencies, CSOs and academic institutions. Near-real- time information to enable responsible authorities and organizations including the communities to take necessary measures against unplanned or unauthorized forest clearing and prevent from further expansion.

Considering the situation above, the GoPNG decided to develop prototype PNG Deforestation Alerts and Monitoring System using the latest technologies with FAO assistance with affordable cost in the world and information existing in PNG, as a part of Monitoring Function under NFMS, to consider the potentials and issues/challenges for PNG. This new system is complementing the existing and potential systems in PNG and collaboratively developed and managed by the several government organizations in PNG.

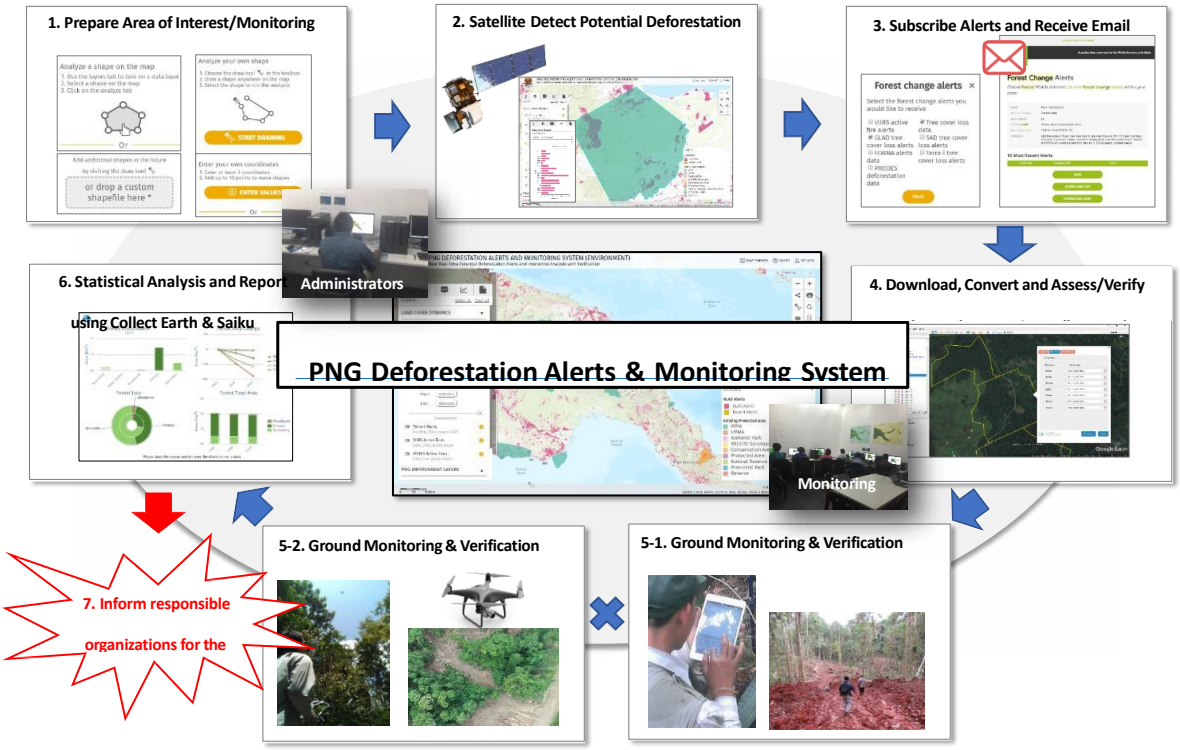


Figure 6.5: Workflow of PNG Near Real-Time Deforestation Alerts and Monitoring System

PNG Near Real-time Deforestation and Degradation Alerts and Monitoring System will be oriented in a part of Monitoring function under NFMS. Figure 6.5 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.

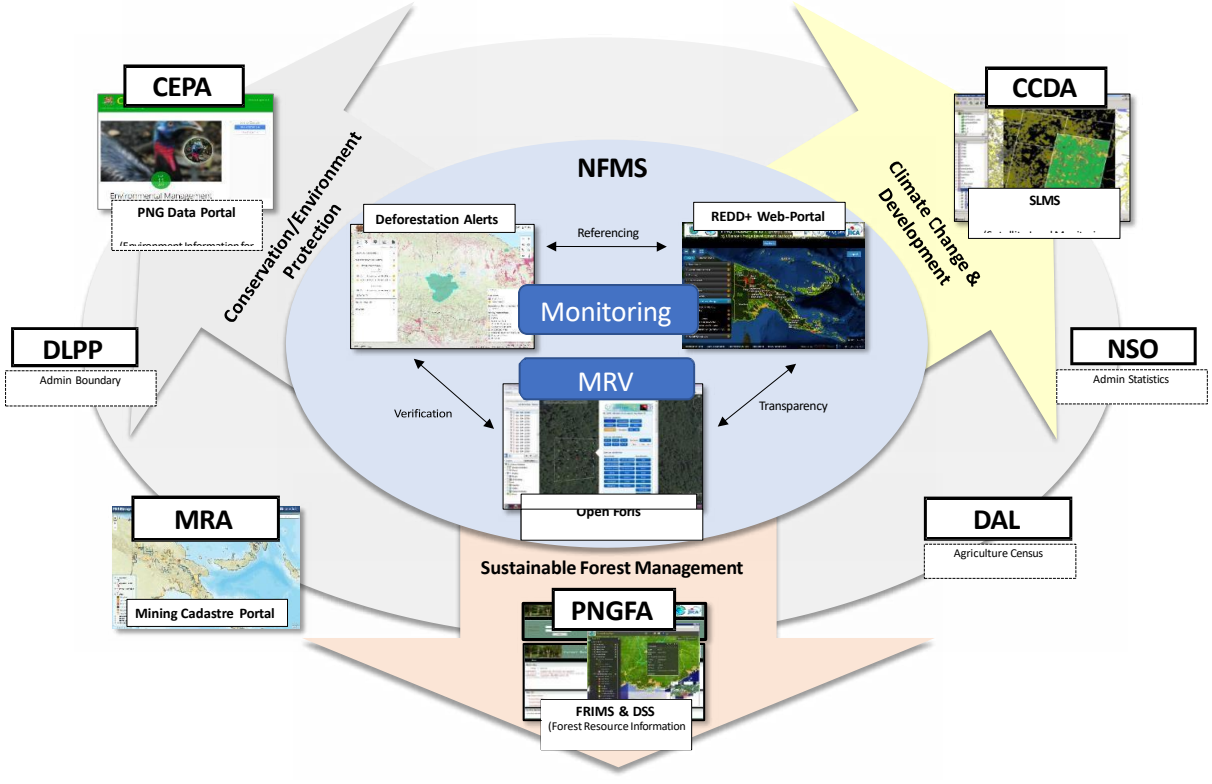


Figure 6.6: PNG Resource Information Network and National Forest Monitoring System (NFMS)

6.3 Multi-Purpose National Forest Inventory (NFI)

PNG launched a first-ever Multipurpose National Forest Inventory (NFI) in March 2016, along with the PNG Climate Change and Forest Monitoring Web-portal which has received national attention, the official endorsement was done by the Prime Minister of PNG. These initiatives aimed to enhance the accuracy of GHG emissions estimation from forest and land use change meeting the requirements of Tier 3 emission factors (as prescribed by the IPCC for REDD+ MRV.

The NFI's methodology and approach was built on the methods and capacity developed within the PNGFA over a number of years. It was anticipated that the data generated by the NFI would significantly improve the accuracy of GHG estimations in the LULUCF sector and provide essential information related to the REDD+ (environmental and social) safeguards in PNG. The GoPNG and the EU had been financing this work with technical support from FAO. This program ended in 2019 with the main deficiencies observed in a number of areas related to the collection of flora and fauna biodiversity information and the development of detailed emission factors for different forest types as well as for different levels of forest degradation.

Important information about the PNG Multi-Purpose National Forest can be found in the links provided below:

PNG Multi-Purpose National Forest Inventory Booklet
https://pngfa.gov.pg/images/articledocs/National_Forest_Inventory/NFI_Information_v3_Booklet_20180615_compressed.pdf

1st National Forest Inventory PNG: Field Manual
https://pngfa.gov.pg/images/articledocs/National_Forest_Inventory/PNG_Biophysical_Field_Manual_08_Feb_2018_FINAL_compressed.pdf

PNG's 1st Multi-Purpose NFI: Project Proceeding
https://pngfa.gov.pg/images/articledocs/National_Forest_Inventory/Proceedings_Feb_2018_compressed.pdf

Proceedings of the 2nd NFI Research Conference
https://pngfa.gov.pg/images/articledocs/National_Forest_Inventory/Proceedings_of_the_second_NFI_Research_Conference_compressed.pdf

Figure 6.7: Multi-purpose National Forest Inventory (source: PNGFA)

So far, only initial data has been derived from the total area earmarked. Information availability on land use and land use change will be a major step forward and a milestone achievement for the country. Based on this forest inventory and via input obtained from respective stakeholders, certain important measures relating to REDD+ such as the National Sustainable Land Use Policy (NSLUP), were developed which is a major advantage for the country.

The capacity on forest monitoring of PNG using remote sensing technology has improved significantly in recent years. However, a large information gap still remains. National scale information on carbon stock in the diverse forests subject to different disturbances is poorly known. Previous studies were too scattered and the estimation of average carbon stock in PNG forests were often contradictory. With the data derived from the NFI these deficiencies will be greatly improved in subsequent reporting periods.

6.4 Roles and Responsibilities for MRV of Results

The two key government organisations responsible for the measuring, reporting and verifying the results are CCDA and PNGFA. Other government departments provide auxiliary information for the REDD+ implementation. For example, Conservation and Environment Protection Authority (CEPA) is responsible for providing data on conservation and protected area; the Department of Agriculture and Livestock provides information on agriculture plantation area and type; and the information on administrative areas are provided by the National Statistics Office. Verification is implemented domestically through the stakeholders' consultation process, particularly through technical working committee meetings and national consultation workshops.

Table 6.1: Stakeholders' responsibility for REDD+ MRV in PNG

MRV Components	**Responsible Institutions/mechanism**	**Roles**	**Platforms use**
Measurement	PNGFA[15]	• PNG Forest Authority (PNGFA) is responsible for providing activity data from the Collect Earth land use assessment for the estimation of emissions and removals in the LULUCF sector • PNGFA also contributes to the estimation of emissions and removals through Technical Working Committee (TWC) meetings and one-on-one meetings.	• Collect Earth • Saiku
	CCDA[16]	• Estimating CO_2 emissions and removals from deforestation, forest degradation and enhancement of forest carbon stocks in PNG based on the Collect Earth land use assessment. • Providing land use dynamic information on extent of forest cover, forest cover change, drivers, and other land use using TerraPNG wall-to-	• TerraAmazon/TerraPNG

		wall mapping system to support/complement Collect Earth point sampling.	
Reporting	CCDA REDD+ and AFOLU/MRV Technical Working Committees	• Providing validation and other technical inputs for the national greenhouse gas inventories and REDD+ results submissions to the UNFCCC and ensuring the quality of the submissions.	Technical Working Committee meetings and workshops
	CCDA	• Reporting country's MRV progress and results to UNFCCC.	National Communication reports and Biennial Update Report (BURs) to UNFCCC
Veri	UNFCCC assigned international experts (Team of Technical Experts, e.g. LULUCF international experts <u>Others:</u> • MRV/AFOLU and REDD+ TWCs (technical working committees) of CCDA. These committees comprise of domestic experts from the government and private sectors, academia, civil society organisations, and national consultants.	• Verifying the submissions from Parties, by appointing two LULUCF experts to assess the FRL submissions and the technical annexes.	UNFCCC International Consultation and Analysis of PNG's submitted FRL and BURs. National Stakeholders consultation i.e. TWC meetings and workshops

6.5 Existing System for Monitoring REDD+ Results

PNG has an operational and robust national REDD+ MRV System for monitoring and evaluating the REDD+ results achieved through the implementation of REDD+ activities (Deforestation and Forest degradation) to ensure that the results reported or claimed for the GCF RBP are maintained over the rest of the results period (2016-18) under the pilot programme. PNG is currently developing a REDD+

Registry with funding from its GCF REDD+ Readiness Project that will further enhance monitoring and evaluation of the REDD+ results reported. The REDD+ Registry System is closely related to BUR, Technical Annex (REDD+ Results Reporting) and FRL. The large part of information of those reports are produced from NFMS and the other systems in PNG, Data Management System (DMS) of REDD+ Registry System will be developed as enhancement of PNG's existing NFMS.

The cause of the emission reduction observed in 2016, 2017 and 2018 was due to the implementation of REDD+ related policies and measures by the Government of PNG since 2009. When PNG's REDD+ registry is fully developed, a component of it will be dedicated to identifying and documenting the exact actions and policies that contributed to the emission reduction/REDD+ results reported.

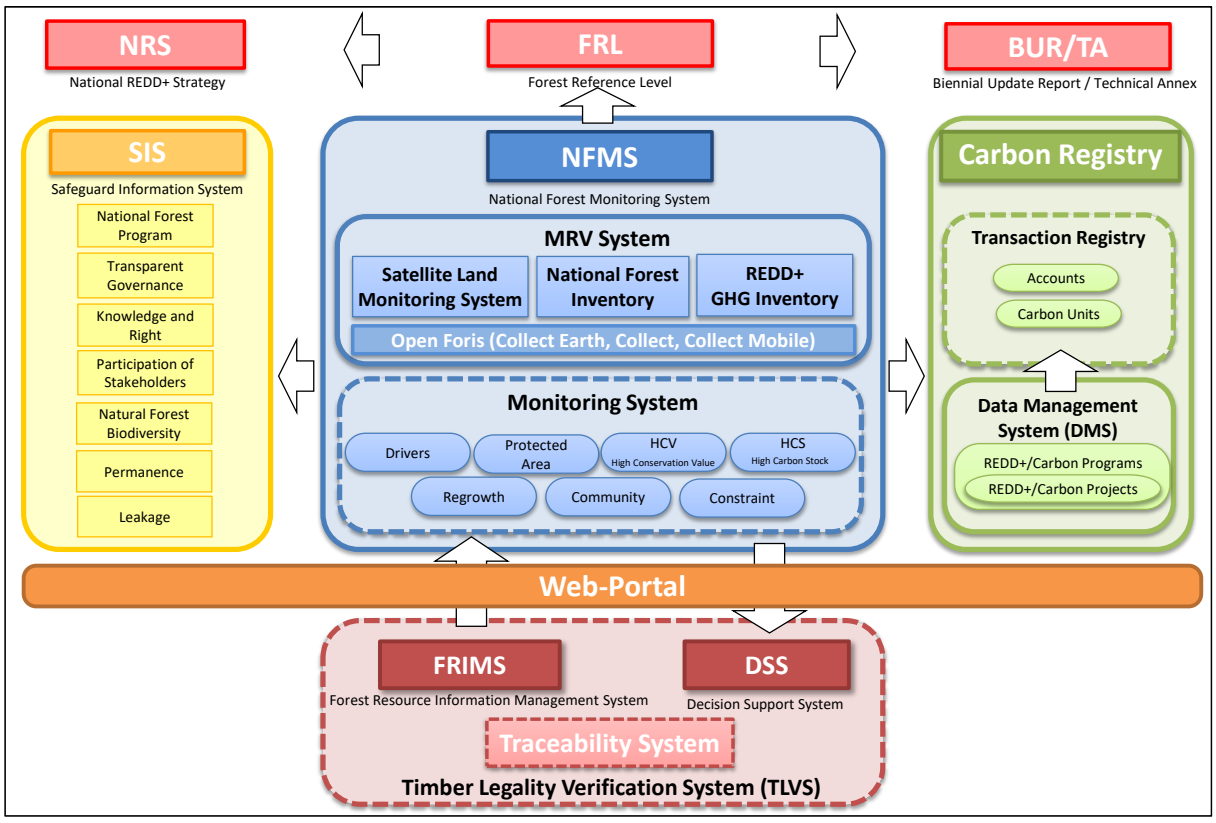


Figure 6.8: Workflow of REDD+ Registry System and NFMS and the other related systems in PNG

7. Information Necessary for The Reconstruction of the Results

This chapter provides the information necessary to enable the reconstruction of the REDD+ results reported in this Technical Annex, in accordance with decision 4/CP.15, paragraph 1(c) and (d). It consolidates and updates information previously provided in the REDD+ technical annexes to PNG's Biennial Update Reports (BUR1 and BUR2), while maintaining full consistency with the technically assessed 2nd FRL.

The chapter is designed to be sufficiently self-contained to allow an expert reviewer to understand how the REDD+ results for the period 2019–2022 were derived, without duplicating detailed methodological descriptions already documented in the 2nd FRL, the national greenhouse gas inventory, and earlier BUR submissions. Cross-references to these documents are provided where more detailed technical information is required for full reconstruction.

This chapter does not revise, update, or reassess the 2nd FRL. The FRL remains the benchmark against which results are calculated, consistent with its technical assessment outcome.

7.1 Scope and purpose of the Reconstruction

The reconstruction addressed in this chapter applies to:

- REDD+ results for the period 2019–2022;
- emissions from deforestation and forest degradation;
- carbon dioxide (CO_2) emissions and removals included in the scope of the assessed 2nd FRL;
- results assessed relative to the technically assessed 2nd FRL.

The purpose of this chapter is to explain:

- the data sources used to derive activity data and emission factors;
- the calculation steps applied to estimate annual emissions and removals; and
- how observed emissions are compared with the FRL to derive REDD+ results.

Supplementary results presented using an updated HFLD adjustment benchmark are addressed elsewhere in this Technical Annex and do not alter the assessed FRL or its technical assessment.

7.2 Overview of the Reconstruction Pathway

The reconstruction of REDD+ results follows a transparent and sequential pathway that is consistent with the methodologies applied in the construction of the 2nd FRL and subsequent REDD+ reporting.

In simplified terms, the reconstruction pathway consists of the following steps:

1. Derivation of activity data
   Annual activity data for deforestation and forest degradation are derived from the national forest and land use assessment using the Collect Earth system.
2. Application of emission factors
   Activity data are combined with emission factors derived using Tier 1 and Tier 2 approaches consistent with the 2006 IPCC Guidelines.
3. Estimation of annual emissions and removals
   Annual emissions from deforestation and forest degradation are calculated for each year in the results period (2019–2022).
4. Comparison with the FRL
   Observed emissions are compared with the applicable FRL to derive annual REDD+ results.
5. Aggregation of annual results
   Annual results are aggregated to derive total REDD+ results for the reporting period.

Each element of this pathway is described in more detail in the sections below, with explicit references to the source documents that contain detailed methodological descriptions.

7.3 Activity Data for Deforestation and Forest Degradation

Activity data for deforestation and forest degradation are derived from PNG's national forest and land use assessment conducted by the PNG Forest Authority (PNGFA) using the Collect Earth tool. The assessment covers the period 2001–2022 and constitutes the official source of activity data for

the 2nd FRL, the REDD+ technical annexes to BUR1 and BUR2, and the REDD+ results reported in this Biennial Transparency Report.

The Collect Earth methodology applies a statistically robust, sample-based approach that combines systematic sampling with visual interpretation of high-resolution satellite imagery. This approach is consistent with IPCC guidance and UNFCCC requirements and allows for the identification of land-use changes across the national territory in a transparent and repeatable manner.

For the reconstruction of REDD+ results for 2019–2022:

- the same forest definition;
- the same land-use and land-use change classification system;
- the same activity data sources; and
- the same quality assurance and quality control procedures

as those applied in the construction of the assessed 2nd FRL are used. No alternative activity data sources or revised classification rules have been introduced for the results period.

The Collect Earth assessment also enables the identification of major drivers of deforestation and forest degradation, including agricultural expansion, commercial logging, and infrastructure development. These drivers provide contextual information relevant to understanding observed emission trends, although driver attribution does not directly affect the calculation of REDD+ results.

Detailed descriptions of the sampling design, classification procedures, driver attribution methodology, and QA/QC processes are provided in the 2nd FRL and the REDD+ technical annex to BUR2.

7.4 Emission Factors for Deforestation and Forest Degradation

Emission factors applied to deforestation and forest degradation are identical to those used in the technically assessed 2nd FRL and previous BUR submissions. They are derived using a combination of Tier 1 and Tier 2 approaches, consistent with the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.

Tier 1 emission factors are based on IPCC default values and are applied where country-specific data are not yet available. Tier 2 emission factors draw on national and sub-national studies conducted in PNG, including peer-reviewed research on forest biomass and carbon stocks across different forest types and disturbance regimes (e.g. Fox et al.).

The selection of emission factors reflects a conservative approach, prioritising consistency over time and alignment with the assessed FRL. While improved country-specific emission factors are being developed through the Multi-Purpose National Forest Inventory, these data have not yet been fully integrated into the FRL or REDD+ results to avoid introducing inconsistencies with the assessed baseline.

Ground-based forest carbon inventories conducted during 2016–2019 and in 2024 are expected to support future improvements in emission factor estimation and methodological refinement, consistent with the step-wise approach encouraged under decision 12/CP.17.

7.5 Calculation of REDD+ Results

REDD+ results for the period 2019–2022 are calculated by comparing observed annual emissions and removals from deforestation and forest degradation with the 2nd FRL.

For each year *t*, REDD+ results are calculated as:

REDD+ Results (t) = FRL – Observed emissions and removals (t)

Observed emissions and removals are derived from the combination of activity data and emission factors described in Sections 7.3 and 7.4. The applicable FRL corresponds to the technically assessed 2nd FRL.

This calculation approach is identical to that applied in previous REDD+ technical annexes and ensures full consistency across BUR1, BUR2, and the present BTR. Supplementary results using an updated HFLD adjustment benchmark are presented separately and do not affect the assessed FRL or the primary results reported under the UNFCCC.

Numerical results and annual values are presented in Chapter 3 of this Technical Annex.

7.6 Availability of Information for Reconstruction

To avoid duplication and ensure transparency, detailed methodological information required for full reconstruction of REDD+ results is provided in previously submitted documents. Table 7.1 summarises where each element of information can be found.

Table 7.1: Cross-reference of information necessary for reconstruction of REDD+ results

Reconstruction element	Source document	Relevant section
Forest definition	2nd FRL; BUR1 TA	FRL Section 2.2
Activity data methodology (Collect Earth)	2nd FRL; BUR2 TA	FRL Chapter 3; BUR2 TA
Emission factors	2nd FRL; PSP and NFI reports	FRL Annexes; NIR LULUCF
FRL construction methodology	2nd FRL	FRL Chapters 2–4
HFLD adjustment (assessed)	2nd FRL	FRL HFLD section
REDD+ results (2019–2022)	This Technical Annex	Chapter 3
Uncertainty analysis	This Technical Annex	Chapter 5
NFMS and institutional roles	BUR2 TA; This Technical Annex	Chapter 6

Taken together, the information presented in this chapter and the referenced documents provides sufficient transparency to enable the reconstruction of PNG's REDD+ results for the period 2019–2022.

8. Description of How the Elements in Decision 4/CP.15 paragraph 1 (c) and (d), have been taken into account

This chapter describes how the elements contained in decision 4/CP.15, paragraph 1(c) and (d), have been taken into account in the preparation of this Technical Annex on REDD+ Results.

In accordance with UNFCCC guidance for Technical Annexes to Biennial Transparency Reports, this chapter does not introduce new methodologies, data, or results. Instead, it provides a structured overview of where and how the relevant requirements of decision 4/CP.15 are addressed elsewhere in the Technical Annex.

Specifically, this chapter demonstrates that:

- the most recent IPCC guidance and guidelines have been applied in the estimation and reporting of emissions and removals;

- a robust and transparent NFMS and MRV arrangements are in place;
- REDD+ results are transparent, consistent, and accurate; and
- sufficient information is made available to enable the reconstruction of reported results.

Detailed descriptions of methodologies, data sources, systems, and calculations are provided in Chapters 2 to 7. This chapter therefore serves as a synthesis and cross-referencing section, ensuring clarity, transparency, and traceability with respect to the requirements of decision 4/CP.15.

8.1 Use of the Most Recent IPCC Guidance and Guidelines

PNG has applied the most recent IPCC guidance and guidelines relevant to the estimation and reporting of emissions and removals from deforestation and forest degradation in the preparation of this Technical Annex.

The FRL, REDD+ results, and associated methodological components are based on the 2006 IPCC Guidelines for National Greenhouse Gas Inventories and the IPCC Good Practice Guidance for LULUCF, consistent with UNFCCC decisions applicable to REDD+ and FRLs. These guidelines provide the methodological basis for the selection of activity data, emission factors, carbon pools, and gases included in the estimation of emissions and removals.

Application of IPCC guidance is demonstrated through:

- the use of IPCC-consistent land-use categories and definitions (Section 2.2);
- the application of Tier 1 and Tier 2 emission factors, consistent with national circumstances and data availability (Sections 2.1, 2.4 and 7.4);
- the use of stock-difference and gain–loss approaches, as appropriate for deforestation and forest degradation activities (Sections 2.4 and 7.5); and
- the application of IPCC principles of transparency, consistency, comparability, completeness, and accuracy across the FRL, REDD+ results, and national GHG inventory (Chapters 4 and 5).

Any exclusions of carbon pools or gases from the FRL and REDD+ results, relative to the national GHG inventory, are explicitly documented and justified based on data availability and methodological feasibility, in accordance with IPCC guidance and UNFCCC decisions (Section 4.2).

Through these applications, PNG demonstrates that the REDD+ results reported in this Technical Annex are fully consistent with the most recent IPCC guidance and guidelines applicable to developing countries and REDD+ implementation.

8.2 Establishing a Robust and Transparent NFMS and MRV

PNG has established a robust and transparent NFMS and associated Measurement, Reporting and Verification (MRV) arrangements in accordance with decision 4/CP.15, paragraph 1(c), and related UNFCCC guidance for REDD+ implementation.

The NFMS provides the institutional, technical, and methodological foundation for the estimation of emissions and removals from deforestation and forest degradation, the construction of the FRL, and the calculation of REDD+ results reported in this Technical Annex.

A detailed description of the design, components, and operation of the NFMS and MRV system is provided in **Chapter 6**. That chapter documents:

- the institutional roles and responsibilities of national entities involved in REDD+ MRV;

- the operational remote sensing–based land-use and land-use change assessment system used for activity data;
- the ground-based forest carbon inventory supporting emission factor development; and
- the procedures for monitoring, quality assurance, quality control, and data archiving.

In summary, the NFMS and MRV system underpinning the REDD+ results reported in this Technical Annex demonstrates the following key attributes required under decision 4/CP.15:

- **Transparency**: methodologies, data sources, assumptions, and institutional arrangements are clearly documented and publicly accessible through UNFCCC submissions and national reports;
- **Consistency**: the same data sources, definitions, and methodological approaches are applied consistently across the FRL, REDD+ results, and national GHG inventory, with any differences explicitly documented;
- **Accuracy**: activity data and emission factors are derived using IPCC-consistent methods, supported by national data and field-based measurements where available; and
- **Robustness**: the system is designed to be repeatable over time, supported by institutional mandates and ongoing capacity development.

Through the establishment and application of this NFMS and MRV framework, PNG meets the requirements of decision 4/CP.15 for establishing, according to national circumstances and capabilities, a robust and transparent NFMS for REDD+.

8.3 Transparency, Consistency and Accuracy of REDD+ Results

This section explains how the REDD+ results reported in this Technical Annex meet the principles of transparency, consistency, and accuracy, as required under decision 4/CP.15, paragraph 1(c) and (d), without duplicating the detailed methodological explanations provided elsewhere in the document.

Transparency

Transparency is ensured through the comprehensive documentation of data sources, methodologies, assumptions, and institutional arrangements used to estimate emissions, construct the FRL, and calculate REDD+ results.

In particular:

- the methodologies and data underpinning the assessed 2nd FRL are summarized in **Chapter 2**;
- the calculation of REDD+ results and the application of HFLD adjustments are transparently presented in **Chapter 3**;
- methodological consistency with the national greenhouse gas inventory and earlier submissions is explained in **Chapter 4**; and
- detailed information necessary to enable the reconstruction of results is provided in **Chapter 7**.

All key datasets and methodological choices have been previously subjected to technical assessment through UNFCCC processes, including the assessment of the 2nd FRL and the technical analysis of Biennial Update Reports. Public availability of these submissions further supports transparency.

Consistency

Consistency is maintained across reporting cycles, methodologies, and datasets used for the FRL, REDD+ results, and national GHG inventory, in line with decision 12/CP.17 and related guidance.

Specifically:

- the same forest definition, activity data sources, emission factors, and scope of REDD+ activities are applied consistently between the assessed 2nd FRL and the REDD+ results reported for 2019–2022;
- any differences between REDD+ results and the LULUCF sector of the national GHG inventory are clearly identified and justified, as documented in **Section 4.2**; and
- the use of supplementary HFLD adjustment benchmarks based on updated external guidance does not modify the assessed FRL, ensuring consistency with the outcome of the UNFCCC technical assessment.

This approach ensures that changes in reported results arise from observed emissions trends or clearly documented methodological distinctions, rather than from unreported changes in methods or data.

Accuracy

Accuracy of REDD+ results is supported through the application of IPCC-consistent methods, the use of nationally appropriate data where available, and conservative methodological choices.

Key elements supporting accuracy include:

- the use of spatially explicit activity data derived from a national land-use and land-use change assessment using Collect Earth;
- the application of Tier 1 and Tier 2 emission factors consistent with IPCC guidance and national circumstances;
- conservative treatment of emissions and removals, including the exclusion of certain carbon pools and gases where reliable data are not available; and
- explicit assessment and reporting of uncertainty, as presented in **Chapter 5**.

Together, these measures ensure that reported REDD+ results are neither overestimated nor reliant on unsupported assumptions.

Summary

Through the combined application of transparent reporting, consistent methodologies, and accuracy-oriented data and assumptions, PNG's REDD+ results reported in this Technical Annex fully meet the requirements of decision 4/CP.15, paragraph 1(c) and (d).

Detailed technical descriptions supporting this conclusion are provided in Chapters 2 through 7, while this section confirms, at a summary level, that the REDD+ results adhere to the core quality principles required under the UNFCCC REDD+ framework.

8.4 Availability of Information to Enable Reconstructing Results

This section confirms that PNG has made available sufficient and transparent information to enable the reconstruction of the REDD+ results reported in this Technical Annex, in accordance with decision 4/CP.15, paragraph 1(d).

The information necessary for reconstruction is not repeated in this section, but is comprehensively documented in **Chapter 7**, with cross-references to previously submitted and technically assessed UNFCCC documents.

Scope of information available for reconstruction

The information provided by PNG enables an independent technical expert to reconstruct the REDD+ results by tracing each step from input data to final results. This includes:

- the activity data used to estimate emissions from deforestation and forest degradation;
- the emission factors applied to each activity and forest stratum;
- the equations and calculation procedures used to derive emissions and REDD+ results;
- the FRL against which results are assessed; and
- the treatment of adjustments, assumptions, and conservative choices.

Location of information

The information required for reconstruction is organised as follows:

- **Chapter 2** summarizes the construction and key characteristics of the technically assessed 2nd FRL, including the reference period, scope, carbon pools, and HFLD adjustment approach;
- **Chapter 3** presents the observed emissions, the applied FRL values, and the calculation of REDD+ results for the period 2019–2022;
- **Chapter 4** explains methodological consistency with the FRL, the national greenhouse gas inventory, and previous submissions;
- **Chapter 5** documents the treatment and magnitude of uncertainties associated with activity data and emission factors;
- **Chapter 6** describes the NFMS and institutional arrangements underpinning data generation and MRV; and
- **Chapter 7** provides detailed descriptions of activity data, emission factors, and calculation methods, including references to prior UNFCCC submissions (FRL, BURs, and NIR) where the underlying datasets and methods are documented in full.

Together, these chapters provide a complete and traceable information chain from raw data to reported REDD+ results.

Use of previously submitted and assessed information

Consistent with UNFCCC guidance, PNG builds on information previously submitted and technically assessed under the Convention, including the 2nd FRL, Biennial Update Reports, and the national greenhouse gas inventory. Where such information is referenced rather than reproduced, clear citations are provided to ensure accessibility and avoid duplication.

This approach ensures both transparency and efficiency, while maintaining the ability of reviewers to reconstruct the results using publicly available documentation.

Conclusion

Based on the information provided in Chapters 2 through 7 and the explicit cross-referencing of prior UNFCCC submissions, PNG has made available sufficient information to enable the reconstruction of the REDD+ results reported in this Technical Annex, fully meeting the requirements of decision 4/CP.15, paragraph 1(d).

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Annex to the Technical Annex on REDD+ Results 2018

Supplementary Information on the Application of the Updated GCF RBP Mainstreaming Scorecard to Previously Reported REDD+ Results (2018)

A.1 Purpose and scope of this Annex

This Annex provides supplementary information to demonstrate the consistency of Papua New Guinea's previously reported REDD+ results for the year 2018 with the updated requirements of the Green Climate Fund (GCF) REDD+ Results-Based Payments (RBP) Mainstreaming Scorecard, adopted in 2024.

The information presented in this Annex is **purely explanatory** and **does not modify**:

- the technically assessed Second Forest Reference Level (FRL);
- the scope, methodologies, activity data, or emission factors applied in the FRL or REDD+ results; or
- the reporting period of the Biennial Transparency Report (BTR).

This Annex is provided to ensure transparency and to retain the possibility of future consideration of previously reported results under updated external payment frameworks.

A.2 Background

Papua New Guinea reported REDD+ results for the period including the year 2018 in its Second Biennial Update Report (BUR2), together with a Technical Annex on REDD+. These results were assessed through the UNFCCC technical analysis process.

At the time of FRL development and BUR2 reporting, the most robust and applicable international guidance for High Forest Cover, Low Deforestation (HFLD) adjustments was provided by the ART TREES 2.0 standard. Accordingly, Papua New Guinea applied an HFLD adjustment consistent with TREES 2.0 in the construction of its Second FRL.

Subsequently, in 2024, the GCF adopted updated requirements for REDD+ Results-Based Payments under the Mainstreaming Scorecard. These requirements apply to results for the period **2018–2022**, which partially overlaps with results previously reported by Papua New Guinea under BUR2.

A.3 Updated GCF RBP Mainstreaming Scorecard constraints

The GCF RBP Mainstreaming Scorecard specifies that, for countries with high forest cover and low deforestation rates, any upward adjustment applied to an FREL/FRL shall not exceed:

a) **10% of the average annual historical emissions**; and
b) **0.1% of the total forest carbon stock over the relevant period**.

Countries are required to apply the **more conservative** of these two constraints.

A.4 Quantitative comparison of HFLD adjustment approaches

Using the same historical activity data and emission factors applied in the Second Forest Reference Level and in BUR2, three alternative HFLD adjustment benchmarks can be derived for the historical reference period 2009–2013:

a) **HFLD adjustment applied in BUR2 and the technically assessed FRL**, based on the GCF RBP Pilot Scorecard and ART TREES 2.0 guidance, resulting in an adjusted FRL of:

42,172,324 tCO_2e per year

b) **Updated GCF RBP Mainstreaming Scorecard – 10% cap**, calculated as 10% above the historical average emissions for 2009–2013, resulting in:

43,139,527 tCO_2e per year

c) **Updated GCF RBP Mainstreaming Scorecard – carbon stock–based cap**, calculated as 0.1% of total forest carbon stock over the eligibility period (expressed as an annual equivalent), resulting in:

46,604,183 tCO_2e per year

In accordance with the GCF RBP Mainstreaming Scorecard, the applicable adjustment is the **more conservative (lower) of the two caps**, namely **43,139,527 tCO_2e per year**.

A.5 Demonstration of conservativeness of BUR2-reported results

A comparison of the HFLD adjustment values demonstrates that the adjustment applied in BUR2 and used for reporting REDD+ results for 2018:

- **42,172,324 tCO_2e per year (BUR2)**

is **lower than** the maximum adjustment permitted under the updated GCF RBP Mainstreaming Scorecard:

- **43,139,527 tCO_2e per year (10% cap)**

Accordingly, the HFLD adjustment applied by Papua New Guinea in BUR2 is **more conservative** than the adjustment that would be allowed under the 2024 GCF RBP Mainstreaming Scorecard.

A.6 Implications for previously reported 2018 REDD+ results

This quantitative comparison confirms that:

- the Forest Reference Level and REDD+ results for 2018 reported in BUR2;
- the associated HFLD adjustment applied at the time of reporting; and
- the results that underwent UNFCCC technical analysis,

fully comply with, and exceed, the conservativeness requirements introduced by the updated GCF RBP Mainstreaming Scorecard.

The previously reported 2018 REDD+ results therefore remain valid, robust, and compatible with current GCF RBP Mainstreaming requirements, without any need for recalculation or revision.

Table A1. Comparison of HFLD adjustment benchmarks for the 2009–2013 historical period

Adjustment approach	**Annual FRL (tCO_2e/yr)**	**Status**
BUR2 / assessed FRL	42,172,324	**Applied & TA-completed**
GCF RBP Mainstreaming – 10% cap	43,139,527	Upper limit
GCF RBP Mainstreaming – carbon stock cap	46,604,183	Non-binding