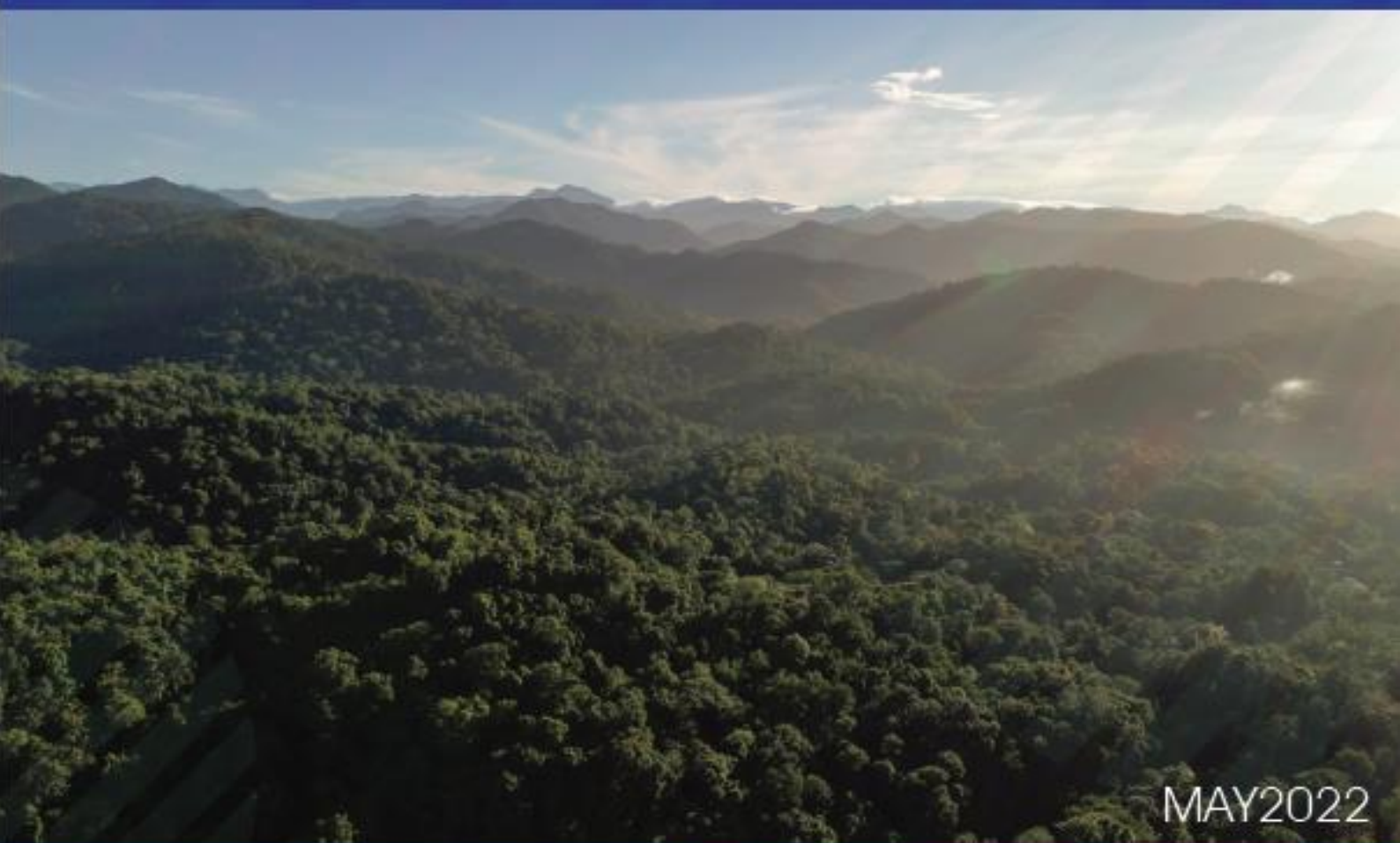


INTRODUCTION TO PNG CLIMATE CHANGE AND FOREST MONITORING WEB-PORTAL



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Climate Change & Development Authority

Introduction to PNG Climate Change and Forest Monitoring Web-Portal

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The information in this document is subject to change without notice.

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Acronyms

BioRAP - Biological Rapid Appraisal Project

CCDA – Climate Change and Development Authority

CEPA – Conservation and Environment Protection Authority

DAL – Department of Agriculture and Livestock

DLPP – Department of Lands and Physical Planning

FAO – Food and Agriculture Organization of the United Nations

IFC - International Finance Corporation

IPCC - Intergovernmental Panel on Climate Change

LLG – Local Level Government

NFI – National Forest Inventory

MRV – Measurement, Reporting and Verification

NSO – National Statistics Office

NBPOL - New Britain Palm Oil Ltd

PNG – Papua New Guinea

PNGFA – Papua New Guinea Forest Authority

PNGRIS - Papua New Guinea Resource Information System

REDD+ – Reducing Emissions from deforestation and forest degradation in developing countries including forest conservation, sustainable management of forest and enhancement of forest carbon stocks

TerraPNG – PNG’s customized version of TerraAmazon

UMD – The University of Maryland

SRTM - Shuttle Radar Topographic Mission

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1. Introduction

1.1 Background

Papua New Guinea (PNG) has been making great efforts on the REDD+ readiness and establishing the four design elements for REDD+ implementation, namely 1) National REDD+ Strategy (NRS), 2) National Forest Monitoring System (NFMS), 3) Forest Reference Level (FRL), and 4) Safeguard Information System (SIS). NFMS and FRL have been supported by FAO through UN-REDD National Programme and EU/FAO PNG National Forest Inventory (NFI) Project, while NRS and SIS have been supported by UNDP under UN-REDD and Forest Carbon Partnership Facility (FCPF).

PNG developed and has been improving NFMS including MRV (Measurement, Reporting and Verification) 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 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 FRL was officially published by UNFCCC at early 2018. PNG had also prepared NRS and officially released it in 2017. PNG had also submitted the Summary of Information on Safeguard to UNFCCC and currently has been working on SIS.

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-Inventory and Biennial Update Report (BUR) with Technical Annex on REDD+ in 2018 and submitted the compiled summary reports to UNFCCC in April 2019. Technical Assessment by UNFCCC had been conducted for PNG BUR and Technical Annex on REDD+ from August to the end of 2019 then a technical assessment report had been released by UNFCCC in early 2020.

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; PNG Forest Authority (PNGFA) and Climate Change and Development Authority (CCDA).

As part of the monitoring function, PNG established and officially released PNG Climate Change and Forest Monitoring Web-Portal (<https://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.

1.2 Objective of the Web-Portal

PNG's Climate Change and Forest Monitoring Web-Portal was established for the following main reasons;

- (i) Disseminating achievements of the country (PNG) related to Land Use and Land Use Change and Forestry (LULUCF) through Web-Interface (and API) as a part of National Forest Monitoring System (NFMS);
- (ii) Stakeholders (government organizations, developing partners, private sectors and NGO) can understand the information available in the country and publish their achievements/data through one single web-based platform;
- (iii) Preparing the base information/system for Enhanced Transparency Framework (ETF) under the Paris agreement to make sure transparency of the NDC/MRV progress as well as base for Data Management System Registry System; and
- (iv) Ensuring the transparency of REDD+ processes in PNG.

1.3 Orientation of the Web-Portal

PNG Climate Change and Forest Monitoring Web-Portal (this is the current name, which may be revised considering adding more information from other stakeholders) is located as a part of National Forest Monitoring System (NFMS) and its Monitoring Functions. The orientation/position of the Web-Portal and the other systems among the organization are shown below.

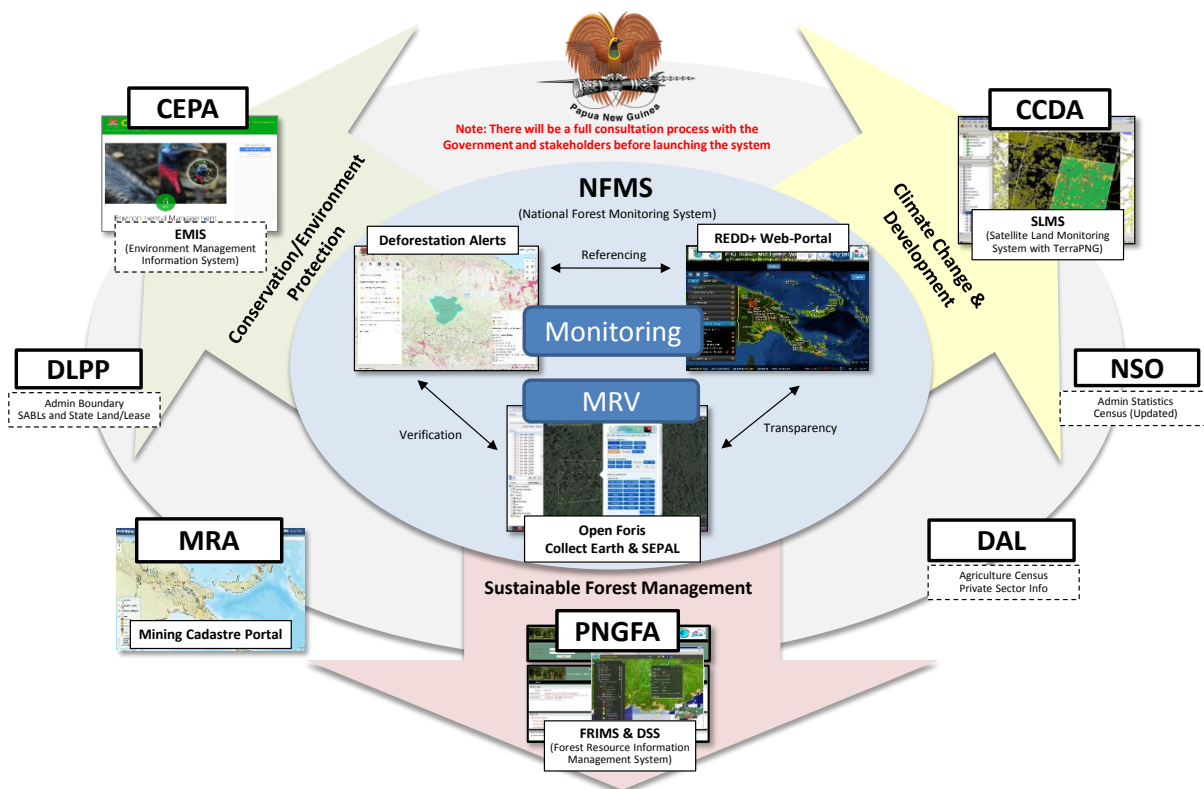


Figure 2: PNG Resource Information Network and the Web Portal

2. Development and Updating of the Web-Portal

2.1 Development/Management of the Web-Portal

PNG's Climate Change and Forest Monitoring Web-Portal was developed jointly by PNG CCDA and PNGFA with CCDA as the core implementing partner. Other government agencies and private sectors (PNG Forest Authority, Conservation and Environmental Protection Authority, Department of Agriculture and Livestock, Mineral Resources Authority, National Statistical Office, New Britain Palm Oil Limited, Oil Palm Industry Council, 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 including the geospatial information.

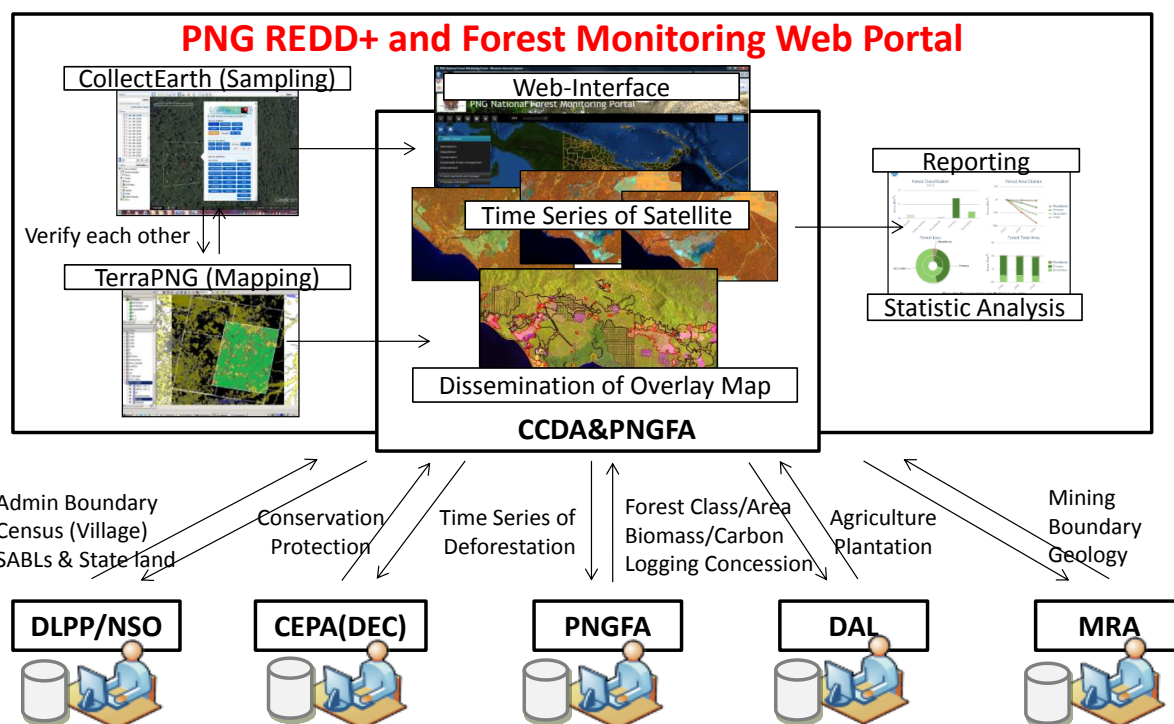


Figure 3: PNG Climate Change and Forest Monitoring Web-Portal

Through the addition of the data from the aforementioned sources, it is envisioned that the web-portal will become a broader planning and monitoring tool in the already established forestry, biodiversity and agricultural space. It aims to achieve this by enriching the portal with information relevant to these sectors, for example the mapping of existing agricultural and agroforestry practices but also additional infrastructure information. Soil and climatic data will extend the possibilities of the platform to make planning decisions and ensure that future expansions can easily identify suitable areas for their business, while taking into account protected or conservation forest areas and existing infrastructure. In this way the portal aims to become a monitoring tool for government agencies, as well as a planning tool for both public and private sector stakeholders. For this objective the portal will invite relevant stakeholders, like government organizations, developing partners, private sectors and NGO's to share their data on the platform.

2.2 Updating and Enhancement of the Web-Portal

Updating the Web-Portal will be implemented with following steps.

(1) Concept Note/Plan, Consultations

Preparation of concept note with draft implementation plan follow by stakeholders' consultation and finalisation of the concept note and implementation plan.

(2) TOR preparation

Terms of Reference (TOR) prepared for the IT related works as there are several tasks in web-portal updating that requires IT knowledge and skills.

(3) Data Collection (one on one visit)

Data collection (one-on-one visit and consultation with data providers then official request for the sharing of the data) is conducted based on the concept note/plan.

(4) Updating / Adding the Contents

The web-portal is updated (new contents added) using the collected data. Missing/remaining data are collected and updated when become available.

2.3 Data Sharing Policy of the Web-Portal

All data on the PNG Climate Change and Forest Monitoring Web-Portal can only be viewed online via the web-portal interface. Currently, no downloading options are available for the users. In the case that someone needs a certain data; he/she will always be referred to the original data providers due to data sharing restrictions in place.

2.4 Supporting Functions of the Web-Portal

The PNG Climate Change and Forest Monitoring Web-Portal has the following support functions:

1. Information tool available for each spatial layer
2. Links to sources of data are provided in the form of URL
3. Legends
4. Transparency adjust tab
5. Feedback for sending questions or comments (External Link to PNG REDD+ Website Feedback Form)

All information provided on the web-portal is written in English. Hence, all feedbacks or comments from anyone are expected to be written in English.

3. Information on the Web-Portal

3.1 Outline of the PNG Web-Portal

PNG's Climate Change and Forest Monitoring Web Portal has a total of twelve information tabs: (1) Climate Change; (2) Mitigation/REDD+; (3) Adaptation/DRR; (4) Forestry; (5) Environment; (6) Agriculture; (7) Mining; (8) Base Information; and (9) Partner Data (10) Global Forest Change; (11) Global Surface Water; (12) Satellite Imagery (see Figure 5). Each tab contains layer(s) of related data from a specific sector, provided by different state agencies or stakeholders based on the existing institutional arrangement. Some of those layers are shown below (see Appendix section for the complete list of layers with descriptions).

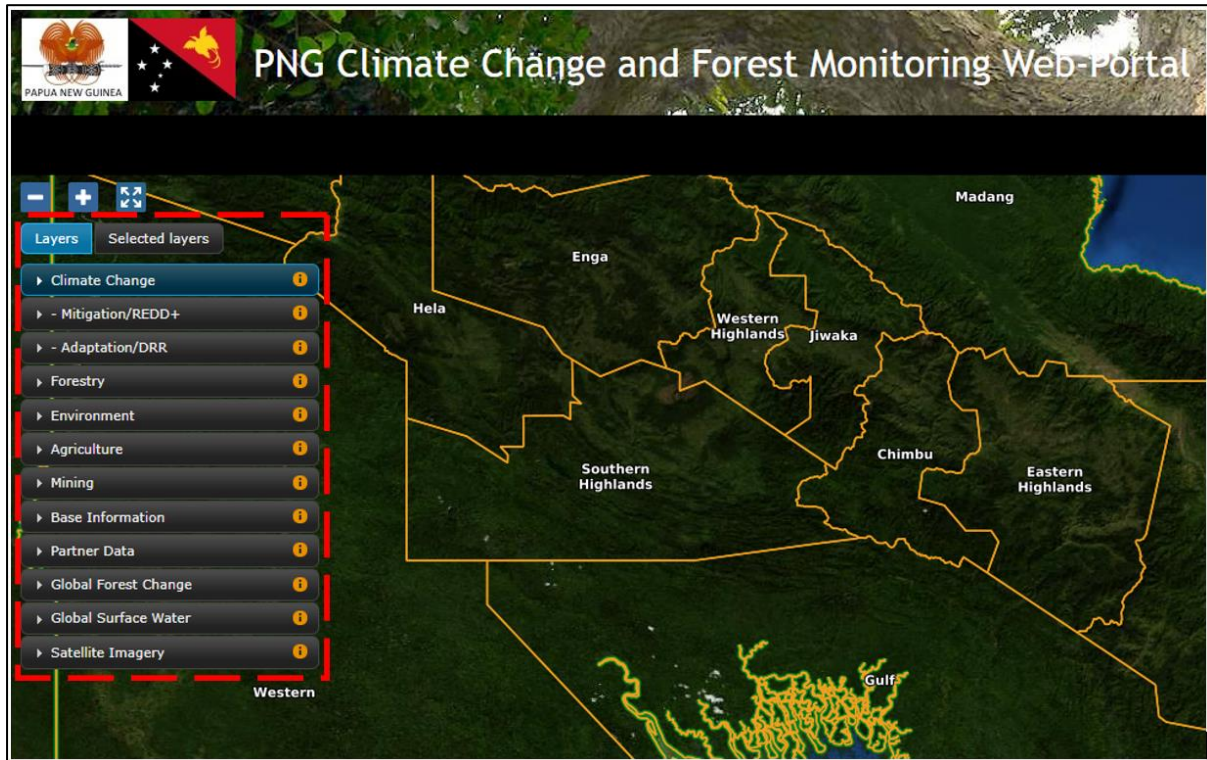


Figure 4: Twelve (12) information tabs of PNG's Web-Portal

The layers under the twelve different information tabs can be switched on concurrently or one at a time to extract spatial correlated information. Each of those layers has a unique purpose and function. Transparency of certain layers such as forest base maps and the hillshade can be adjusted during queries. The map layers contain legends that can be switched on or off.

Table 1: Functions of the layers of PNG’s Climate Change and Forest Monitoring Web-Portal

Web-Portal information tabs	Available Layers of Information	Functions
(1) Climate Change	TerraPNG Land Use Map 2015	This is the result of the land cover/land use assessment conducted by CCDA in 2015. This land use map was developed based on Landsat8 cloud-free mosaic (30m). It shows PNG’s major land cover/use in eight (8) different classes. https://png-nfms.org/portal/static/loc/en/documents/TerraPNG_Manual_Users_Guide.pdf
	TerraPNG Digitized Roads 2015	This is a part of the land cover/land use assessment conducted by CCDA in 2015. This road network data was digitized based on Landsat8 cloud-free mosaic (30m). It shows PNG’s major road network which related to the land use change https://png-nfms.org/portal/static/loc/en/documents/TerraPNG_Manual_Users_Guide.pdf
(2) Mitigation/REDD +	April Salumei REDD Project	The April Salumei REDD Project is the pilot project for Papua New Guinea. The aim of the project is to protect the forest and biodiversity of the area (603,579ha) whilst providing an important source of income for the traditional owners.
	NIHT Topaiyo REDD+	NIHT Inc. has partnered with the traditional landowners of New Ireland and East New Britain to put an end to deforestation initiated by industrial logging in the region. The preservation of these rainforests is essential to not only the carbon and biodiversity benefits inherent with projects of this nature, but also for the wellbeing and prosperity of the people of New Ireland and East New Britain.
	HCV Probability Map	This project aimed to provide practical options for adapting global High Conservation Values (HCV) and High Carbon Stock Approach (HCSA) assessment methods for smallholders in the Papua New Guinea context
	Above Ground Biomass Carbon	Shows aboveground biomass carbon density at 30 m resolution, based on a pantropical remote sensing-based study by Baccini et al. (2015).
	Soil Organic Carbon	Shows soil organic carbon stocks to a depth of 30 cm, and is based on a global soil organic carbon map developed by the Food and Agriculture Organization of the United Nations (FAO) and the Intergovernmental Technical Panel of Soils (ITPS) (2018)
	Range Size Rarity Index	This index combines species richness and endemism based on the distribution of all 1184 forest-based mammals, birds, reptiles and amphibian species native to PNG, as defined by the IUCN Red List of Threatened Species (2017)
	Soil Erosion Control	Shows the role of forests in controlling soil erosion in PNG is illustrated here based on the estimated total soil loss avoided because of forest cover. These values were obtained by comparing estimated soil erosion under current forest cover (using land cover data from the MODIS Vegetation Continuous Fields (DiMiceli et al. 2011)) and in the absence of trees
	Land Slide Risk Reduction	shows the relative importance of forests in controlling landslide risk in PNG
	Accessibility	Accessibility of intact forests to tourists was measured by estimating travel time from major PNG airports via surface transport. Travel time from major airports was estimated by adapting data and methods developed by Weiss et al. (2018), and using Google Earth Engine (Gorelick et al. 2017).
	Birds of	Shows the relationship between Bird-of-Paradise richness and forest

Web-Portal information tabs	Available Layers of Information	Functions
	Paradise and Accessibility	accessibility
	Birds of Paradise species Richness	Shows estimated Bird-of-Paradise richness using a regular grid of 25 km ² size hexagons, based on the spatial distribution of all 30 species belonging to the Paradisaeidae family according to the IUCN Red List of Threatened Species (2017).
	Combined Benefits	Shows the combination of individual benefit layers and identifies areas of spatial congruence amongst them, as well as forest areas that do not hold these values. This was produced by first standardising the values of the individual benefit layers (0 to 100, by means of equally-weighted linear combination), and then creating a composite layer with the same numeric range as the standardized factors.
(3) Adaptation/DRR	Climate Zone	These are the IPCC default climate zones as expected by the ALU tool, the dataset that can be used is hosted at http://esdac.jrc.ec.europa.eu/projects/renewable-energy-directive
	Global Eco Zone	These are the default FAO GEZ (download here: http://www.fao.org/geonetwork/srv/en/resources.get?id=47105&fname=gez2010.zip&access=private http://www.fao.org/docrep/017/ap861e/ap861e00.pdf Ecological zones that are used as the standard classes in the GHG inventory software ALU http://www.nrel.colostate.edu/projects/ALUsoftware/
	Soil Type	Soil classes that are consistent with the IPCC defaults expected by ALU. You can obtain this data from : http://www.isric.org/content/download-form?dataset=CBP_Global_IPCC_soil_classes_2010Nov04.zip
	Streams	The layer shows all the major rivers and stream network in PNG.
	Contours	Contours layer shows major contour lines across PNG.
	Geology (Rock Type)	Geology (Rock Type) Source: PNGRIS 3rd Edition (2008) https://png-data.sprep.org/system/files/PNGRIS%203rd%20edition.pdf
	Soil (Group Code)	Soil (Group Code) Source: PNGRIS 3rd Edition (2008) https://png-data.sprep.org/system/files/PNGRIS%203rd%20edition.pdf
	Slope Degree 30m	This Slope was computed from Shuttle Radar Topographic Mission (SRTM) digital elevation model, collected during 11 day mission in February of 2000 by NASA, processed 30m (1 arc-second) resolution under the project with NGA
	Hillshade Overlay	This Hillshade Overlay was computed from the Shuttle Radar Topographic Mission (SRTM) digital elevation data, collected during an 11 day mission in February of 2000 by NASA, processed 90 meter (3 arc-second) resolution data under the project with NGA
	Hillshade 30m	This Hillshade Overlay was computed from the Shuttle Radar Topographic Mission (SRTM) digital elevation data, collected during an 11 day mission in February of 2000 by NASA, processed 90 meter (3 arc-second) resolution data under the project with NGA
	Elevation 30m	This Elevation was computed from Shuttle Radar Topographic Mission (SRTM) digital elevation model, collected during 11 day mission in February of 2000 by NASA, processed 30m (1 arc-second) resolution under the project with NGA
	Watershed Level 1 (500K)	This watershed was computed from Shuttle Radar Topographic Mission (SRTM) digital elevation model, collected during 11 days-mission in February 2000 by NASA, processed at 30m (1 arc-second)
Watershed		

Web-Portal information tabs	Available Layers of Information	Functions
	Level 2 (100K)	resolution under the project with NGA.
	Watershed Level 3 (50K)	
	Stream Link Level 1 (500K)	This stream link was computed from Shuttle Radar Topographic Mission (SRTM) digital elevation model, collected during 11 days-mission in February 2000 by NASA, processed at 30m (1 arc-second) resolution under the project with NGA.
	Stream Link Level 2 (100K)	
	Stream Link Level 3 (50K)	
	Precipitation	From PNGRIS 2008 (C) University of Papua New Guinea (UPNG)
	Erosion Risk	Estimates erosion risk from sheet and rill erosion from rainfall and associated runoff. This layer shows the risk of erosion around the world, from low to high. Estimates of soil loss from rainfall and runoff on a scale from 1 to 5. A value of 1 indicates a low risk of erosion and 5 indicates a high risk of erosion. Source: World Resources Institute. 2016. "Erosion." Global Forest Watch Water. Accessed through Resource Watch, (2/6/2022). www.resourcewatch.org
(4) Forestry	Land Use (IPPC) 2015	This is the cropland plots of the Forest and Land Use Change in Papua New Guinea 2000-2015 conducted by PNGFA and CCDA. These plots was developed by using Open Foris Collect Earth. It shows PNG's landuse, subtype, subdivision, and disturbance type.
	Land Use Strata 2015	This is the cropland plots of the Forest and Land Use Change in Papua New Guinea 2000-2015 conducted by PNGFA and CCDA. These plots was developed by using Open Foris Collect Earth. It shows PNG's landuse, subtype, subdivision, and disturbance type.
	Deforestation 2001-2015	This is the cropland plots of the Forest and Land Use Change in Papua New Guinea 2000-2015 conducted by PNGFA and CCDA. These plots was developed by using Open Foris Collect Earth. It shows PNG's landuse, subtype, subdivision, and disturbance type. "Deforestation is the conversion from forest land to any non-forest land". https://pngreddplus.org/wp-content/uploads/2021/09/png_frl_resubmission_modified_20170071_0_final.pdf
	Forest Degradation 2001-2015	This is the cropland plots of the Forest and Land Use Change in Papua New Guinea 2000-2015 conducted by PNGFA and CCDA. These plots was developed by using Open Foris Collect Earth. It shows PNG's landuse, subtype, subdivision, and disturbance type. "Forest degradation is the conversion from primary forest to disturbed forest." https://pngreddplus.org/wp-content/uploads/2021/09/png_frl_resubmission_modified_20170071_0_final.pdf
	NFI Pre-assessment (CollectEarth 2013)	National Forest Inventory (NFI) pre-assessment data 2013 was developed by PNGFA with support of UN-REDD/FAO and EU/FAO programmes by utilizing the tool "Open Foris Collect Earth" (developed by FAO). This tool enables to collate all the available time-series data of height-resolution satellites (Landsat) for human interpretation in a user-friendly and efficient manner. MP-NFI related documents are published by PNGFA as follows; (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/P

Web-Portal information tabs	Available Layers of Information	Functions
		NG Biophysical Field Manual 08 Feb 2018 FINAL compressed.pdf (PNG's 1st Multi-Purpose NFI: Project Proceedings) 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
	Soil Sampling Survey Plots	Refer to the Factsheet and Field Guide for more detailed Information (Field Guide for Sampling and Describing Soils in the Papua New Guinea National Forest Inventory) https://pngfa.gov.pg/images/articledocs/National_Forest_Inventory/NFI_soil_field_guide_version_4th_edition_28_June_2017_compressed_pics_compressed.pdf
	Permanent Sample plots (PSP)	Location of the Permanent Sample Plots (PSP) maintained by PNGFA Forest Research Institute (FRI): 1 ha square size, approximately 120 plots were established under the research project supported by ITTO. Most of them are located in secondary lowland forest though some are already terminated. Please contact PNGFA FRI for further detail.
	Forest Base Map 2012	Forest Base Map 2012 was developed by PNGFA with support of JICA technical cooperation project using satellite data (RapidEye and ALOS/PALSAR) procured by the Japan's Grant Aid, based on the PNG's forest definition and classification. The current version 1.0 of the map will be soon replaced by a finalized version once it is completed.
	Forest Cover Map 2015	
	Logging Concessions	The logging concession boundaries managed by PNGFA: All the expired and operational concessions are displayed. Once a new concession is agreed and authorized by PNGFA, its boundary will be added. Please contact PNGFA for further detail.
	Digitized Logging Road	The Digitized Logging Road Map was developed by PNGFA with support of JICA technical cooperation project using satellite data (RapidEye and ALOS/PALSAR) procured by the Japan's Grant Aid, based on the PNG's forest definition and classification. The current version 1.0 of the map will be soon replaced by a finalized version once it is completed.
(5) Environment	Conservation Needs Assessment Areas	The conservation needs assessment areas in PNG are found under this layer.
	Biodiversity priority Areas	This layer shows all the biodiversity priority areas in PNG.
	Existing protected Areas	Existing protected Areas
	Proposed Protected Areas	This layer shows all the proposed protected areas in PNG.
	Key Biodiversity Areas (KBA)	The Key Biodiversity Areas (KBA) approach helps to identify and designate areas of international importance in terms of biodiversity conservation using globally standardised criteria. KBAs extend the Important Bird Area (IBA) concept to other taxonomic groups and are now being identified in many parts of the world, by a range of organisations. Examples include Important Plant Areas (IPAs), Ecologically and Biologically Significant Areas (EBSAs) in the High Seas, Alliance for Zero Extinction (AZE) sites, Prime Butterfly Areas, Important Mammal Areas

Web-Portal information tabs	Available Layers of Information	Functions
		and Important Sites for Freshwater Biodiversity, with prototype criteria developed for freshwater molluscs and fish and for marine systems. Source: https://www.keybiodiversityareas.org/ IUCN (2016). A Global Standard for the Identification of Key Biodiversity Areas, Version 1.0. First edition. Gland, Switzerland: IUCN. https://portals.iucn.org/library/sites/library/files/documents/2016-048.pdf
(6) Agriculture	NBPOL (Estates)	This is the information from New Britain Palm Oil Ltd (NBPOL) acquired in September 2015. NBPOL is keep updating the information. When the original information is updated, the information displayed will be updated accordingly. Please contact NBPOL for further detail. https://www.nbpol.com.pg
	NBPOL (Mills)	
	NBPOL (Small Holders)	
	Hargy	This is the information from Hargy Oil Palms Limited (HOPL), SIPEF Papua New Guinea. When the original information is updated, the information displayed will be updated accordingly. Please contact HOPL for further detail. https://www.sipef.com/sipef-papua-new-guinea/ https://www.sipef.com/sipef-papua-new-guinea/about-hargy-oil-palms-ltd/
	Cropland Areas (TerraPNG 2015)	This is the cropland areas of the land cover/land use assessment conducted by CCDA in 2015. This land use map was developed based on Landsat8 cloud-free mosaic (30m). It shows PNG's major land cover/use in eight (8) different classes.
	Cropland Plots:Subtype (CollectEarth 2015)	This is the cropland plots of the Forest and Land Use Change in Papua New Guinea 2000-2015 conducted by PNGFA and CCDA. These plots was developed by using Open Foris Collect Earth. It shows PNG's landuse, subtype, subdivision, and disturbance type.
	Cropland Plots: Subdivision (CollectEarth 2015)	This is the cropland plots of the Forest and Land Use Change in Papua New Guinea 2000-2015 conducted by PNGFA and CCDA. These plots was developed by using Open Foris Collect Earth. It shows PNG's landuse, subtype, subdivision, and disturbance type.
(7) Mining	Exploration Licenses areas (EL)	EL layer display areas of land in PNG in which a mining exploration license may be granted.
	Mining Leases (ML)	ML layer shows the areas under mining lease. These lease areas may be active or expired and waiting renewal.
	Special Mining Leases (SML)	The SML layer shows locations of the Special Mining Lease issued to the exploration licenses holder for large scale mining operations.
	Alluvial Mining Leases (AML)	AML layer displays areas currently under lease for alluvial mining. The alluvial mining leases may be active or expired and waiting renewal.
	Mining Easement (ME)	The ME layer shows locations of mining easements which may be granted in connection with mining, treatment or ancillary operations.
(8) Base Information	Country	The 2011 updated country boundary layer shows the entire terrestrial boundary of PNG.
	Province	The 2011 updated PNG provinces boundaries show boundaries of all 22 provinces of PNG.
	Districts	The 2011 updated PNG district's boundaries show boundaries of all 89 districts of PNG.
	Local Level	The 2011 updated PNG LLG boundaries show boundaries of all 317 LLGs of PNG.

Web-Portal information tabs	Available Layers of Information	Functions
	Government (LLG)	
	Roads	This layer shows major road networks in PNG which include provincial and national highways.
	Tracks	The Tracks layer shows track network in PNG which are connected to the major roads/highways.
	Settlements 2000	Settlements 2000 layer shows village points' information or census units/ wards based on 2000 Population Census information.
	Settlements 2011	Settlements 2011 layer shows village points' information or census units/ wards based on 2011 Population Census information.
	Buildings	The building layer consists of information on building footprints of PNG.
	Major Airport	Major Airports in Papua New Guinea
	Major Cities	Major Cities/Townships in Papua New Guinea
	Major Peaklist	Highest Mountain Peaks in Papua New Guinea
	Major Rivers	Major Rivers in Papua New Guinea
	Major Waters	Major Lakes and Streams in Papua New Guinea
(9) Partner Data	Cassava Suitability	Markham/Ramu Agricultural Growth Corridor Please review the Report to get more information – Markham Ramu report https://www.ifc.org/wps/wcm/connect/d7ea3532-5354-4721-92ac-03fa06ba2205/Markham+Ramu+Report+-+Final.pdf?MOD=AJPERES&CVID=nRaOKkM
	Maize Suitability	
	Oil palm Suitability	
	Sugar Cane Suitability	
	Cattle Suitability	
(10) Global Forest Change	Tree Cover Gain 2012	Forest gain during the period 2000–2012, defined as the inverse of loss, or a non-forest to forest change entirely within the study period. Encoded as either 1 (gain) or 0 (no gain). Source: Hansen/UMD/Google/NASA
	Tree Cover Loss-Year 2019	Forest loss during the period 2000–2019, defined as a stand-replacement disturbance, or a change from a forest to non-forest state. Encoded as either 0 (no loss) or else a value in the range 1–19, representing loss detected primarily in the year 2001–2019, respectively. Source: Hansen/UMD/Google/NASA
	Tree Cover Loss-Year 2019 : Kernel Density 1km	This is visualized and calculated data of Year of gross forest cover loss event (lossyear) from Global Forest Change by using Kernel Density: Kernel Density calculates the density of point features in a neighbourhood around features. This data calculated the density per 1 km grid
	Tree Cover Loss-Year 2019 : Kernel Density 4km	This is visualized and calculated data of Year of gross forest cover loss event (lossyear) from Global Forest Change by using Kernel Density: Kernel Density calculates the density of point features in a neighbourhood around features. This data calculated the density per 4 km grid.
	Tree Cover Height 2019 (GEDI)	This layer shows the height of global forest canopy in the year 2019. A new, 30-m spatial resolution global forest canopy height map was developed through the integration of the Global Ecosystem Dynamics Investigation (GEDI) lidar forest structure measurements and Landsat analysis-ready data time-series. The NASA GEDI is a spaceborne lidar

Web-Portal information tabs	Available Layers of Information	Functions
		instrument operating onboard the International Space Station since April 2019. Source: UMD/NASA GEDI https://glad.umd.edu/dataset/gedi/
(11) Global Surface Water	Water Occurrence (1984-2020)	The Joint Research Centre (JRC) developed the GSW dataset in the framework of the Copernicus Programme. The GSW maps the location and temporal distribution of water surfaces at the global scale over the past 3.7 decades and provides statistics on the extent and change of those water surfaces. The GSW produced from Landsat imagery, will support applications including water resource management, climate modelling, biodiversity conservation and food security. Source: EC JRC/Google
	Water Occurrence Change (1984-1999 to 2000-2020)	
	Water Seasonality (2020)	
	Annual Water Recurrence (1984-2020)	
	Water Transitions (First Year to last year)	
	Maximum Water Extent (1984-2020)	
(12) Satellite Imagery	Blue Marble	Provides backdrop satellite image composite of PNG. Vegetation cover and distribution is clearly visualised under this layer.
	Landsat 2000 Enhanced	This is enhanced image of Circa year 2000 Landsat 8 cloud-free image composite (first). Reference multispectral imagery from the first available year, typically 2000. If no cloud-free observations were available for year 2000, imagery was taken from the closest year with cloud-free data, within the range 1999–2012. Source: Hansen/UMD/Google/USGS/NASA
	Landsat 2013 Enhanced	This is enhanced image of Circa year 2013 Landsat 7 cloud-free image composite (first). Reference multispectral imagery from the first available year, typically 2013. If no cloud-free observations were available for year 2013, imagery was taken from the closest year with cloud-free data, within the range 1999–2013. Source: Hansen/UMD/Google/USGS/NASA
	Landsat 2015 Enhanced	This is enhanced image of Circa year 2015 Landsat 8 cloud-free image composite (first). Reference multispectral imagery from the first available year, typically 2015. If no cloud-free observations were available for year 2015, imagery was taken from the closest year with cloud-free data, within the range 1999–2015. Source: Hansen/UMD/Google/USGS/NASA
	Landsat 2019 Enhanced	This is enhanced image of Circa year 2019 Landsat 8 cloud-free image composite (first). Reference multispectral imagery from the first available year, typically 2019. If no cloud-free observations were available for year 2019, imagery was taken from the closest year with cloud-free data, within the range 1999–2019. Source: Hansen/UMD/Google/USGS/NASA

3.2 Layers of the PNG Web-Portal

This section provides descriptions of the twelve (12) information tabs of the web-portal. Detail description of the different layers under each other the information tabs is found in Table 1.

(1) Climate Change

This tab contains data from the Climate Change and Development Authority, namely TerraPNG Land Use Map 2015 and TerraPNG Digitized Roads 2015.



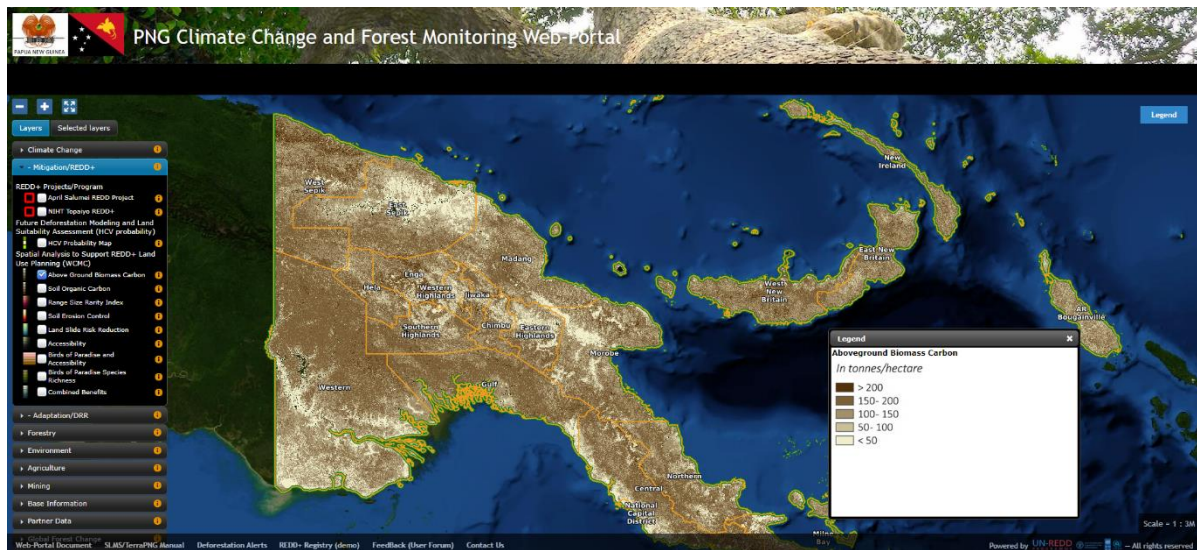
(2) Mitigation/REDD+

Geographic location of REDD+ Projects/Program with summary and the list of projects/program; results of Land Suitability Assessment (HCV Probability Map); and Spatial Analysis to Support REDD+ Land Use Planning. REDD+ Projects/Program information will be enhanced as a part of REDD+ registry system in future. Layers under Mitigation/REDD+ tab include; April Salumei REDD Project, NIHT Topaiyo REDD+, HCV Probability Map, Above Ground Biomass Carbon, Soil Organic Carbon, Range Size Rarity Index, Soil Erosion Control, Land Slide Risk Reduction, Accessibility, Birds of Paradise and Accessibility, Birds of Paradise species Richness, and Combined Benefits.

April Salumei REDD Project Overlayed on HCV Probability Map



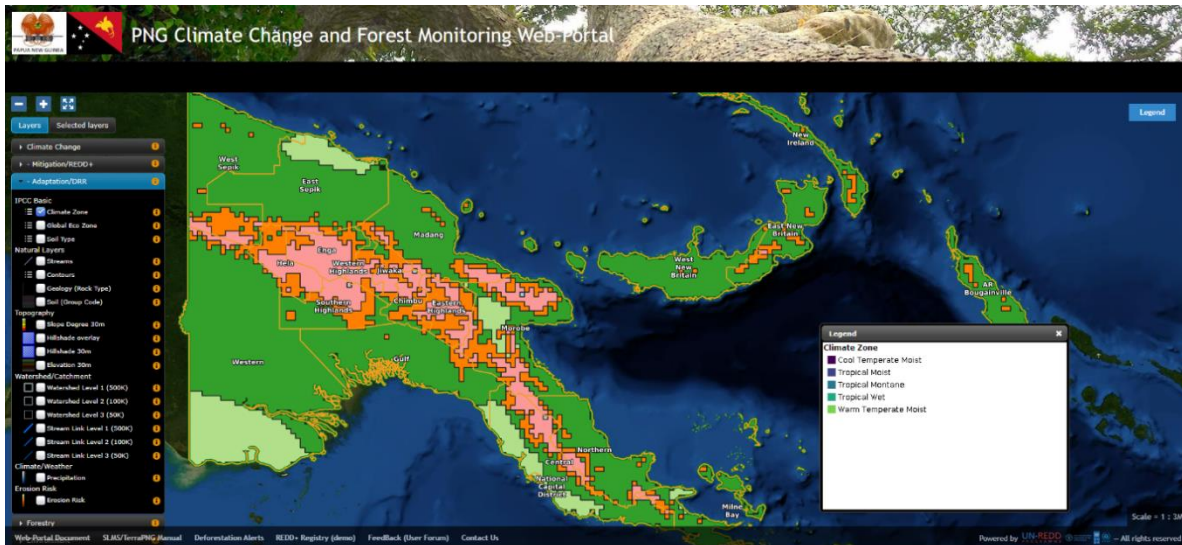
Above Ground Biomass Carbon



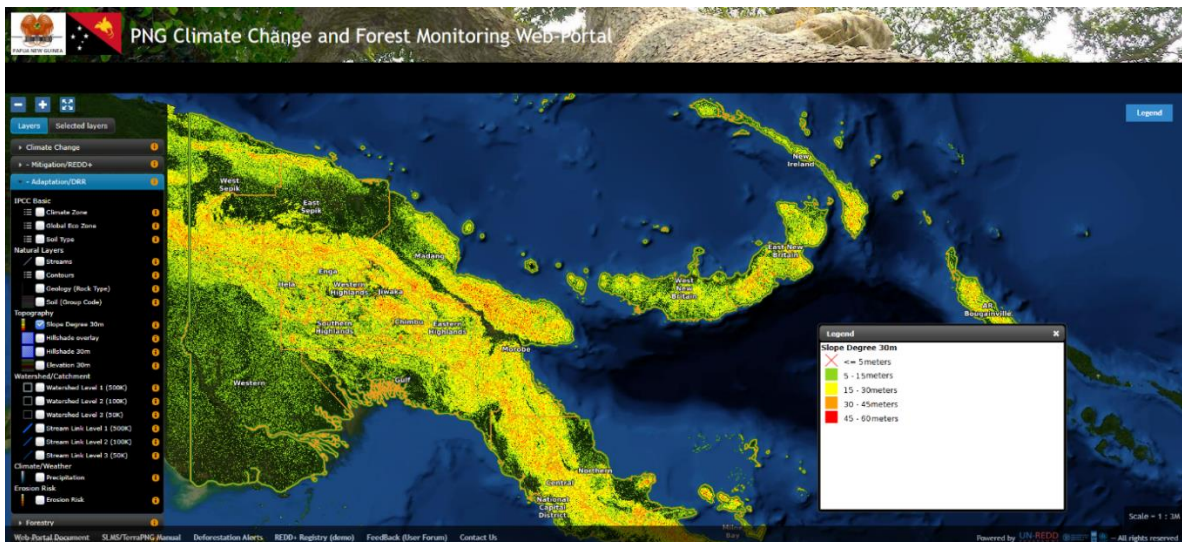
(3) Adaptation/DRR

The data useful to Adaptation/DRR (Disaster Risk Reduction) is displayed under this information tab. Future spatial data on adaptation will be added this tab. Climate Zone, Global Eco Zone, Soil Type (from IPCC), Geology, Soil (from PNGRIS) and Topography/Watershed information (Elevation, Hillshade, Slope and Watershed, Stream Link), and Climate Weather e.g. Precipitation, Erosion Risk are displayed currently.

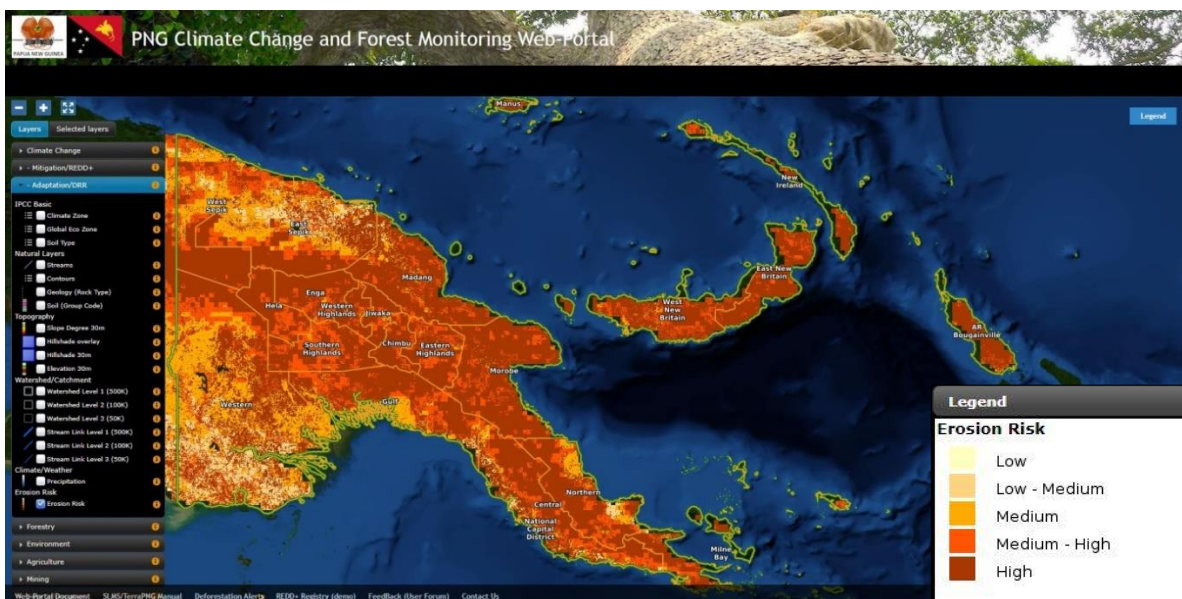
Climate Zone



Slope Degree



Erosion Risk



(4) Forestry

The data from the Papua New Guinea Forest Authority is found here. Under this tab, one can access information on Collect Earth Land Use/Land Use Change assessment (Land Use (IPCC) 2015, Land Use Strata 2015, Deforestation 2001-2015, and Forest Degradation 2001-2015), the Multi-purpose National Forest Inventory (NFI pre-assessment, Soil Sampling Survey Plots, and Permanent Sample Plots), and Forest Resource Information Management System (Forest Base Map 2012, Forest Cover Map 2015, Logging Concessions 2015, and Digitized Logging Road).

Land Use Strata 2015



NFI pre-assessment (Collectearth 2013)



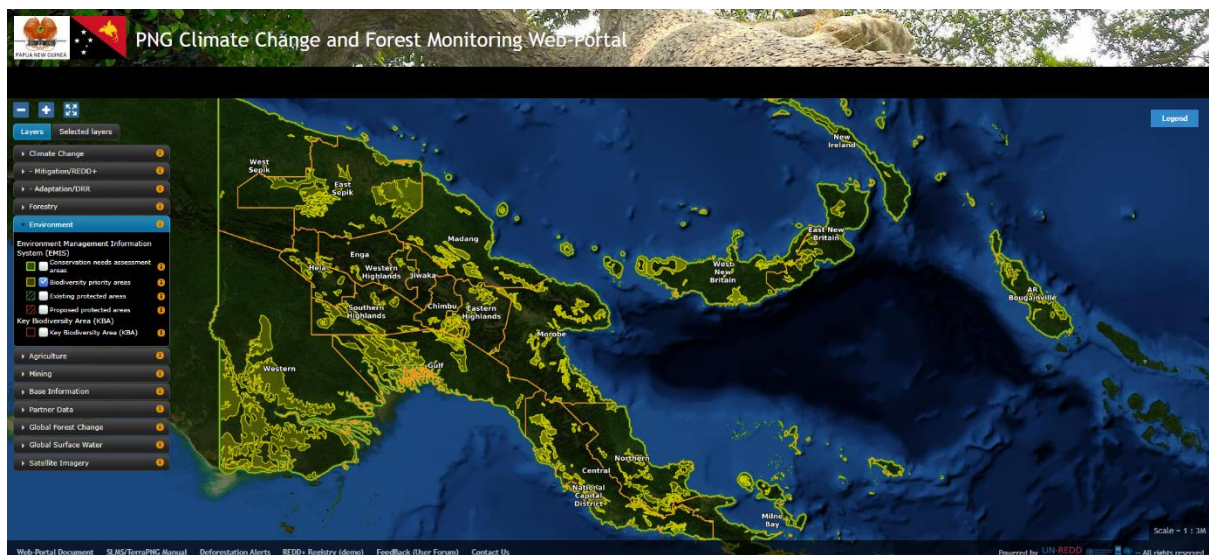
Logging Concession



(5) Environment

Data from Conservation Environment Protection Authority (CEPA) are found under this spatial information tab which includes: Conservation need assessment areas; Biodiversity priority areas; Existing Protected Areas; Proposed Protected Areas; and Key Biodiversity Area.

Biodiversity priority areas



Existing and Proposed Protected Areas



(6) Agriculture

The data in the Agriculture sector in PNG is displayed and will be added in this section. Information of Palm Oil Concessions from private companies has been displayed on the web-portal. Data on Oil Palm Concessions was provided by New Britain Palm Oil Limited and Hargy Limited. Other layers under Agriculture are on Cropland Distribution (Cropland Areas-TerraPNG 2015; Cropland Plots: Subtype-CollectEarth 2015; and Cropland Plots: Subdivision – CollectEarth 2015).

NBPOL (Estates), NBPOL (Mills), NBPOL (Small holders)



Cropland Areas (TerraPNG 2015)



(7) Mining

The mining tab consists of information/data from the Mineral Resource Authority (MRA). Different spatial layers under this tab include: Exploration Licenses (EL); Mining Leases (ML); Special Mining Leases (SML); Alluvial Mining Leases (AML); Lease for Mining Purpose; Mining Easement (ME).

Exploration Licenses



(8) Base Information

Base Information tab contains the base layers of the PNG Climate Change and Forest Monitoring Web-Portal to which other layers of the web-portal can be georeferenced against. They are drawn continuously during navigation. Layers under the *Base Information*

includes Administrative (Country, Province, Districts, LLGs); Infrastructure (Roads, Tracks, Settlements 2000, Settlements 2011, and Buildings); and Landmark/Feature (Major Airports, Major Cities, Major Peaks, Major Rivers, and Major Waters).

Country and Provinces boundaries



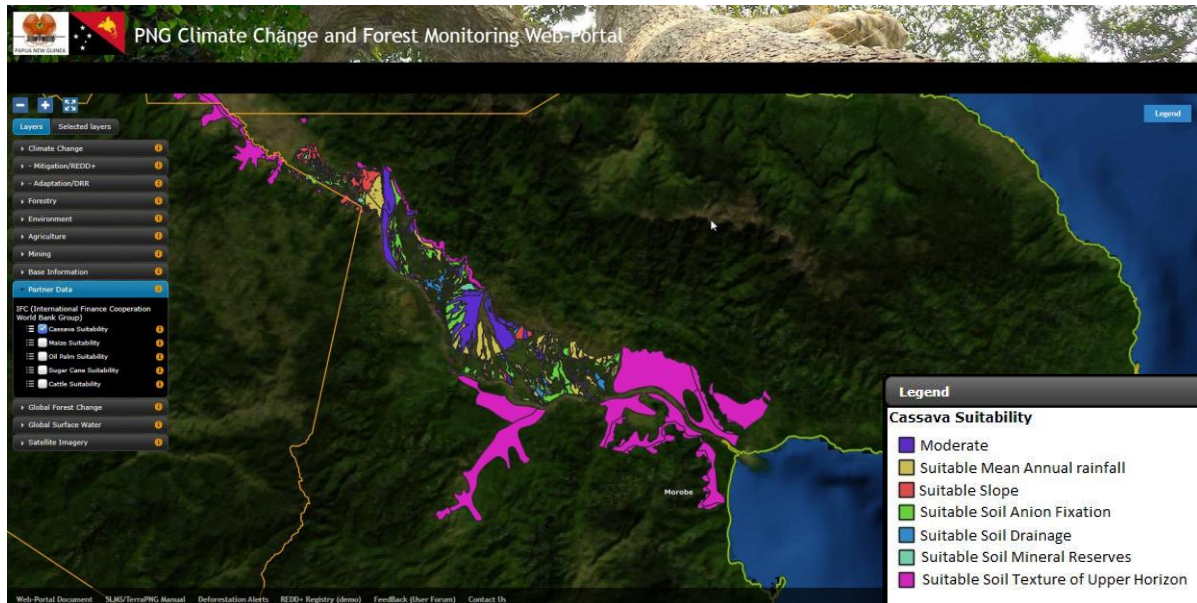
Country and Provinces boundaries overlaid with Roads layer



(9) Partner Data

The data developed by developing partner's projects is added under this section. Currently the data (Cassava Suitability, Maize Suitability, Oil Palm Suitability, Sugar Cane Suitability, and Cattle Suitability) from the IFC (International Finance Corporation World Bank Group) project is being displayed under this tab.

Cassava Suitability



(10) Global Forest Change

The available global data is displayed and will be added under this section. Land Cover/Change data (Tree Cover Gain 2012, Tree Cover Loss 2019, Tree Cover Loss 2019 Kernel Density 1km, Tree Cover Loss 2019 Kernel Density 4km, and Tree Cover Height 2019 – GEDI) from Hansen data from University of Maryland’s Global Forest Change is currently being displayed under this tab.

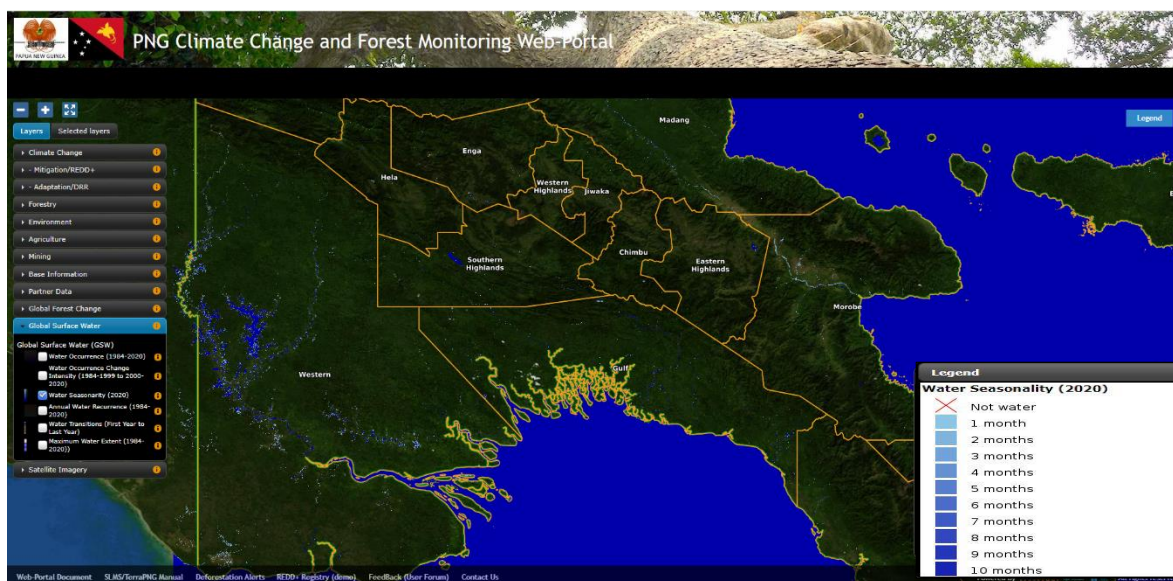
Tree Cover Loss 2019 Kernel Density 4km



(11) Global Surface Water

This dataset was developed by the Joint Research Centre (JRC) in the framework of the Copernicus Programme. The Global Surface Water (GSW) maps the location and temporal distribution of water surfaces at the global scale over the past 3.7 decades and provides statistics on the extent and change of those water surfaces. Layers under this tab include Water Occurrence (1984-2020); Water Occurrence Change (1984-1999 to 2000-2020); Water Seasonality (2020); Annual Water Recurrence (1984-2020); Water Transitions (First Year to last year); and Maximum Water Extent (1984-2020).

Water Seasonality (2020)



(12) Satellite Imagery

The satellite imagery is displayed and is added in this section. Blue Marble Mosaic of MODIS is used as a default base layer. Landsat imagery of the important observation years (2000, 2013, 2015 and 2019) is displayed with the band combination R:G:B = SWIR:NIR:RED. The other layers (apart from Blue Marble) under this tab include Landsat 2000 Enhanced; Landsat 2013 Enhanced, Landsat 2015 Enhanced; and Landsat 2019 Enhanced.

Landsat 2019 Enhanced



4. Technical Specification

4.1 Overall Configuration

Web-Portal is one of two main components of SLMS (One is “Analysis System” and the other is “Dissemination System”). TerraPNG is used for Analysis System with support of INPE Brazil and Web-Portal was developed as Dissemination System with support of FAO Rome. The Analysis System produces the information for Web Portal and Web Portal disseminates the produced information. The following figure is the configuration of Terra-PNG and Web Portal of SLMS in PNG.

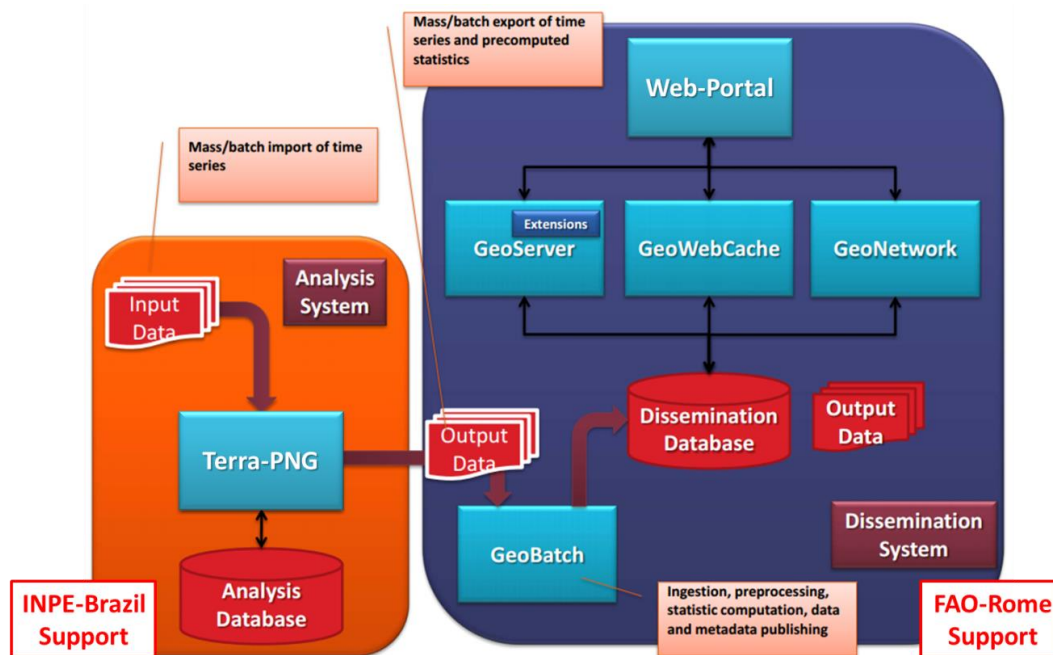


Figure 5: Web-Portal System Architecture

4.2 Hardware Specification

The development and staging areas are located on a single Virtual Machine (VM). The VM consists of two 500GB hard drives. The live environment is hosted by FAO.

4.3 Software Specification

The Web-Portal comprises several different components. The web service is provided by Apache Tomcat which is written in the Java programming language along with GeoServer which provides the service to edit and process geospatial data. For the data upload, FTP (WinSCP) is used. The operating system used to host above is GNU/Linux Ubuntu.

png-nfms.org/diss_geoserver/web/?wicket:bookmarkablePage=:org.geoserver.web.data.layer.LayerPage

GeoServer Logged in as admin. Logout

About & Status

- Server Status
- GeoServer Logs
- Contact Information
- About GeoServer

Data

- Layer Preview
- Workspaces
- Stores
- Layers
- Layer Groups
- Styles

Services

- WCS
- WFS
- WMS

Settings

- Global
- JAI
- Coverage Access

Tile Caching

- Tile Layers
- Caching Defaults
- Gridsets
- Disk Quota
- BlobStores

Security

- Settings
- Authentication
- Passwords
- Users, Groups, Roles
- Data
- Services

Layers

Manage the layers being published by GeoServer

+ Add a new resource
- Remove selected resources

<< < 1 2 3 > >> Results 1 to 25 (out of 75 items) Search

<input type="checkbox"/>	Type	Workspace	Store	Layer Name	Enabled?	Native SRS
<input type="checkbox"/>	png	png	concessions	concessions	✓	EPSG:20355
<input type="checkbox"/>	png	png	hillshade-hr	hillshade-overlay-hr	✓	EPSG:32755
<input type="checkbox"/>	png	png	mining_leases_application	mining_leases_application	✓	EPSG:4326
<input type="checkbox"/>	png	png	mining_leases_active	mining_leases_active	✓	EPSG:4326
<input type="checkbox"/>	png	png	districts	districts	✓	EPSG:4326
<input type="checkbox"/>	png	png	terrapng_basemap_raster	terrapng_basemap_raster	✓	EPSG:4326
<input type="checkbox"/>	png	png	biodiversity_priority_areas	biodiversity_priority_areas	✓	EPSG:4326
<input type="checkbox"/>	png	png	hansen_lossyear_kernel	hansen_lossyear_kernel	✓	EPSG:32755
<input type="checkbox"/>	png	png	terrapng_secondary_forest	secondary_forest	⚠	EPSG:4326
<input type="checkbox"/>	png	png	mining_easement	mining_easement	✓	EPSG:4326
<input type="checkbox"/>	png	png	blue_marble	blue_marble	✓	EPSG:4326
<input type="checkbox"/>	png	png	training_mask	training_mask	✓	EPSG:4326
<input type="checkbox"/>	png	png	terrapng_forest_primary_raster	terrapng_forest_primary_raster	✓	EPSG:4326
<input type="checkbox"/>	png	png	llg	llg	✓	EPSG:4326
<input type="checkbox"/>	png	png	lease_for_mining_purposes	lease_for_mining_purposes	✓	EPSG:4326
<input type="checkbox"/>	png	png	terrapng_grassland_raster	terrapng_grassland_raster	✓	EPSG:4326
<input type="checkbox"/>	png	png	basemap	basemap	✓	EPSG:32755
<input type="checkbox"/>	png	png	exploration_licenses_renewal	exploration_licenses_renewal	✓	EPSG:4326
<input type="checkbox"/>	png	png	mining_exploration_licenses	mining_exploration_licenses	✓	EPSG:4326
<input type="checkbox"/>	png	png	protected_areas_proposed	protected_areas_proposed	✓	EPSG:4326

Figure 6: PNG Web-Portal Data on the GeoServer

4.4 Development Standard

Data that is to be uploaded to GeoServer is of either vector Shapefile or raster (GeoTIFF). Uploaded data is named in the following standard: [date]_[layername].[extension] Data is organised into folders depending on the organisation that generated it under the /var/diss_geoserver/data folder.

Appendix A. Layers of PNG Climate Change and Forest Monitoring Web-portal

Web-Portal Layers	Available Information/data	Description	Data format
(1) Climate Change	TerraPNG Land Use Map 2015	This land use map was developed based on Landsat8 cloud-free mosaic (30m). It shows PNG's major land cover/use in eight(8) different classes	Shapefile
	TerraPNG Digitized Roads 2015	This road network data was digitized based on Landsat8 cloud-free mosaic (30m). It shows PNG's major road network which related to the land use change	Shapefile
(2) Mitigation/REDD+	REDD+ Projects/Program		
	April Salumei REDD Project	One of the five official REDD+ pilot site in PNG. It has an area of 204,343 hectares and is located in the Wosera Gawi and Ambuti Drekiker Districts of East Sepik Province.	Shapefile
	NIHT Topaiyo REDD+	NIHT Inc. has partnered with the traditional landowners of New Ireland and East New Britain to put an end to deforestation initiated by industrial logging in the region	Shapefile
	Future Deforestation Modelling and Land Suitability Assessment (HCV)		
	HCV Probability Map	High Conservation Values (HCV) and High Carbon Stock Approach (HCSA) assessment methods for smallholders in the Papua New Guinea context	GeoTIFF
	Spatial Analysis to Support REDD+ Land Use Planning (WCMC)		
	Above Ground Biomass Carbon	aboveground biomass carbon density at 30 m resolution, based	GeoTIFF

		on a pantropical remote sensing-based study by Baccini et al. (2015).	
	Soil Organic Carbon	Soil organic carbon stocks to a depth of 30 cm, and is based on a global soil organic carbon map developed by the Food and Agriculture Organization of the United Nations (FAO) and the Intergovernmental Technical Panel of Soils (ITPS) (2018).	GeoTIFF
	Range size Rarity Index	This index combines species richness and endemism based on the distribution of all 1184 forest-based mammals, birds, reptiles and amphibian species native to PNG, as defined by the IUCN Red List of Threatened Species (2017).	GeoTIFF
	Soil Erosion Control	Soil erosion in PNG is illustrated here based on the estimated total soil loss avoided because of forest cover.	GeoTIFF
	Landslide Risk Reduction	Landslide risk was evaluated applying a Weighted Linear Combination Method (WLC), which involved establishing the relational importance and degree of influence of eight parameters known to have an Influence on landslide occurrence in PNG.	
	Accessibility	Accessibility of intact forests to tourists was measured by estimating travel time from major PNG airports via surface transport. Travel time from major airports	GeoTIFF

		was estimated by adapting data and methods developed by Weiss et al. (2018), and using Google Earth Engine (Gorelick et al. 2017).	
	Bird of Paradise and Land Accessibility	Shows the relationship between Bird-of-Paradise richness and forest accessibility	GeoTIFF
	Birds of Paradise Species Richness	Shows estimated Bird-of-Paradise richness using a regular grid of 25 km ² size hexagons, based on the spatial distribution of all 30 species belonging to the Paradisaeidae family according to the IUCN Red List of Threatened Species (2017).	GeoTIFF
	Combined Benefits	The combination of the individual benefit layers described in section 3 allows identification of areas of spatial congruence amongst them, as well as forest areas that do not hold these values	GeoTIFF
(3) Adaptation/DRR	IPCC Basic		
	Climate Zone	These are the IPCC default climate zones as expected by the ALU tool	Shapefile
	Global Eco Zone	These are the default FAO GEZ	Shapefile
	Soil Type	Soil classes that are consistent with the IPCC defaults expected by ALU	Shapefile
	Natural Layers		
	Streams	The Stream network from National Statistical Office (NSO) from GeoBook published by University of PNG Remote Sensing Centre is currently used. This is not river	Shapefile

		network but stream network developed from elevation data.	
	Contours	The contour lines from National Statistical Office (NSO) from GeoBook published by University of PNG Remote Sensing Centre are currently used. This is developed SRTM with supplemental topographic information. When the original information is updated, the information displayed will be updated accordingly.	Shapefile
	Geology(Rock Type)	Geology (Rock Type) Source: PNGRIS 3rd Edition (2008)	Shapefile
	Soil (Group Code)	Geology Source PNGRIS 3rd Edition (2008)	Shapefile
Topography			
	Slope Degree 30m	This Slope was computed from Shuttle Radar Topographic Mission (SRTM) digital elevation model, collected during 11 day mission in February of 2000 by NASA, processed 30m (1 arc-second) resolution under the project with NGA	GeoTIFF
	Hillshade Overlay	This Hillshade Overlay was computed from the Shuttle Radar Topographic Mission (SRTM) digital elevation data, collected during an 11 day mission in February of 2000 by NASA, processed 90 meter (3 arc-second) resolution data under the project with NGA.	GeoTIFF
	Hillshade 30m	This Hillshade Overlay was	GeoTIFF

		computed from the Shuttle Radar Topographic Mission (SRTM) digital elevation data, collected during an 11 day mission in February of 2000 by NASA, processed 90 meter (3 arc-second) resolution data under the project with NGA.	
	Elevation 30m	This Elevation was computed from Shuttle Radar Topographic Mission (SRTM) digital elevation model, collected during 11 day mission in February of 2000 by NASA, processed 30m (1 arc-second) resolution under the project with NGA	GeoTIFF
Watershed/Catchment			
	Watershed Level 1 (500K)	This watershed was computed from Shuttle Radar Topographic Mission (SRTM) digital elevation model, collected during 11 days-mission in February 2000 by NASA, processed at 30m (1 arc-second) resolution under the project with NGA	Shapefile
	Watershed Level 2 (100K)	This watershed was computed from Shuttle Radar Topographic Mission (SRTM) digital elevation model, collected during 11 days-mission in February 2000 by NASA, processed at 30m (1 arc-second) resolution under the project with NGA.	Shapefile
	Watershed Level 3 (50K)	This watershed was computed from Shuttle Radar Topographic Mission (SRTM) digital	Shapefile

		elevation model, collected during 11 days-mission in February 2000 by NASA, processed at 30m (1 arc-second) resolution under the project with NGA.	
	Stream Link Level 1 (500K)	This stream link was computed from Shuttle Radar Topographic Mission (SRTM) digital elevation model, collected during 11 days-mission in February 2000 by NASA, processed at 30m (1 arc-second) resolution under the project with NGA.	Shapefile
	Stream Link Level 2 (100K)	This stream link was computed from Shuttle Radar Topographic Mission (SRTM) digital elevation model, collected during 11 days-mission in February 2000 by NASA, processed at 30m (1 arc-second) resolution under the project with NGA.	Shapefile
	Stream Link Level 3 (50K)	This stream link was computed from Shuttle Radar Topographic Mission (SRTM) digital elevation model, collected during 11 days-mission in February 2000 by NASA, processed at 30m (1 arc-second) resolution under the project with NGA.	Shapefile
Climate/Weather			
	Precipitation	From PNGRIS 2008 (C) University of Papua New Guinea (UPNG)	GeoTIFF
Erosion Risk			
	Erosion Risk	Estimates of soil loss from rainfall and runoff on a scale from 1 to 5. A value	GeoTIFF

		of 1 indicates a low risk of erosion and 5 indicates a high risk of erosion.	
(4) Forestry	Collect Earth (CE) Land Use/Land Use Change and Forestry (LULUCF)		
	Land Use (IPCC) 2015	cropland plots of the Forest and Land Use Change in Papua New Guinea 2000-2015 conducted by PNGFA and CCDA	Shapefile
	Land Use Strata 2015	PNG's landuse, subtype, subdivision, and disturbance type.	Shapefile
	Deforestation 2001-2015	It shows PNG's landuse, subtype, subdivision, and disturbance type. "Deforestation is the conversion from forest land to any non-forest land."	Shapefile
	Forest Degradation 2001-2015	It shows PNG's landuse, subtype, Subdivision, and disturbance type. "Forest degradation is the conversion from primary forest to disturbed forest."	Shapefile
	Multi-Purpose National Forest Inventory (MP-NFI)		
	NFI Pre-Assessment (Collect Earth 2013)	The NFI pre-assessment was conducted using Landsat and Google Earth high resolution images. Classification is based on IPCC land use categories, PNG Forest types (13 forest types plus Forest plantation).	Shapefile
	Soil Sampling Survey Plots	Field Guide for Sampling and Describing Soils in the Papua New Guinea National Forest Inventory	Shapefile
	Permanent Sample Plots (PSP)	These were 100m x 100m plots (1 ha) divided diagonally into 4 quadrats. There are a total of 127 PSP plots in PNG, established since 1992 – 73 plots funded by ITTO and	Shapefile

		73 plots by PNGFRI.	
Forest Resource Information Management System (FRIMS)			
Forest Base Map 2012	Forest Basemap was developed using RapidEye (optical sensor, captured in 2010 and 2011) and ALOS-PALSAR (radar sensor, captured in 2001 and 2010). The ground resolution of the RapidEye imageries used for the development of the Forest Base Map 2012 data is five (5) meters meanwhile it is ten (10) meters for PALSAR used for interpolating cloud cover area. There are 6 land use classes with 12 sub forest vegetation classes used.		Shapefile
Forest Cover Map 2015	Forest Cover Map 2015 was developed by PNGFA with support of JICA technical cooperation project using satellite data (RapidEye and ALOS/PALSAR) procured by the Japan's Grant Aid, based on the PNG's forest definition and classification. The current version 1.0 of the may will be soon replaced by a finalized version once it completed.		Shapefile
Logging Concessions	Boundaries of logging concessions in PNG manage by the PNG Forest Authority. This information may be subjected to regular updating.		Shapefile
Digitized Logging Roads	The Digitized Logging Road Map was developed by PNGFA with support of JICA technical cooperation project using satellite data (RapidEye and ALOS/PALSAR)		Shapefile

		procured by the Japan's Grant Aid, based on the PNG's forest definition and classification. The current version 1.0 of the may will be soon replaced by a finalized version once it completed.	
(5) Environment	Environment Management Information Systems (EMIS)		
	Conservation Needs Assessment Areas	Developed by CEPA as part of an effort to identify high priority areas for conservation.	Shapefile
	Biodiversity Priority Areas	National data developed by Biological Rapid Appraisal Project (BioRAP) in 2000 under CEPA.	Shapefile
	Existing Protected Areas	Developed by CEPA in 2011 to display the various protected areas in PNG.	Shapefile
	Proposed Protected Areas (KBA)	Developed by CEPA in 2011 to show the various proposed protected areas in PNG.	Shapefile
	Key Biodiversity Areas (KBA)	KBAs extend the Important Bird Area (IBA) concept to other taxonomic groups and are now being identified in many parts of the world, by a range of organisations	Shapefile
(6) Agriculture	Palm Oil Concessions		
	NBPOL (Estates)	This is the information from New Britain Palm Oil Ltd (NBPOL) Estates acquired in September 2015	Shapefile
	NBPOL (Mills)	This is the information from New Britain Palm Oil Ltd (NBPOL) Mills acquired in September 2015	Shapefile
	NBPOL (Small Holders)	This is the information from New Britain Palm Oil Ltd (NBPOL) Small	Shapefile

		Holders acquired in September 2015	
	Hargy	information from Hargy Oil Palms Limited (HOPL), SIPEF Papua New Guinea.	Shapefile
Cropland Distributions			
	Cropland Areas (TerraPNG 2015)	This is the cropland areas of the land cover/land use assessment conducted by CCDA in 2015. This land use map was developed based on Landsat8 cloud-free mosaic (30m).It shows PNG's major land cover/use in eight(8) different classes.	Shapefile
	Cropland Plots: Subtype (CollectEarth 2015)	This is the cropland plots of the Forest and Land Use Change in Papua New Guinea 2000-2015 conducted by PNGFA and CCDA. These plots was developed by using Open Foris Collect Earth. It shows PNG's landuse, subtype, subdivision, and disturbance type.	Shapefile
	Cropland Plots: Subdivision (CollectEarth 2015)	This is the cropland plots of the Forest and Land Use Change in Papua New Guinea 2000-2015 conducted by PNGFA and CCDA. These plots was developed by using Open Foris Collect Earth. It shows PNG's landuse, subtype, subdivision, and disturbance type.	Shapefile
(7) Mining	Mining Cadastre Portal		
	Exploration Licences (EL)	Areas of land in respect of which an exploration license may be granted. The area shall no more than 2557.5 km2.	Shapefile
	Mining Leases (ML)	Generally issued for small to medium	Shapefile

		scale alluvial and hard rock mining operations with a term not exceeding 20 years, which may be extended for periods no exceeding 10 years. The area of land shall be no more than 60km ² and in a rectangular or polygonal shape.	
	Special Mining Leases	Generally issued to the Exploration Licenses holders for large scale mining operations with specific requirements. A special mining lease may be granted for a term not exceeding 40 years, which may be extended for periods not exceeding 20 years.	Shapefile
	Lease for Mining Purposes	May be granted in connection with mining operations conducted or to be conducted by the applicant for Lease for Mining Purposes. The area and shape of a lease for mining purposes shall be not more than 60 km ² and in a rectangular or polygonal shape.	Shapefile
	Mining Easement (ME)	May be granted in connection with mining, treatment or ancillary operations conducted by the applicant for mining easement.	Shapefile
	Alluvial Mining Leases	Granted to citizen or a land group in respect of land own by that citizen or land group. It may be granted for a term not exceeding 5 years which may be extended for periods not exceeding five years.	Shapefile
(8) Base Information	Administrative		

Country	2011 updated country boundary provided by the National Statistical Office of PNG.	Shapefile
Provinces	2011 updated province boundaries for all 22 provinces of PNG provided by the National Statistical Office of PNG.	Shapefile
Districts	2011 updated district boundaries for all 89 districts of PNG provided by the National Statistical Office of PNG.	Shapefile
Local Level Government (LLG)	2011 updated district boundaries for all 31 urban LLGs and 317 rural LLGs of PNG provided by the National Statistical Office of PNG.	Shapefile
Infrastructure		
Roads	Major road networks in PNG which include provincial and national highways. Developed from Landsat data.	Shapefile
Tracks	This information shows all the major tracks in PNG which are connected to the major roads/highways. Developed from Landsat data.	Shapefile
Settlements 2000	These are village points' information which has population information per unit. Produced from 2000 Population Census information.	Shapefile
Settlements 2011	These are village points' information which has population information per unit. Produced from 2011 Population Census information.	Shapefile
Buildings	Provided by CCDA in 2013, the building layer consists of information on building footprints of	Shapefile

		PNG.	
	Landmark/Feature		
	Major Airport	List of Airports in Papua New Guinea	Shapefile
	Major Cities	List of Towns and Cities in Papua New Guinea	Shapefile
	Major Peak list	List of highest peaks in Papua New Guinea	Shapefile
	Major Rivers	List of Major Streams and Rivers in Papua New Guinea	Shapefile
	Major Waters	List of Major Lakes in Papua New Guinea	Shapefile
(9) Partner Data	IFC (International Finance Cooperation World Bank Group)		
	Cassava Suitability	Shows the area suitability for cassava Cultivation currently being cultivated by Ramu	Shapefile
	Maize Suitability	Shows the area suitability for Maize Cultivation currently being cultivated by Ramu	Shapefile
	Oil Palm Suitability	Shows the area suitability for Oil Palm currently being cultivated Cultivation by Ramu	Shapefile
	Sugar Cane Suitability	Shows the area suitability for Sugar Cane Cultivation currently being cultivated by Ramu	Shapefile
	Cattle Suitability	Shows the area suitability for cattle farming by Ramu	Shapefile
(10) Global Forest Change	Global Forest Change (GFC)	Land Cover/Change data from Global Forest Change (Hansen data from University of Maryland)	GeoTIFF
	Tree Cover Gain 2012	Forest gain during the period 2000–2012, defined as the inverse of loss, or a non-forest to forest change entirely within the study period. Encoded as either 1 (gain) or 0 (no gain).	GeoTIFF
	Tree Cover Loss-Year	Forest loss during the	GeoTIFF

	2019	period 2000–2019, defined as a stand-replacement disturbance, or a change from a forest to non-forest state. Encoded as either 0 (no loss) or else a value in the range 1–19, representing loss detected primarily in the year 2001–2019, respectively.	
	Tree Cover Loss-Year 2019: Kernel Density 1Km	Kernel Density calculates the density of point features in a neighbourhood around features. This data calculated the density per 1 km grid.	GeoTIFF
	Tree Cover Loss-Year 2019: Kernel Density 4Km	Kernel Density calculates the density of point features in a neighbourhood around features. This data calculated the density per 4 km grid.	GeoTIFF
	Tree Cover Height 2019 (GEDI)	This layer shows the height of global forest canopy in the year 2019. A new, 30-m spatial resolution global forest canopy height map was developed through the integration of the Global Ecosystem Dynamics Investigation (GEDI) lidar forest structure measurements and Landsat analysis-ready data time-series. The NASA GEDI is a space borne lidar instrument operating on-board the International Space Station since April 2019. Source: UMD/NASA GEDI	GeoTIFF
(11) Global Surface Water (GSW)	Water Occurrence (1984-2020)	The GSW maps the location and temporal distribution of water	GeoTIFF

		surfaces at the global scale over the past 3.7 decades and provides statistics on the extent and change of those water surfaces	
	Water Occurrence Change Intensity (1984-1999 to 2000-2020)	The GSW maps the location and temporal distribution of water surfaces at the global scale over the past 3.7 decades and provides statistics on the extent and change of those water surfaces	GeoTIFF
	Water Seasonality (2020)	The GSW maps the location and temporal distribution of water surfaces at the global scale over the past 3.7 decades and provides statistics on the extent and change of those water surfaces	GeoTIFF
	Annual Water Recurrence (1984-2020)	The GSW maps the location and temporal distribution of water surfaces at the global scale over the past 3.7 decades and provides statistics on the extent and change of those water surfaces	GeoTIFF
	Water transitions (First Year to Last year)	The GSW maps the location and temporal distribution of water surfaces at the global scale over the past 3.7 decades and provides statistics on the extent and change of those water surfaces	GeoTIFF
	Maximum Water Extent (1984-2020)	The GSW maps the location and temporal distribution of water surfaces at the global scale over the past 3.7 decades and provides statistics on the extent and change of those water surfaces	GeoTIFF
(12) Satellite Imagery	Blue Marble	Composite of four months of MODIS	Online raster

		observations with a spatial resolution of 1 square kilometre per pixel.	
	Landsat 2000 Enhanced	This is enhanced image of Circa year 2000 Landsat 8 cloud-free image composite (first). Reference multispectral imagery from the first available year, typically 2000. If no cloud-free observations were available for year 2000, imagery was taken from the closest year with cloud-free data, within the range 1999–2012.	GeoTIFF
	Landsat 2013 Enhanced	This is enhanced image of Circa year 2013 Landsat 7 cloud-free image composite (first). Reference multispectral imagery from the first available year, typically 2013. If no cloud-free observations were available for year 2013, imagery was taken from the closest year with cloud-free data, within the range 1999–2013.	GeoTIFF
	Landsat 2015 Enhanced	This is enhanced image of Circa year 2015 Landsat 8 cloud-free image composite (first). Reference multispectral imagery from the first available year, typically 2015. If no cloud-free observations were available for year 2015, imagery was taken from the closest year with cloud-free data,	GeoTIFF

		within the range 1999–2015.	
	Landsat 2019 Enhanced	This is enhanced image of Circa year 2019 Landsat 8 cloud-free image composite (first). Reference multispectral imagery from the first available year, typically 2019. If no cloud-free observations were available for year 2019, imagery was taken from the closest year with cloud-free data, within the range 1999–2019.	GeoTIFF



PNG Climate Change and Forest Monitoring Web- Portal

<https://png-nfms.org/portal/>