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Big-Book

Papua New Guinea Forest Base-Map and Atlas

Papua New Guinea Forest Resource Information Management System (PNG-FRIMS)

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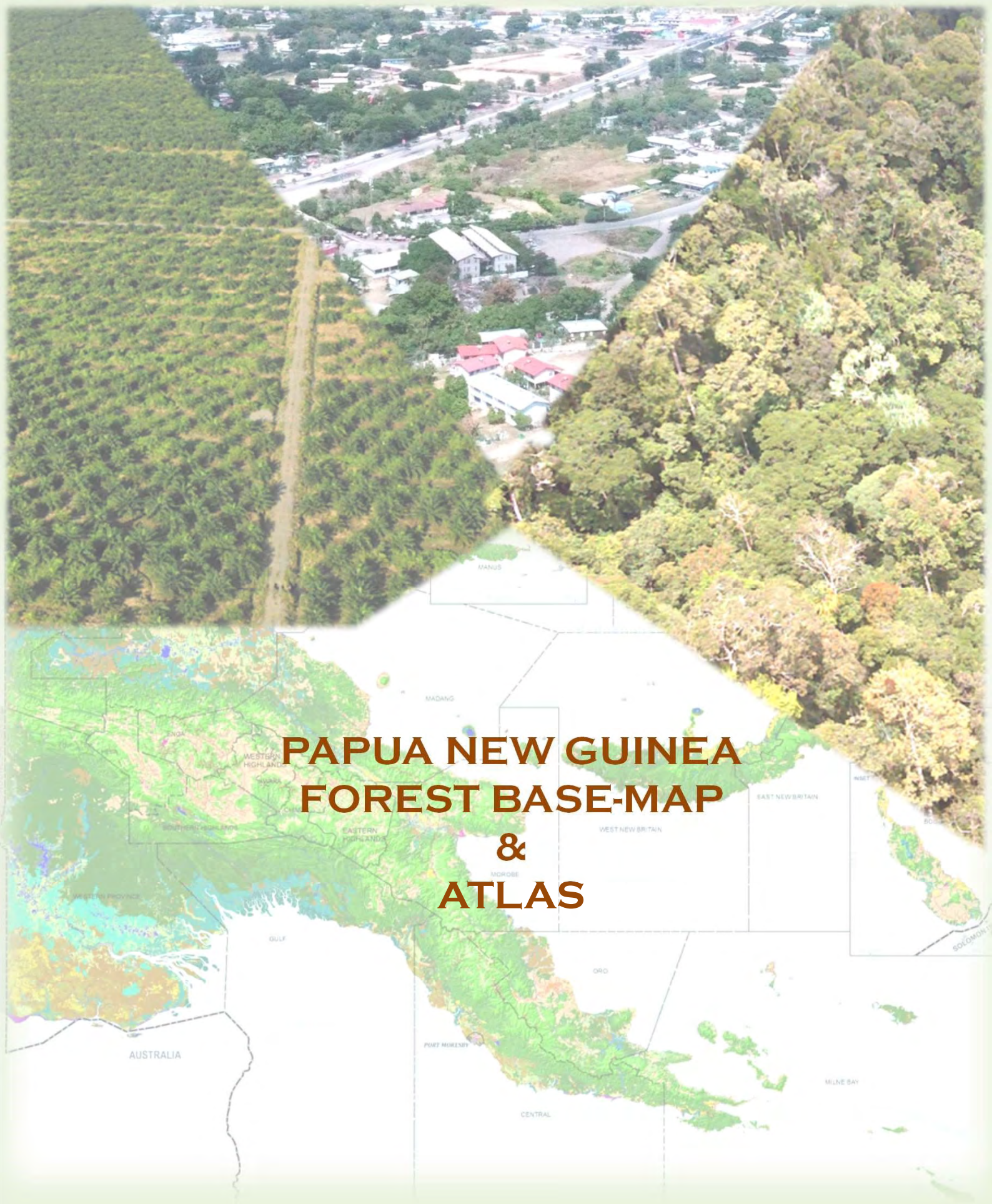
- Appendix -



PAPUA NEW GUINEA FOREST BASE-MAP & ATLAS

R. Turia, E. Kaidong, P. Malan, J. Antiko, G. Rome, D. Kadowaki, T. Koyama, M. Haraguchi, A. Ochi

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Papua New Guinea

Forest Base-Map and Atlas

Papua New Guinea Forest Authority (PNGFA)

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I. Foreword

This very important publication documents the great collaboration that the people and government of Japan have provided to Papua New Guinea and, in particular to the Papua New Guinea Forest Authority (PNGFA) through the PNGFA/JICA Project – "Capacity Development on the Forest Resource Monitoring for Addressing Climate Change in Papua New Guinea". One cannot measure enough the value of the technology and the skills gained by the PNGFA Officers and those other Papua New Guineans that were involved in the project.

I also encourage the other government agencies, development partners and relevant stakeholders to work with my Ministry to collect appropriate information so to provide accurate and reliable data to assist the government chart the course for forestry management in PNG. This, will in the long run, assist in providing accurate reports on other emerging issues such as climate change.

It is my hope that the PNGFA officers continue on the good work that has been developed and challenge themselves to continue to update and improve the forest resource information for Papua New Guinea in the years to come.

Hon. Solan Mirisim, *MP*
Minister for Forests

II. Preface

As Papua New Guinea moves forward to address the challenges that global warming poses to its many natural resources; of which many are very poorly known, one agency of the Government has taken on the task to update its data on the forest resources of the country – The Papua New Guinea Forest Authority. This work has been 'thankfully' made possible through the generous support of the people and Government of Japan under its Forest Preservation Programme. This programme gave headway to the commencement of the project titled 'Capacity Development on Forest Resource Monitoring for Addressing Climate Change in Papua New Guinea'.

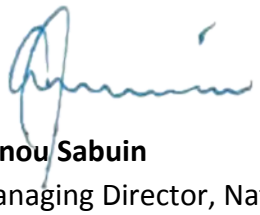
The Project has developed a Forest Base Map (herein referred to as 'FBM'), which has taken many long hours by both the Japanese experts and the Papua New Guinea experts. The various tasks included; interpreting satellite imageries and describing/classifying the various vegetation types and producing reports to come up with the current map and data, as will be presented in this Report. The Report will also include some work that has been undertaken under the second follow-on project titled 'Capacity Development Project for Operationalization of PNG Forest Resource Information Management System (PNG-FRIMS) for Addressing Climate Change'.

This Report has been put together by those that have been involved in the project; Japanese experts, PNG national counterparts and short-term PNG nationals attached with the Japanese experts, all of which whose names appear in the Acknowledgement section. Each of these persons have made a tremendous contribution to the interpretation of satellite imageries, conducting desk top and field-based research to confirm vegetation types and forest categories, preparing maps and writing up the specifics of how the FBM was developed as well as documenting the specific provincial trees of the 21 Provinces of Papua New Guinea, excluding the National Capital District.

The development of the FBM also took into account other work that has been developed and documented under the PNG Resource Information System series (PNGRIS). It is therefore believed to contain the latest data on the vegetation types and forest categories as presently known in PNG. It has contributed to the preparation of various reports relating to climate change, including the National REDD+ Strategy, Forest Reference Level, the Biennial Update Report and the Collect Earth Assessments on Forest and Land Use Change 2000-2015 Report.

Any inquiries on the FBM, can be directed to the PNG Forest Authority at –

P. O. Box 5055, Boroko, N.C.D., Papua New Guinea. Telephone: (675) 3277800 or email: infor_general@pngfa.gov.pg



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Ms Ayako Ochi (Expert on Forest Remote Sensing 2/ Forest GIS 2)

IV. Acknowledgement

The completion of the Papua New Guinea Forest Base-Map and Atlas book could not have been possible without the involvement, participation and support of so many people whose names may not all be mentioned. Their contributions are sincerely appreciated and gratefully acknowledged. However, the authors would like to express our deep appreciation and indebtedness particularly to the following-

The respected former JICA Experts, Mr Tatsuya Watanabe, Mr Kiyoshi Suzuki and Mr Masaya Nishimura and the ongoing support from Kokusai Kogyo Co., Ltd (KKC) Experts, Mr Masaki Kawai, Mr Kunihiro Ishii, Mr Yasuyuki Okada, Dr Ryota Kajiwara, Dr Takahiro Koide and Mr Hirokazu Takahashi who shared their knowledge with the Papua New Guinea Forest Authority (PNGFA) staff.

The PNGFA counterparts namely; Mr Patrick La'a, Mr Samuel Gibson, Ms Margaret Tongo, Mr Gewa Gamoga, Mr Dambis Kaip, Mr Ledino Saega, Mr Rabbie Lalo, Mr Kipiro Damas, Mr Goodwill Amos and Mr Constin Bigol;

The PNG national consultant; Mr Oala Iuda, and the JICA project casuals namely; Mr Benjamin Matambuai, Mr Joshua Turia, Ms Evelyn Paul, Ms Aida Kai and Ms Dika Davai who were privileged and fortunate to participate in this unique opportunity in working on this project.

All other PNG Forest Authority staff (from headquarters and provinces) that participated in the project activities, including the Administrative staff that coordinated logistics for duty travel and meetings relating to the Project, namely; Ms Matilda Kila, Ms Helen Bure and Mrs Ikimairi Wak.

The authors also would like to acknowledge the other relevant organizations which provided the data and information, such as the Mapping Agriculture Systems Project (MASP) under the Australian National University, the Papua New Guinea National Mapping Bureau which provided the Digital Elevation Model (DEM) data, the Mineral Resources Authority which provided the mining licences data and the Conservation and Environment Protection Authority (CEPA) which provided the protected area data.

It is a great pleasure and opportunity to work on this Book. For this, we are deeply indebted and sincerely thankful to everyone for their help, invaluable guidance and encouragement throughout the course of the JICA-PNGFA project.

V. Acronyms

AGD66	1966 Australian Geodetic Datum
AGD84	1984 Australian Geodetic Datum
ALOS	Advanced L-band Synthetic Aperture Radar
AMG	Australian Map Grid
AusAID	Australian Agency for International Development
CSIRO	Commonwealth Scientific and Industrial Organization
DEM	Digital Elevation Model
FAO	Food Agriculture Organization
FBM	Forest Base Map
FIMS	Forest Inventory Mapping System
FMU	Forest Mapping Unit
GeoSAR	Geographic Synthetic Aperture Radar
GIS	Geographic Information System
GPS	Global Positioning System
JICA	Japan International Cooperation Agency
KKC	Kokusai Kogyo Co., LTD.
LANDSAT	Land-Sensing Satellite (System)
NDVI	Normalized Difference Vegetation Index
NIR	Near Infra-Red
NMB	National Mapping Bureau
PALSAR	Phased Array type L-band Synthetic Aperture Radar
PNG	Papua New Guinea
FRIMS	Forest Resource Information Management System
PNGRIS	PNG Resource Information System
RMU's	Resource Mapping Units
RS	Remote Sensing
UN-REDD	United Nation - Reduced Emissions from Deforestation and forest Degradation
USGS	United States Geological Survey
UTM	Universal Transverse Mercator

1. Background:

Forest Resource Information in PNG

1.1 Before Forest Base Map

Many assessments and reports of the forest resources and land uses of Papua New Guinea have been conducted spanning many years; going back to the 1920s. In this Report, we will highlight some of those reports and provide some guidance as to how and what has changed up to the point of developing the FBM of Papua New Guinea.

1.1.1 Forest Resources of the Territories of Papua and New Guinea

The very first assessments of PNG's forest resources had been undertaken by Lane-Poole[1] from 1922-1924, unfortunately there is no record of that assessment report in PNG. In this assessment, Lane-Poole used the normal survey method of walking the forest along strip lines and taking measurements where he grouped his forest types as 'Forest Regions' and are as follows-

i) Lowland forests (0 - 1,000 feet) (0 - 305 m);
ii) Foothill forests (1,000 - 5,500 feet) (305 - 1,676 m);
iii) Mid-mountain forests (5,500 - 7,500 feet) (1,676 – 2,286 m);
iv) Mossy forests (7,500 - 11,000 feet) (2,286 – 3,353 m);
v) Alpine forests (over 11,000 feet) (over 3,353); and
vi) Savannah forests

1.1.2 Vegetation Map of Papua New Guinea

This vegetation map of PNG was developed by Paijmans (1975) of the Division of Land Use Research, Commonwealth Scientific and Industrial Organization (CSIRO) [2] which based its work on interpretations of aerial photographs, taking into consideration the features and floristics of the vegetation. This was complemented by field observations spanning over 20 years where topography, drainage and altitude were also considered in coming up with the nine (9) vegetation types, which are-

Table 1: Vegetation types of the map developed by CSIRO (1975)

Forest	Mixed herbaceous vegetation
Woodland	Pioneer vegetation
Scrub	Mangrove vegetation
Savanna	Garden
Grassland	

[1] Lane-Poole (1925). The Forest Resources of the Territories of Papua and New Guinea, Government of the Commonwealth of Australia, Victoria, Australia
[2] Paijmans (1975). Explanatory Notes to the Vegetation Map of Papua New Guinea. Land Research Series No. 35. Commonwealth Scientific and Industrial Research Organization, Melbourne, Australia.

Paijmans (1975) has further mapped out the vegetation types into specific mapping types based on certain features such as tree crowns and the ecology and habitats where such vegetation type is available. For example, in the category of 'forest', he has established that you can identify the various types of forest as shown in Table 2 below.

Table 2: Forest types of the map developed by CSIRO (1975)

Forest Type	*Description*
Forest on plains and fans	Large-to medium crowned forest Open forest Small-crowned forest Littoral forest Swamp forest
Forest on hills and mountains Lowland hill forest zone (sea level to 1 400 m)	Medium-crowned forest Small-crowned forest Large-crowned forest
Lower montane forest zone (1 400 – 3 400 m)	Lower montane forest General type Coniferous lower montane forest Very small-crowned lower montane forest
Montane forest zone (3 400 m to the forest limit at 3 900 m)	Montane forest
Forest restricted to south-west Papua New Guinea	Dry evergreen forest

More specific details of these vegetation types, including Woodlands, Scrub, Savanna, Grassland, etc. are contained in his book as referred above.

1.1.3 Papua New Guinea Resource Information System (PNGRIS)

PNGRIS was developed by the CSIRO, based on interpretation of air photographs and is a continuation and improvement on the work by Paijmans (1975; 1976). In this work, CSIRO has developed maps that show the type and distribution of natural resources, land use and population distribution for the whole country.[3]

In effect, PNGRIS is a computerised mapping database based on a geographic information systems (GIS) that contains about 4,837 resource mapping units (RMU's) or land units covering PNG landmass by geology, topography and climate at a scale of 1: 500,000. The database contains a summary list of landform type, physical data, land-use information and population figures attached to each RMU. Since the promotion of PNGRIS, advancement of GIS and comparatively low-cost satellite derived data has enabled landscape features captured at original PNGRIS scale can now be reproduced at

[3] Saunders, J (1993). Forest Resources of Papua New Guinea. PNGRIS Publication No. 2. CSIRO, Brisbane, Australia

finer scale. Details are contained in "Papua New Guinea: Inventory of Natural Resources, Population Distribution and Land Use Handbook" 2nd edition.[4]

Consequently, PNGRIS has been updated using the advancements in technology utilizing GIS and satellite imageries but only looked at climate, geology, topography, population, soil and inundation to measure land use intensity. This work was undertaken by Bryan and Shearman in 2007 in partnership with the Department of Agriculture and Livestock[5].

The initial data from PNGRIS was used to undertake the Forestry Rapid Resource Appraisal[6] and is of a much broader scale than that of the Forest Inventory Mapping System (FIMS).

1.1.4 Forest Inventory Mapping System (FIMS)

FIMS has been developed to provide a consistent and country wide set of information on the type and extent of the forest resource and of its current use by the forest industry in PNG. FIMS was developed as a geographic information system, based on MapInfo 4.5 and Microsoft Access 97 to provide integrated information to assist in the effective management and planning of forest resource use. It was developed by John Quigley, a programmer under an AusAID project (1996)[7].

The FIMS focuses on a mapping of forest resources and vegetation at a scale of 1:100,000 and covers the entire country. The mapping is based on the 1972-75 SKAIPIKSA air photo interpretation coverage of a similar scale. This interpretation was based on data and experience gained in the earlier long-term mapping and field survey program of CSIRO and PNG Department of Forests (now National Forest Service). Details of the mapping procedures are contained in Hammermaster and Saunders (1995)[8].

The forest mapping of 1:100,000 was compiled on the same scale as standard PNG topographic series mapping using the Universal Transverse Mercator (UTM) projection with the Australian Map Grid (AMG) and the 1966 Australian Geodetic Datum (AGD66). This mapping is polygonised with the same projection and grid in MapInfo version 4.5, but with the later Australian Geodetic Datum of 1984 (AGD84). It was compiled as a series of film overlays at scale 1:250, 000 and stored at PNGFA.

The FMU; the basic mapping unit of FIMS, is an area of forest or other vegetation mapped as a polygon during the mapping process on a scale of 1:100,000. Each FMU is assigned a code describing the vegetation/forest type. There are total of 58 types of forest and other vegetation, of which 35 are forest types. A further four types deal with land use, urban areas, bare areas and lakes. The information is stored in the FIMS as a series of map layers in MapInfo software linked to a Microsoft Access database. Information can be accessed easily through a series of standard reports and maps in most common demand. The latter can be produced as either a single layer or any combination of layers. FIMS information includes; forest resource and vegetation mapping, FMU, disturbances and complexes, species composition and stocking rates, logged-over areas and land use change 1975-96, concession areas, logging constraints, protected areas and topographical maps.

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[4] Bellamy and McAlpine (1995). PNGRIS Publication No.6, 1995. AusAID, Canberra, Australia.

[5] Bryan and Shearman (2008). Papua New Guinea Resource Information System Handbook 3rd Edition, PNGRIS Publication No. 7. University of Papua New Guinea, Port Moresby, Papua New Guinea.

[6] Saunders (1993). Forest Resources of Papua New Guinea. PNGRIS Publication No. 2. CSIRO, Brisbane, Australia

[7] J. McAlpine and J. Quigley (1998). Forest Resources of Papua New Guinea. Summary Statistics From FIMS

[8] E. T. Hammermaster and J. C. Saunders (199). Forest Resources and Vegetation Mapping of Papua New Guinea. PNGRIS Publication No. 4. CSIRO, Brisbane, Australia

1.2 History of Forest Base Map

1.2.1 Status of Remote Sensing Data in FIMS

The aerial photographs used to prepare the FIMS were taken in the 1970s. The spatial resolution was high, but since they were taken in the analogue era, forest distribution and forest classification work were performed at a small scale with a digitizer board. Consequently, discrepancies were identified between the current forest distribution and forest classification, and deviations in the forest position. The map has been used widely and played an important role for PNGFA for a long time but certainly it is getting outdated based on legacy technology, and causing various practical difficulties to PNGFA recently, especially on forest planning and monitoring activities. Responding to this situation, the updating of the map used in FIMS was highly recommended to enable proper forest management planning in PNG.

1.2.2 Forest Base Map 2012(1.0) in JICA/PNGFA Project 2011-2014

JICA and PNGFA started a technical cooperation project "Capacity Development on Forest Resource Monitoring for Addressing Climate Change" (hereafter "the first JICA project") since 2011 to 2014. The first project was implemented with the "Forest Preservation Program" under the Japan Grant Aid that provided the Remote Sensing data (satellite imagery, GIS equipment and software tools) to the first JICA project.

15 years has passed since the FIMS was developed in 1996. Therefore, one of the outputs of the first JICA project was "Nation-wide forest base map is improved by using remote sensing technology". This enabled the FBM 2012 (1.0) to be developed at the end of the project.

The figure below shows existing FIMs GIS boundaries and latest procured satellite imagery.

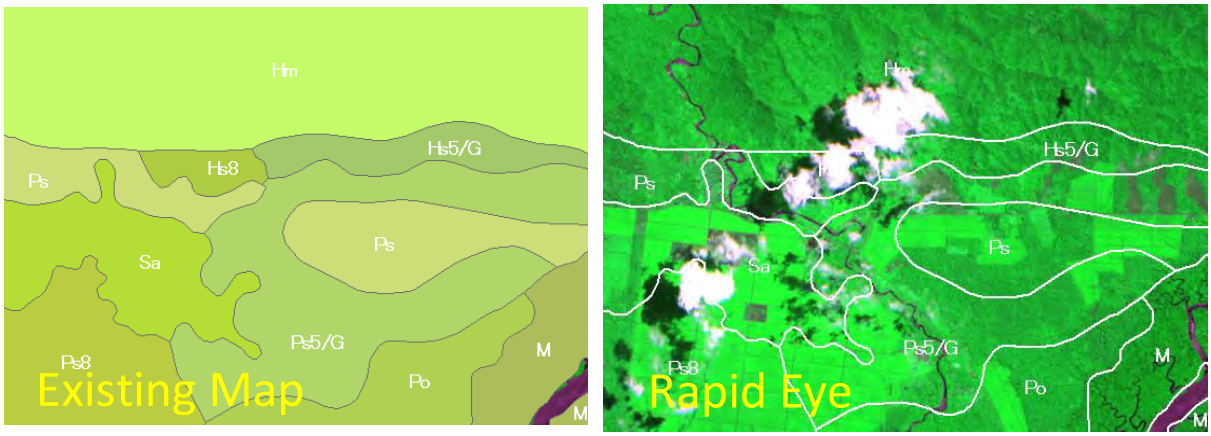


Figure 1: FIMS GIS boundaries overlaid onto latest procured satellite imagery

2. Development and Improvement of the Forest Base Map 2012 (1.1)

2.1 Data Input and Development Process

2.1.1 Defining Classification Items and the Codes

The land cover classification items and the code which were registered in the FIMS were extracted, reorganized and reviewed to take into consideration whether they are identifiable from the satellite imagery or not. A total of 21 classification items and codes were defined for PNGFA to perform their mapping tasks. Detailed classification items by canopy size and tree species of FIMS were omitted due to the limitation of satellite imagery that were planned to be used. The 21 Classification items include, other than forest, grasslands and cropland (agriculture land). In addition to existing FIMS classes, "Forest Plantation" and "Plantation other than Forest Plantation" were newly added to the FBM 2012 (1.0) because plantations are important for forest management and they can be classified by using the plantation boundaries which PNGFA had developed and managed.

Table 3: Classification item and its code of the Forest Base Map 2012

P	Low Altitude Forest on Plains and Fans (below 1000m)	G	Grassland and Herbland
H	Low Altitude Forest on Uplands (below 1000m)	Gi	Grassland (Sub-Alpine)
L	Lower Montane Forest (above 1000m)	Ga	Grassland (Alpine)
Mo	Montane Forest	Z	Bare areas
D	Dry Seasonal Forest	U	Larger Urban Centre
B	Littoral Forest	E	Lake and Larger Rivers
Fri	Seral Forest	O	Agriculture Land
Fsw	Swamp Forest	Qa	Plantation other than Forest Plantation
M	Mangrove Forest	Qf	Forest Plantation
W	Woodland		
Sa	Savanna		
Sc	Scrub		

Note: Light green items were classified as forest as per PNG forest definition.

National forest definition of PNG is "*Land spanning more than 1 hectare, with trees higher than 3 meters and the canopy cover of more than 10 percent (%)*". It was endorsed by the PNG National Executive Council # 256 of Meeting #07/2014.

This definition was developed under the PNGFA initiative toward preparation and implementation of NFI (National Forest Inventory) supported by UN-REDD/FAO. The JICA first project joined in the process and contributed to verify the definition by providing technical inputs as below;

- Minimum Area:
  -- 1 ha is adequately small by comparison with the FIMS vegetation boundary and satellite image spatial resolution (RapidEye: 5m, ALOS/PALSAR: 10m, LANDSAT: 30m)
- Canopy Cover:
  -- 10% is desirable to classify "Savanna" as forest (PNGFA needed to include this vegetation in forest as to properly manage forests in PNG).
  -- As it is challenging to classify "Savanna" and "Scrub" by remote sensing automatically (even with RapidEye), human interpretation is needed with considering the distribution of these vegetation.
- Tree Height:
  -- 3m is appropriate (to include Scrub as Forest) by verifying airborne data and RapidEye satellite imagery in Central Suau, Milne Bay (This value is the same as the definition in FIMS).

2.1.2 Data used for Forest Base Map Development

Satellite observation data used for developing the FBM 2012 (1.0) includes; RapidEye (optical sensor, captured mainly in 2011 and some in 2010) and ALOS-PALSAR (radar sensor, captured in 2010 and 2011). Airborne radar information was acquired from the PNG National Mapping Bureau (NMB) and utilized as data for elevation above sea level.

RapidEye (5 constellation satellites, which have the most frequent observation opportunities among the satellites with the same level of resolution) was utilized as the main base information because of the high resolution (5m) with multi-band (5 bands). ALOS/PALSAR was used as alternative source for cloud cover area. NMB Digital Elevation Model (DEM) was used for segmentation process and decision tree classification.

Table 4: Data used for Forest Base Map Development

Data (Satellite etc.)	Sensor type	Resolution	Years	Remarks
RapidEye	Optical (5 bands)	5 m	2011 (some are 2010)	Main base information
ALOS/PALSAR	Radar (L-band)	10m	2010-2011	For cloud covered area
NMB DEM	Radar (P & X band)	5 m	2006	Slope, and watershed

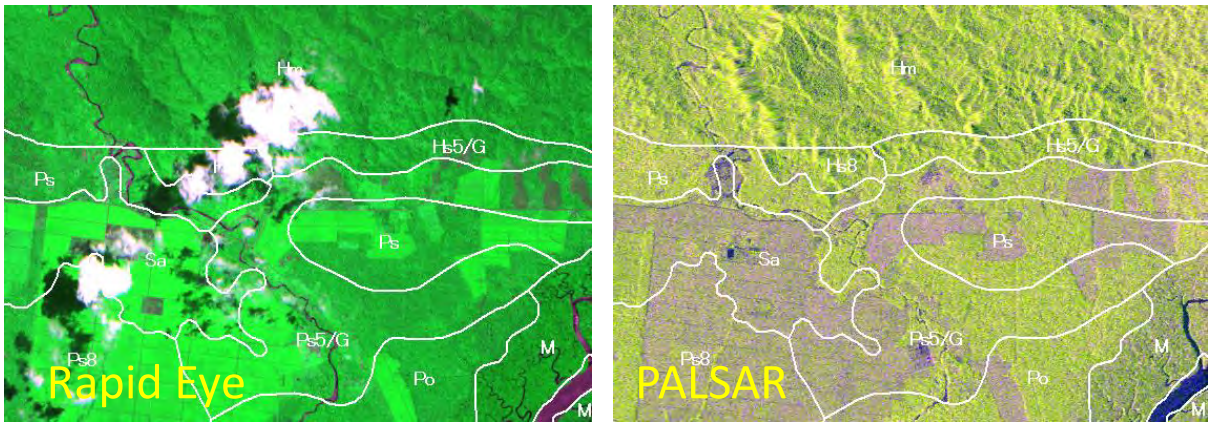


Figure 2: RapidEye (optical sensor) and ALOS/PALSAR (radar sensor)

2.1.3 Examination of Classification Items and Flow

Satellite imagery by optical sensor (RapidEye) and radar senor (ALOS/PALSAR) of the existing vegetation types in PNG were compared and examined; then existing GIS data in the FIMS was overlaid onto the satellite imagery to confirm how the 21 discernible classes/items can be interpreted with respect to discrepancies between elements such as tone/colour, size, shape, pattern, texture, shadow, and association.

Based on the results from comparison and examination of the satellite imagery and classification items, the draft classification flow-chart was prepared and this flow-chart has been kept updated and improved based on the results of consecutive trial and error.

The final classification flow-chart used for the FBM 2012 (1.0) development is shown in Figure 3.

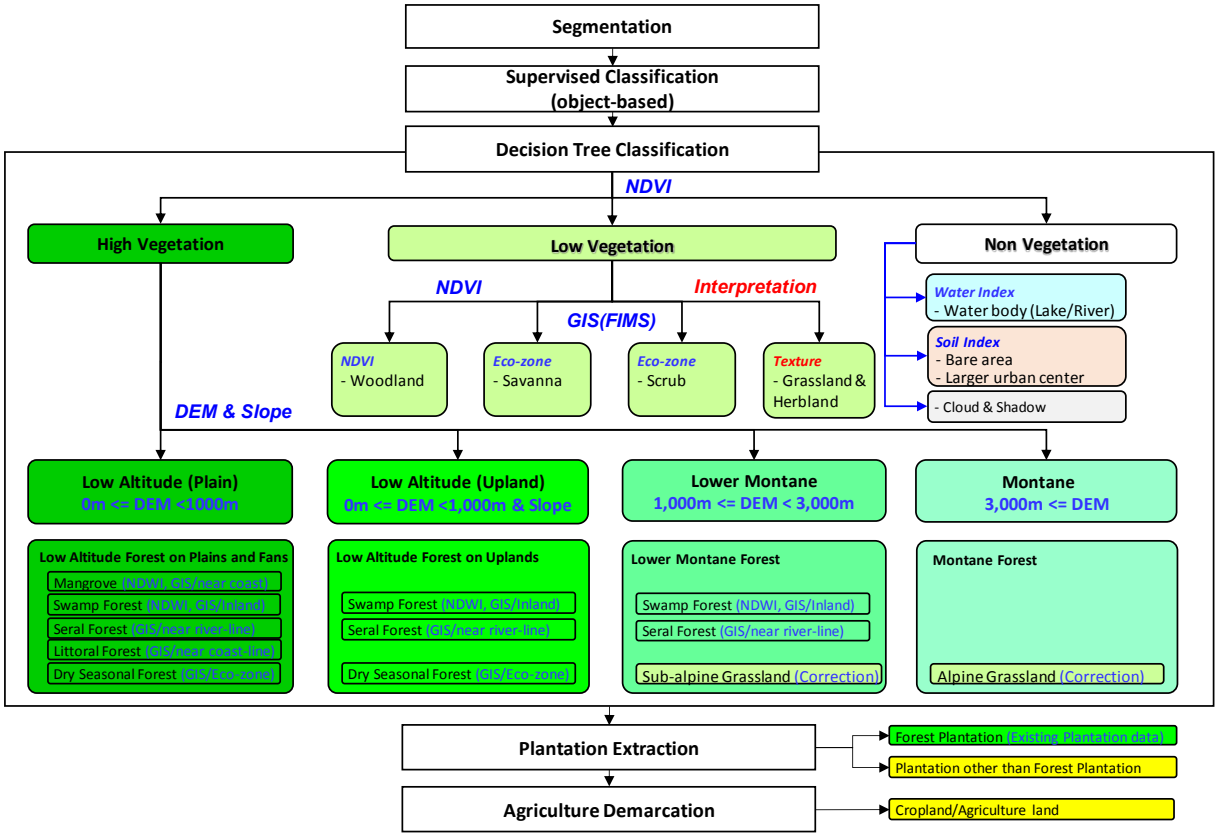
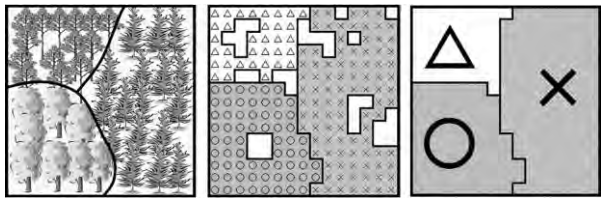


Figure 3: Classification Flow-chart for Forest Base Map Development

2.1.4 Segmentation and Object-based Classification

Segmentation and object-based classification of the land cover, as well as satellite imagery analysis was done using the software 'eCognition'. Another software called 'R' was used for statistical analysis of the segments. For this analysis, we utilized RapidEye satellite imagery (5 bands), Normalized Differential Vegetation Index (NDVI) generated from analysis on RapidEye data, elevation data acquired from NMB (5m mesh), and slope and watershed data (or catchment boundaries) generated from analysis on NMB elevation data.



(a) Forest (b) Pixel based classification (c) Object based classification

Figure 4: Pixel based Classification and Object based Classification

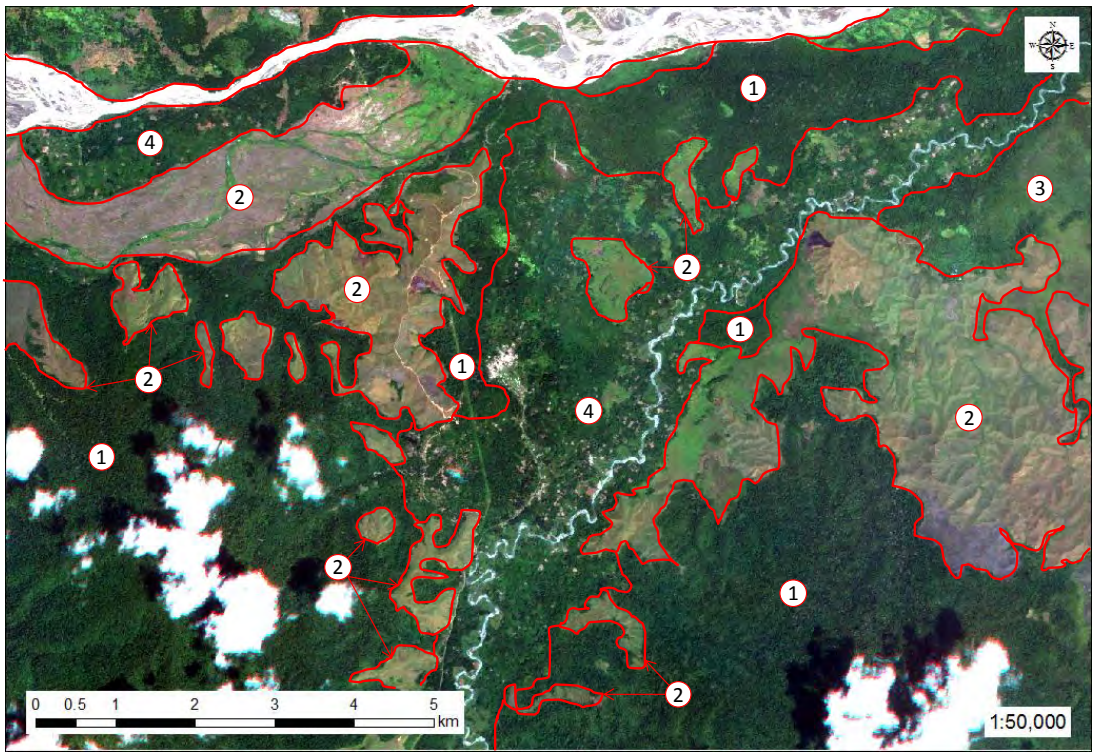
Automated classification of the segments was done for forest and other vegetation by 'eCognition' and 'R' after calculating 'feature parameters' of each segment. This was done by using statistical values including average and standard deviation of various parameters of all pixels in each segment. The classification was done by multi-stage classification, following a forest classification flowchart tailored (Figure 3) for this work by using parameters including Brightness, Green, Near Infra-Red (NIR), NDVI, elevation from DEM and slope etc.

2.1.5 Correction Process by Human Interpretation

Correction by human interpretation was made where we found automated classification difficult, for instance, in classes such as Larger Urban Centres, Bare Areas, Cropland/ Agriculture land, Woodland, Savanna, and Scrub, or if the error in classification made by automated process was obvious. Human interpretation was supported by photographs taken by digital camera on hand-held GPS terminals from a helicopter, verification by ground truth surveys, mobilization of existing knowledge, and literature study.

Interpretation cards were prepared for 21 vegetation types as a common understanding and standardizing method for interpretation to obtain the same results regardless of interpreters. The interpretation cards were overlaid with interpreted polygons describing the vegetation type and interpretation features (e.g. colour, tone, size, shape, texture, etc.), topographic and social background, classification codes based on knowledge of PNGFA, FIMS class, and high resolution images obtained from Google Earth.

True color	Morobe	Wampar	Tile 5536013	Percent Clip Min: 0.5 Max: 4.5



No.	Vegetation type	Color/Texture viewed from the RapidEye tile		Note	Reference	
		True color (RGB 3:2:1)	False color (RGB 3:5:2)		FIMS	Other images
1	Forest	Dark green Rough	Green with black dots Rough		Hm, Po, Fsw	
2	Grassland	Light green to light Very smooth	Reddish purple Very smooth		G, Gf	
3	Swamp Woodland	Brownish green Relatively smooth	Light green Relatively smooth	Sparse tree crown can be seen.	Wsw, Fsw, Po,	
4	Gardening Settlement	Green with small brown patches	Light green with small purple patches	Generally gardening and settlement are occurred along river and road.	Po, Fsw, G	
5	Burned grassland	Dark purple to Very smooth	Purple to black Very smooth			

Figure 5: Sample of Image Interpretation Card for Forest Base Map

2.1.6 Plantation Extraction / Agriculture Demarcation

'Forest Plantation' class was distinguished from 'Plantation other than forest plantation' by referring to plantation boundary data taken from PNGFA. 'Forest Plantation' indicated on the FBM 2012 (1.0) is not necessarily corresponding to the actual distribution of forest plantations, as PNGFA does not have all boundary information of forest plantations, as this data is normally managed by private sectors.

Cropland/Agriculture land, Forest Plantation, and Plantations other than forest plantation are delineated by human interpretation relying on local knowledge of PNGFA officers, including staff of Area and Provincial Offices, RapidEye imagery and geo-referenced photographs. The PNGFA officers used high resolution imagery taken from Google Earth and Bing Map, existing information on cropland (Mapping Agriculture Systems of PNG [MASP] and PNGRIS) and DEM.

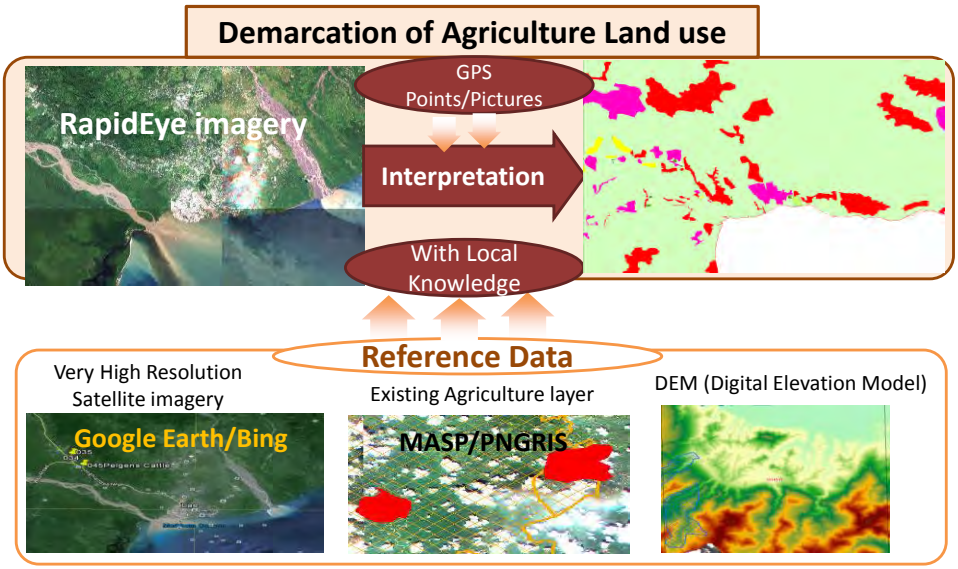


Figure 6: Demarcation of Agriculture Land Use and Reference Data

Subsistence (SUB)–Agricultural Land-use which has the following attributes: Located closer to rural settings (place) where the produce is mainly for consumption and smaller in size. Usually subsistence gardening are scattered, with irregular shapes, pattern and rough textures on a satellite image. Subsistence Land use activities include fallow areas as well.

Commercial (COM) – Agricultural Land use areas that are manage by small holders (Block owners) mostly for monetary benefits (coffee, cocoa, banana..) as identified thru MASP and confirm by local knowledge. Such land uses cover a smaller area and may have smooth/rough texture and irregular patterns in a satellite image.

Mixed (MIX) – Agricultural Land use areas which have both subsistence and commercial activities coexisting. These Land use types are identified thru local knowledge. Mixed Agricultural Land use activities have irregular shapes and pattern and a rough texture on satellite images.

Uncertain (AUN) – Uncertain Agricultural land use has the following attributes: Agricultural Land use areas where the types of agricultural activities are not clearly identifiable.
Agricultural Land use areas which cannot be identified in Google Maps, Bing Maps and RapidEye Images due to heavy cloud cover or poor image resolution. Local knowledge about area of interest is limited thus cannot confirm.

Grazing (GRZ) – Agricultural Land use areas that have extensive grassland which are used for cattle grazing. Grazing areas usually have regular patterns and smooth texture on a satellite image.

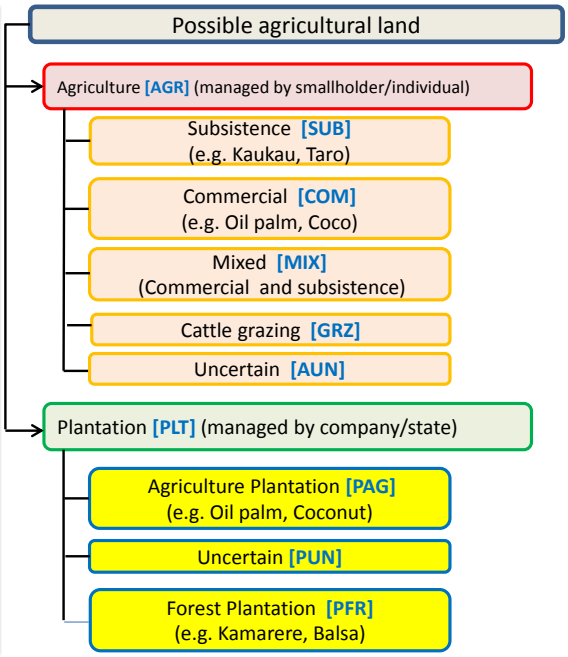


Figure 7: Definition of Agriculture Land Use and Classification Groups/Codes

2.2 Identified Issues and Improvement

After the first project finished in March 2014, JICA and PNGFA started the 2nd Technical Cooperation Project, "Capacity Development for Operationalization of PNG Forest Resource Information Management System (PNG-FRIMS) for Addressing Climate Change" (hereinafter referred to as the second project). The second project commenced in August 2014 and ended in August 2019. It aimed to enhance the capacity of PNGFA in its ability to continuously update forest information, and to fully operationalize and utilize PNG-FRIMS for promoting sustainable forest management and for addressing climate change.

Under the second Project, the FBM 2012 (1.0) was updated to the FBM 2012 (1.1) with small modifications made on polygons of coastlines. The quality and accuracy of the FBM 2012 (1.1) was also assessed by comparing the data taken from the Collect Earth Assessment (supported by UN-REDD/FAO). Issues that rose during the JICA first and second project were analysed for future updating.

2.2.1 Classification among Woodland, Savanna, and Scrub:

The accurate delineation, verification and monitoring of boundaries of Woodland, Savanna, and Scrub cannot be done by relying on interpretation and classification solely from satellite imagery. The Savanna, particularly in PNG, only occurs in the Southern region with specific vegetation that is confined by specific climatic and ecological conditions. Three types of vegetation can be distinguished, and they are Eucalyptus Savanna, Maleulecca Savanna and Mixed Savanna. However, it is challenging to distinguish with RS. The Scrub land in PNG is also specifically defined as low-rise forest vegetation comprised of specific tree species. Taking these conditions into account, these three classes are identified on the FBM 2012 (1.1) by referring to FIMS and localities.

2.2.2 Subdividing codes of land use (missing codes of FIMS)

In the process of developing the FBM 2012 (1.0), based on the FIMS, more precise land cover information was simplified into rough information in the FBM (1.0); this was due to reasons such as limitation in interpretation using satellite imagery. For example, the definition of land cover in FIMS includes not only swamp in forest but also swamp in woodland and in grass land. The FBM does not have these classes.

As the information is useful for PNGFA, to enable them to judge the possibility of forestry operation in its planning stage, some codes in the FIMS which related to swamp distribution was added back. Other detail codes were also revived in terms of usefulness for calculating forest timber volume with more accuracy based on forest type.

2.2.3 Distinction between P (Plain Forest) and H (Hill Forest)

The distinction between 'P' and 'H' type forest are made according to incline (or slope) in the FBM 2012 (1.1). As plains are dominant and topography is relatively gentle in Western Province, it was recognized that the distribution of 'P' and 'H' are significantly different between the FBM 2012 (1.0) and FIMS. This difference occurred mainly because the FIMS development process took into account the composition of tree species as well.

After consultations within the JICA Project Team (comprised of PNGFA officers and JICA experts), it was decided to keep the methodology for the FBM 2012 (1.1), as slope is important and useful

information for forest management operations. The slope is often a main determinant of efficiency and practicability of the logging operations as it determines manoeuvrability of heavy machineries in the field.

2.2.4 Examining RS methodology to detect wetland-forest

In addition to the wetland distribution issue due to simplification of original land cover codes, the deviation of distribution of swamp forests between the FIMS and current actual distribution was apparent. Therefore, for future updating of the FBM 2012 (1.1), the methodology to detect wetland-forest was examined in the Second project.

For the examination, GeoSAR data with its P-band microwave and a false colour composite of LANDSAT-8 were used to detect peatland located around April Salumei in East Sepik province. The P-band of GeoSAR was expected to observe forest floor by penetrating the tree crown. However, it could not detect peat land which was likely considered to exist in the targeted area.

On the other hand, a false colour composite of LANDSAT-8 (R: Band 6, G: Band5, B: Band 4) looks capable for helping estimate peat distribution. Note that NDWI (Normalized difference water index) calculated from LANDSAT-8 imagery could not show significant difference between inside and outside of peatland.

This suggests that digitizing work or objected-based segmentation using LANDSAT-8 imagery is an option to detect wetland forest using remote sensing data. However, ground survey is necessary to ensure accuracy of information derived from RS method in general. Therefore, it is necessary to conduct ground survey to establish this method.

2.2.5 Improving forest plantation data (collecting the data)

There were gaps identified of forest plantation area between the value calculated on the FBM 2012 (1.1) and the value from the Plantation branch of PNGFA. This was caused by the difficulty in distinguishing between forest plantation and agricultural plantation, such as oil palm plantation with satellite imagery, and limitation of local knowledge of field staff. Upon discovering this, it was found necessary to update plantation data held by PNGFA. Forestry plantations in PNG are managed by communities, private companies and PNGFA. Companies should manage their plantation(s) with GIS software; however, most of the state-owned plantations and community plantations do not use GIS software.

Based on the situation, it was decided that PNGFA request private companies to share their GIS data on their plantation(s), and conduct ground surveys on state-own plantation and community plantations to acquire data of actual plantations. The acquired data would then be inputted into one of the thematic layers within PNG-FRIMS. As a result, more accurate maps could be prepared by overlying FBM 2012 (1.1) and the thematic layers.

2.3 Quality and Accuracy Assessment

The quality and accuracy of the FBM 2012 (1.1) was assessed using an error matrix. This assessment ideally should be done with ground truth data as a reference data which is collected by appropriate sampling design. However, the national level comprehensive ground truth data whose sample size is statistically sufficient is not available in PNG yet. Therefore, the assessment was implemented by comparing the land use classes in the FBM with the land use classes of Collect Earth assessment 2013 (which was supported by UN-REDD/FAO), as the reference data. The correspondence of land use classes in the FBM and Collect Earth Assessment are shown in the table below.

Table 5: Correspondence of land use classes in Forest Base Map and Collect Earth Assessment

IPCC Category	Forest Base Map			Collect Earth Assessment
	No	Code	Class	Land use class
Forest	1	P	Low Altitude Forest on Plains and Fans	low_altitude_forest_on_plains and
	2	H	Low Altitude Forest on Upland	low_altitude_forest_on_upland
	3	L	Lower Montane Forest	lower_montane_forest
	4	Mo	Montane Forest	montane_forest
	4	Mo	Montane Forest	montane_coniferous_forest
	5	D	Dry Seasonal Forest	dry_seasonal_forest
	6	B	Littoral Forest	littoral_forest
	7	Fri	Seral Forest	seral_forest
	8	Fsw	Swamp Forest	swamp_forest
	15	M	Mangrove	mangrove
	20	Qf	Forest Plantation	acacia_plantation
				balsa_plantation
				eucalyptus_plantation
				hoop_plantation
				klinki_plantation
				pine_plantation
				rubber_plantation
				teak_plantation
				terminalia_plantation
				undetermined_plantation
Woodland	9	W	Woodland	woodland
Savanna	10	Sa	Savanna	savanna
Scrub	11	Sc	Scrub	scrub
Grassland	12	G	Grassland and Herbland	herbland
				meadows
	13	Ga	Alpine grassland	alpine_grassland
	14	Gi	Subalpine grassland	-

IPCC Category	Forest Base Map			Collect Earth Assessment
	No	Code	Class	Land use class
Cropland	16	O	Agricultural Land Use	irrigated_perennial_crops
				non_irrigated_perennial_crops
				other_crop
				subsistence_agriculture
				subsistence_agriculture_not_sure
				subsistence_agriculture_permanen
				subsistence_agriculture_shifting
	21	Qa	Plantation other than forest plantation	palm_oil
				cocoa
				coconut
				coffee
				tea
Wetlands	-	-	-	freshwater_swamp
				lowland_freshwater_swamp
				montane_swamp
				saline_brackish_swamp
	17	E	Lakes and larger rivers	lake
				river
Other land	18	Z	Bare areas	barrein_soil
				land_slides
				rock
				sand_soil
Settlements	19	U	Larger urban centres	large_settlement
				infrastructure
				village
-	22	Es	Sea	sea
	-	-	-	clouds
	-	-	-	other_reason

2.3.1 The results of the assessment

Table 6: The result of the Quality and Accuracy Assessment of Forest Base Map

				Collect Earth Assessment																					
				Forest										Woo	Savanna/Sc		Grassland		Cropland		Wetlands	Other land	Settlements	Total	U.A.
				P	H	L	Mo	D	B	Fri	Fsw	M	Qf	W	Sa	Sc	G	Ga/G	O	Qa	E	Z	U		
Forest Base Map	Forest	P	Low Altitude Forest on Plai	2446	1138	4		40	21	70	309	31	16	65	9	18	41		184	26	80		31	4529	54%
		H	Low Altitude Forest on Upl	1122	4820	109			9	47	18		4	17	6	17	41		225	21	23	4	22	6505	74%
		L	Lower Montane Forest		58	4208	74						2			16	56	18	165	7	6	1	13	4624	91%
		Mo	Montane Forest			19	186									6	2	26						239	78%
		D	Dry Seasonal Forest	121	8			207	1	5	47			65	3	3	13				7			480	43%
		B	Littoral Forest	8					6		3	1		7			1			1				27	22%
		Fri	Seral Forest	17	18	11			1	4	11	1		5			3		2	3	6			82	5%
		Fsw	Swamp Forest	297	38			48	6	22	314	11		90	15	11	33		13	1	116		6	1021	31%
		M	Mangrove	17				2	11	2	34	104		5	2		1		3	2	62		2	247	42%
		Qf	Forest Plantation	3	3	1			1				7	1		2	1	1	11	2				33	21%
	Woodland	W	Woodland	267	33	1		326	5	16	247	7		307	115	40	51		36	5	104		2	1562	20%
	Savanna /Scrub	Sa	Savanna	5	1	1		34			8	3		77	132	8	27		11		9	1	6	323	41%
		Sc	Scrub	2	1	1	1	33			3			58	85	11	8		1		2			206	5%
	Grassland	G	Grassland and Herbland	83	44	45		53	3	7	72	4	1	98	24	36	689	20	162	15	303	7	19	1685	41%
		Ga/G	Alpine grassland/Subalpine			7	12									2	23	70	2				1	117	60%
	Cropland	O	Agricultural Land Use	225	299	363	4	7	12	16	45	6	7	21	9	24	233	30	1211	132	47	2	165	2858	42%
		Qa	Plantation other than forest	13	6				1		1		2			2	10		66	132			9	242	55%
	Wetlands	E	Lakes and larger rivers	13	18	3		2		4	6	3		1	2	1	19		2		209		2	285	73%
	Other land	Z	Bare areas	2	1	1										1	4				3	2	1	15	13%
	Settlements	U	Larger urban centres														1		1				14	16	88%
			Total	4641	6486	4774	277	752	77	193	1118	171	39	817	402	198	1257	165	2095	347	977	17	293	25096	
			P.A.	53%	74%	88%	67%	28%	8%	2%	28%	61%	18%	38%	33%	6%	55%	42%	58%	38%	21%	12%	5%		

O.A.	60%

U.A. (User Accuracy) is used for accuracy assessment for land classification. It shows how much percentage of land classification is correctly done (matching classification result and reference class).
P.A. (Producer Accuracy) is used for assessment of classification by showing how much percentage of the reference classes are matching classification results.
O.A. (Overall Accuracy) of classification of forest and non-forest and of six land class as per Intergovernmental Panel on Climate Change (IPCC) are 87 % and 83 % respectively. These values show high accuracy. On the other hand, O.A. of the most detailed land classes is 60 % (refer to the Table 6).

2.3.2 Main findings from the assessment

i) **Wetlands**: U.A. of Wetland is high, 73 %; however, P.A. is low, 21 %. This means much of the Wetlands categorized in the FBM 2012 (1.1) are also categorized as Wetland in the Collect Earth Assessment 2013, but many Wetlands picked out of the Collect Earth Assessment cannot be categorized in the FBM.

ii) **Settlement**: U.A. of Settlement is high, 88 %, however, P.A. is significantly low, only 5 %. This is caused by the difference in the classification approach used between the FBM 2012 (1.1) and the Collect Earth Assessment 2013. In fact, the Collect Earth Assessment picked out small scale settlements, such as villages, while the FBM did not pick out the same small-scale settlements.

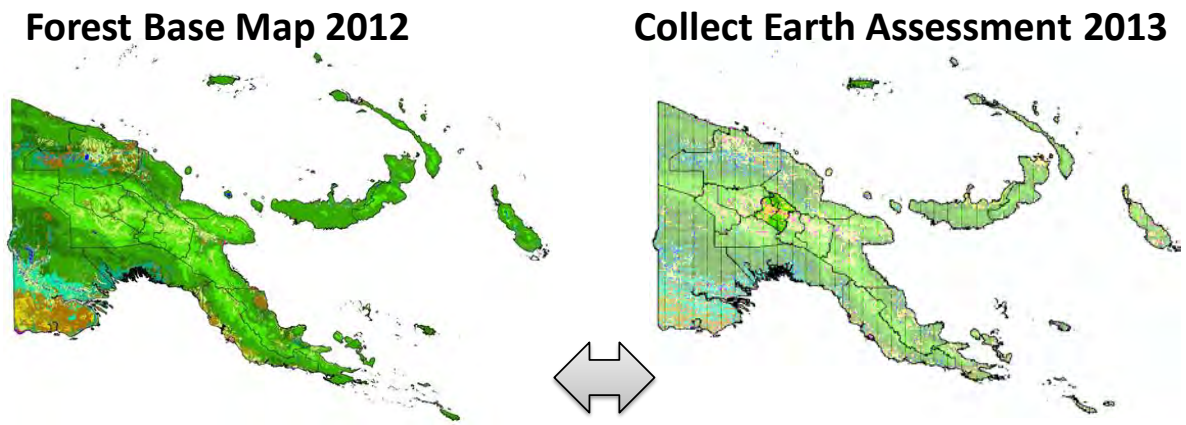
iii) **Seral Forest** (Fri): Both U.A. and P.A. are very low. It is assumed that the results were caused by the difficulty of interpreting Fri from remotely sensed images; especially for the systematic point sampling method used in the Collect Earth assessment. This is because Fri is usually located along rivers, and its shape is long and thin.

vi) **Woodland** (W): Most of the Woodland in the FBM 2012 (1.1) is classified as Dry Seasonal Forest (D) in the Collect Earth Assessment. It is assumed that separating W and D would be challenging.

2.3.3 Points to be noted in comparison

Overall accuracy (matching) of forest and non-forest and IPCC 6 land use classes between the FBM 2012 (1.1) and Collect Earth Assessment 2013, are good, but for detailed classes only; as only a few mismatches were observed by comparing the classification between the FBM and the Collect Earth Assessment. However, since the data of Collect Earth was used as the reference data, and not data taken from a ground truth survey, the result does not mean that the accuracy of the FBM is entirely correct. These mismatches are mainly caused by the difference in data capture methods used between the FBM and the Collect Earth. Points to be noted in comparing the result of assessment are below;

i) **Difference of the methods** (recognition of land use classes in Collect Earth Assessment 2013 and the FBM 2012 (1.1))**:** The method used in classification of the FBM recognizes land covers as collective groups of polygons which have similar features. Collect Earth recognizes land uses by 25 check points in 1 hectare of land area which is a grid point of about 4km mesh in most cases except for Provinces with less land mass, a grid point of 2km mesh is used.



	Basemap	Point Sampling
Spatial Coverage	**Wall-to-Wall by Polygons** Segmentation: minimum mapping unit 1ha (100x100m)	**Systematic sampling point** Points every 4x4km (2x 2km for 2 provinces) 1ha unit with 25 check points
Satellite	RapidEye (ALOS/PALSAR)	LANDSAT, Digital Globe, RapidEye, SPOT, etc.
Land cover class	21 classes based on PNGRIS including agricultural land and plantations (referring to IPCC category)	6 IPCC categories (Forest, Grassland, Cropland, Wetland, Settlement, Other), with 54 detailed subdivision (including disturbance)

Figure 8: Comparing features of the Forest Base Map and Collect Earth

ii) **Measure the area directly**; the FBM can show the extent of vegetation/land covers by wall to wall mapping and the area of vegetation/land covers can be calculated by polygon basis against Collect Earth Assessment. It enables PNGFA staff to conduct various analysis by comparing the FBM and other maps used in planning, implementing and the monitoring stage of forest management.

iii) **High cost of satellite imagery;** procurement of high-resolution satellite imagery was very costly and was a disadvantage of the FBM.

iv) **Necessity of High GIS skills;** More GIS skills were needed to interpret the satellite imageries in the Forest Base Map compared to Collect Earth as the analysis by Collect Earth can be done with open source software and satellite imagery provided for free through the internet. High skill GIS staff is not needed for analysis and therefore the Collect Earth is suited for analysis which needs to be updated annually.

By the difference in methods of the FBM 2012 (1.1) and Collect Earth 2013, each method has different features. Both methods should be properly understood and used based on its features.

2.4 Appropriate Scale of Map Utilization

The ground resolution of the RapidEye imageries used for the development of the FBM 2012 (1.1) is five (5) meters (re-sampled from original six-point five (6.5) meters) meanwhile, PALSAR imagery uses a ten (10) meter resolution for interpolating data over cloud cover area. The mapping scale is between 1:25,000 and 1:50,000 for the data development while minimum mapping polygon size is 1 hectare. Therefore, this map should be used at a scale between 1:25,000 and 1:50,000, taking note of the constraint of location accuracy described in the sub-section 2.5 below.

2.5 Limitations of Geographical Accuracy and Coverage

Geographical Accuracy: The location accuracy of the FBM 2012 (1.1) is equal to that of the ortho-rectified dataset of LANDSAT (Land Satellite) developed by United States Geological Survey (USGS); this being because the specification was designed in accordance with LANDSAT taking into account the conditions of reference data available for PNG and future updating of the data. According to the limitation of the resolution of LANDSAT, location error of plus or minus thirty (30) meters may have been included. Due to this limitation, it should be noted that the ground-based positioning by GPS has higher location accuracy than that of this map.

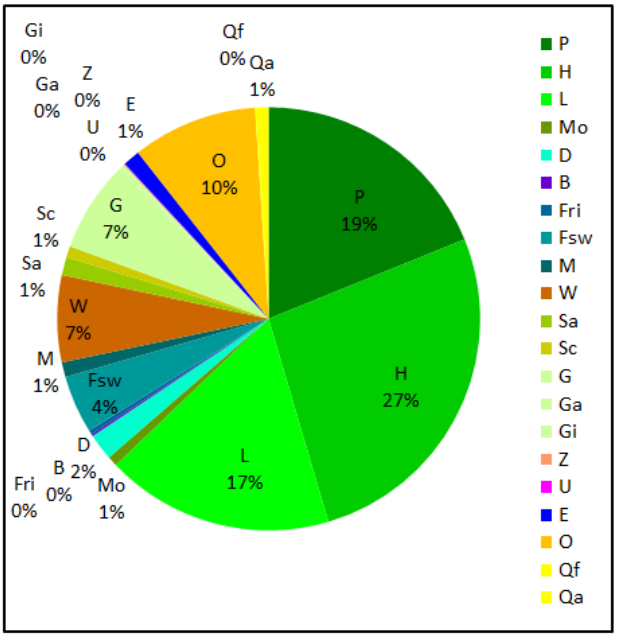
Geographical Coverage: This map is developed for utilizing on purpose of forest management by the PNGFA. Therefore, the map does not exhaustively cover some small islands and other areas where forest management operation by PNGFA are not currently conducted.

Delineation of Cropland/Agriculture land: Since conditions of crop land varies depending on applied practice and cropping cycle, local knowledge and supplementary information is prerequisite for the interpretation and classification at a localized level. According to that nature, the map does not exhaustively cover all cropland and agriculture land.

3. Contents of the Forest Base Map 2012 (1.1)

3.1 Forest Base Map 2012 (1.1) at National Level

	VEG	VEGNAME	Area (ha)
	P	Low Altitude Forest on Plains & Fans	8,707,393
	H	Low Altitude Forest on Uplands	12,264,035
	L	Lower Montane Forest	8,042,001
	Mo	Montane Forest	355,513
	D	Dry Seasonal Forest	935,368
	B	Littoral Forest	70,358
	Fri	Seral Forest	158,719
	Fsw	Swamp Forest	2,035,431
	M	Mangrove Forest	521,933
	W	Woodland	3,062,749
	Sa	Savanna	639,969
	Sc	Scrub	392,078
	G	Grassland and Herbland	3,231,935
	Ga	Grassland (Alpine)	110,602
	Gi	Grassland (Subalpine)	86,979
	Z	Bare areas	23,874
	U	Larger Urban Centres	23,896
	E	Lake & Larger Rivers	600,105
	O	Cropland/Agriculture land	4,413,543
	Qf	Forest Plantation	66,670
	Qa	Plantation other than Qf	411,614
		SUM	46,154,764



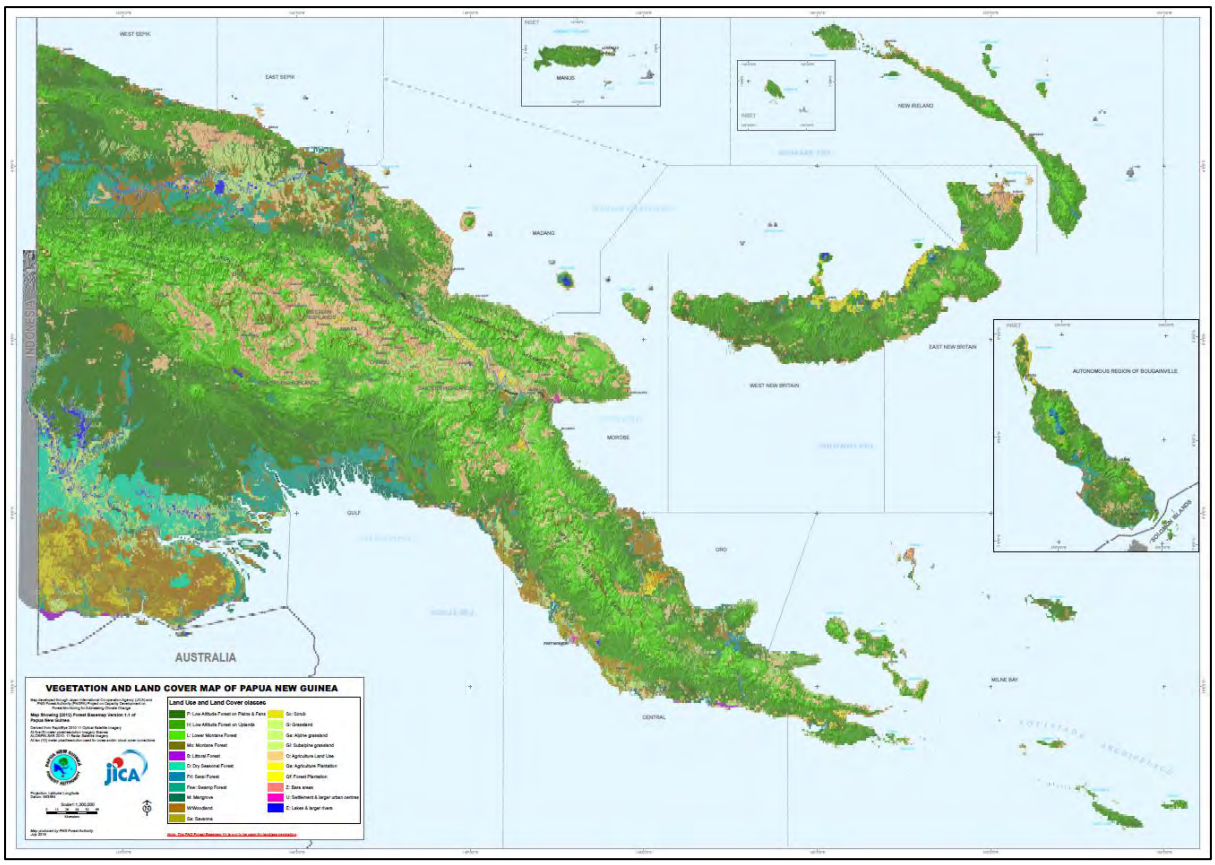


Figure 9: Sample of the Forest Base Map (Not to Scale)

4. Forest Concession and Land Management Layers in PNG-FRIMS

4.1 Timber Concession Areas

Timber concessions refer to the permits or licences to perform logging operations in an area which PNGFA has acquired and/or allocated. Currently there are three concession types; Timber Rights Purchase (TRP), Local Forest Area (LFA) and Forest Management Agreement (FMA). LFA's and TRP's are no longer being issued under the Forestry Act, 1991 (as amended), however they are still in use as they were saved under the Forestry Act, 1991 (as amended). FMA's are the only type of concession allowed under the Forestry Act, 1991 (as amended).

4.2 Constraints to Commercial Timber Production

The Constraints to Commercial Timber Production encompasses a range of aspects of an area that limits the logging activity in that area. There are socio-economic factors, regarding licensing processes, government regulation or demographics that do affect logging operations and timber production, however, the constraints that are presented in this publication are only focused on the topographical and environmental aspects. These aspects are classified below:

Table 7: The Logging Constraints

Constraint	Description
Extreme Altitude:	land over 2400m altitude
Extreme Slope:	land with over 30-degree dominant slope
Serious Slope:	land with dominant slope of 20-30 degrees and sub-dominant slope over 30 degrees and with high to very high relief
Extreme Karst:	land with polygonal karst landform
Extreme Inundation:	land permanently or near permanently inundated extending over more 80% of the area of that land
Serious Inundation:	50-80% permanent or near permanent inundation
Mangrove:	land covered by mangroves

4.3 Terrestrial Protected Areas

Terrestrial protected areas are totally or partially protected areas that are designated by national authorities as scientific reserves with limited public access, national parks, natural monuments, nature reserves or wildlife sanctuaries, protected landscapes, conservation areas, and areas managed mainly for sustainable use.

In Papua New Guinea, there are nine (9) types of protected areas.

1. Conservation Areas
2. Protected Areas
3. Memorial Parks
4. Wildlife Management Areas
5. National Parks
6. Protected Parks
7. Reserve Areas
8. Wildlife Sanctuaries
9. National Reserve

Currently, there are a total of sixty-one (61) protected areas throughout the country.[9]

[9] Terrestrial protected areas data was obtained from the Conservation and Environment Protection Authority (CEPA).

5. Map Atlas and Provincial Profiles

This section contains the map atlases of the Forest Base Map (2012) and the Forest Concession and Land Management layers in PNG-FRIMS at the National Level and the Provincial Level (Provincial Profiles and Provincial Trees).

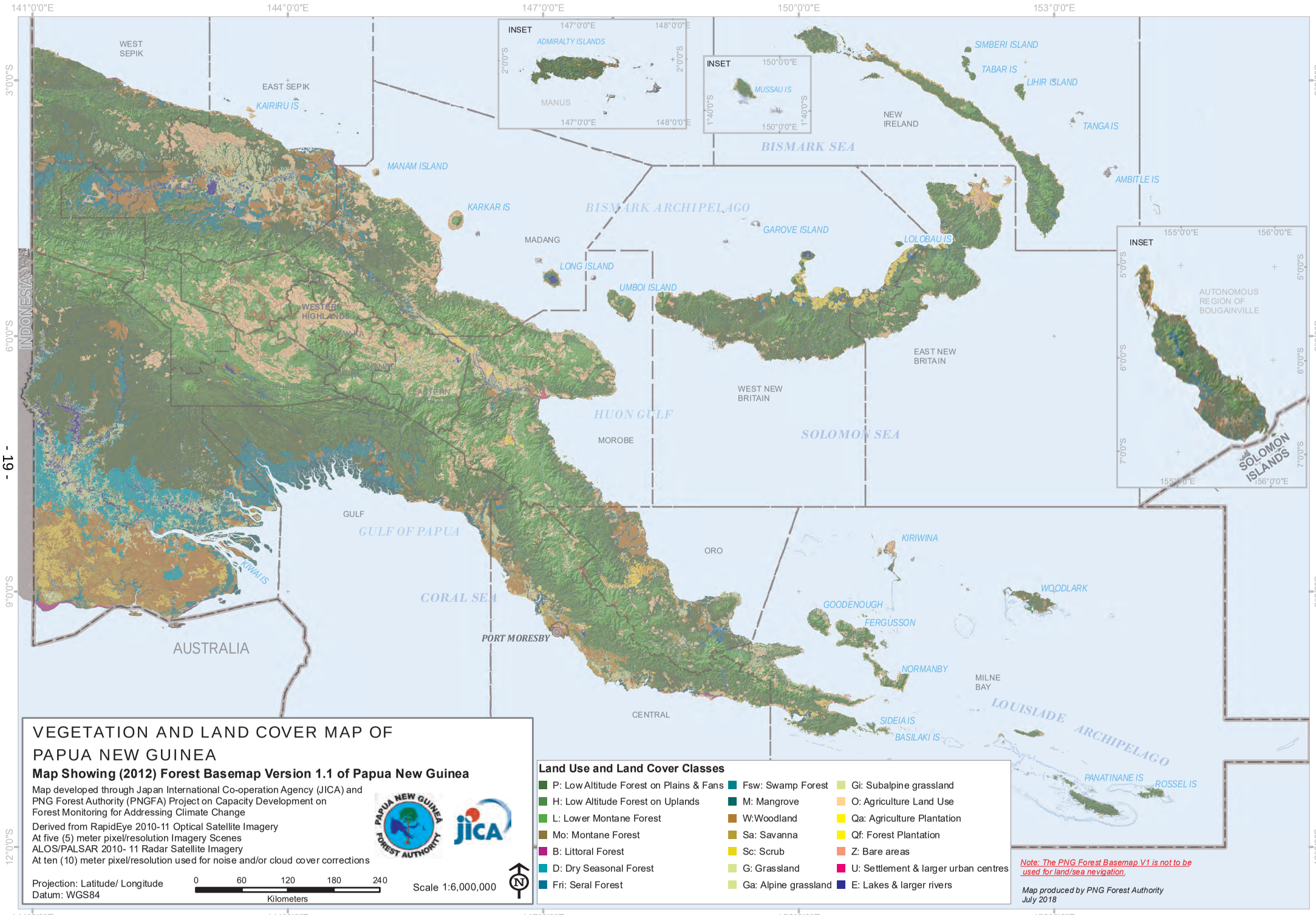
The Provincial Trees were not part of the JICA/PNGFA Project but were part of the International Year of Forests activities that took place in 2011 and have been included to give some added value to the Provinces and its forest base.

National Level Maps:

1. Vegetation and Land Cover Map of Papua New Guinea (FBM 2012)
2. Timber Concession Areas in Papua New Guinea
3. Constraints to Commercial Timber Production in Papua New Guinea
4. Terrestrial Protected Areas in Papua New Guinea

Provincial Profiles:

1. Western Province
2. Gulf Province
3. Central Province
4. Milne Bay Province
5. Northern (Oro) Province
6. Southern Highlands Province
7. Eastern Highlands Province
8. Chimbu (Simbu) Province
9. Western Highlands Province
10. West Sepik (Saundaun) Province
11. East Sepik Province
12. Madang Province
13. Morobe Province
14. West New Britain Province
15. East New Britain Province
16. New Ireland Province
17. Autonomous Region of Bougainville
18. Manus Province
19. Enga Province
20. National Capital District
21. Jiwaka Province
22. Hela Province



VEGETATION AND LAND COVER MAP OF PAPUA NEW GUINEA

Map Showing (2012) Forest Basemap Version 1.1 of Papua New Guinea

Map developed through Japan International Co-operation Agency (JICA) and PNG Forest Authority (PNGFA) Project on Capacity Development on Forest Monitoring for Addressing Climate Change

Derived from RapidEye 2010-11 Optical Satellite Imagery
At five (5) meter pixel/resolution Imagery Scenes
ALOS/PALSAR 2010- 11 Radar Satellite Imagery
At ten (10) meter pixel/resolution used for noise and/or cloud cover corrections

Projection: Latitude/ Longitude
Datum: WGS84

0 60 120 180 240
Kilometers

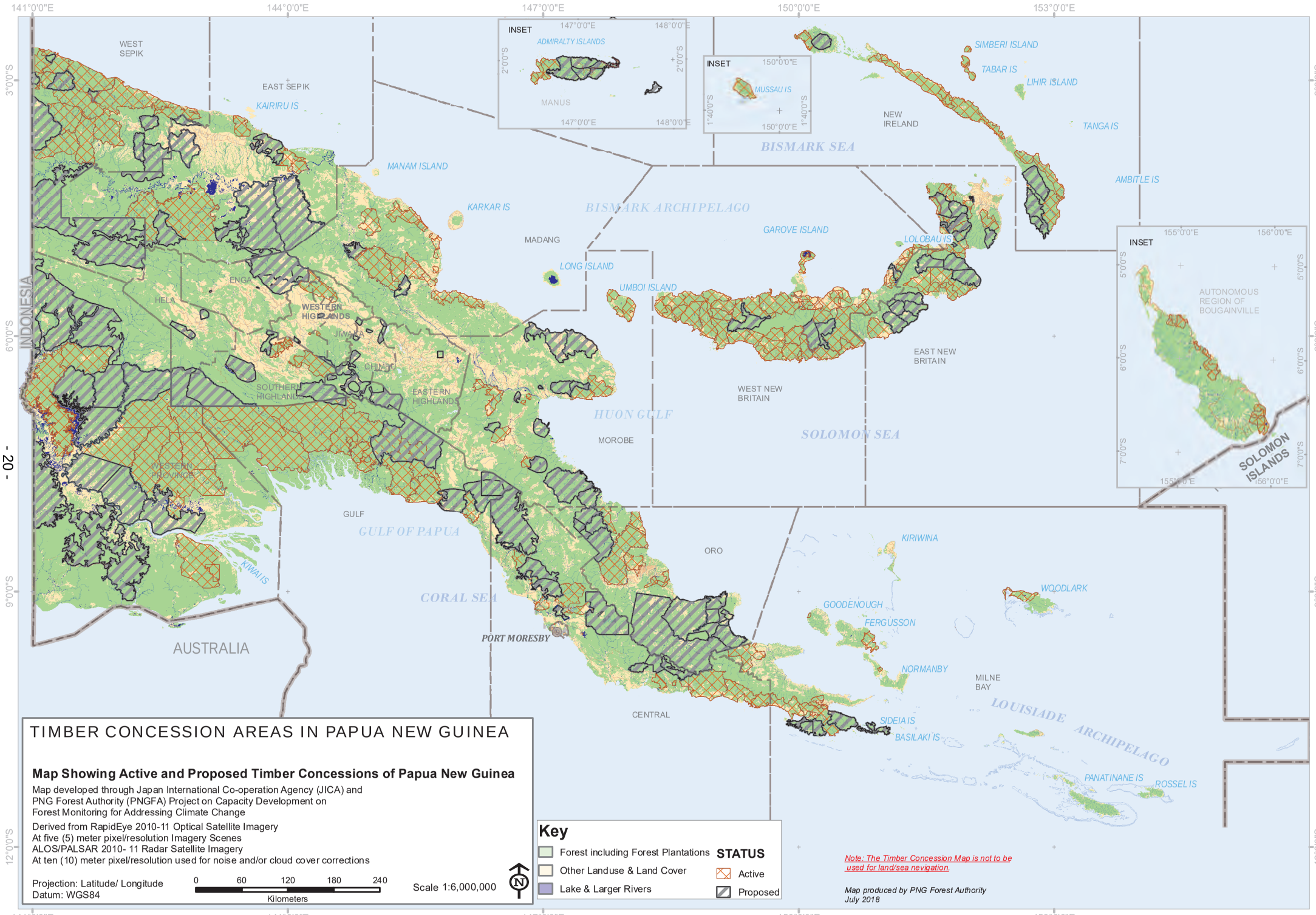
Scale 1:6,000,000

Land Use and Land Cover Classes

- P: Low Altitude Forest on Plains & Fans
- H: Lower Altitude Forest on Uplands
- L: Lower Montane Forest
- Mo: Montane Forest
- B: Littoral Forest
- D: Dry Seasonal Forest
- Fri: Seral Forest
- Fsw: Swamp Forest
- M: Mangrove
- W:Woodland
- Sa: Savanna
- Sc: Scrub
- G: Grassland
- Ga: Alpine grassland
- Gi: Subalpine grassland
- O: Agriculture Land Use
- Qa: Agriculture Plantation
- Qf: Forest Plantation
- Z: Bare areas
- U: Settlement & larger urban centres
- E: Lakes & larger rivers

Note: The PNG Forest Basemap V1 is not to be used for land/sea nevigation.

Map produced by PNG Forest Authority
July 2018



TIMBER CONCESSION AREAS IN PAPUA NEW GUINEA

Map Showing Active and Proposed Timber Concessions of Papua New Guinea

Map developed through Japan International Co-operation Agency (JICA) and
PNG Forest Authority (PNGFA) Project on Capacity Development on
Forest Monitoring for Addressing Climate Change

Derived from RapidEye 2010-11 Optical Satellite Imagery
At five (5) meter pixel/resolution Imagery Scenes
ALOS/PALSAR 2010- 11 Radar Satellite Imagery
At ten (10) meter pixel/resolution used for noise and/or cloud cover corrections

Projection: Latitude/ Longitude
Datum: WGS84

0 60 120 180 240
Kilometers

Scale 1:6,000,000

Key

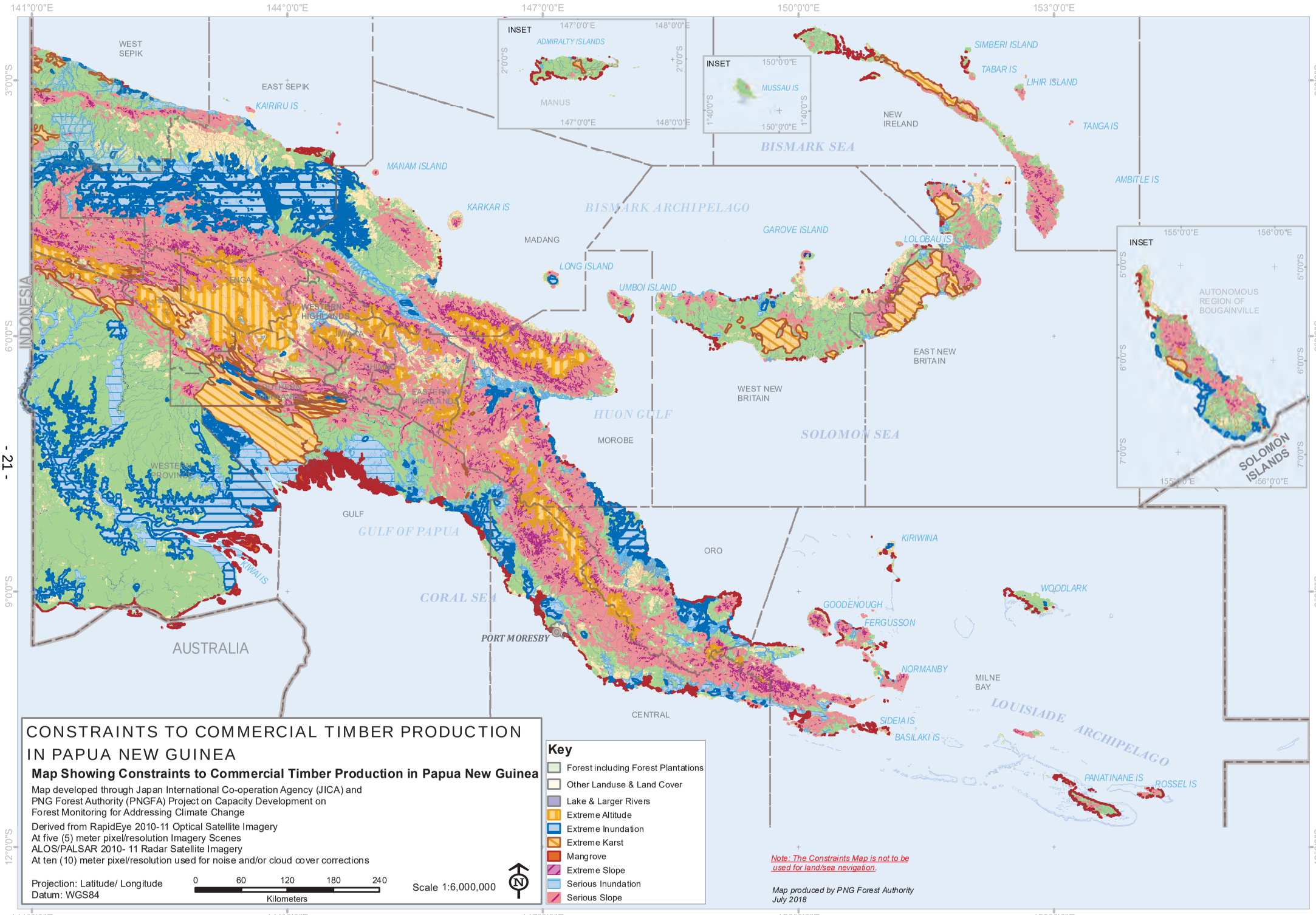
- Forest including Forest Plantations
- Other Landuse & Land Cover
- Lake & Larger Rivers

STATUS

- Active
- Proposed

Note: The Timber Concession Map is not to be used for land/sea nevigation.

Map produced by PNG Forest Authority
July 2018



CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION IN PAPUA NEW GUINEA

Map Showing Constraints to Commercial Timber Production in Papua New Guinea

Map developed through Japan International Co-operation Agency (JICA) and
PNG Forest Authority (PNGFA) Project on Capacity Development on
Forest Monitoring for Addressing Climate Change

Derived from RapidEye 2010-11 Optical Satellite Imagery
At five (5) meter pixel/resolution Imagery Scenes
ALOS/PALSAR 2010- 11 Radar Satellite Imagery
At ten (10) meter pixel/resolution used for noise and/or cloud cover corrections

Projection: Latitude/ Longitude
Datum: WGS84

0 60 120 180 240
Kilometers

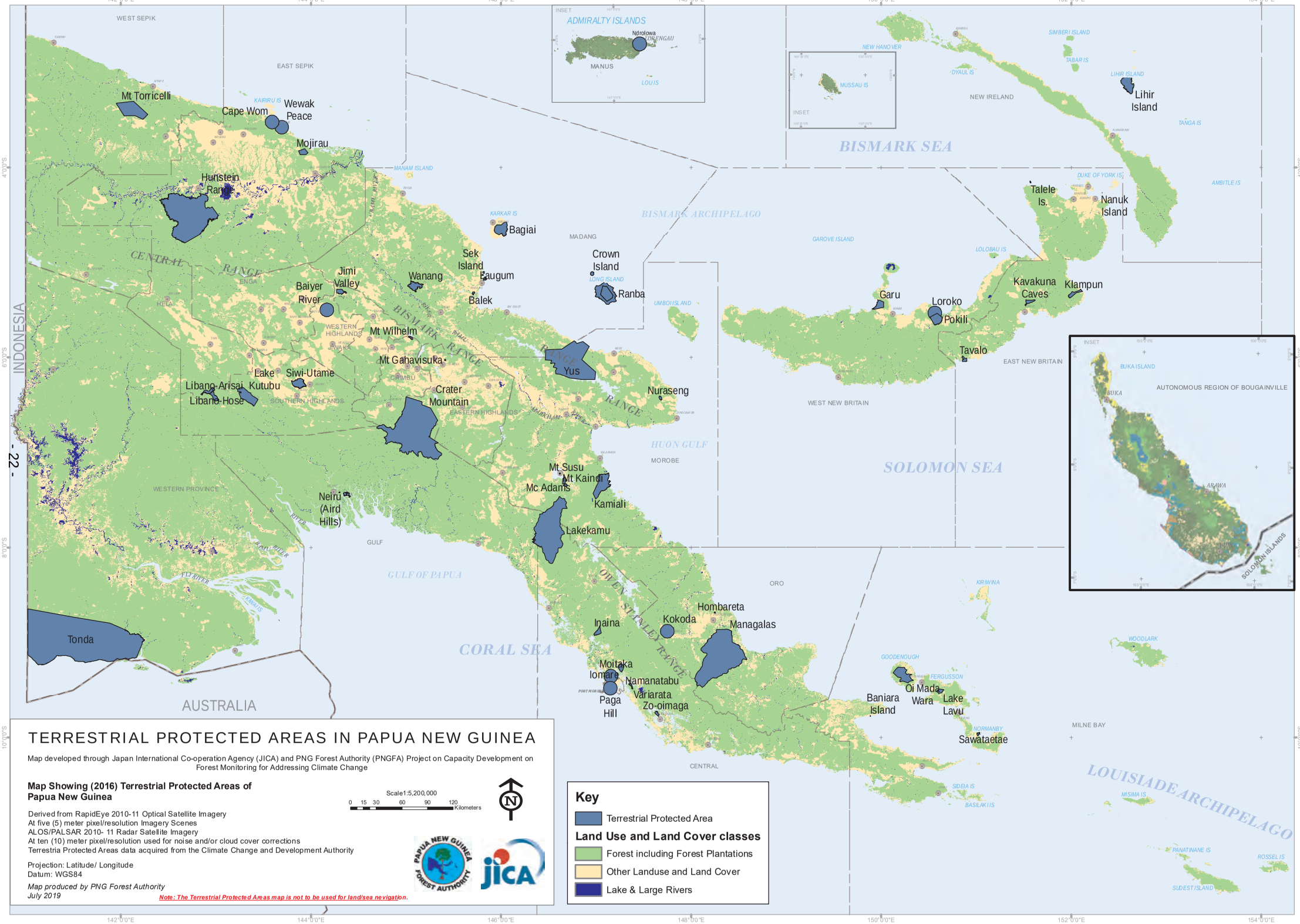
Scale 1:6,000,000

Key

- Forest including Forest Plantations
- Other Landuse & Land Cover
- Lake & Larger Rivers
- Extreme Altitude
- Extreme Inundation
- Extreme Karst
- Mangrove
- Extreme Slope
- Serious Inundation
- Serious Slope

Note: The Constraints Map is not to be used for land/sea nevigation.

Map produced by PNG Forest Authority
July 2018


TERRESTRIAL PROTECTED AREAS IN PAPUA NEW GUINEA
Map developed through Japan International Co-operation Agency (JICA) and PNG Forest Authority (PNGFA) Project on Capacity Development on Forest Monitoring for Addressing Climate Change
Map Showing (2016) Terrestrial Protected Areas of Papua New Guinea
Derived from RapidEye 2010-11 Optical Satellite Imagery
At five (5) meter pixel/resolution Imagery Scenes
ALOS/PALSAR 2010- 11 Radar Satellite Imagery
At ten (10) meter pixel/resolution used for noise and/or cloud cover corrections
Terrestria Protected Areas data acquired from the Climate Change and Development Authority
Projection: Latitude/ Longitude
Datum: WGS84
Map produced by PNG Forest Authority
July 2019
Note: The Terrestrial Protected Areas map is not to be used for land/sea nevigation.
Scale1:5,200,000
0 15 30 60 90 120 Kilometers
Key
Terrestrial Protected Area
Land Use and Land Cover classes
Forest including Forest Plantations
Other Landuse and Land Cover
Lake & Large Rivers
INDONESIA
AUSTRALIA
PAPUA NEW GUINEA
BISMARK SEA
SOLOMON SEA
CORAL SEA
GULF OF PAPUA
HUON GULF
LOUISIADE ARCHIPELAGO
BISMARK ARCHIPELAGO
ADMIRALTY ISLANDS
Ndrolowa
MANUS
LOUIS
CORENGAU
MUSSAU IS
NEW HANOVER
NEW IRELAND
SIMBERI ISLAND
TABAR IS
LIHIR ISLAND
TANGA IS
DYAUL IS
Lihir Island
DUKE OF YORK IS
AMBITLE IS
Talele Is.
Nanuk Island
Kavakuna Caves
Klampun
LOLOBAU IS
Garu
Loroko
Pokili
Tavalo
EAST NEW BRITAIN
WEST NEW BRITAIN
BUKA ISLAND
AUTONOMOUS REGION OF BOUGAINVILLE
BUKA
ARAWA
SOLOMON ISLANDS
Mt Torricelli
Cape Wom
Wewak Peace
Mojirau
KAIRIRU IS
EAST SEPIK
WEST SEPIK
MANAM ISLAND
Hurnstein Ran
KARKAR IS
Bagiai
MADANG
GAROVE ISLAND
Crown Island
LONG ISLAND
Ranba
Sek Island
Baugum
Wanang
Balek
UMBOI ISLAND
Jimi Valley
Baiyer River
CENTRAL RANGE
WESTERN HIGHLANDS
Mt Wilhelm
JIWAKA
Mt Gahavisuka
CHIMBU
Lake Kutubu
Siwi-Utame
Libano-Arisai
Libano-Hose
SOUTHERN HIGHLANDS
Crater Mountain
EASTERN HIGHLANDS
Yus
Nuraseng
MOROBE
Mt Susu
Mt Kaindi
Mc Adams
Kamiali
Lakekamu
Neiru (Aird Hills)
WESTERN PROVINCE
GULF
Tonda
ORO
OWEN STANLEY RANGE
Hombareta
Kokoda
Managalas
Inaina
Moitaka
Iomare
Namanatabu
Variarata
Zo-oimaga
Paga Hill
KIRIWINA
GOODENOUGH
FERGUSSON
Oi Mada
Wara
Lake Lavu
Baniara Island
NORMANBY
Sawataetae
MILNE BAY
CENTRAL
WOODLARK
SIDEIA IS
BASILAKI IS
MISIMA IS
PANATINANE IS
ROSSEL IS
SUDEST ISLAND
142°0'0"E
144°0'0"E
146°0'0"E
148°0'0"E
150°0'0"E
152°0'0"E
154°0'0"E
4°0'0"S
6°0'0"S
8°0'0"S
10°0'0"S

1. Western Province

General information/Overview

1. Location

Western Province is located in the southwest of mainland of PNG and it's the largest province in terms of land mass. It shares its borders with Indonesia (western) and Australia (south) and the province has some of the unique flora, fauna, landforms and estuarine that is restricted to this part of the province.

Provincial Administration Centre:	Daru
Land area:	9, 797, 778 ha
Population:	201, 351 (2011)
Number of District:	3 (North Fly, Middle Fly, South Fly)
Number of Local Level Governments (LLGs):	14 LLGs

2. Forest Information

Forest Area:	8, 345, 275 ha

Provincial Tree

The provincial tree is Vatica (scientifically known as *Vatica papuana) and is* commonly found in Low Altitude Forest on Plains and Fans, and Low Altitude Forest on Uplands.

Significance of Provincial tree:

It is a hard wood species and is one of the species exported in round log form. Traditionally, Vatica is an important tree species to Western because of its long association with the people before the introduction of torch and lamps. The bark produces/releases the sap which becomes solid when exposed to air which the locals collect and attach it to a piece of stick or wood and light it up. It burns continuously like a candle and gives light to the people in their homes/ houses. This can be used as a torch even today in the absence of torch or lamp at night. In the absence of the solid sap, dry wood splinters are normally used as torch to give light.

Scientific name:	Family:	Common Name/Trade name:
Vatica papuana/V. rassak	***Diptercarpaceae***	***Vatica***

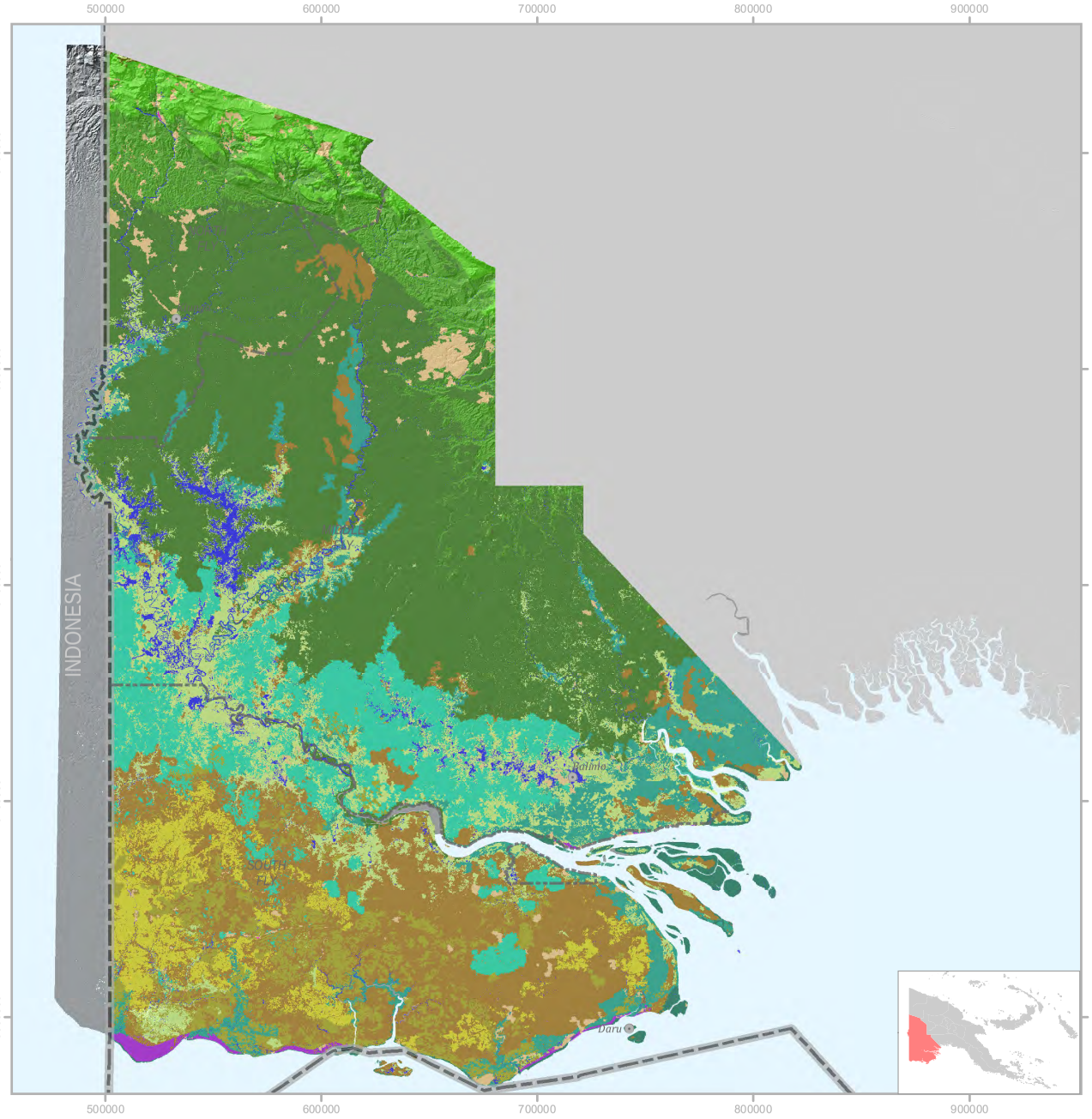
Description

Vatica a large canopy tree with crooked or straight cylindrical bole less buttressed. Outer bark is grey - black, rough, scaly or flaky and inner bark blaze pale brown or pale brown, fibrous. Exudate: colourless and non-sticky. Leaves: spiral, simple, broad, upper surface f is green and underneath is pale green. Flowers: small yellow flowers with distinct sepals and petal whorls. Fruit/Seed; narrow (ovoid), brown in colour, fleshy and contains one seed.

Tree	Bark	Leaf/Leaves
	 	

Note:	Flower	Fruit/Seed
Short description was from the PNG Plant database website (link below) http://www.pngplants.org/PNGtrees/Tree Descriptions Photo source: (tree, bark, leaves and flowers): KDamas, Senior Botanist, FRI, Lae, Morobe Province		 Source: https://www.mybis.gov.my/sp/43945

VEGETATION AND LAND COVER MAP OF WESTERN PROVINCE (2012 FOREST BASEMAP VERSION 1.1)



Land Use and Land Cover Classes

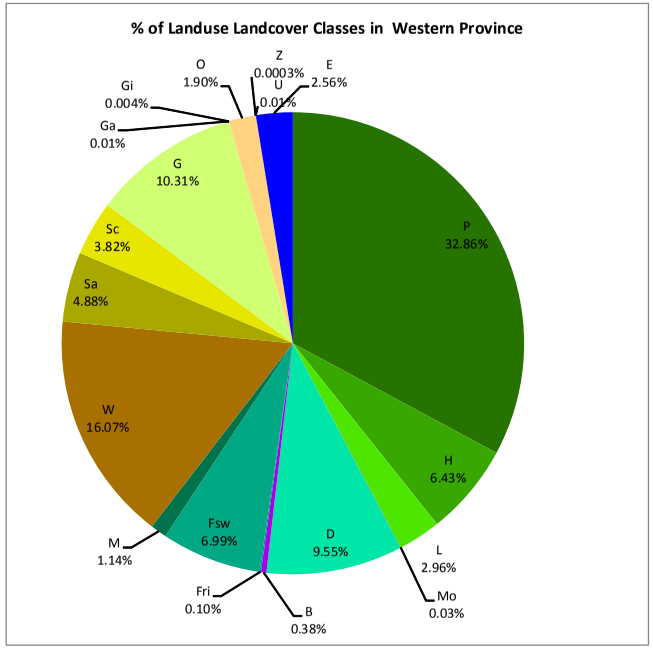
P: Low Altitude Forest on Plains & Fans	D: Dry Seasonal Forest	Sa: Savanna	O: Agriculture Land Use
H: Low Altitude Forest on Uplands	Fri: Seral Forest	Sc: Scrub	Z: Bare areas
L: Lower Montane Forest	Fsw: Swamp Forest	G: Grassland	U: Settlement & larger urban centres
Mo: Montane Forest	M: Mangrove	Ga: Alpine grassland	E: Lakes & larger rivers
B: Littoral Forest	W:Woodland	Gi: Subalpine grassland	

N

1 cm = 30 km

0 30 60 90

Kilometers

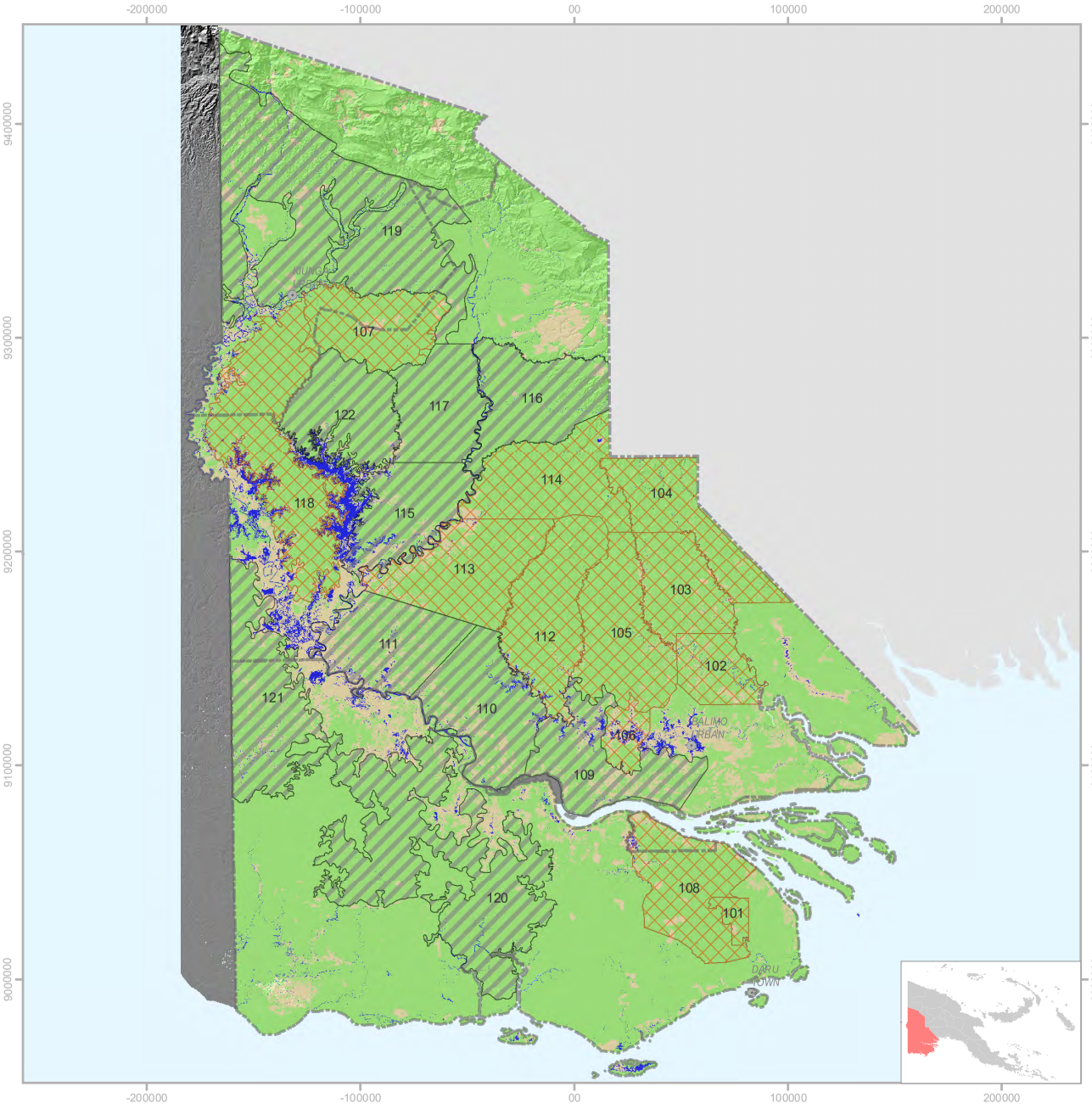


Pie Chart showing percentage in Landuse, Landcover of Western Province.

% of Landuse Lancover			
Code	Middle Fly	North Fly	South Fly
P	48.27%	48.31%	0.34%
H	5.73%	22.30%	0.01%
L	0.72%	16.88%	
Mo		0.18%	
D	12.15%		9.92%
B	0.02%		1.15%
Fri	0.19%		0.01%
Fsw	9.43%	2.40%	5.17%
M	0.26%		2.66%
W	4.61%	0.44%	42.52%
Sa	0.24%		14.89%
Sc			11.96%
G	13.15%	3.31%	9.00%
Ga		0.06%	
Gi		0.02%	
O	1.55%	4.34%	1.30%
Qf			
Z			0.001%
U		0.02%	0.01%
E	3.70%	1.75%	1.06%
Land Area (ha)	5,143,184.50	1,499,777.58	3,129,175.46

Table showing percentage in Landuse, Landcover of Districts in Western Province. Percentage calculated from area in hectares.

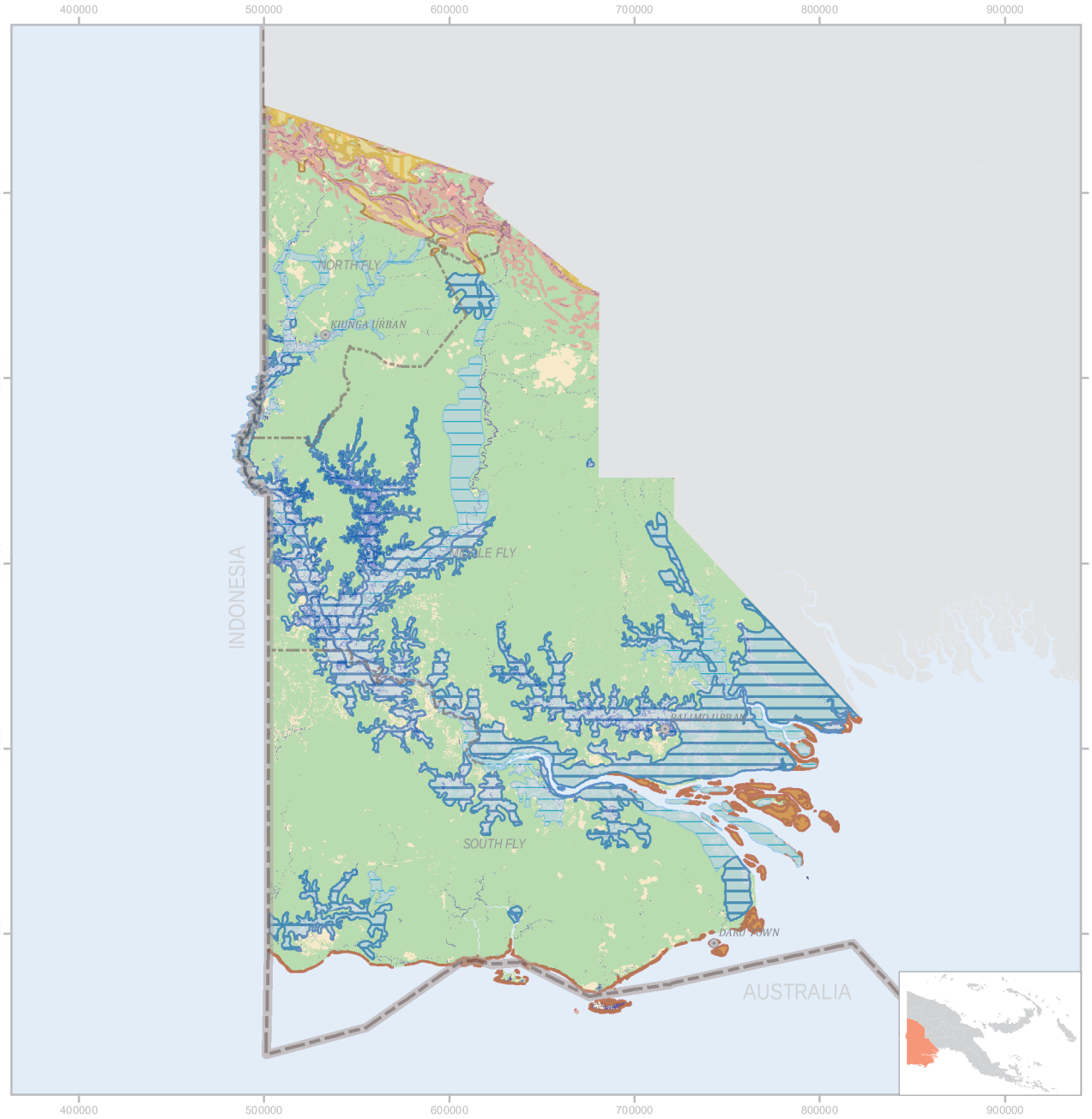
TIMBER CONCESSION MAP OF WESTERN PROVINCE



PLAN_ID	NAME	AREA	CONSTYPE	STATUS
105	Makapa	255748.53	TRP	Concession
101	Waimare (Oriomo)	24834.81	TRP	Concession
104	Wawoi Guavi Block 3	207180.80	TRP	Concession
102	Wawoi Guavi Block 1	108665.22	TRP	Concession
103	Wawoi Guavi Block 2	172364.77	TRP	Concession
106	SEMABO	54222.18	FMA	Concession
108	Wipim Tapila FMA	243851.36	FMA	Concession
107	EAST AWIN	202294.67	FMA	Concession
113	KAMULA DOSO Block 2	265906.92	FMA	Concession
112	KAMULA DOSO Block 1	268785.97	FMA	Concession
114	KAMULA DOSO Block 3	257962.38	FMA	Concession
116	Nomad Strickland	238571.85	PFD	Proposed
111	Fly Block 2	227278.20	PFD	Proposed
115	Lake Murray Block 1	202639.10	PFD	Proposed
117	Lake Murray Block 2	197683.51	PFD	Proposed
110	Fly Block 1	263291.40	PFD	Proposed
109	Balimo Fly	237716.29	PFD	Proposed
120	Morehead / Suki Block 1	589211.95	PFD	Proposed
121	Morehead / Suki Block 2	297385.42	PFD	Proposed
119	Ningerum	723666.12	PFD	Proposed
122	East Awin Extension	211003.41		Proposed
118	Kiunga-Aiambak TA	394751.45	TA	Concession

Table showing Timber Concession for Western Province.
Information updated as at 2016.

CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, WESTERN PROVINCE



Key

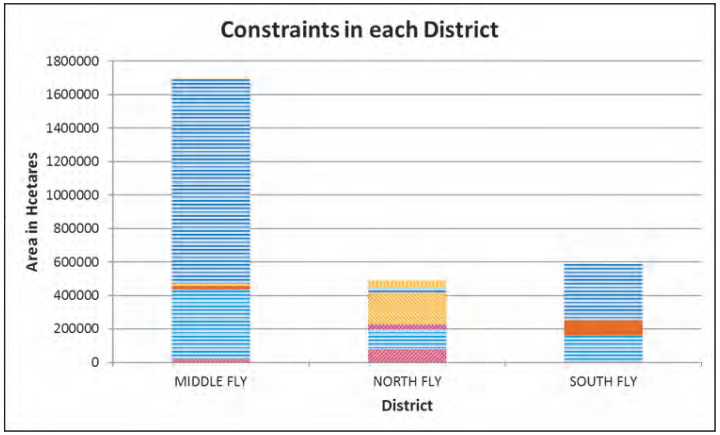
- Extreme Altitude
- Extreme Slope
- Serious Slope
- Extreme Karst
- Extreme Inundation
- Serious Inundation
- Mangrove
- Forest including Forest Plantations
- Other Landuse & Land Cover
- Lake & Larger Rivers

N

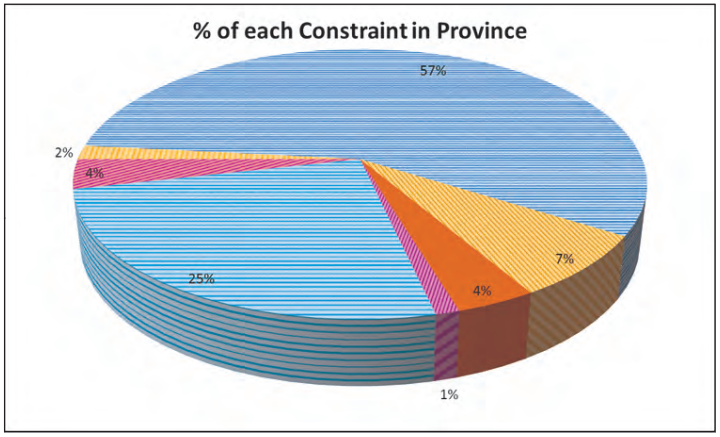
1 cm = 35 km

0 35 70 105 Kilometers

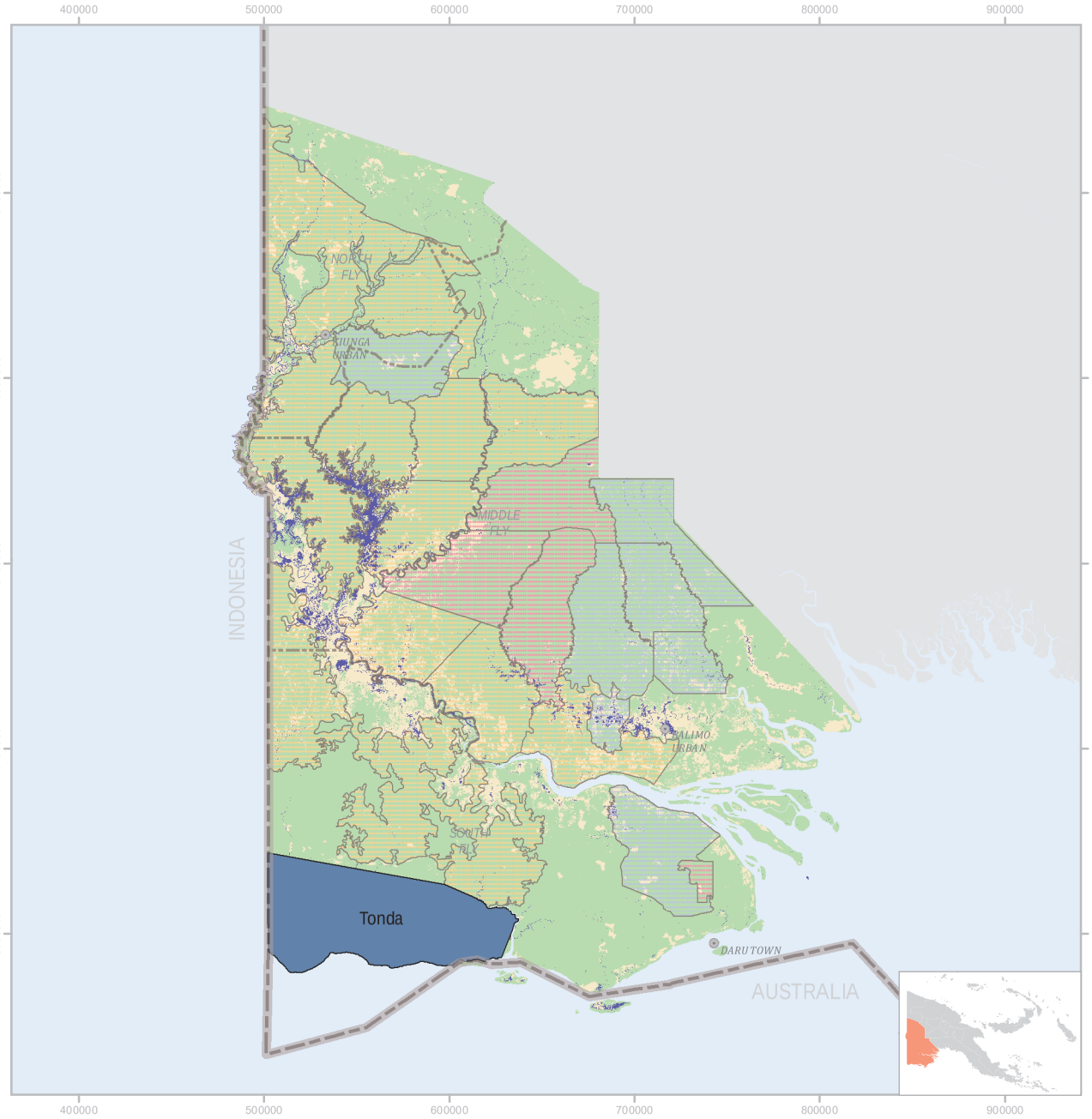
Brief Report on Logging Constraints of Western Province



Western Province is predominantly constrained by inundation ('Serious Inundation' and 'Extreme Inundation'). Although, the constrained areas cover a tiny fraction of the total land area in the province. The 'Extreme Altitude', 'Serious slope' and 'Extreme Slope' make up the remaining percentage of constrained areas, all of which are found in the North Fly district of the province (except for Mangroves, which are found along the coastline and up the Fly River). Both the Middle Fly and South Fly Districts have the majority of the inundated areas and mangroves.



TERRESTRIAL PROTECTED AREAS, WESTERN PROVINCE



Key

	Concessions	Forest Base Map Class
Terrestrial Protected Area	Current	Forest including Forest Plantations
	Expired	Other Landuse & Land Cover
	Proposed	Lake & Larger Rivers

N

1 cm = 35 km

0 35 70 105 Kilometers

Information on Terrestrial Protected Areas in Western Province

Name	Tonda WMA
Protected Area ID	50
Protected Area Type	Wildlife Management Area
Province	Western
Location	Tonda
Area (ha)	610, 937
Longitude	141° 32' 47" E
Latitude	9° 1' 59" S

2. Gulf Province

General information/Overview

1. **Location**

Gulf Province is located on the south coast of the mainland of PNG; Gulf of Papua. There are six major rivers that flows into one large delta of islands, swamps and channels and dominated by limestone.

Provincial Administration Centre:	Kerema
Land area:	3, 471, 860 ha
Population:	158, 197 (2011)
Number of District:	2 (Kerema, Kikori)
Number of Local Level Governments (LLGs):	10 LLGs

2. **Forest Information**

Forest Area:	3, 246, 068 ha

Provincial Tree

The provincial tree is 'Sandalwood' (scientifically known as *Santalum macgregorii)* and is commonly found in seasonally dry, evergreen savannah woodlands and grasslands, with occasional occupation of riparian semi-deciduous thickets and rainforest habitats.

Significance of Provincial tree:

It is highly valued for its fragrant heartwood oils which are highly sought after by the world markets for cosmetics and religious uses/occasions and one of the precious non-timber forest products.

Sandalwood is a rare species and can only be found in 3 provinces in the Southern region of PNG. The local people plant the tree around the houses as ornaments and to mark/demarcate boundaries while allowing it to mature for future monetary benefits.

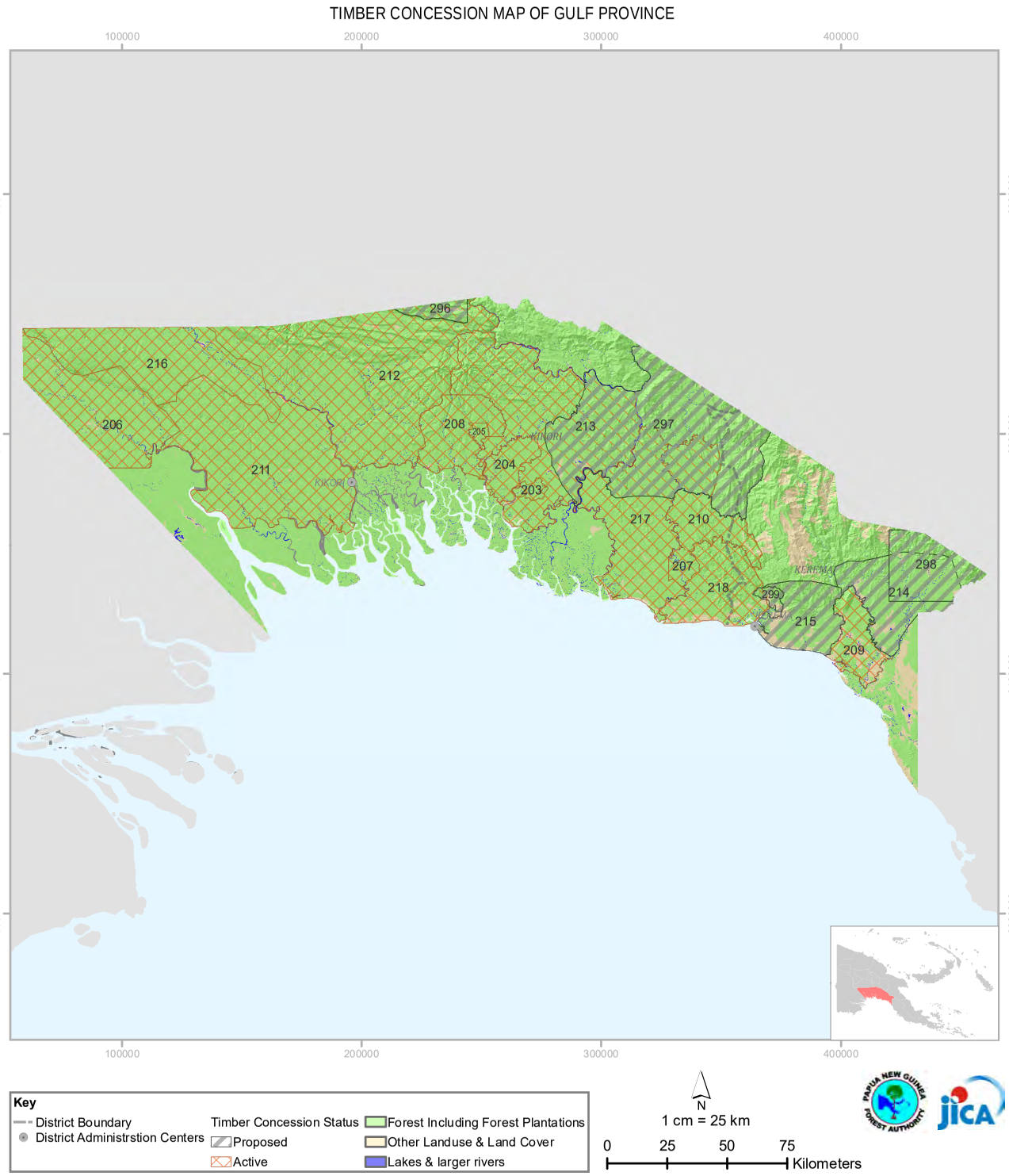
Scientific name: *Santalum macgregorii*	Family: *Santalaceae*	Common Name/Trade name: *Sandalwood*

Description

A small to medium sized tree and a multi-stemmed with short, crooked boles with open crowns. Outer bark is rough, moderately tessellated bark. Inner bark yellow to red, under bark is pale yellow to white. Leaves: light green leaves in opposite pairs that tend to be drooping Flowers: small with four greenish-white/pink flower parts. Fruit/Seed; fruit is green when immature and red when it matures. Seeds: single seed; smooth and light brown.

Tree	Bark	Leaf/Leaves
 Source: http://phytoimages.siu.edu/imgs/paraman1/r/Santalaceae_Santalum_macgregorii_76930.html	 Source: http://www.phytoimages.siu.edu/imgs/paraman1/r/Santalaceae_Santalum_macgregorii_77007.html	 Source: http://www.phytoimages.siu.edu/imgs/paraman1/r/Santalaceae_Santalum_macgregorii_77007.html

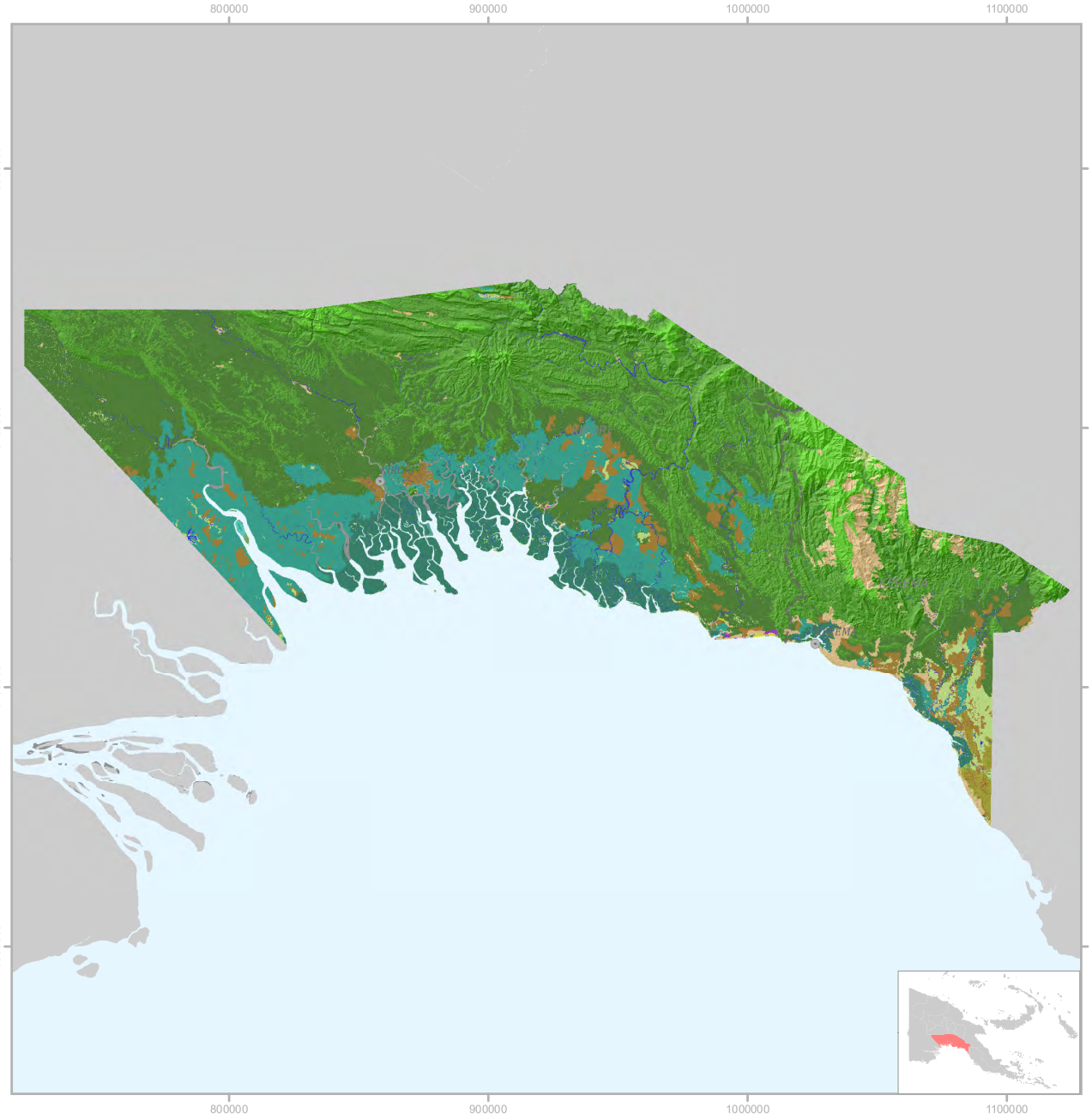
Note:	Flower	Fruit/Seed
Short description was from a different source. Source: a). Flowering shoot http://phytoimages.siu.edu/imgs/paraman1/r/Santalaceae_Santalum_macgregorii_76990.html Source: a) Fruit Page T, Sandalwood seed collection & preparation, Technical note, ACAIR (2017)	  Source: http://www.fiapng.com/Nursery_techniques.pdf	  Source: http://www.fiapng.com/Nursery_techniques.pdf

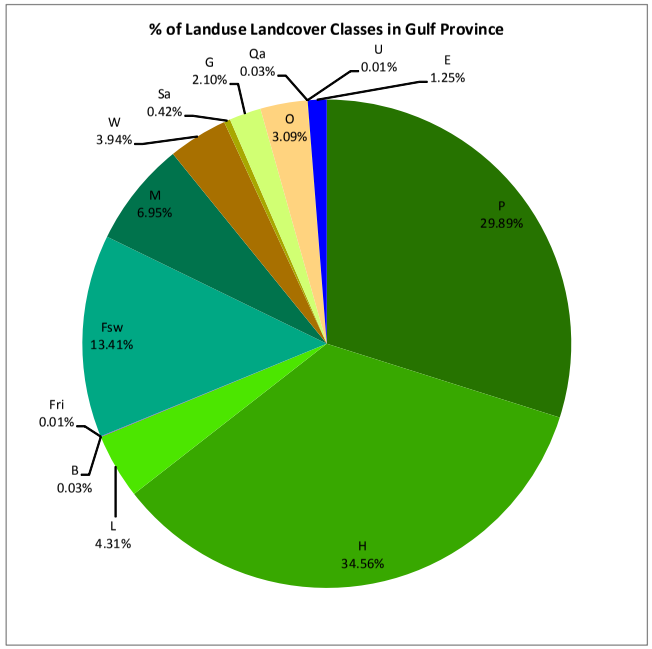


PLAN_ID	NAME	AREA (ha)	CONCESSION TYPE	STATUS
210	Vailala Blk 2	101,892.12	FMA	Concession
208	East Kikori	83,168.00	TRP	Concession
209	Tauri Meporo	54,167.70	TRP	Concession
206	Turama	185,669.81	TRP	Concession
211	TURAMA BLOCK 1	335,930.18	FMA	Concession
216	HEKIKO FMA	195,459.95	TA	Concession
217	Vailala Blk 3	195,414.81	FMA	Concession
207	VAILALA	14,465.09	TRP	Concession
203	EIA RIVER	8,036.56	TRP	Concession
204	PIE Era	37,328.96	TRP	Concession
205	IOWA RIVER	5,731.64	TRP	Concession
214	Kakoro	127,518.88	proposed	Proposed
215	Meporo(Malalaua)	78,710.91	Proposed	Proposed
212	Kikori Block 2	442,792.99	FMA	Concession
218	Vailala Blk 1	103,822.65	TRP	Concession
213	Baimuru blk 3	320,730.13	FMA	Concession
296	Polopa	18,911.80		Proposed
298	Bulldog_oilpalm	87,618.59		Proposed
297	Vailala_Purari_oilpalm	390,291.52		Proposed
299	Vailala Blk 1ext	7,351.67		Proposed

Table showing Timber Concessions of Gulf Province.
Information updated as at 2016.

VEGETATION AND LAND COVER MAP OF GULF PROVINCE (2012 FOREST BASEMAP VERSION 1.1)



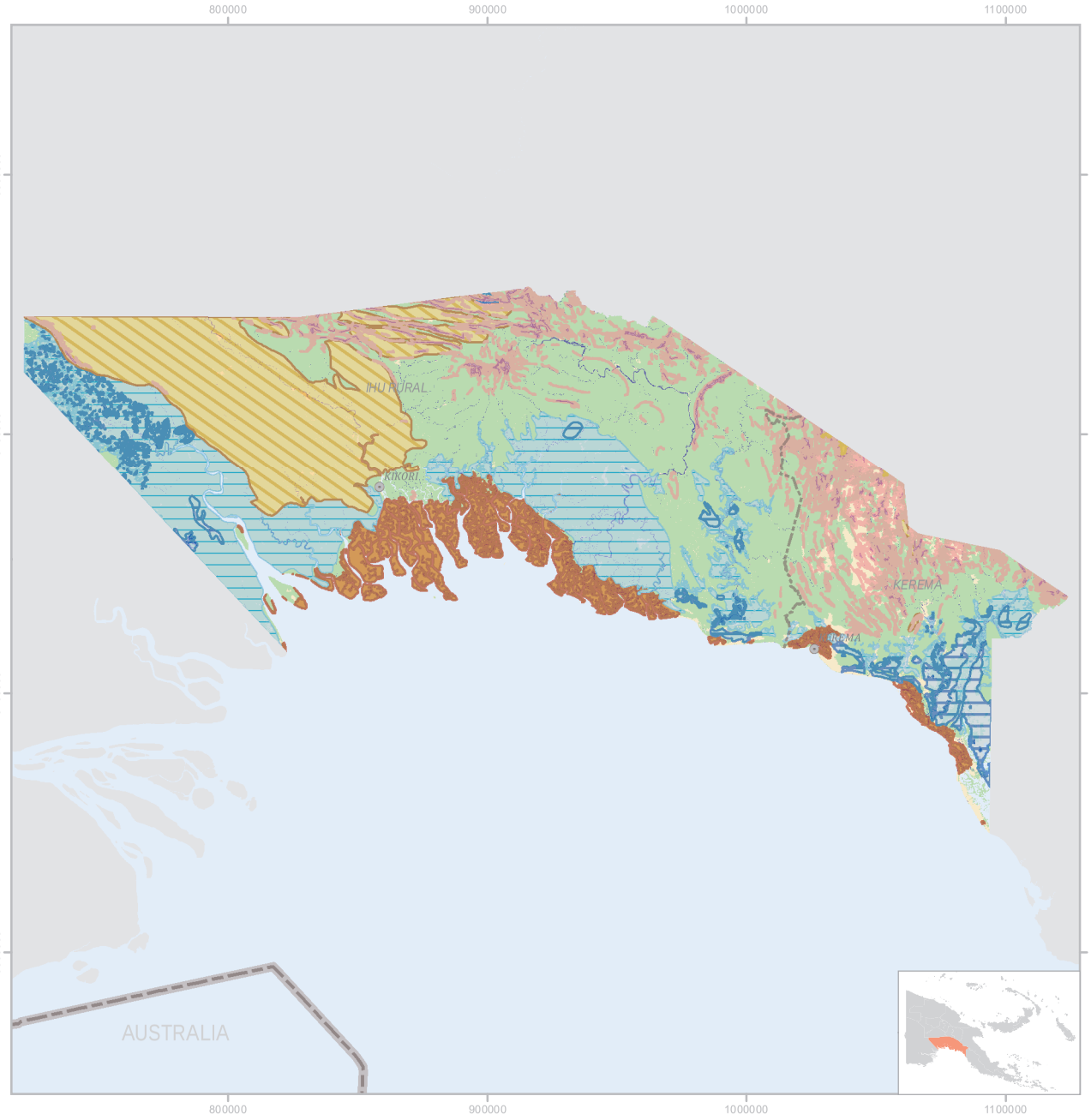


Pie Chart showing percentage in Landuse, Landcover of Gulf Province.

% of Landuse Lancover		
Code	**Kerema**	**Kikori**
P	13.54%	34.57%
H	38.16%	34.10%
L	14.32%	1.70%
B		0.04%
Fri		0.01%
Fsw	1.68%	16.51%
M	2.97%	7.23%
W	6.90%	3.17%
Sa	2.00%	
G	6.44%	0.89%
O	12.96%	0.45%
Qa		0.04%
U	0.01%	0.003%
E	1.01%	1.30%
Land Area (ha)	723,635.17	2,708,452.04

Table showing percentage in Landuse, Landcover of Districts in Gulf Province. Percentage calculated from area in hectares.

CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, GULF PROVINCE



Key

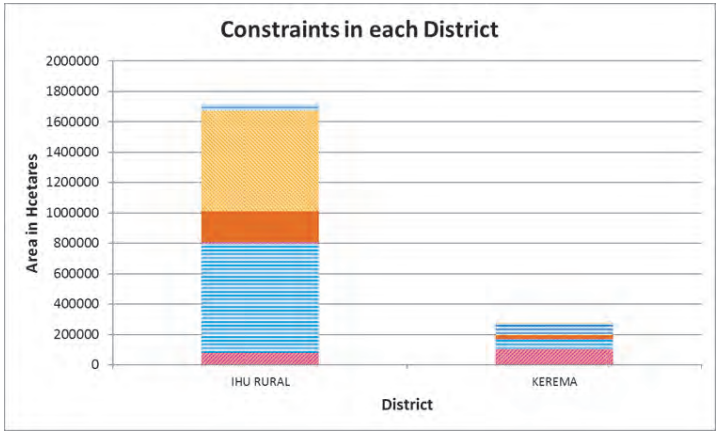
- Extreme Altitude
- Extreme Slope
- Serious Slope
- Extreme Karst
- Extreme Inundation
- Serious Inundation
- Mangrove
- Forest including Forest Plantations
- Other Landuse & Land Cover
- Lake & Larger Rivers

N

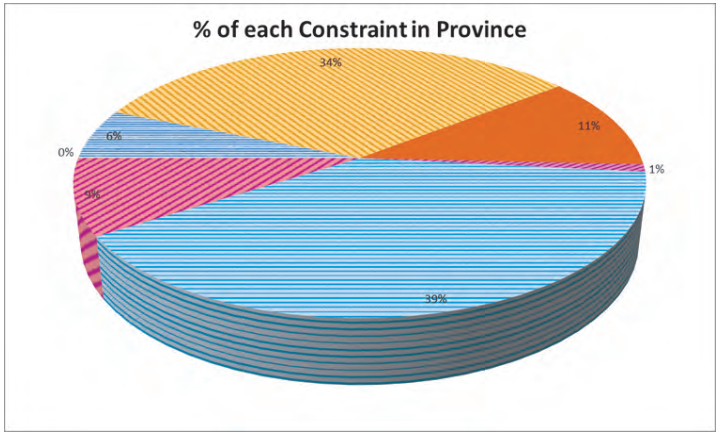
1 cm = 25 km

0 25 50 75 Kilometers

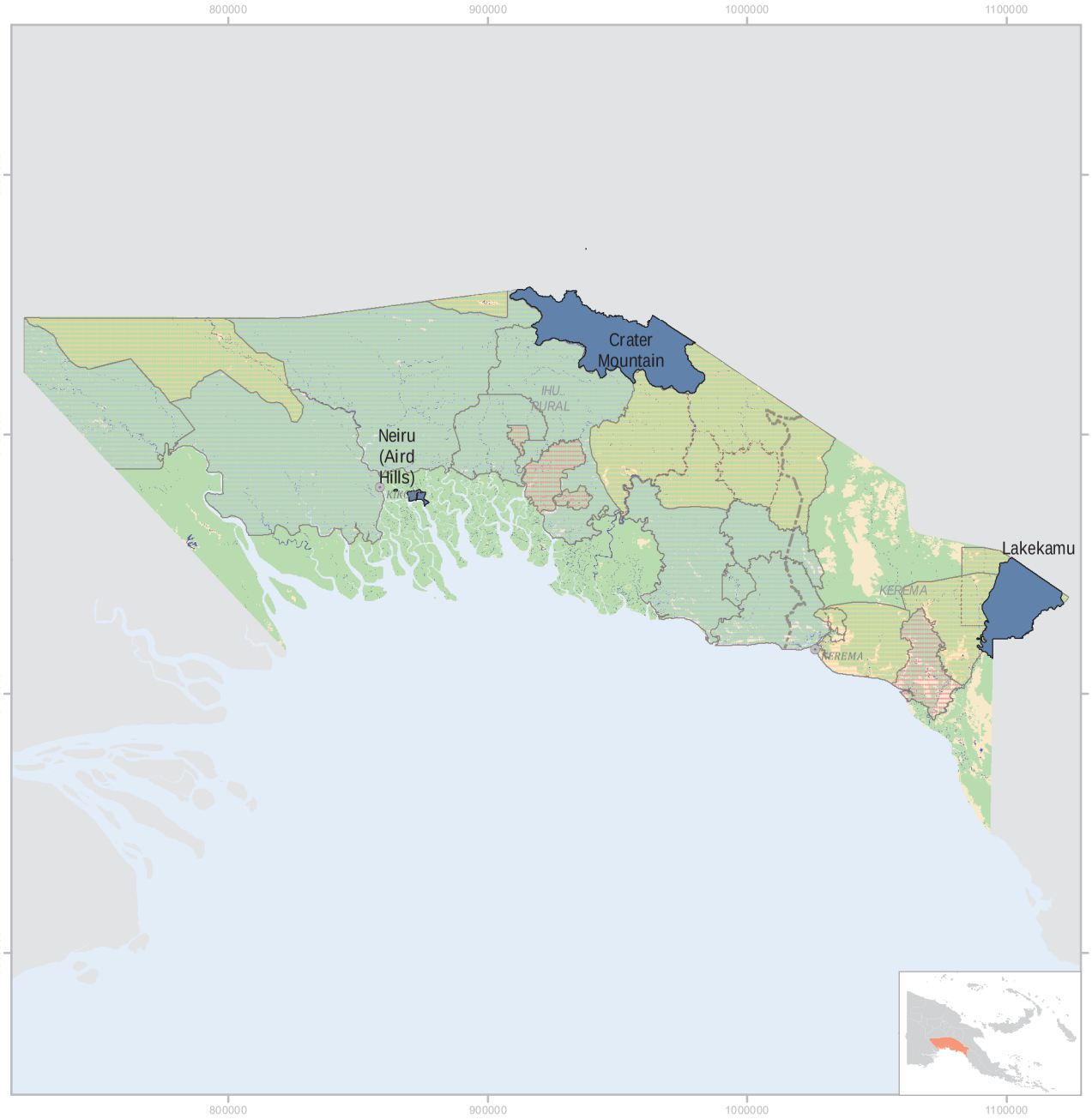
Brief Report on Logging Constraints of Gulf Province



Of the two districts in Gulf Province, Ihu Rural has the largest land area and the highest fraction of constrained areas, with Kerema accounting for about less than half of the total constrained areas. The predominant constraints found throughout the province include 'Extreme Karst', 'Serious Inundation', 'Extreme Inundation' areas and Mangroves. The province shares its northern borders with the Highlands Region; however, it has a general lack of high-altitude areas and is filled with slope areas in the northern part of the province.



TERRESTRIAL PROTECTED AREAS, GULF PROVINCE



Key

	Concessions	Forest Base Map Class
Terrestrial Protected Area	Current	Forest including Forest Plantations
	Expired	Other Landuse & Land Cover
	Proposed	Lake & Larger Rivers

N

1 cm = 25 km

0 25 50 75 Kilometers

Information on Terrestrial Protected Areas in Gulf Province

Name	Crater Mountain WMA
Protected Area ID	7
Protected Area Type	Wildlife Management Area
Province	Gulf
Location	Crater Mountain
Area (ha)	130958
Longitude	145° 3' 49"E
Latitude	7° 6' 19" S
Name	**Lakekamu Proposed CA**
Protected Area ID	<NA>
Protected Area Type	Conservation Area
Province	Gulf
Location	Lakekamu
Area (ha)	61, 838
Longitude	146° 27' 49" E
Latitude	8° 12' 31" S
Name	**Neiru (Aird Hills)WMA**
Protected Area ID	34
Protected Area Type	Wildlife Management Area
Province	Gulf
Location	Neiru (Aird Hills)
Area (ha)	2, 460
Longitude	144° 22' 20" E
Latitude	8° 33' 35" S

Note:

A) Lakekamu Conservation Area is located in three different provinces:

1. Central => 66, 674 ha
2. Gulf => 61, 838 ha
3. Morobe => 37, 121 ha

Total Area: 165, 633 ha

B) Crater Mountain Wildlife Management Area is located in three different provinces:

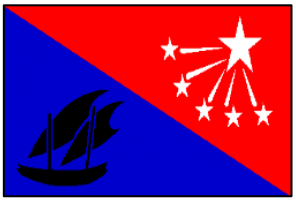
1. Chimbu
=> 89, 928 ha

2. Eastern Highlands
=> 52, 848 ha

3. Gulf
=> 130, 958 ha

Total Area: 273, 734 ha

3. Central Province



General information/Overview

1. Location

Central Province is located in the south coast of mainland of PNG, it shares the border with Northern (Oro) Province, the rugged Owen Stanley Range.

Provincial Administration Centre:	Konedobu (Port Moresby)
Land area:	2, 955, 783 ha
Population:	269, 756 (2011)
Number of District:	4 (Abau, Goilala, Kairuku-Hiri, Rigo)
Number of Local Level Governments (LLGs):	13 LLGs

2. Forest Information

Forest Area:	2, 503, 069 ha

Provincial Tree

The provincial tree is 'Rosewood' (scientifically known as *Pterocarpus indicus)* and is commonly found in Low Altitude Forest on Plains and Fans

Significance of Provincial tree:

It is a valuable hard wood species (durability and quality; colour) and is a banned species for export in round log form but can be processed (timber) for domestic use and export as well. Rosewood is used by the people of Central to make kundu drums (traditional instrument) which is mainly used in traditional dances/singsing during bride price (ceremony where the groom's family give food or traditional money to the bride's family) and other special occasions. It is also used for carvings and other artefacts by the people. The sap is used as herbal remedy/medicine for coughs.

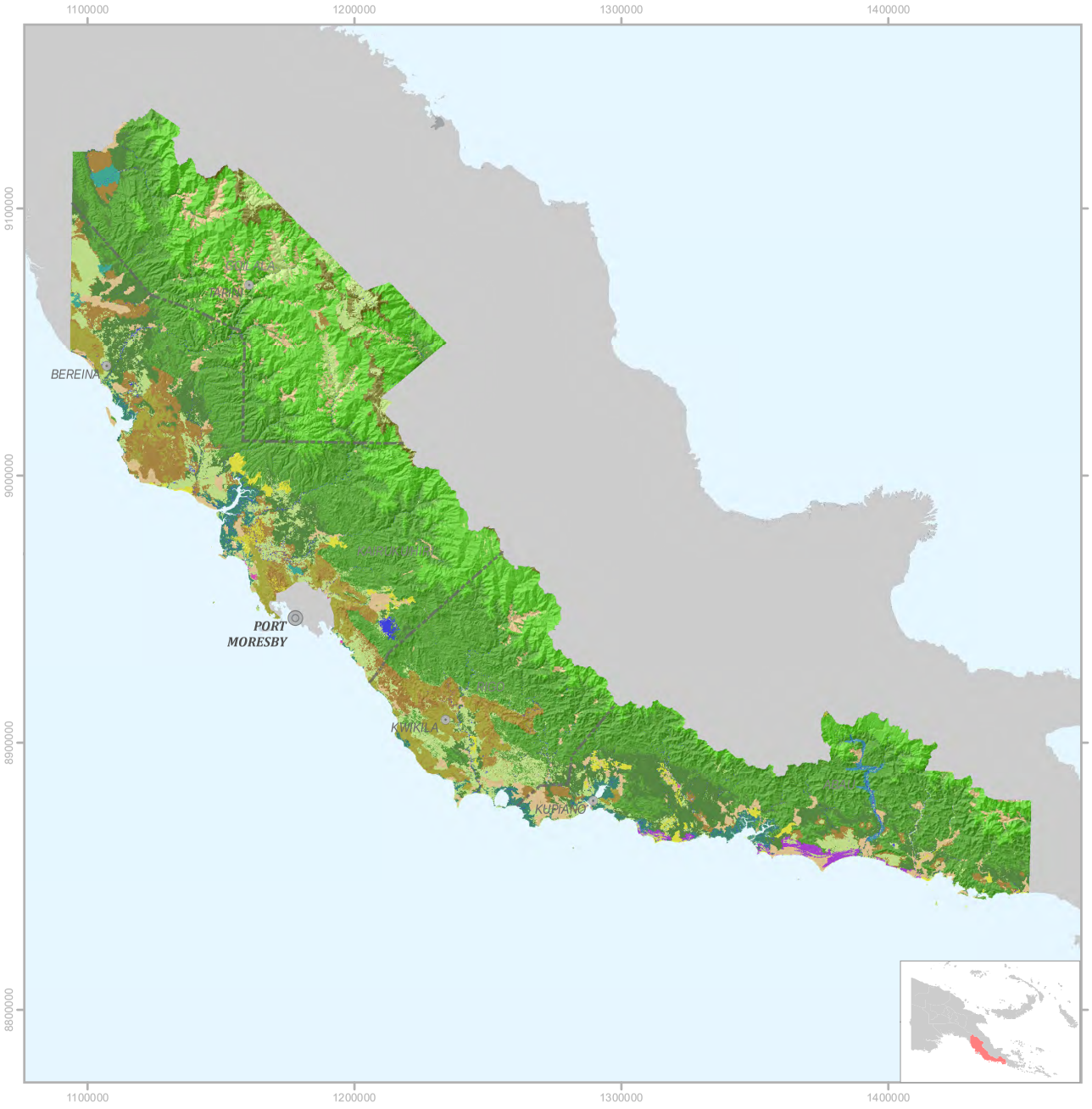
Scientific name: *Pterocarpus indicus*	Family: *Fabaceae*	Common Name/Trade name: *Rosewood*

Description

A large canopy tree with crooked or straight cylindrical bole and has a buttress. Outer bark is brownish grey, rough, scaly or flaky. Inner bark blaze white or slightly pink and dark red sticky sap. Leaves: compound pinnate (two or more pairs of leaflets), upper surface of leaf is green and underneath is pale green. Flower: l yellow or yellowish orange flower. Fruit: winged, flattened green when immature, brown when mature. Seeds: one to four seeds and winged (fruit with a thickened central seed-bearing part and a surrounding stiff membranous wing); easily dispersed by the wind.

Tree	Bark	Leaf/Leaves
 Source: http://tropical.theferns.info/viewtropical.php?id=Pterocarpus+indicus	 Source: https://www.google.com/search?q=pterocarpus+indicus+bark&tbm=isch&source  Photo source: KDamas, Senior Botanist, FRI, Lae, Morobe Province	 Source: http://tropical.theferns.info/viewtropical.php?id=Pterocarpus+indicus
Note: Short description was from the PNG Plant database website (link below) http://www.pngplants.org/PNGtrees/TreeDescriptions	Flower	Fruit/Seed
	 Source: *https://www.dreamstime.com/stock-image-pterocarpus-indicus-blooming-tree-image40129141*	 Photo source: KDamas, Senior Botanist, FRI, Lae, Morobe Province

VEGETATION AND LAND COVER MAP OF CENTRAL PROVINCE (2012 FOREST BASEMAP VERSION 1.1)



Land Use and Land Cover Classes

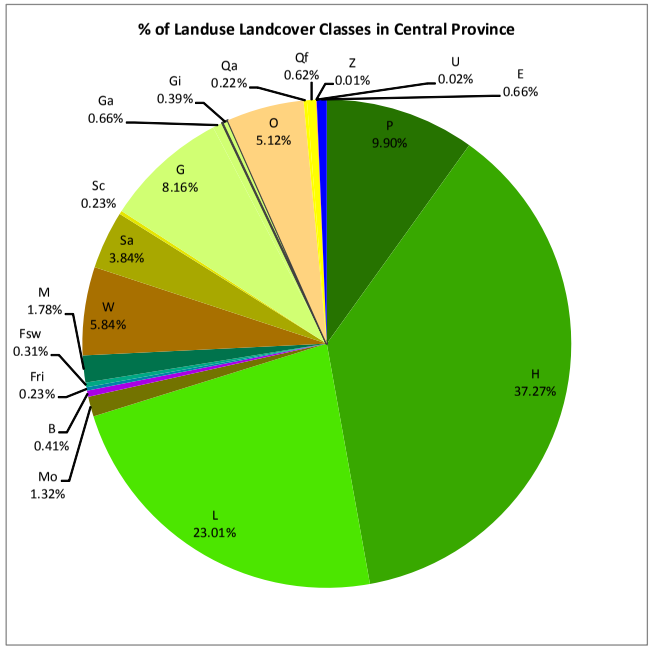
P: Low Altitude Forest on Plains & Fans	Fri: Seral Forest	Sc: Scrub	Qa: Agriculture Plantation
H: Low Altitude Forest on Uplands	Fsw: Swamp Forest	G: Grassland	Qf: Forest Plantation
L: Lower Montane Forest	M: MangroveM: Mangrove	Ga: Alpine grassland	Z: Bare areas
Mo: Montane Forest	W:Woodland	Gi: Subalpine grassland	U: Settlement & larger urban centres
B: Littoral Forest	Sa: Savanna	O: Agriculture Land Use	E: Lakes & larger rivers

N

1 cm = 24 km

0 24 48 72

Kilometers

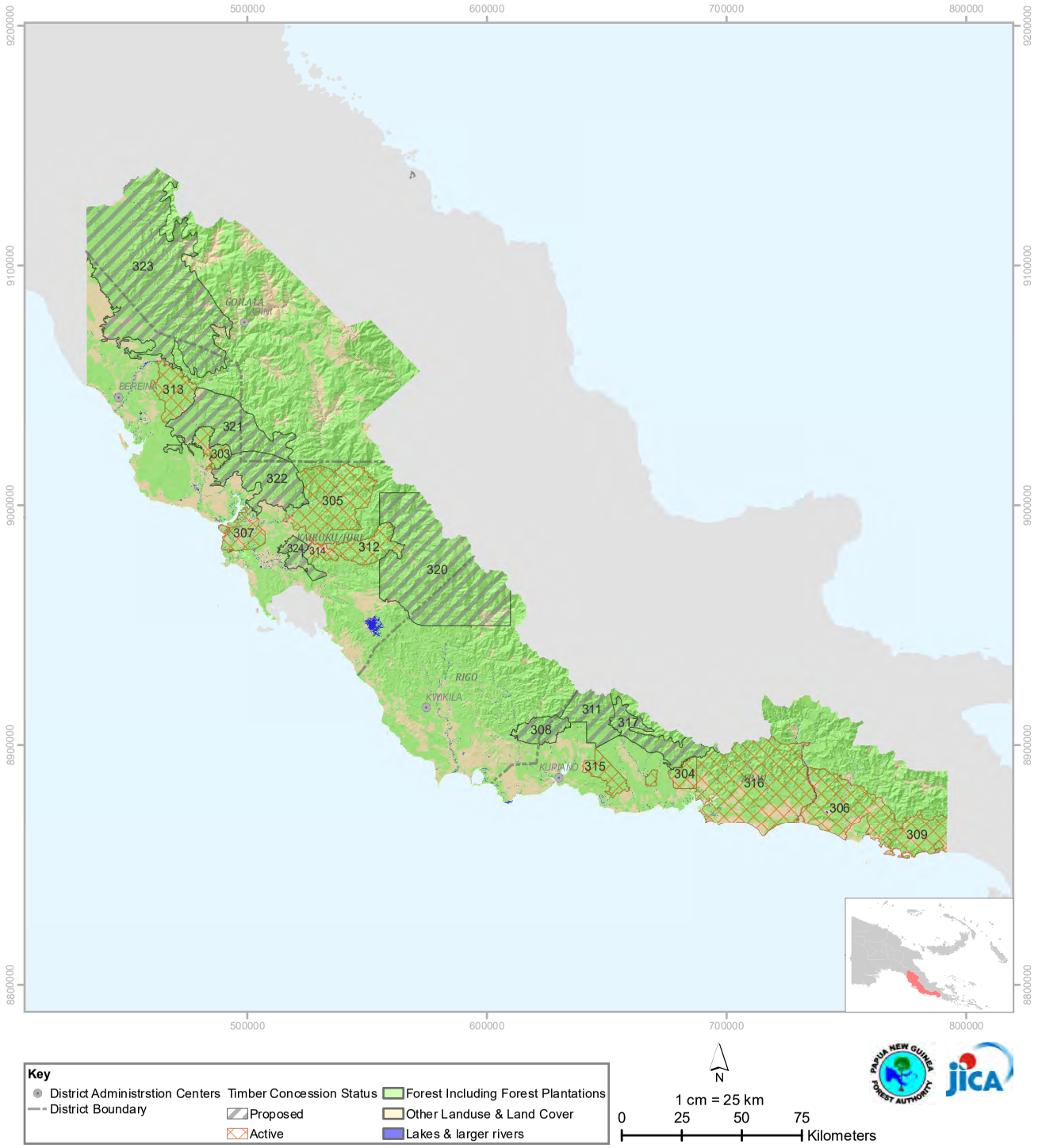


Pie Chart showing percentage in Landuse, Landcover of Central Province.

% of Landuse Lancover				
Code	**Abau**	**Goilala**	**Kairuku Hiri**	**Rigo**
P	19.19%	2.49%	12.23%	4.16%
H	46.63%	25.14%	36.14%	45.73%
L	11.08%	51.48%	12.64%	15.53%
Mo	0.01%	4.65%	0.21%	0.10%
B	1.71%			
Fri	0.96%			
Fsw		0.73%	0.35%	
M	3.05%		2.13%	0.83%
W	2.60%	1.33%	11.13%	7.58%
Sa	0.19%		6.37%	10.24%
Sc	0.02%		0.68%	
G	5.60%	3.72%	11.80%	11.94%
Ga	0.04%	2.45%	0.01%	
Gi	0.01%	1.44%	0.03%	
O	6.62%	6.35%	3.89%	3.19%
Qa	0.60%		0.13%	0.20%
Qf	1.01%		1.14%	0.02%
Z	0.01%			
U	0.02%		0.02%	
E	0.65%	0.21%	1.10%	0.49%
Land Area (ha)	703,794.90	782,154.81	962,527.01	500,630.04

Table showing percentage in Landuse, Landcover of Districts in Central Province. Percentage calculated from area in hectares.

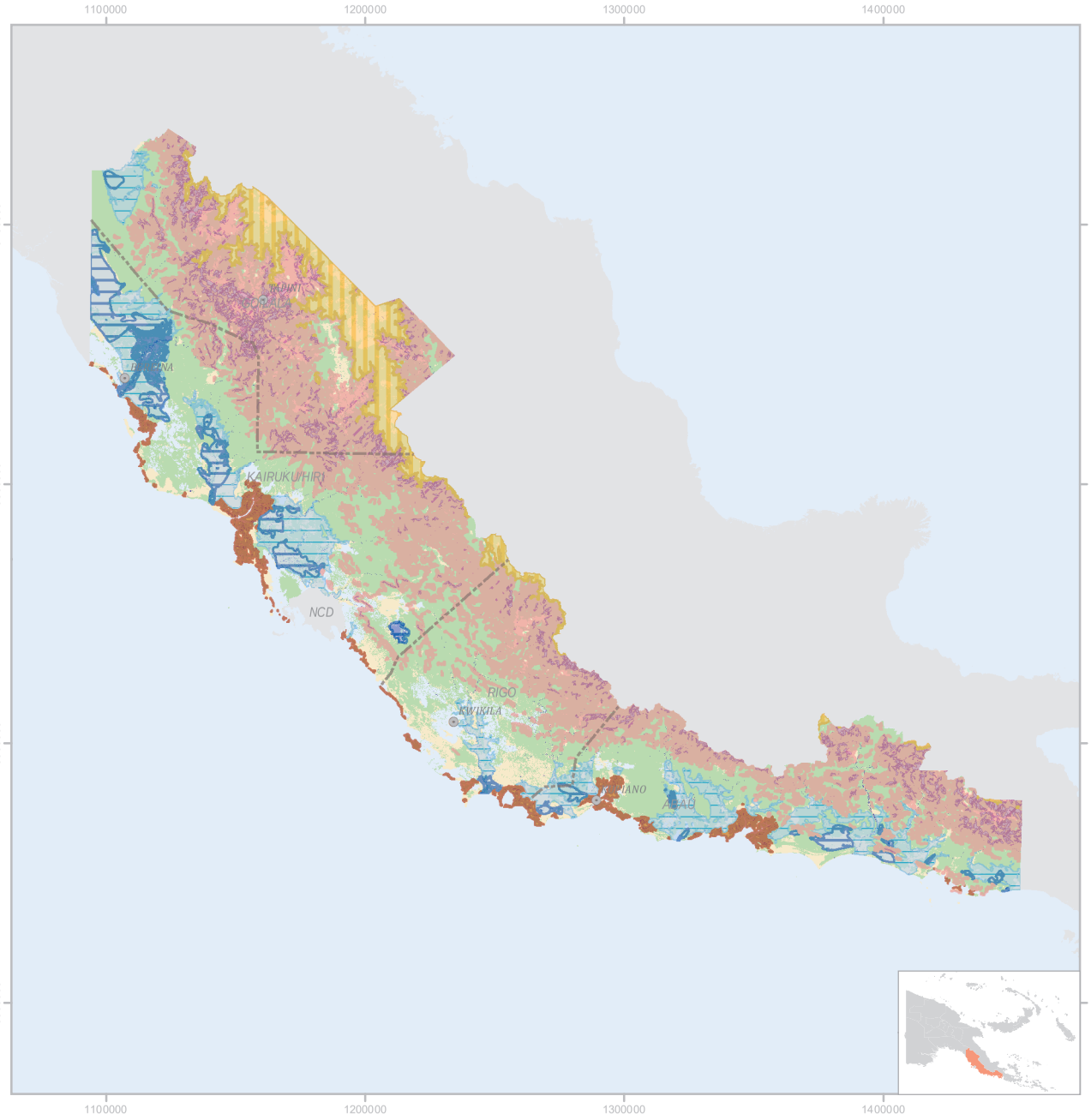
TIMBER CONCESSION MAP OF CENTRAL PROVINCE



PLAN_ID	NAME	AREA (ha)	CONCESSION TYPE	STATUS
313	Ome Ome	27,747.46	TRP	Concession
314	Varagadi FMA	7,000.53	FMA	Concession
316	Cloudy Bay	148,340.29	FMA	Concession
305	North Vanapa TRP	79,144.76	TRP	Concession
312	Edevu TRP	26,688.76	TRP	Concession
304	Ganai	11,489.18	TRP	Concession
303	Iva Inika	13,375.91	TRP	Concession
306	Bonua Magarida	72,004.88	TRP	Concession
309	West Gadaisu TRP	32,835.44	TRP	Concession
307	Gorohu TRP	23,174.54	LFA	Concession
308	Ormand Lako TRP	19,533.07		Proposed
311	Lako Imila LFA	33,504.54		Proposed
322	Transvanapa	57,097.94		Proposed
320	Sogeri / Efogi Timber area	200,892.90		Proposed
324	Brown River Timber Area	13,845.04	TA	Proposed
315	Marshall Lagoon	17,730.66	FMA	Concession
323	Uda Mekeo	297,952.60		Proposed
321	Trans Angabanga	76,545.94		Proposed
317	Amaru	37,087.99		Proposed

Table showing Timber Concessions of Central Province.
Information updated as at 2016.

CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, CENTRAL PROVINCE



Key

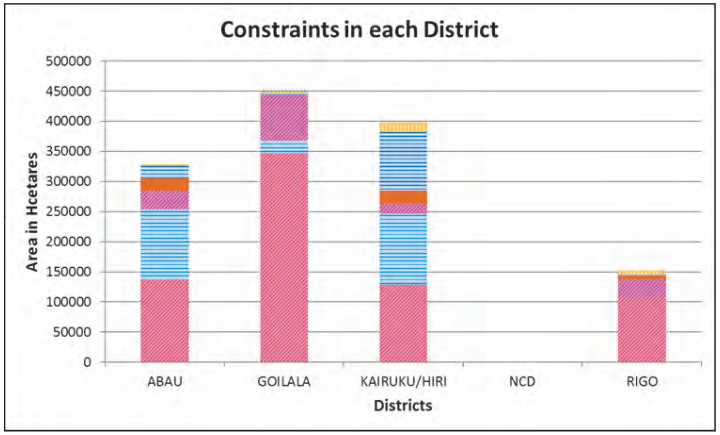
- Extreme Altitude
- Extreme Slope
- Serious Slope
- Extreme Inundation
- Serious Inundation
- Mangrove
- Forest including Forest Plantations
- Other Landuse & Land Cover
- Lake & Larger Rivers

N

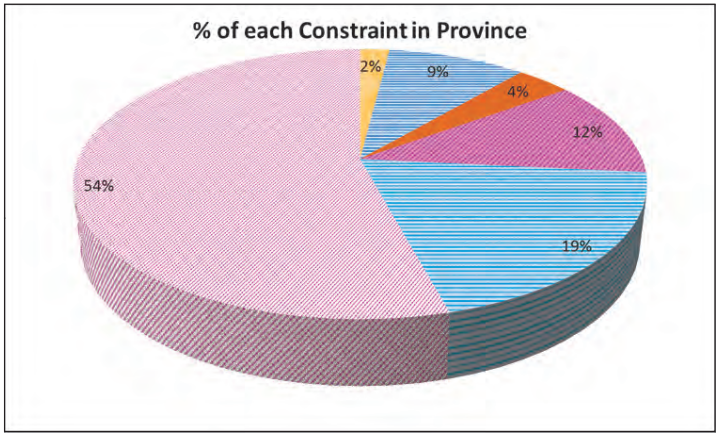
1 cm = 25 km

0 25 50 75 Kilometers

Brief Report on Logging Constraints of Central Province



The majority of the constrained areas in the Central Province are inclined and inundated. The province is bordered by mangroves throughout the coastlines and high altitude areas inland towards the Owen-Stanley Range. The Rigo District has the lowest amount of constrained areas in the province (NCD not included, as it is an urban area), while the other three districts have about the same fraction (of constrained areas) in the province. Most of the inclined areas ('Serious Slope' and 'Extreme Slope') is located in the Goilala District, with Abau, Kairiku-Hiri and Rigo Districts having about equal occurances.



TERRESTRIAL PROTECTED AREAS, CENTRAL PROVINCE

Key

	Concessions	Forest Base Map Class
Terrestrial Protected Area	Current	Forest including Forest Plantations
	Expired	Other Landuse & Land Cover
	Proposed	Lake & Larger Rivers

N

1 cm = 25 km

0 25 50 75 Kilometers

Information on Terrestrial Protected Areas in Central Province

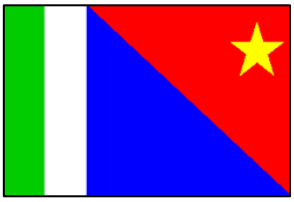
Name	Inaina Proposed WMA
Protected Area ID	<NA>
Protected Area Type	Wildlife Management Area
Province	Central
Location	Inaina
Area (ha)	3, 964
Longitude	147° 1' 14" E
Latitude	9° 6' 35" S
Name	**Iomare WMA**
Protected Area ID	11
Protected Area Type	Wildlife Management Area
Province	Central
Location	Iomare
Area (ha)	3, 923
Longitude	147° 15' 49" E
Latitude	10° 44' 5" S
Name	**Lakekamu Proposed CA**
Protected Area ID	<NA>
Protected Area Type	Conservation Area
Province	Central
Location	Lakekamu
Area (ha)	66, 674
Longitude	146° 32' 2" E
Latitude	8° 1' 40" S
Name	**Namanatabu Res.**
Protected Area ID	31
Protected Area Type	Reserve
Province	Central
Location	Namanatabu
Area (ha)	55
Longitude	147° 21' 1" E
Latitude	10° 35' 49" S
Name	**Variarata Nat. Park**
Protected Area ID	51
Protected Area Type	National Park
Province	Central
Location	Variarata
Area (ha)	1, 028
Longitude	147° 22' 8" E
Latitude	10° 32' 39" S
Name	**Zo-oimaga WMA**
Protected Area ID	53
Protected Area Type	Wildlife Management Area
Province	Central
Location	Zo-oimaga
Area (ha)	1, 472
Longitude	147° 38' 25" E
Latitude	10° 15' 3" S

Note:
Lakekamu Conservation Area is located in three different provinces:

1. Central	2. Gulf	3. Morobe
=> 66, 674 ha	=> 61, 838 ha	=> 37, 121 ha

Total Area: 165, 633 ha

4. Milne Bay Province



General information/Overview

1. Location

Milne Bay Province is southeast of mainland of PNG; it covers the eastern part of the island of New Guinea and as well consist number of large to smaller islands. The landforms of the province from the mainland to the islands consist of mountain ranges, coastal plains, floodplains, limestone and coral atolls.

Provincial Administration Centre:	Alotau
Land area:	1, 416, 666 ha
Population:	276, 512 (2011)
Number of District:	4 (Alotau, Esa'ala, Kiriwinia-Goodenough, Samarai- Murua)
Number of Local Level Governments (LLGs):	16 LLGs

2. Forest Information

Forest Area:	1, 024, 130 ha

Provincial Tree

The provincial tree is 'Ebony' (scientifically known as *Diospyros maritima)* and it is commonly found in Low Altitude Forest on Plains and Fans.

Significance of Provincial tree:

It is a hard wood species, however it is a banned species and not exported in round log form but it is harvested for local use (carved into wooden products).

Ebony is dominant on the islands of Milne Bay and is an important species for the province. Traditionally, the locals used it mainly to carve quality carvings, paddles, furniture & other artefacts. The artefacts are sold is a source of revenue for the local people and given as gifts to other people, guests or dignitaries during special occasions.

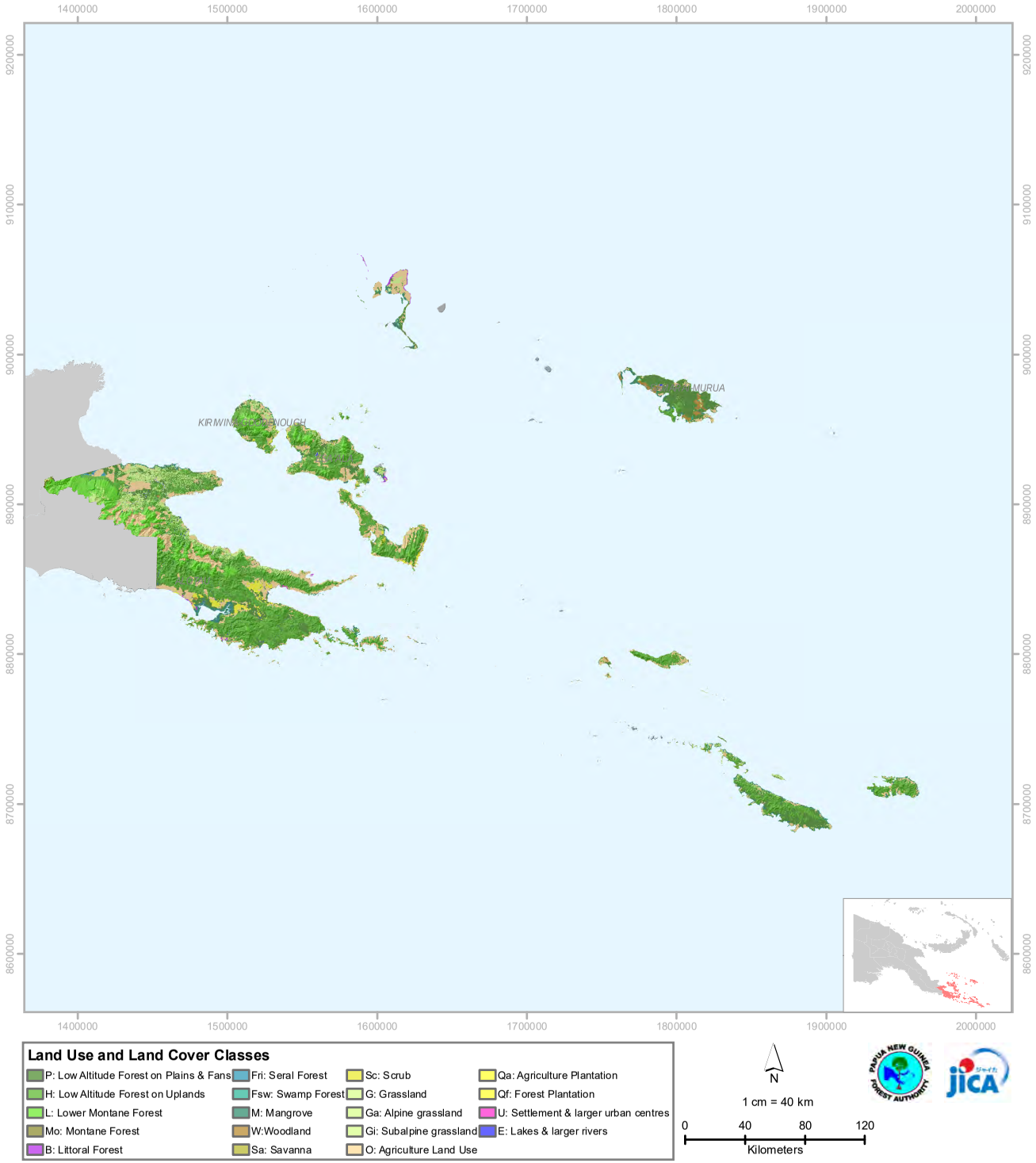
Scientific name: *Diospyros maritima*	Family: *Ebenaceae*	Common Name/Trade name: *Ebony*

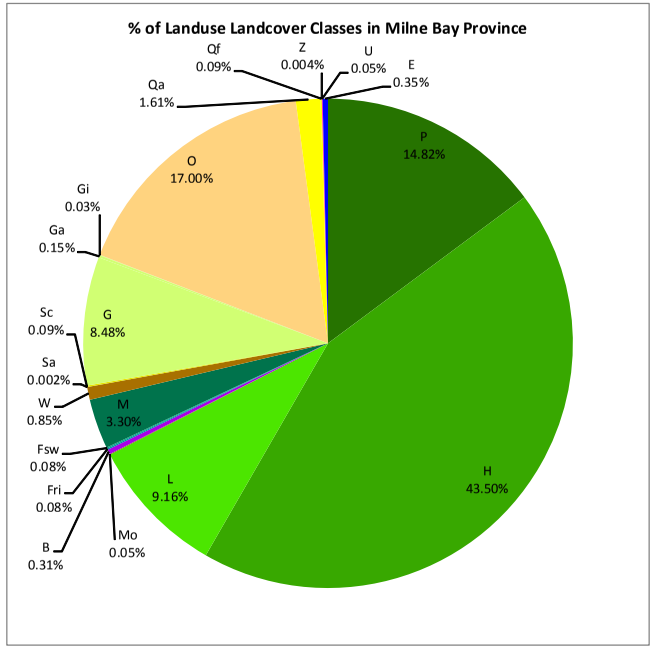
Description

A tree which grows up to 15 metres in height and has a crooked bole. Outer bark is smooth greyish brown and flaking off in scales. Leaves: simple, alternate, upper surface glossy dark green and beneath is green. Flowers: male and female flowers on separate plant, small creamy yellow. Fruit: green-yellow berry when immature then turns orange-red when it matures (ripens). Seeds: have 7-8 seeds which are glossy blackish brown in colour.

Tree	Bark	Leaf/Leaves
 Source: https://www.monaconatureencyclopedia.com/diospyros-maritima/?lang=en	 Source: https://www.monaconatureencyclopedia.com/diospyros-maritima/?lang=en	 Source: http://tropical.theferns.info/viewtropical.php?id=Diospyros+maritima
Note: Short description was from different source.	Flower	Fruit/Seed
	 Source: https://www.naturalmedicinefacts.info/plant/diospyros-maritima.html	 Source: http://tropical.theferns.info/viewtropical.php?id=Diospyros+maritima

VEGETATION AND LAND COVER MAP OF MILNE BAY PROVINCE (2012 FOREST BASEMAP VERSION 1.1)



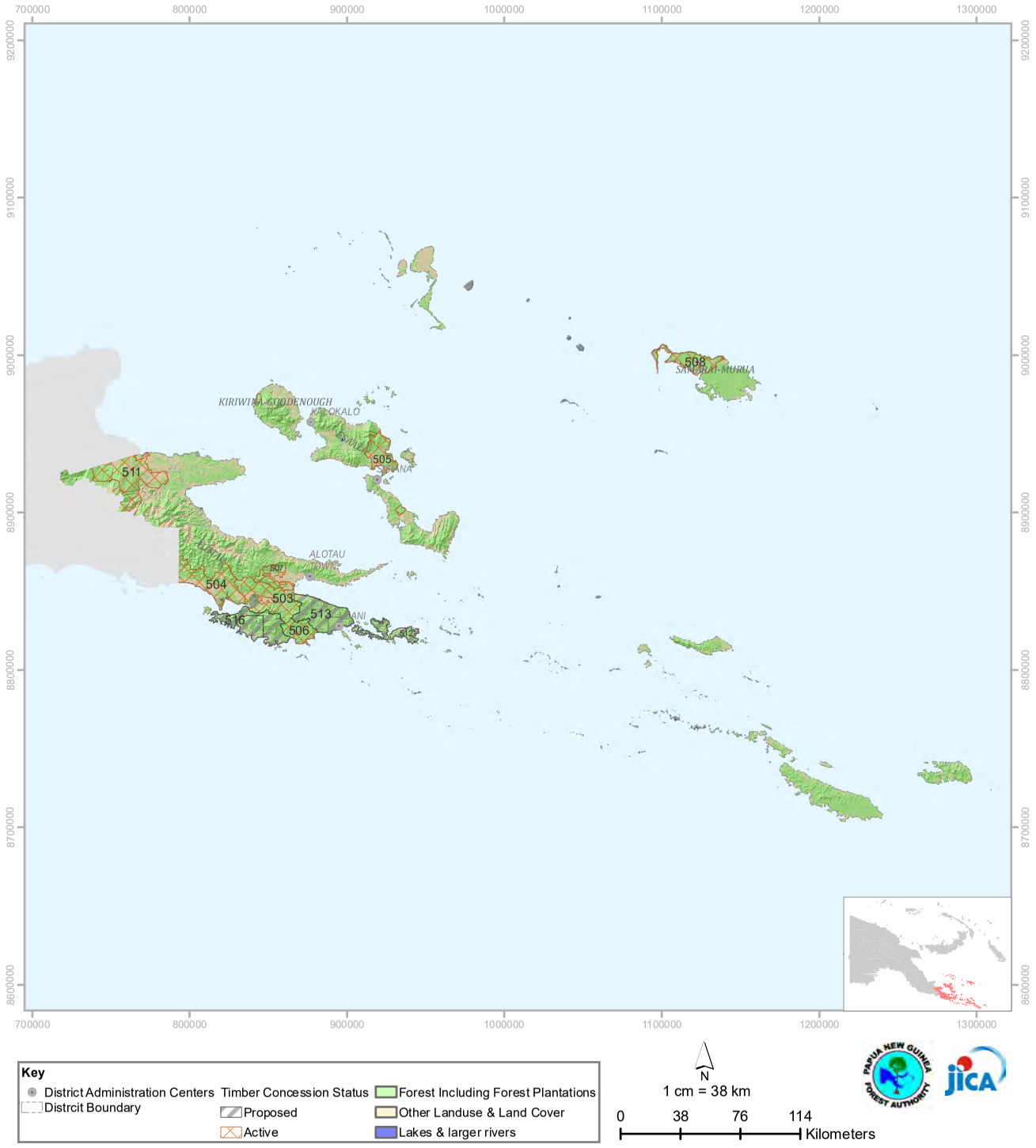


Pie Chart showing percentage in Landuse, Landcover of Milne Bay Province.

% of Landuse Landcover				
Code	Alotau	Esa Ala	Kiriwina Goodenough	Samarai Murua
P	9.89%	8.48%	12.69%	34.55%
H	44.48%	56.17%	26.97%	37.68%
L	13.36%	4.80%	12.45%	
Mo	0.08%			
B	0.16%	0.20%	2.06%	0.01%
Fri	0.15%			
Fsw			0.51%	0.21%
M	1.70%	1.25%	5.40%	7.33%
W	0.08%		0.19%	3.97%
Sc	0.02%	0.49%	0.00005%	0.02%
G	10.43%	4.32%	12.87%	4.41%
Ga	0.27%			
Gi	0.05%			
O	16.59%	21.97%	25.45%	11.56%
Qa	2.09%	2.08%	1.23%	0.03%
Qf	0.15%			
U	0.05%		0.05%	0.02%
E	0.43%	0.24%	0.16%	0.22%
Land Area (ha)	791,763.07	227,343.52	104,811.40	278,436.51

Table showing percentage in Landuse, Landcover of Districts in Milne Bay Province. Percentage calculated from area in hectares.

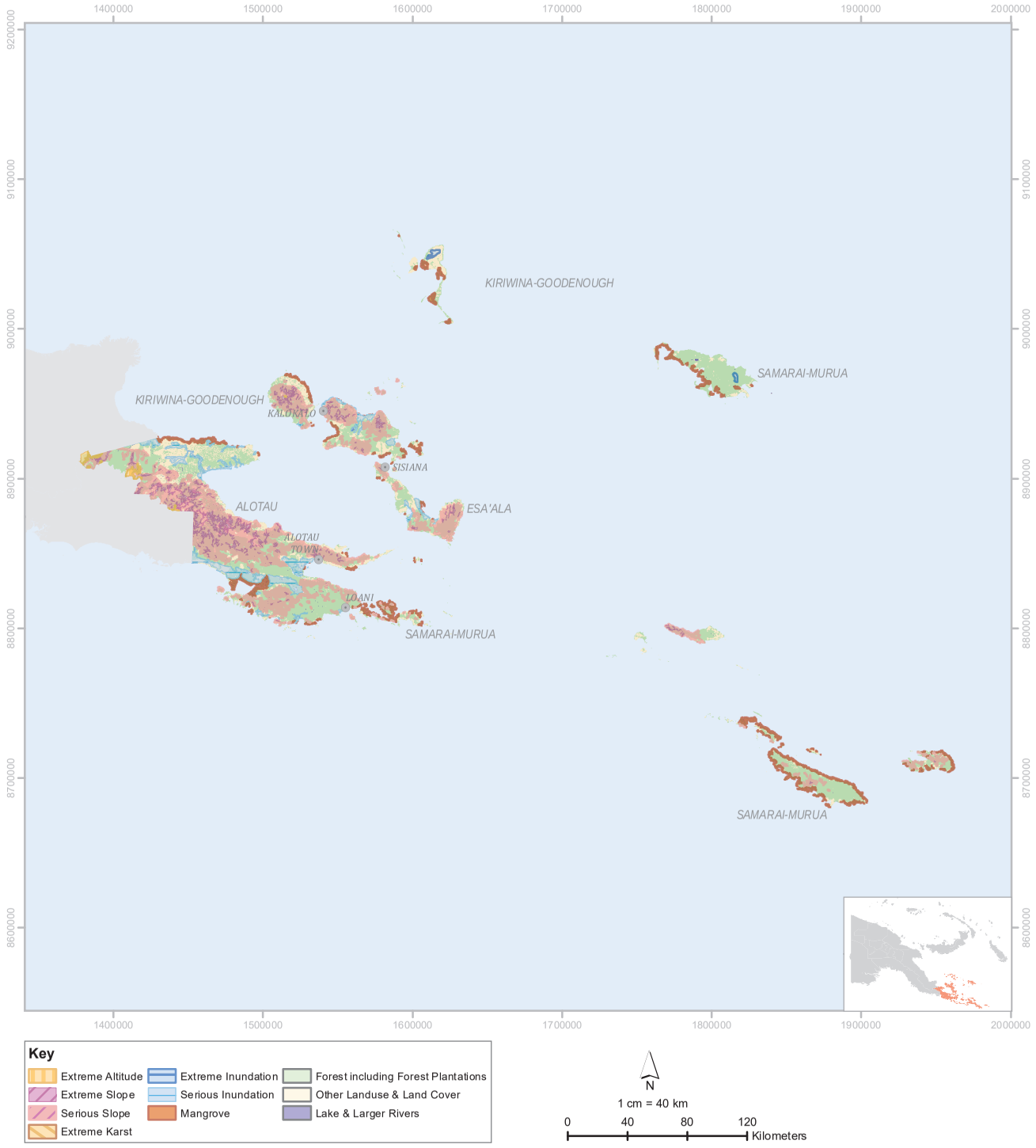
TIMBER CONCESSION MAP OF MILNE BAY PROVINCE



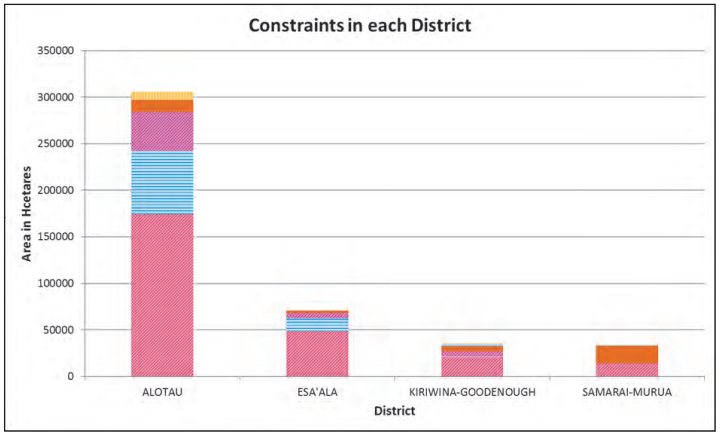
PLAN_ID	NAME	AREA (ha)	CONCESSION TYPE	STATUS
507	WEST GURNEY	21,031.64	TRP	Concession
504	GADAISU	60,911.87	TRP	Concession
503	SAGARAI	57,685.32	TRP	Concession
506	GARA - MODEWA	23,884.00	TRP	Concession
508	WOODLARK IS	31,112.69	TRP	Concession
502	AWARAI	2,341.90	TRP	Concession
505	EAST FERGUSON	31,237.25	TRP	Concession
501	GOODENOUGH	1,728.51	TRP	Concession
511	East Collingwood	80,442.44	Fma	Concession
515	Sideia Island	2,375.83	PFD	Proposed
509	Basilaki Island	9,811.58	PFD	Proposed
512	East Woodlark Island	10,602.60	PFD	Proposed
516	Suau Coast (West Suau)	60,652.50	PFD	Proposed
513	Loani (East Suau)	56,755.50	PDF	Proposed
599	Dadara's land	20,648.96		Proposed

Table showing Timber Concessions of Milne Bay Province.
Information updated as at 2016.

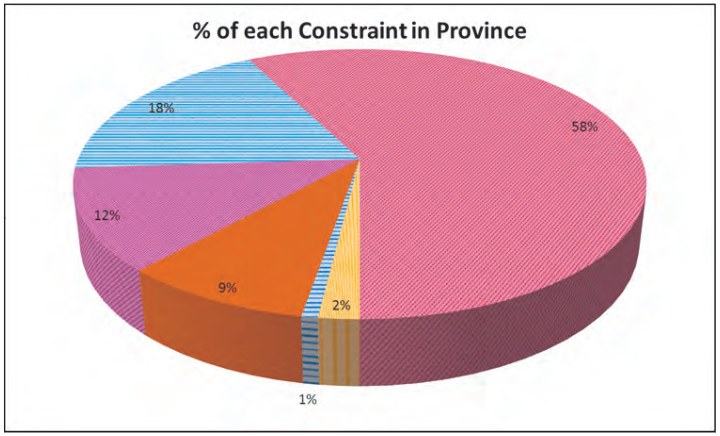
CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, MILNE BAY PROVINCE



Brief Report on Logging Constraints of Milne Bay Province



The Milne Bay Province is a province made up of islands. Alotau District, being situated on the mainland has the largest land area and amount of constrained areas in the province. Esa'ala, Kiriwina-Goodenough and Samarai-Murua Districts containe the constrints which make up the remaining fraction of constrained areas. The outer islands are mostly constrained by mangroves, with patches of inundated ('Serious Inundation') and inclined (Serious Slope') areas. The inner islands and the mainland are inundated and inclined, and a few high altitude areas at the eastern end of the Owen Stanley Range.



TERRESTRIAL PROTECTED AREAS, MILNE BAY PROVINCE

Key

	Concessions	Forest Base Map Class
Terrestrial Protected Area	Current	Forest including Forest Plantations
	Expired	Other Landuse & Land Cover
	Proposed	Lake & Larger Rivers

N

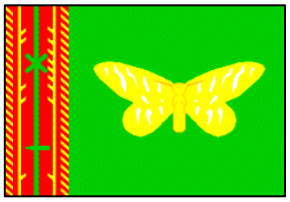
1 cm = 40 km

0 40 80 120 Kilometers

Information on Terrestrial Protected Areas in Milne Bay Province

Name	Baniara Island WMA
Protected Area ID	4
Protected Area Type	Wildlife Management Area
Province	Milne Bay
Location	Baniara Island
Area (ha)	37
Longitude	149° 53' 16" E
Latitude	10° 13' 32" S
Name	**Lake Lavu WMA**
Protected Area ID	19
Protected Area Type	Wildlife Management Area
Province	Milne Bay
Location	Lake Lavu
Area (ha)	2, 612
Longitude	150° 37' 15" E
Latitude	10° 29' 16" S
Name	**Oi Mada Wara WMA**
Protected Area ID	36
Protected Area Type	Wildlife Management Area
Province	Milne Bay
Location	Oi Mada Wara
Area (ha)	22, 547
Longitude	150° 13' 41" E
Latitude	10° 39' 30" S
Name	**Sawataetae WMA**
Protected Area ID	42
Protected Area Type	Wildlife Management Area
Province	Milne Bay
Location	Sawataetae
Area (ha)	711
Longitude	151° 1' 18" E
Latitude	10° 2' 10" S

5. Oro (Northern) Province



General information/Overview

1. Location

Oro (Northern) Province is located on the north coast of mainland of PNG, the Owen Stanley Range forms the southern border with Central Province. The province also shares part its border with Morobe Province; coastal floodplains and the Kumusi River.

Provincial Administration Centre:	Popondetta
Land area:	2, 263, 371 ha
Population:	186, 309 (2011)
Number of District:	2 (Ijivitari, Sohe)
Number of Local Level Governments (LLGs):	8 LLGs

2. Forest Information

Forest Area:	1, 619, 404 ha

Provincial Tree

The provincial tree is '*Okari*' (scientifically known as *Terminalia kaernbachii*) and it is commonly found in Low Altitude Forest on Plains and Fans.

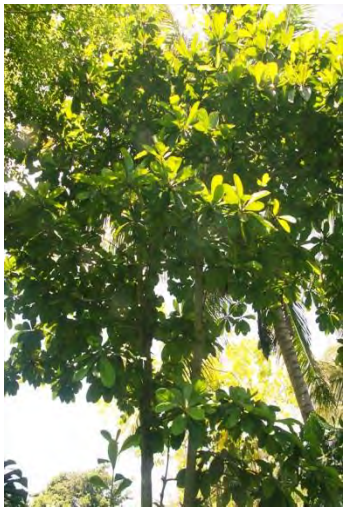
Significance of Provincial tree:

It is a hard wood species which is one of the species exported in round log form. It is one of the popular nuts among the local population for its tasty and delicious flavor. The nuts are highly sought and it provides a source of revenue for the sellers.

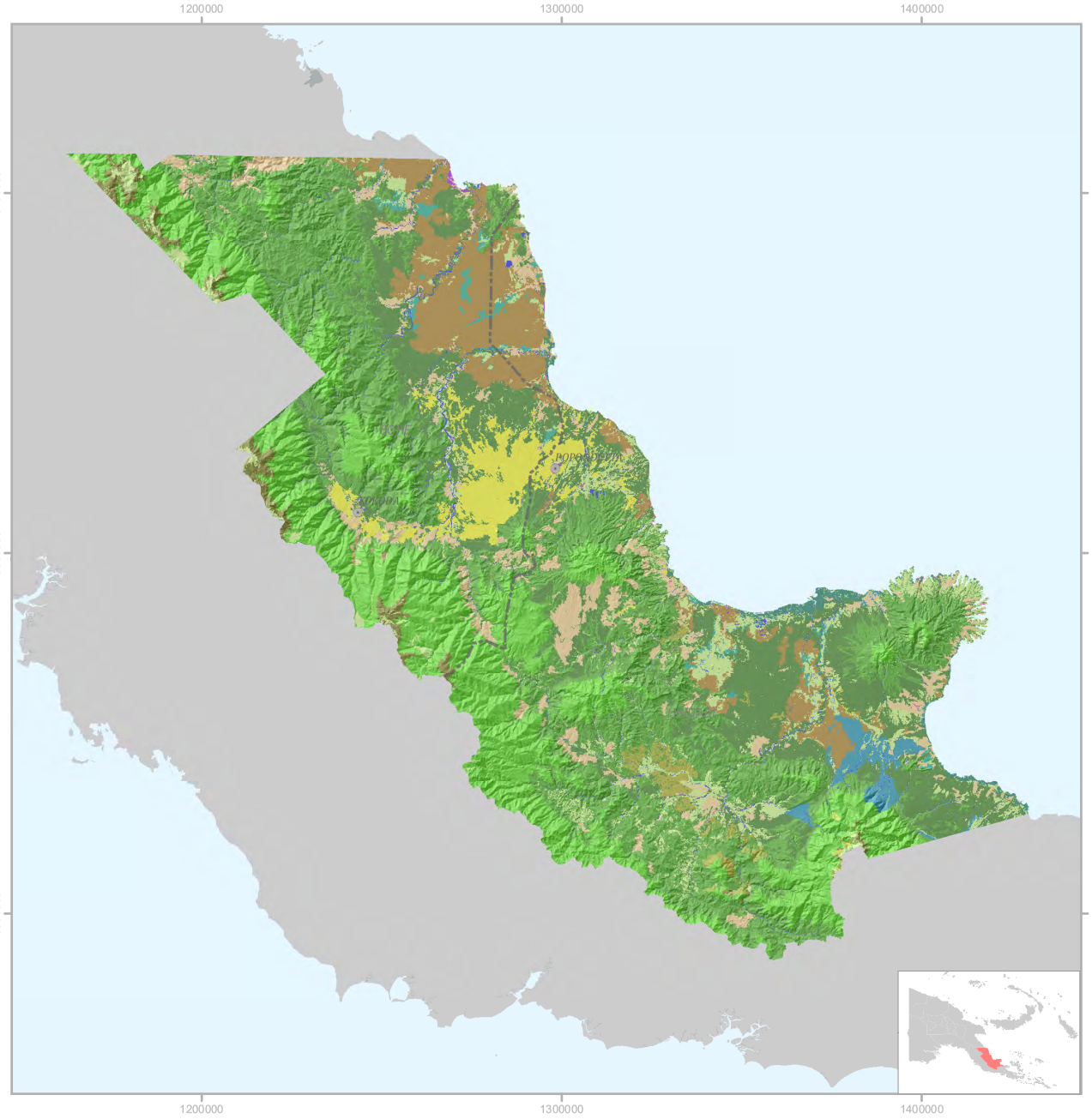
Scientific name: *Terminalia kaernbachii*	Family: *Combretaceae*	Common Name/Trade name: *Okari /Red-brown Terminalia*

Description

A small sub-canopy tree with cylindrical bole and has a buttress. Outer bark is grey and smooth, Leaf; simple, upper surface is green and underneath is green to red (covered with brownish red hairs). Flower: small pale green-white Fruit: slightly oval in shape, green when immature and turns red when it matures (ripens).

Tree	Bark	Leaf/Leaves
 Source: https://toptropicals.com/pics/garden/m2/2005/0/PICT0650Terminalia_kaernbachii_TA.jpg	 Source: https://singapore.biodiversity.online/species/P-Angi-003328?imageId=0	 Source: https://singapore.biodiversity.online/species/P-Angi-003328?imageId=0
Note: Short description was from the PNG Plant database website (link below) http://www.pngplants.org/PNGtrees/TreeDescriptions	Flower	Fruit/Seed
	 Source: https://toptropicals.com/pics/garden/m1/Podarki_15/Terminalia_kaernbachii_1_MKh.jpg	  Source: http://www.fiapng.com/Nursery_techniques.pdf

VEGETATION AND LAND COVER MAP OF ORO PROVINCE (2012 FOREST BASEMAP VERSION 1.1)



Land Use and Land Cover Classes

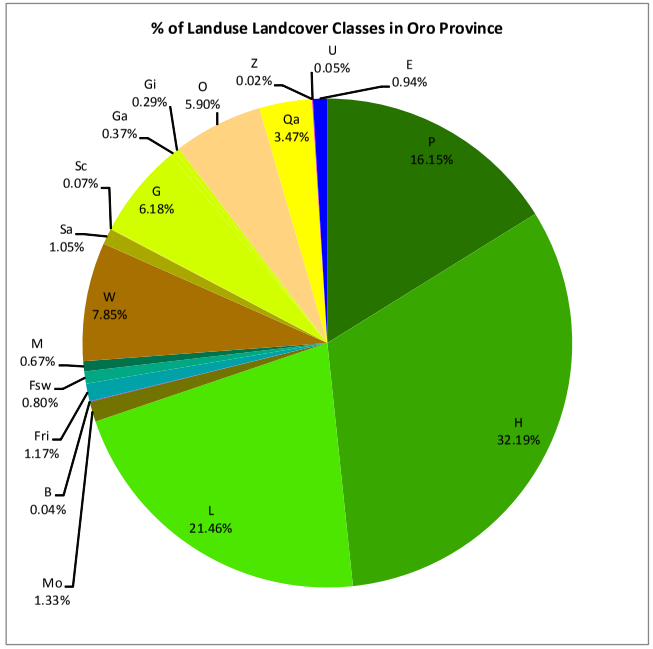
- P: Low Altitude Forest on Plains and Fans
- H: Low Altitude Forest on Uplands
- L: Lower Montane Forest
- Mo: Montane Forest
- B: Littoral Forest
- Fri: Seral Forest
- Fsw: Swamp Forest
- M: Mangrove
- W: Woodland
- Sa: Savanna
- Sc: Scrub
- G: Grassland and Herbland
- Ga: Alpine Grassland
- Gi: Subalpine Grassland
- O: Agricultural Land Use
- Qa: Agriculture Plantation
- Z: Bare areas
- U: Settlements and larger urban centers
- E: Lakes and larger rivers

N

1 cm = 18 km

0 18 36 54

Kilometers



Pie Chart showing percentage in Landuse, Landcover of Oro Province.

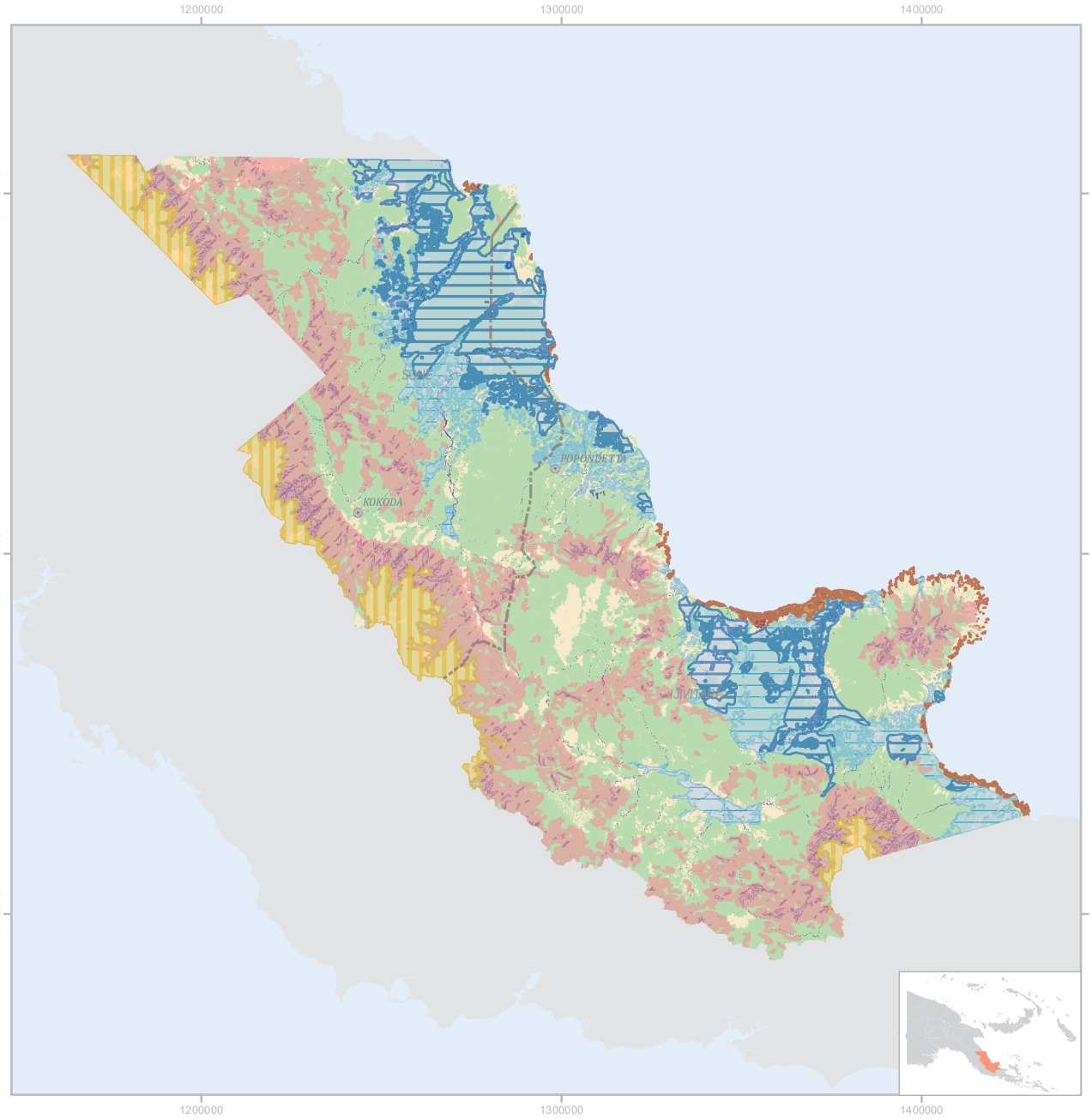
% of Landuse Lancover		
Code	**Ijivitari**	**Sohe**
P	18.70%	12.85%
H	32.68%	31.70%
L	18.77%	25.09%
Mo	0.14%	2.88%
B		0.07%
Fri	2.07%	
Fsw	0.67%	0.98%
M	0.96%	0.02%
W	6.22%	10.02%
Sa	1.86%	
Sc	0.13%	
G	9.03%	2.36%
Ga	0.09%	0.74%
Gi	0.05%	0.60%
O	6.46%	5.28%
Qa	1.23%	6.41%
Z	0.03%	0.01%
U	0.02%	
E	0.88%	1.01%
Land Area (ha)	1,276,058.77	981,526.47

Table showing percentage in Landuse, Landcover of Districts in Oro Province. Percentage calculated from area in hectares.

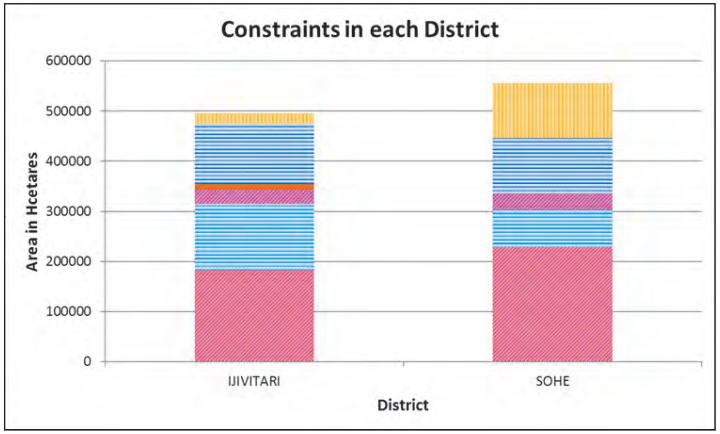
PLAN_ID	NAME	AREA (ha)	Concession Type	STATUS
609	YEMA GAIAPA	38,320.26	LFA	Concession
608	EMBI HANAU	14,203.47	TRP	Concession
607	GIRUA ERE	9,608.01	TRP	Concession
603	SAIHO	3,519.07	TRP	Concession
604	IOMA BLOCK 4	29,720.44	TRP	Concession
601	IOMA MAMBARE	2,177.62	TRP	Concession
602	KUMUSI TRP	43,580.85	TRP	Concession
610	IOMA BLOCK 5	219,972.10	FMA	Concession
611	Collingwood Bay	182,410.57	FMA	Proposed
613	Goro Itakama	580,282.94	FMA	Proposed
612	Musa Pongani	214,968.79	FMA	Proposed
614	Musa_Ext	99,216.64	TRP	Proposed
615	oilpalm	17,839.31		Proposed
618	unnamed1	89,709.24		Proposed
617	Eia_Girua	39,879.70	TRP	Proposed
616	Waria_Eia	46,511.79	TRP	Proposed
619	unnamed2	15,292.58		Proposed
620	unnamed3	10,784.07		Proposed
699	Guruguru	27,975.53		Proposed

Table showing Timber Concessions of Oro Province.
Information updated as at 2016.

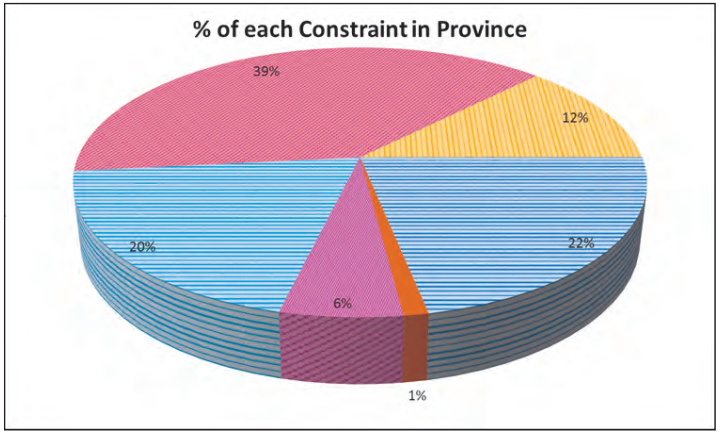
CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, NORTHEN (ORO) PROVINCE



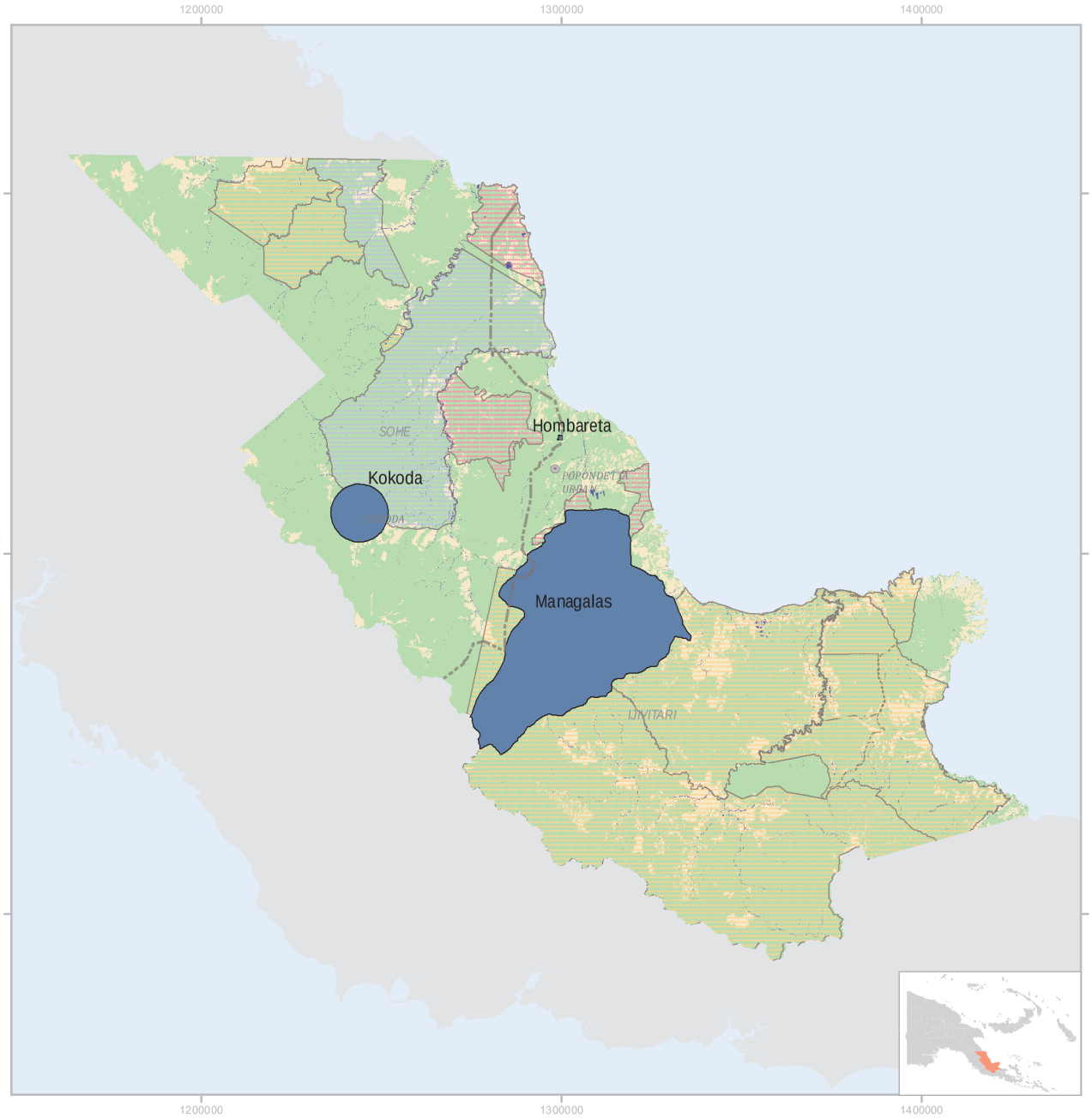
Brief Report on Logging Constraints of Northern (Oro) Province



Northern (Oro) Province, has a lot of rugged terrain evidenced by the clusters of high altitude ('Extreme Altitude') and slope ('Serious and Extreme Slope') areas on the western side of the province. The eastern side of the province is heavily inundated ('Serious Inundation' and 'Extreme Inundation') with mangroves along the coastline. About half of the constrained areas are situated alomost equally in both the Sohe and Ijivitari Districts. Although, they share almost the same amount of contraints area, the difference margin with regard to land area between the two districts is more prominant, as Ijivitari District has more provincial land are than Sohe Dsitrict.



TERRESTRIAL PROTECTED AREAS, ORO PROVINCE



Information on Terrestrial Protected Areas in Oro Province

Name	Hombareta WMA
Protected Area ID	9
Protected Area Type	Wildlife Management Area
Province	Oro
Location	Hombareta
Area (ha)	137
Longitude	148° 14' 56" E
Latitude	9° 18' 55" S
Name	Kokoda Memorial Park
Protected Area ID	17
Protected Area Type	National Park
Province	Oro
Location	Kokoda
Area (ha)	19, 670
Longitude	147° 45' 0" E
Latitude	9° 7' 0" S
Name	Lakekamu Proposed CA
Protected Area ID	<NA>
Protected Area Type	Conservation Area
Province	Oro
Location	Lakekamu
Area (ha)	37121
Longitude	146° 35' 17" E
Latitude	8° 23' 52" S
Name	Managalas Proposed CA
Protected Area ID	<NA>
Protected Area Type	Conservation Area
Province	Oro
Location	Managalas
Area (ha)	213, 269
Longitude	148° 17' 47" E
Latitude	10° 50' 46" S

6. Southern Highlands Province

General information/Overview

1. Location

Southern Highlands Province is located on the central west of the highlands of PNG and consists of mountain ranges, valleys, hills, plains and swamps.

Provincial Administration Centre:	Mendi
Land area:	1, 504, 751 ha
Population:	510, 449 (2011)
Number of District:	5 (Ialibu-Pangia, Imbonggu, Kagua-Erave, Mendi-Munihu, Nipa-Kutubu)
Number of Local Level Governments (LLGs):	19 LLGs

2. Forest Information

Forest Area:	1, 027, 622 ha

Provincial Tree

The provincial tree is *'PNG Oak*[10]*'* (scientifically known as *Castanopsis accuminatissima*) and is commonly found in Lower Montane forest and Montane forest.

Significance of Provincial tree:

It is a hardwood species and valuable for various uses such as timber for homes, footbridges, furniture, etc. The nuts are used as food source.

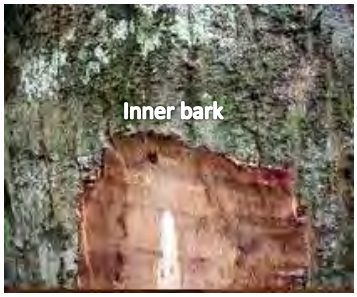
Sap from the bark has medicinal properties used for herbal remedy. The leaves are used as decorations for special occasions such as cultural dances and as well burnt to repel insects. The tree is planted around the homes as ornaments and the edible mushroom can be gathered on the stem/trunk of the dead wood.

[10] Southern Highlands and Western Highlands Provinces have nominated *C. accuminatissima* as their provincial trees. One of these provinces will have to select a different tree species in the later version of this report.

Scientific name: *Castanopsis accuminatissima*	Family: *Fagaceae*	Common Name/Trade name: *PNG Oak*

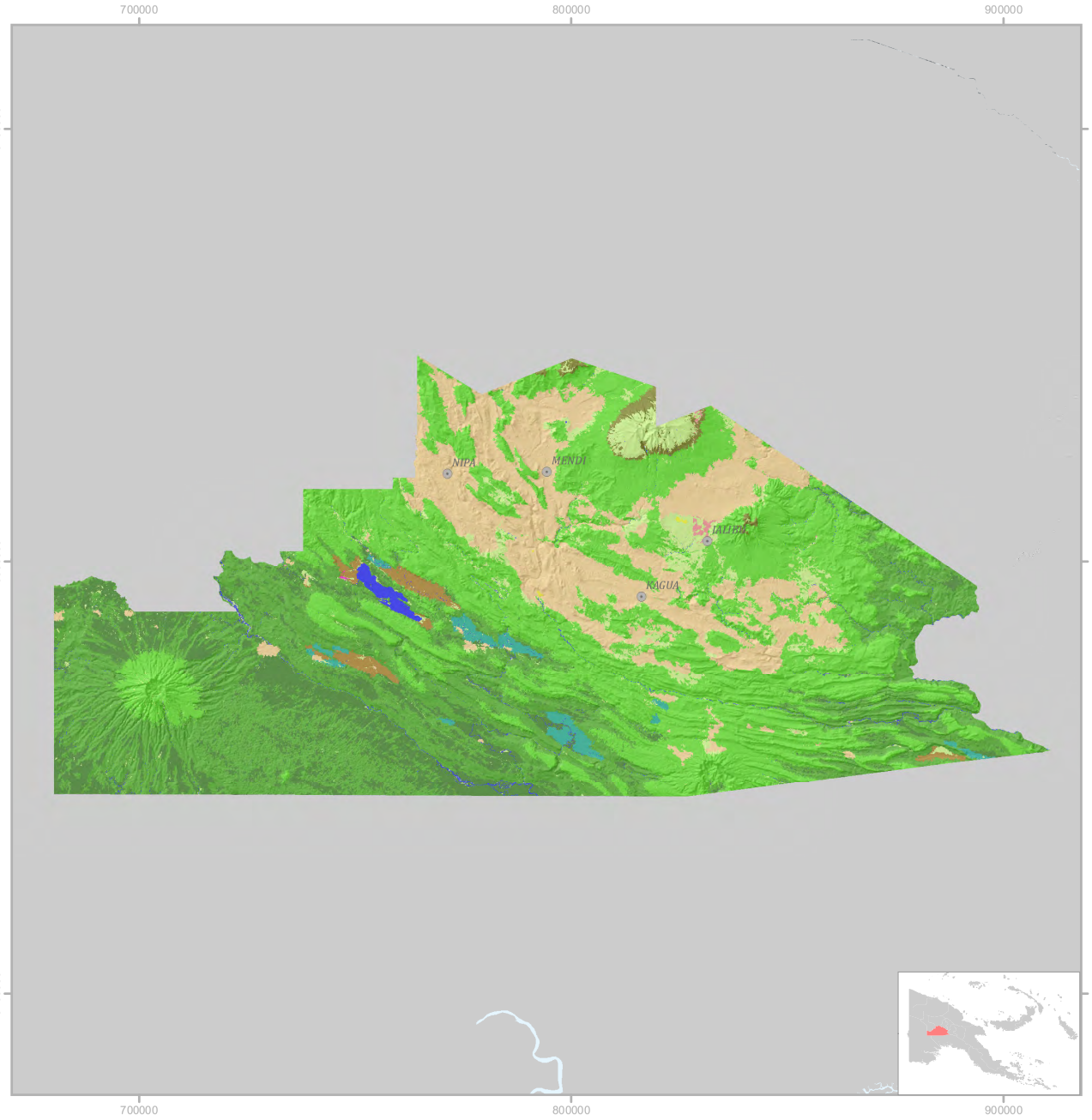
Description

A large canopy tree with markedly fluted straight bole. Outer bark grey or pale brown, rough, fissured and cracked. Inner bark red or pale brown, fibrous with non-sticky colourless sap. Leaves: simple, upper surface is green and lower is pale green or brownish green. Flowers: male and female flowers on the same plant. Small pale yellow, green or brown (pale fawn-coloured) flowers. Fruit/Seed- small brown nut with a single seed.

Tree	Bark	Leaf/Leaves
 Source: https://www.123rf.com/photo_46757006_fresh-green-leaves-of-castanopsis-trees.html?fromid=WEpHMFpyU2dVSzdaMDBDM2JvVEI3dz09	 Source http://www.pngplants.org/PNGtrees/TreeDescriptions/Castanopsis_acuminatissima_Bl_A_DC.html	 Source http://www.pngplants.org/PNGtrees/TreeDescriptions/Castanopsis_acuminatissima_Bl_A_DC.html

Note:	Flower	Fruit/Seed
Short description was from the PNG Plant database website (link below) Source: http://www.pngplants.org/PNGtrees/TreeDescriptions/Castanopsis_acuminatissima_Bl_A_DC.html	 Source: https://memim.com/castanopsis-acuminatissima.html  Source: http://www.biotik.org/laos/species/c/casac/casac_07_en.html	 Source: https://www.flickr.com/photos/jackforest/23546258383/in/photostream/

VEGETATION AND LAND COVER MAP OF SOUTHERN HIGHLANDS PROVINCE (2012 FOREST BASEMAP VERSION 1.1)



Land Use and Land Cover Classes

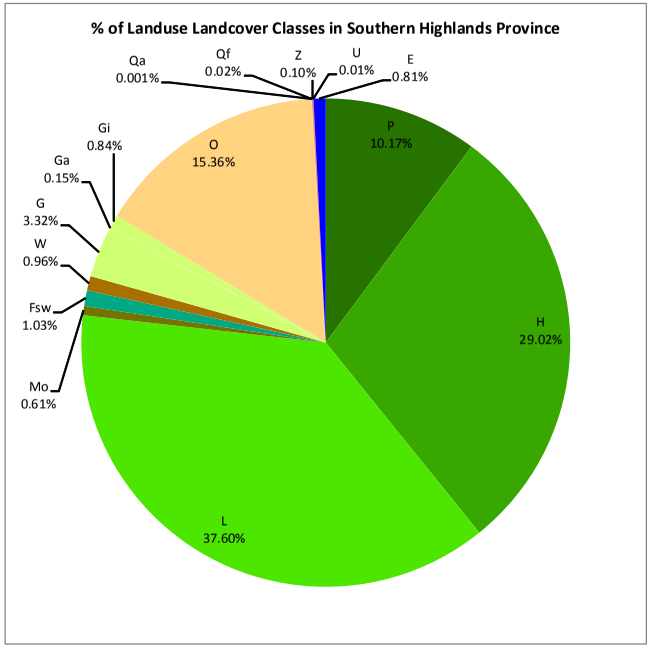
- P: Low Altitude Forest on Plains & Fans
- H: Low Altitude Forest on Uplands
- L: Lower Montane Forest
- Mo: Montane Forest
- Fsw: Swamp Forest
- W:Woodland
- G: Grassland
- Ga: Alpine grassland
- Gi: Subalpine grassland
- O: Agriculture Land Use
- Qa: Agriculture Plantation
- Qf: Forest Plantation
- Z: Bare areas
- U: Settlement & larger urban centres
- E: Lakes & larger rivers

N

1 cm = 15 km

0 15 30 45

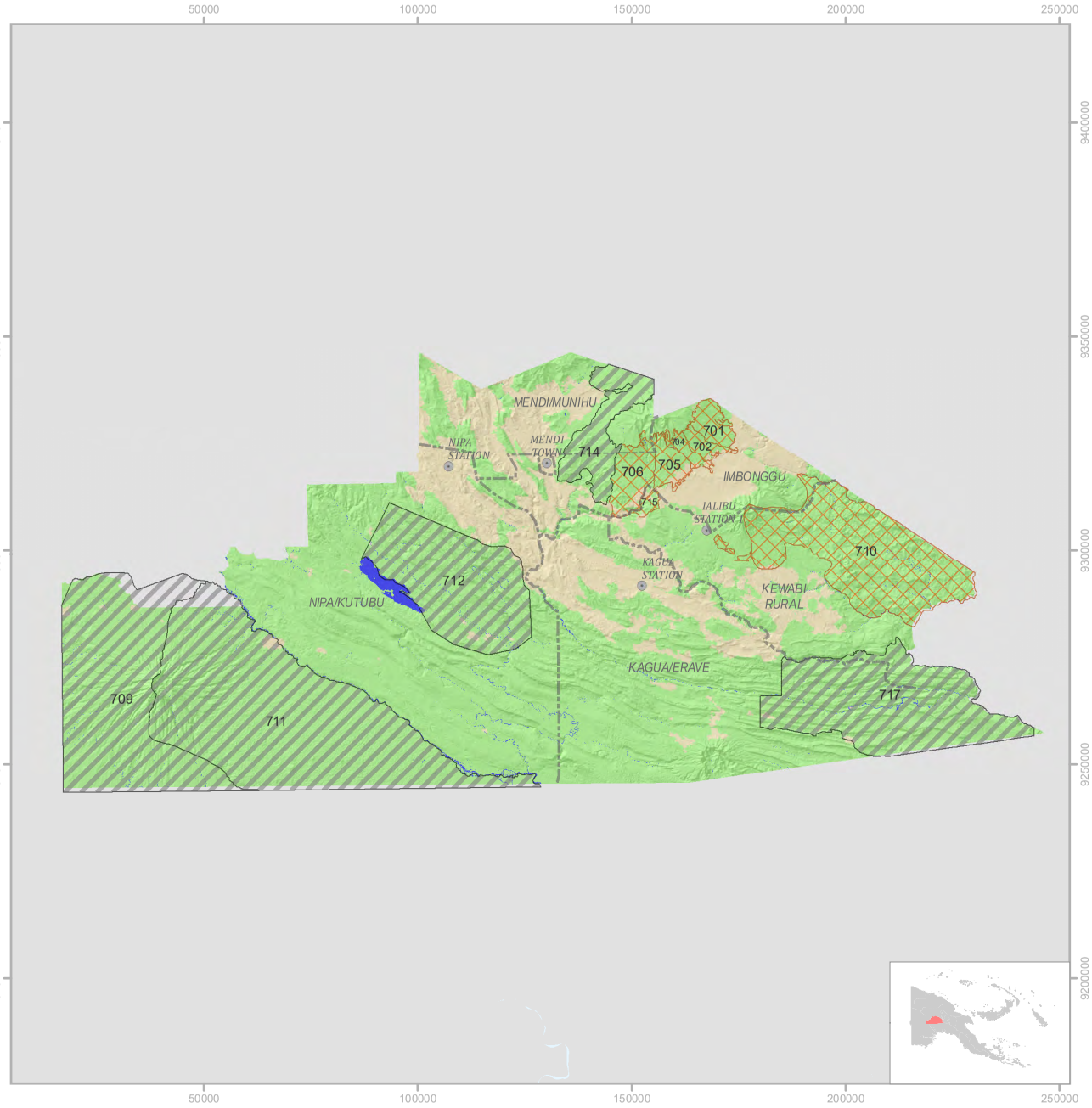
Kilometers



Pie Chart showing pecentage in Landuse, Landcover of Southern Highlands Province.

**Note: district information of Southern Highlands Province is not displayed.*

TIMBER CONCESSION MAP OF SOUTHERN HIGHLANDS PROVINCE



Key

- District Boundary
- District Administrstion Centers

Timber Concession Status

- Proposed
- Active

- Forest Including Forest Plantations
- Other Landuse & Land Cover
- Lakes & larger rivers

N

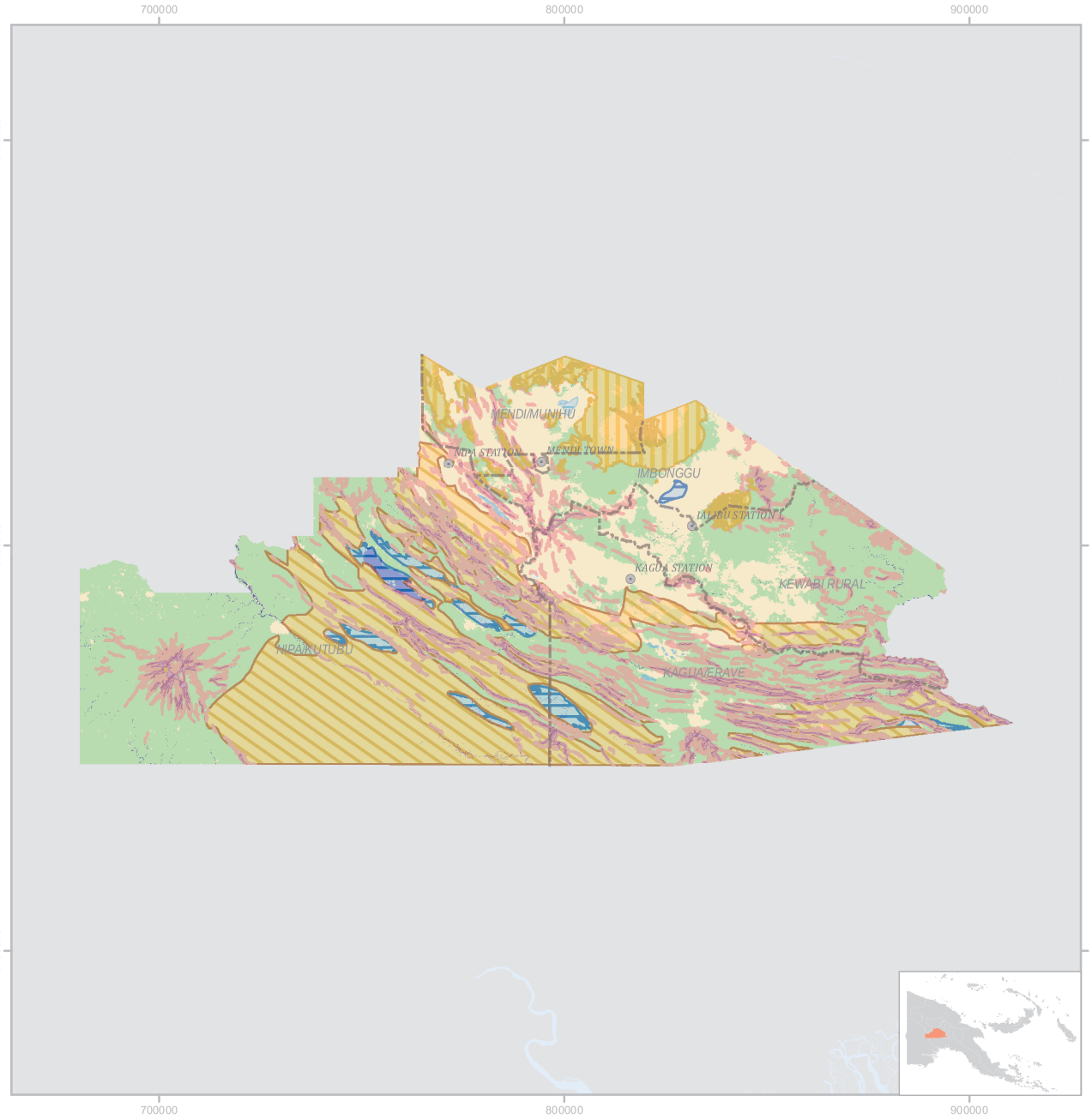
1 cm = 15 km

0 12 24 36 Kilometers

PLAN_ID	NAME	AREA (ha)	CONCESSION TYPE	STATUS
701	Mount Giluwe 1A	6,911.05	TRP	Concession
702	Mount Giluwe1B	4,048.01	TRP	Concession
703	KALGABUNBU	359.90	TRP	Concession
704	Mount Giluwe 1C	3,550.41	TRP	Concession
705	Mount Giluwe 1D	7,138.29	TRP	Concession
706	Mount Giluwe 1E	14,312.11	TRP	Concession
707	Rongo Mondana	611.08	TRP	Concession
708	Koia Wekomini	640.15	TRP	Concession
709	Bosavi	130,903.84		Proposed
710	East Pangia	91,481.51		Concession
711	Hekiko	198,624.95		Proposed
712	Kutubu - Poroma	81,928.72		Proposed
714	West Mount Giluwe	28,413.66		Proposed
715	MOUNT GILUWE 1F	1,995.15	TRP	Concession
717	Polopa	102,325.51		Proposed

Table showing Timber Concessions of Southern Highlands Province. Information updated as at 2016.

CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, SOUTHERN HIGHLANDS PROVINCE



Key

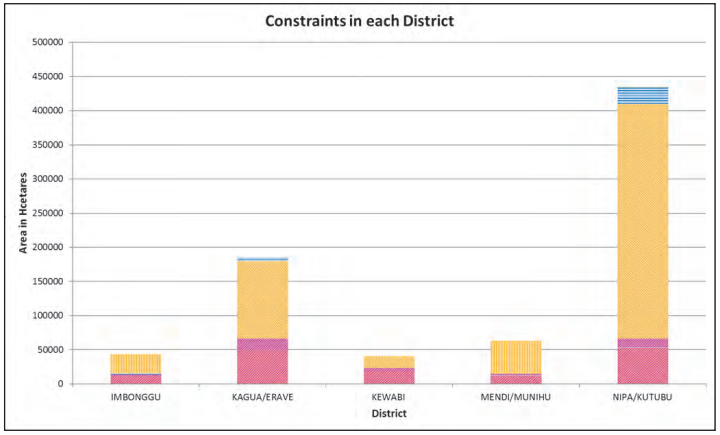
- Extreme Altitude
- Extreme Slope
- Serious Slope
- Extreme Karst
- Extreme Inundation
- Serious Inundation
- Forest including Forest Plantations
- Other Landuse & Land Cover
- Lake & Larger Rivers

N

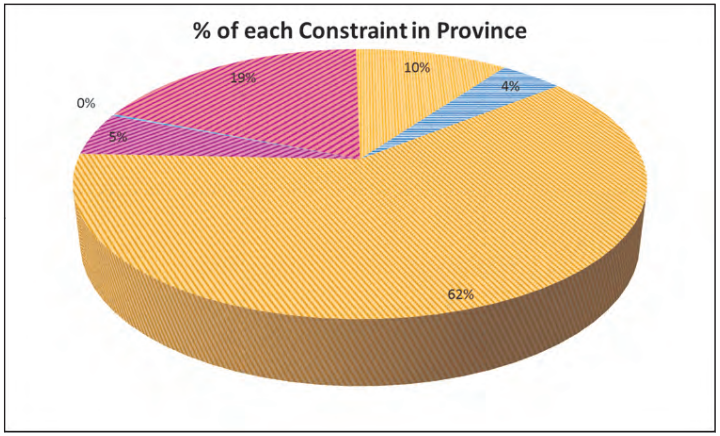
1 cm = 16 km

0 16 32 48 Kilometers

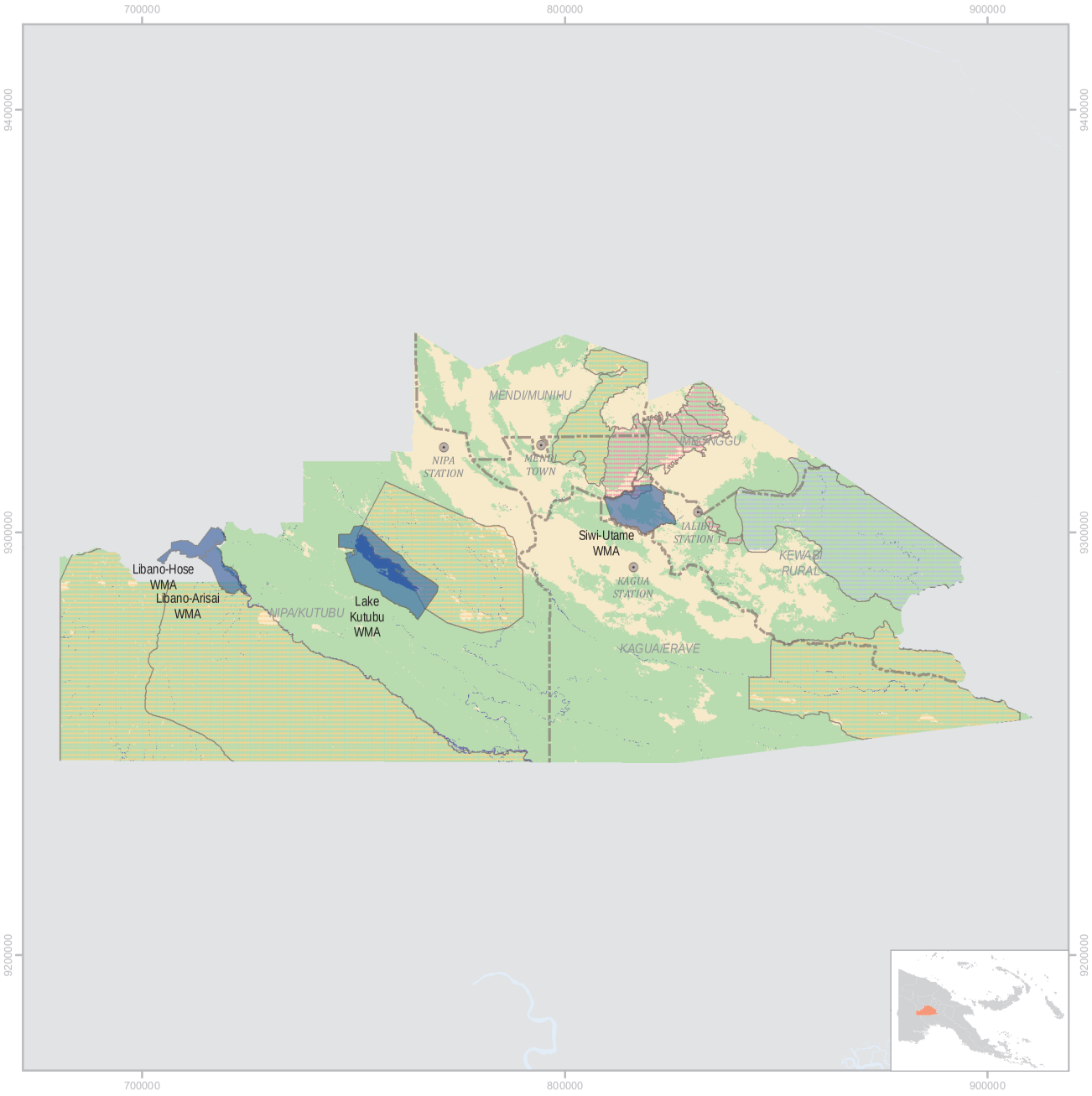
Brief Report on Logging Constraints of Southern Highlands Province



Much of the constrained areas in the Southern Highlands Province are 'Extreme Karst' (limestone). Parts of the province along the edges of the limestone areas are constrained by inclination ('Extreme Slope' and 'Serious Slope'), with 'Extreme Altitude' constrained areas occupying the northern part of the province. Inundation only accounts for a tiny fraction of the total constrained areas, occuring mostly in the centre of the province.



TERRESTRIAL PROTECTED AREAS, SOUTHERN HIGHLANDS PROVINCE



Key

Terrestrial Protected Areas

Concessions: Current; Expired; Proposed

Forest Base Map Class: Forest including Forest Plantations; Other Landuse & Land Cover; Lake & Larger Rivers

N

1 cm = 15 km

0 15 30 45 Kilometers

Information on Terrestrial Protected Areas in Southern Highlands Province

Name	Lake Kutubu WMA
Protected Area ID	18
Protected Area Type	Wildlife Management Area
Province	Southern Highlands
Location	Lake Kutubu
Area (ha)	23, 574
Longitude	143° 19' 47" E
Latitude	7° 35' 24" S
Name	**Libano-Arisai WMA**
Protected Area ID	54
Protected Area Type	Wildlife Management Area
Province	Southern Highlands
Location	Libano-Arisai
Area (ha)	4, 917
Longitude	142° 58' 52" E
Latitude	7° 35' 18" S
Name	**Libano-Hose WMA**
Protected Area ID	55
Protected Area Type	Wildlife Management Area
Province	Southern Highlands
Location	Libano-Hose
Area (ha)	4, 609
Longitude	142° 55' 26" E
Latitude	7° 38' 36" S
Name	**Siwi-Utame WMA**
Protected Area ID	45
Protected Area Type	Wildlife Management Area
Province	Southern Highlands
Location	Siwi-Utame
Area (ha)	12, 128
Longitude	143° 52' 17" E
Latitude	7° 43' 32" S

7. Eastern Highlands Province

General information/Overview

1. Location

Eastern Highlands Province is located in the central highlands of mainland of PNG, has mountain ranges of 3, 500 metres (a.s.l) such as Mt. Michael and as well floodplains, plains and fans and valleys.

Provincial Administration Centre:	Goroka
Land area:	1, 114, 676 ha
Population:	579, 825 (2011)
Number of District:	8 (Daulo, Goroka, Henganofi, Kainatu, Lufa, Obura-Wonenara, Okapa, Unggai-Bena)
Number of Local Level Governments (LLGs):	13 LLGs

2. Forest Information

Forest Area:	655, 720 ha

Provincial Tree

The provincial tree is '*Nothofagus*' (scientifically known as *Nothofagus grandis*) and is commonly found in Lower Montane to Montane forest.

Significance of Provincial tree:

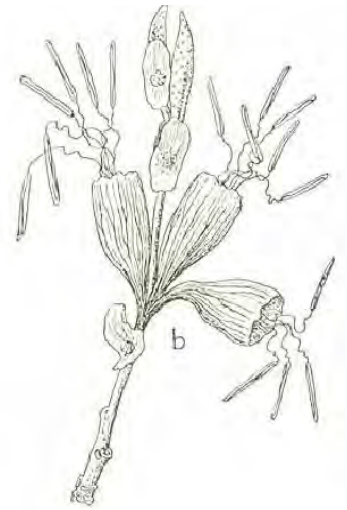
It is a hardwood species and used for various uses such as timber for homes and the bark is prepared and used for the flooring. The leaves are used for decorations for special occasions such as cultural dances and as well burnt to repel insects.

Scientific name: *Nothofagus grandis*	Family: *Nothofagaceae*	Common Name/Trade name: *Nothofagus*

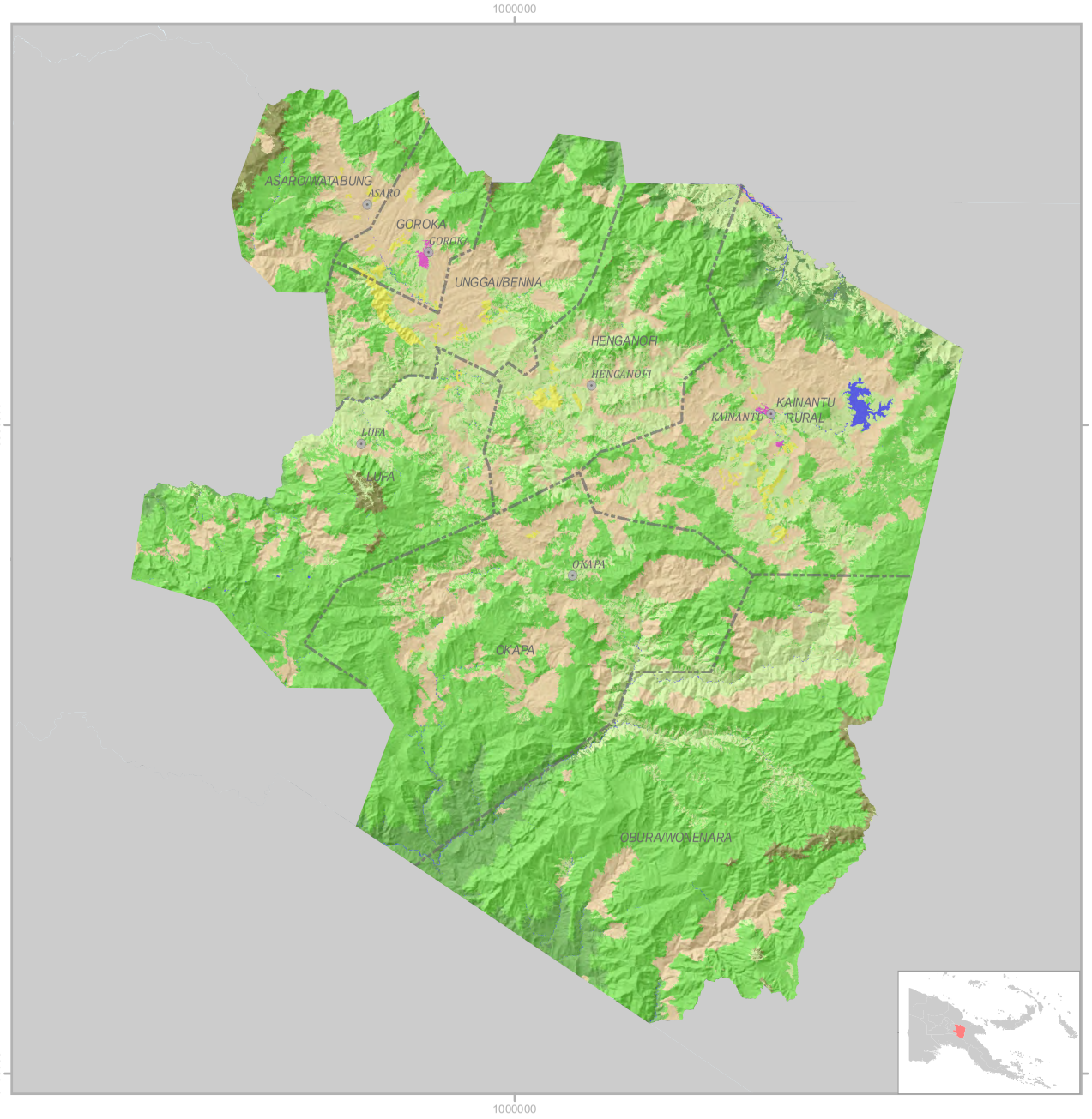
Description

A large canopy tree with markedly fluted bole, outer bark is brownish grey or dark brown and inner bark blaze pink or red, slightly fibrous and no sap. Leaf; simple, upper surface of leaf is green (glossy) and underneath is pale green. Flowers are single; both male and female flowers on the same plant and orange (male). Fruit is red or brown nut and has a single seed.

Tree	Bark	Leaf/Leaves
 Photo courtesy: Andasua W (2019), Area Office, Highlands, Eastern Highlands Province	 Source: http://www.pngplants.org/PNGtrees/TreeDescriptions/Nothofagus_grandis_Blume.html	 Source: http://www.pngplants.org/PNGtrees/TreeDescriptions/Nothofagus_grandis_Blume.html

Note:	Flower	Fruit/Seed
Short description was from the PNG Plant database website (link below) http://www.pngplants.org/PNGtrees/TreeDescriptions/Nothofagus_grandis_Blume.html Source (flower): http://plantillustrations.org/illustration.php?id_illustration=383542&SID=0&mobile=0&code_category_taxon=9&size=1		 Photo source: Fazang K, Technical Assistant, FRI, Lae, Morobe Province

VEGETATION AND LAND COVER MAP OF EASTERN HIGHLANDS PROVINCE (2012 FOREST BASEMAP VERSION 1.1)



Land Use and Land Cover Classes

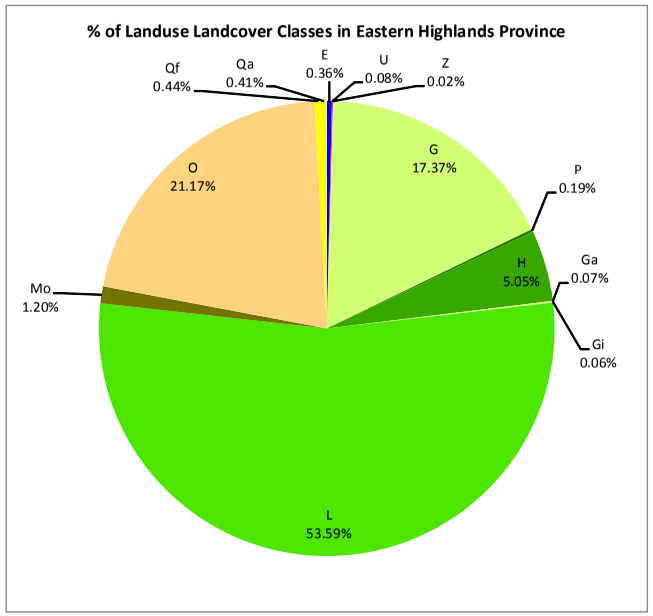
- P: Low Altitude Forest on Plains & Fans
- H: Low Altitude Forest on Uplands
- L: Lower Montane Forest
- Mo: Montane Forest
- G: Grassland
- Ga: Alpine grassland
- Gi: Subalpine grassland
- O: Agriculture Land Use
- Qa: Agriculture Plantation
- Qf: Forest Plantation
- Z: Bare areas
- U: Settlement & larger urban centres
- E: Lakes & larger rivers

N

1 cm = 10 km

0 10 20 30

Kilometers

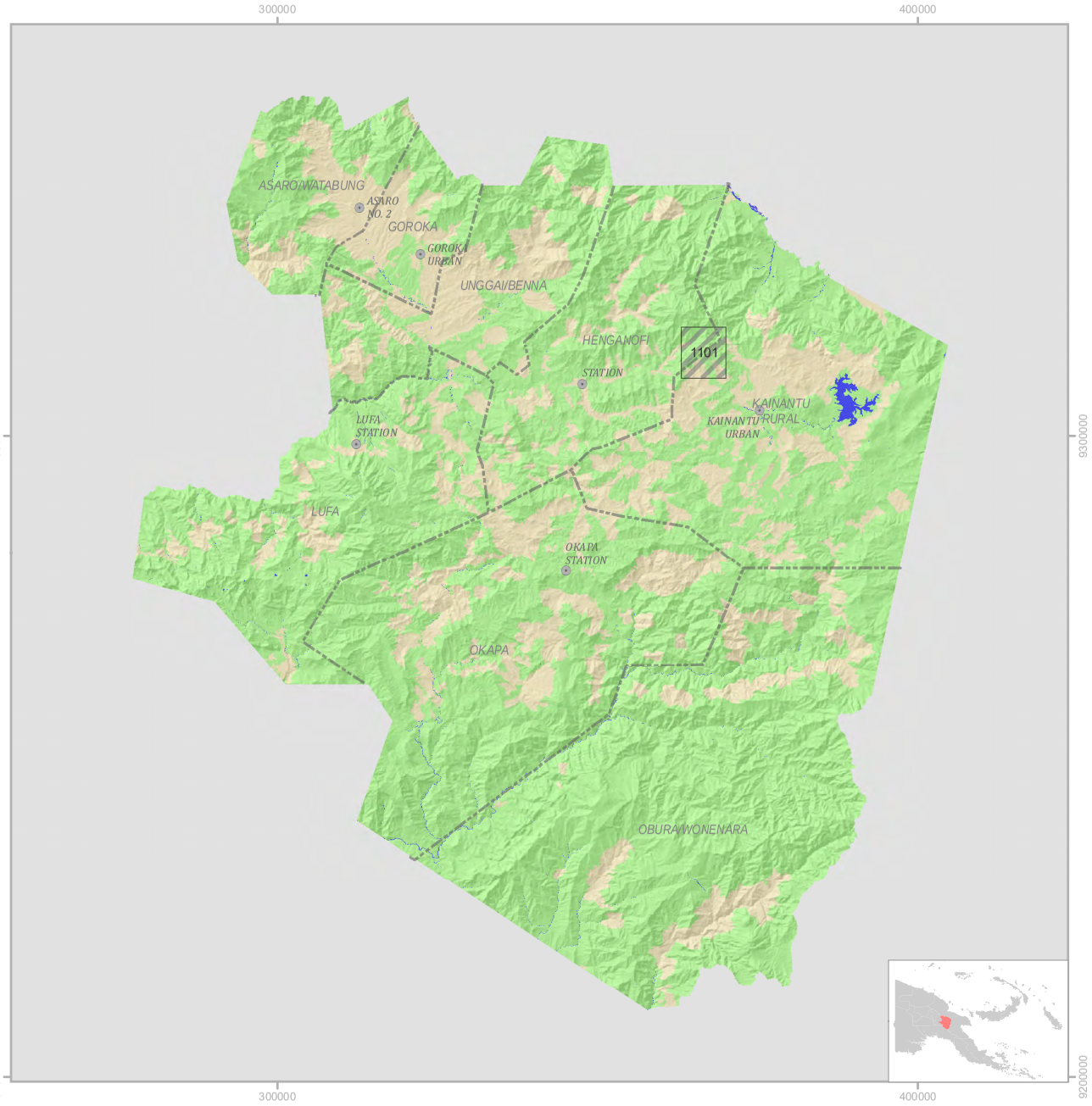


Pie Chart showing percentage in Landuse, Landcover of Eastern Highlands Province.

% of Landuse Lancover							
Code	**Goroka**	**Henganofi**	**Kainantu**	**Lufa**	**Obura Wonenara**	**Okapa**	**Unggai Benna**
P		0.04%	0.86%	0.06%	0.10%	0.01%	
H	0.01%	2.53%	5.59%	1.56%	8.24%	6.82%	3.03%
L	39.17%	39.38%	38.27%	62.18%	67.25%	60.09%	35.87%
Mo	0.89%	0.08%		1.80%	1.89%		0.34%
G	13.45%	39.23%	26.01%	17.01%	10.83%	10.15%	22.77%
Ga	0.03%	0.01%		0.07%	0.15%		
Gi	0.01%			0.32%	0.06%		
O	40.41%	17.24%	26.48%	16.64%	11.28%	22.67%	34.27%
Qa	2.69%	0.15%	0.95%	0.10%		0.07%	1.10%
Qf	1.55%	1.33%	0.37%				2.54%
Z	0.00%	0.02%	0.08%				
U	1.59%		0.15%				
E	0.21%		1.25%	0.27%	0.21%	0.20%	0.07%
Land Area (ha)	33,857.58	104,024.97	193,757.17	136,333.98	281,918.81	213,376.37	90,395.81

Table showing pecentage in Landuse, Landcover of Districts in Eastern Highlands Province.
Percentage calculated from area in hectares.

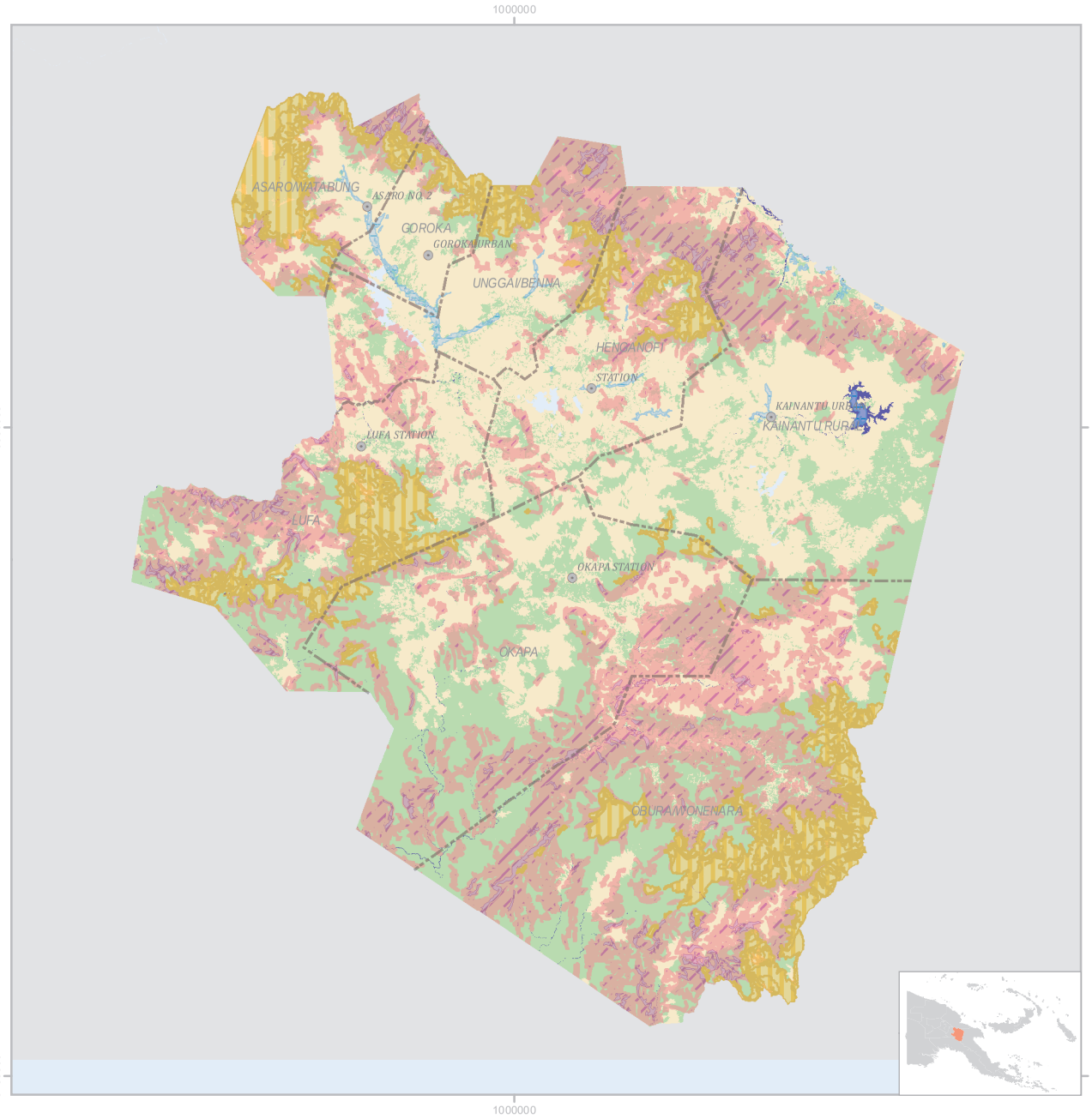
TIMBER CONCESSION MAP OF EASTERN HIGHLANDS PROVINCE



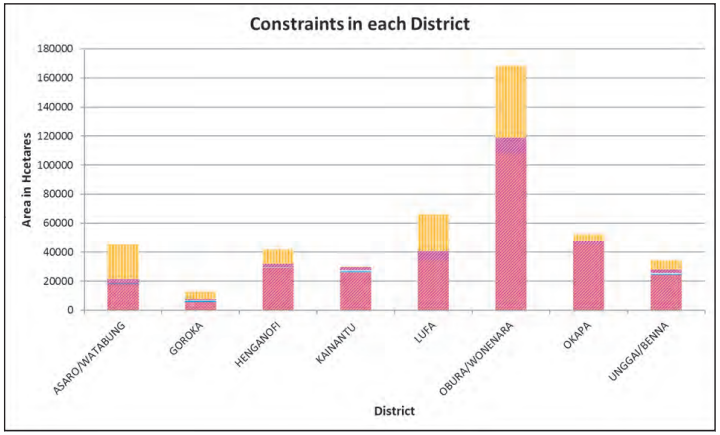
PLAN_ID	NAME	AREA (ha)	CONCESSION TYPE	STATUS
1101	Hengkae Timber Resource Area	5,629.49		Proposed

Table showing Timber Concessions of Eastern Highlands Province. Information updated as at 2016.

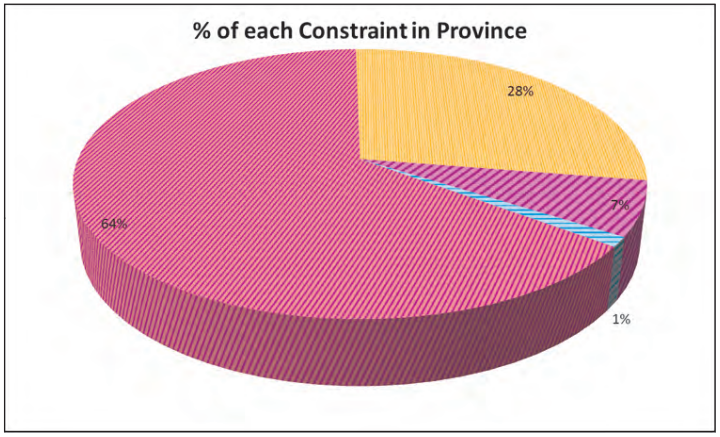
CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, EASTERN HIGHLANDS PROVINCE



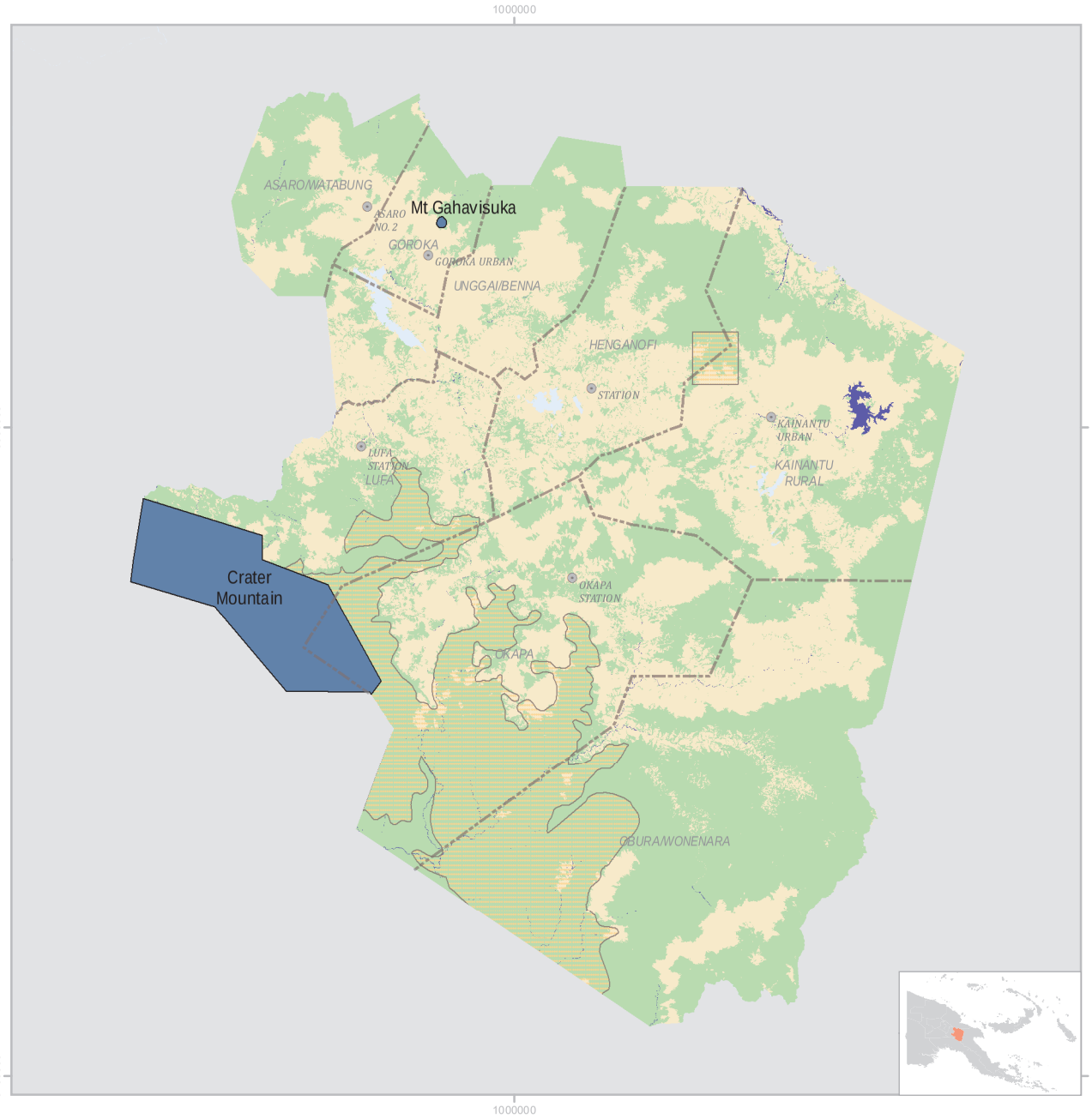
Brief Report on Logging Constraints of Eastern Highlands Province



Eastern Highlands province is surrounded by rugged mountain ranges and broad valley's towards the centre. The leading constraint in the province is 'Serious Slope', as it accounts for 64% of the entirety of constraints within the province. The majority of 'Serious Slope' is situated in Obura/Wonenara, other areas include; the border between Okapa and Obura/Wonenara and along the northern border of the province. The second leading constraint in the province is 'Extreme Altitude', 28%, which is chiefly situated along the south-eastern end of Obura/Wonenara, the north-western end of Asaro/Watabung and the centre of Lufa.



TERRESTRIAL PROTECTED AREAS, EASTERN HIGHLANDS PROVINCE



Key

	Concessions	Forest Base Map Class
Terrestrial Protected Area	Current	Forest including Forest Plantations
	Expired	Other Landuse & Land Cover
	Proposed	Lake & Larger Rivers

N

1 cm = 10 km

0 10 20 30 Kilometers

Information on Terrestrial Protected Areas in Eastern Highlands Province

Name	Crater Mountain WMA
Protected Area ID	7
Protected Area Type	Wildlife Management Area
Province	Eastern Highlands
Location	Crater Mountain
Area (ha)	52, 848
Longitude	145° 9' 19" E
Latitude	7° 26' 42" S
Name	**Mt Gahavisuka Pro. Park**
Protected Area ID	27
Protected Area Type	Protected Park
Province	Eastern Highlands
Location	Mt Gahavisuka
Area (ha)	198
Longitude	145° 24' 42" E
Latitude	7° 58' 18" S

Note:
Crater Mountain Wildlife Management Area is located in three different provinces:

1. Chimbu
=> 89, 928 ha

2. Eastern Highlands
=> 52, 848 ha

3. Gulf
=> 130, 958 ha

Total Area: 273, 734 ha

8. Chimbu (Simbu) Province

General information/Overview

1. Location

Chimbu (Simbu) Province is located in the highlands of mainland of PNG and consists of mountain ranges, valley, plains and hills.

Provincial Administration Centre:	Kundiawa
Land area:	613, 341 ha
Population:	376, 473 (2011)
Number of District:	6 (Chuave, Gumine, Karimui-Nomane, Kerowagi, Kundiawa-Gembogl, Sina Sina- Yonggomugl)
Number of Local Level Governments (LLGs):	19 LLGs

2. Forest Information

Forest Area:	384, 257 ha

Provincial Tree

The provincial tree is '*Dacrycarpus*' (scientifically known as *Dacrycarpus imbricatus*) and is commonly found in Lower Montane to Montane forest.

Significance of Provincial tree:

It is a softwood species and also known as *highlands podocarp* and has various uses such as construction of homes, furniture, fences, bridges, etc.

The leaves are used for decorations for special occasions such as traditional dancing and burnt to repel insects.

Scientific name: *Dacrycarpus imbricatus*	Family: *Podocarpaceae*	Common Name/Trade name: *Dacrycarpus*

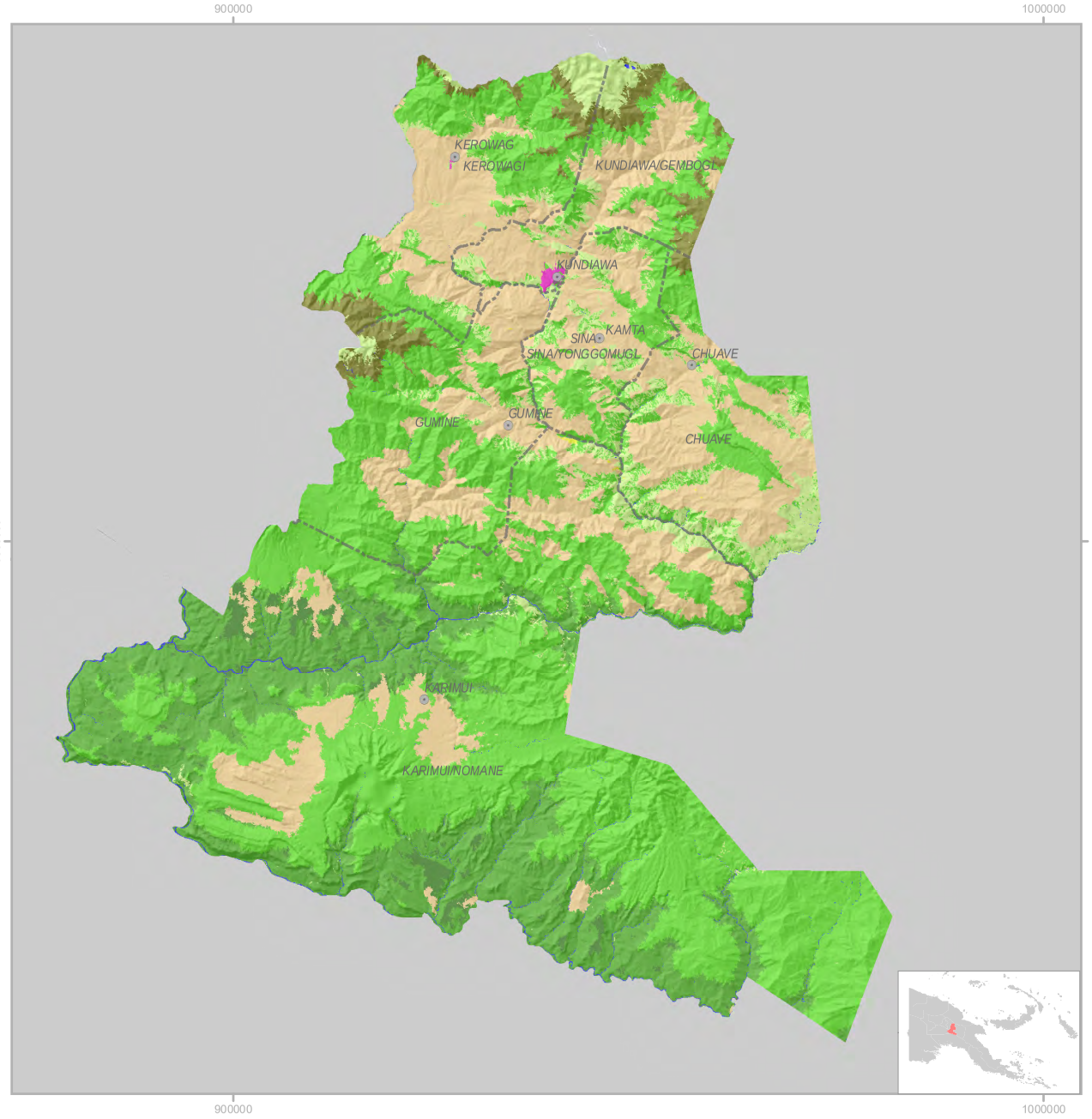
Description

A large canopy tree with a straight cylindrical bole, outer bark is grey or dark brown with slightly rough or smooth, scaly or flaky texture. Inner bark blaze pink or pale red with non-sticky bright red sap. Leaves: simple, both upper and under surface green. Flowers: very small to minute white flowers. Fruits: small dark green cone and contains a single seed.

Tree	Bark	Leaf/Leaves
 Source: https://www.monaconatureencyclopedia.com/dacrycarpus-imbricatus-2/?lang=en	 Source: http://www.pngplants.org/PNGtrees/TreeDescriptions/Dacrycarpus_imbricatus_Blume_de_Laub_var.html	 Source: https://en.wikipedia.org/wiki/Dacrycarpus_imbricatus#/media/File:Dacrycarpus_imbricatus.JPG

Note:	Flower	Fruit/Seed
Short description was from the PNG Plant database website (link below) http://www.pngplants.org/PNGtrees/TreeDescriptions/Dacrycarpus_imbricatus_Blume_de_Laub_var.html	 Source: https://singapore.biodiversity.online/species/P-Gymn-000030	 Source: http://www.biotik.org/laos/species/d/dacim/dacim_03_en.html (female cones above)

VEGETATION AND LAND COVER MAP OF CHIMBU PROVINCE (2012 FOREST BASEMAP VERSION 1.1)



Land Use and Land Cover Classes

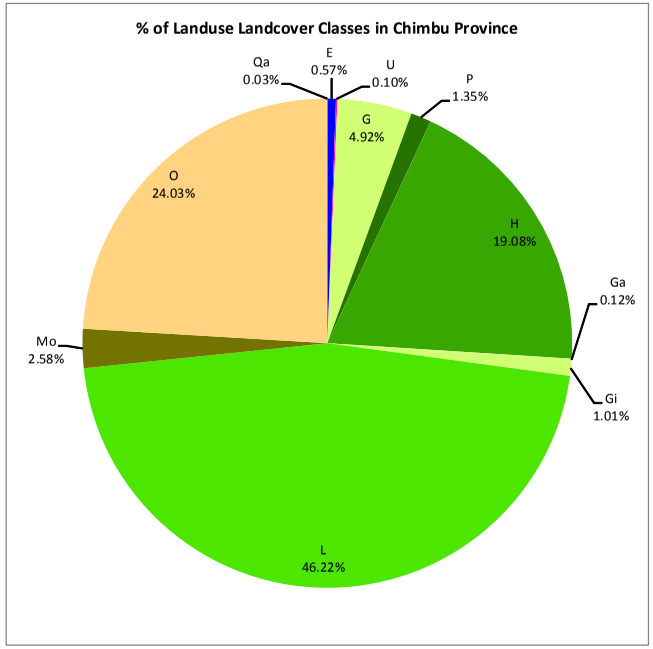
- P: Low Altitude Forest on Plains & Fans
- H: Low Altitude Forest on Uplands
- L: Lower Montane Forest
- Mo: Montane Forest
- G: Grassland
- Ga: Alpine grassland
- Gi: Subalpine grassland
- O: Agriculture Land Use
- Qa: Agriculture Plantation
- U: Settlement & larger urban centres
- E: Lakes & larger rivers

N

1 cm = 8 km

0 8 16 24

Kilometers

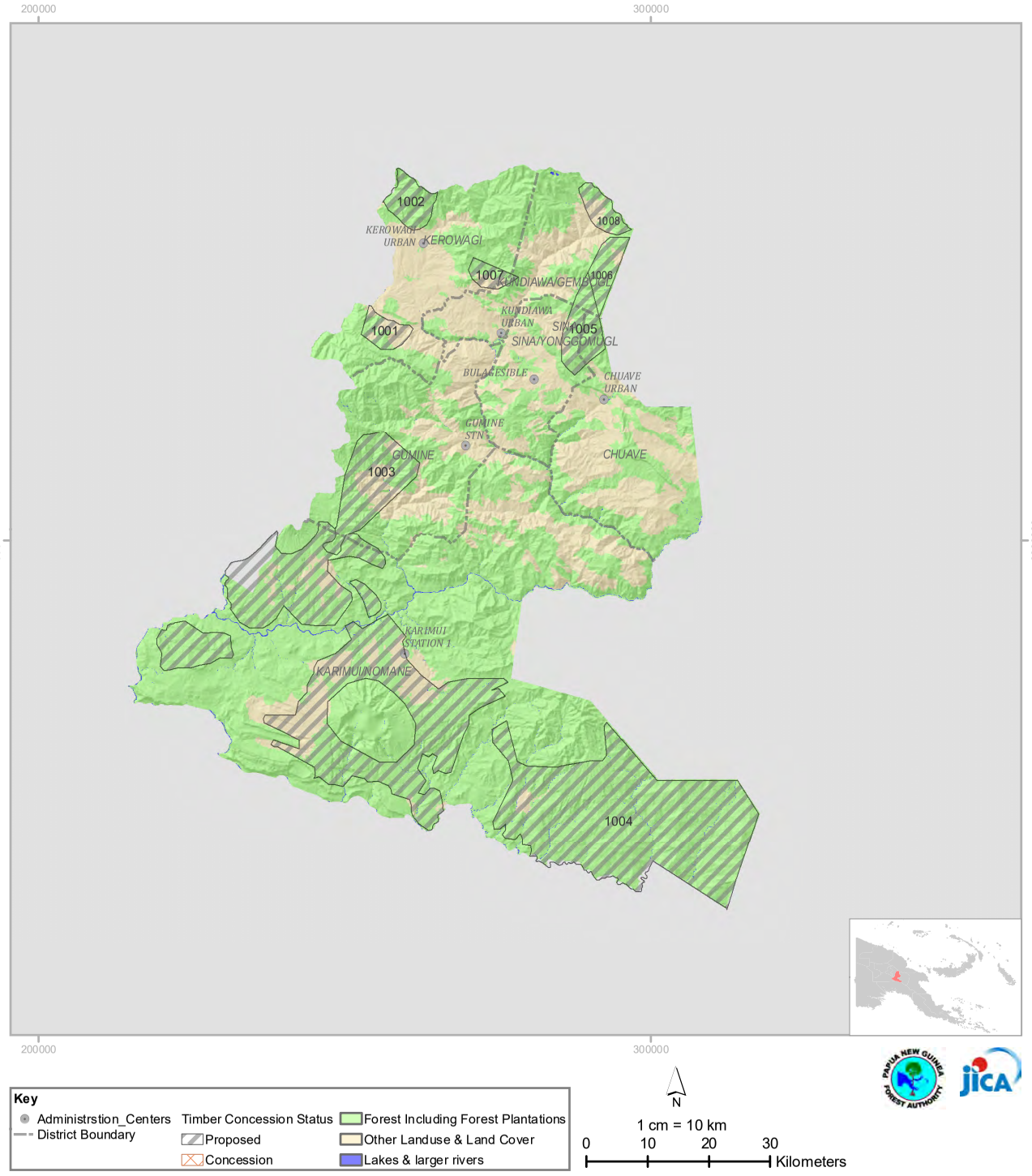


Pie Chart showing percentage in Landuse, Landcover of Chimbu Province.

% of Landuse Lancover						
Code	**Chuave**	**Guminie**	**Karamui Nomane**	**Kerowagi**	**Kundiawa Gembogl**	**Sinasina Yonggomugl**
H	0.31%	1.24%	33.19%			
L	28.64%	56.95%	50.04%	45.75%	28.84%	37.37%
Mo	0.89%	5.57%		9.62%	12.79%	
G	20.61%	2.55%	1.78%	4.44%	6.17%	15.64%
Ga	0.02%	0.03%		0.27%	1.13%	0.20%
Gi	0.00%	1.27%		4.92%	5.21%	
O	49.22%	32.38%	11.71%	34.89%	44.47%	46.61%
Qa	0.03%	0.01%	0.03%			0.07%
U				0.07%	1.24%	0.04%
E	0.27%		0.88%	0.04%	0.16%	0.06%
Land Area (ha)	56,885.27	69,805.38	349,446.35	60,835.65	43,863.66	32,387.78

Table showing percentage in Landuse, Landcover of Districts in Chimbu Province. Percentage calculated from area in hectares.

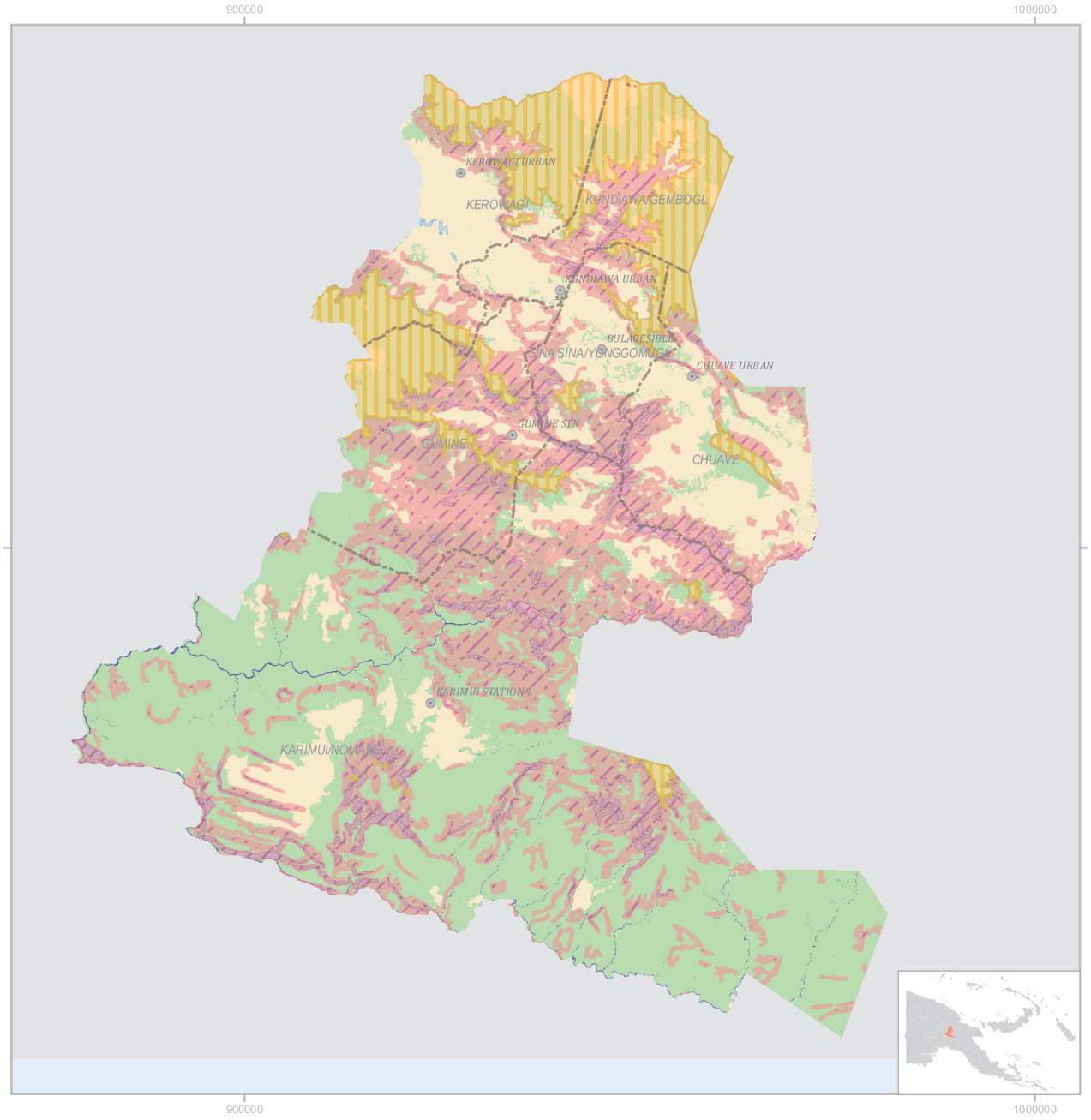
TIMBER CONCESSION MAP OF CHIMBU PROVINCE



PLAN_ID	NAME	AREA (ha)	CONCESSION TYPE	STATUS
1002	BOGO KAWA	4,838.40		Proposed
1008	MONDA	3,486.73		Proposed
1005	KAUTA BANDI	6,876.09		Proposed
1006	KERIGOMA	4,120.32		Proposed
1003	DEGE PAUMA	13,980.19		Proposed
1007	KURUMUL	2,332.07		Proposed
1001	Bill	3,352.76		Proposed
1004	KARAMUI BOMAI	150,442.65		Proposed

Table showing Timber Concessions of Chimbu Province. Information updated as at 2016.

CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, CHIMBU (SIMBU) PROVINCE



Key

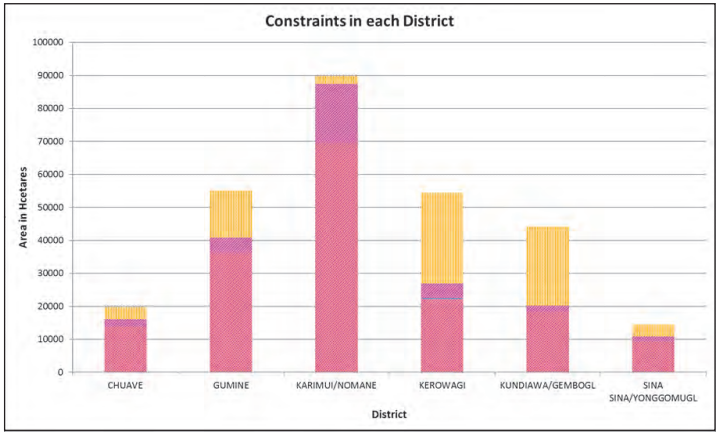
- Extreme Altitude
- Extreme Slope
- Serious Slope
- Serious Inundation
- Forest including Forest Plantations
- Other Landuse & Land Cover
- Lake & Larger Rivers

N

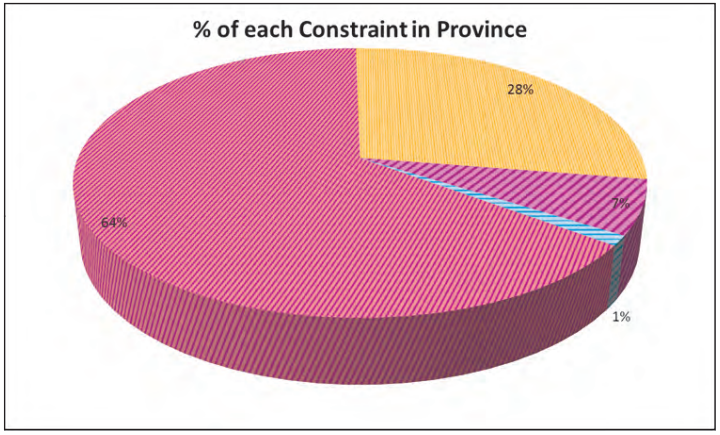
1 cm = 8 km

0 8 16 24 Kilometers

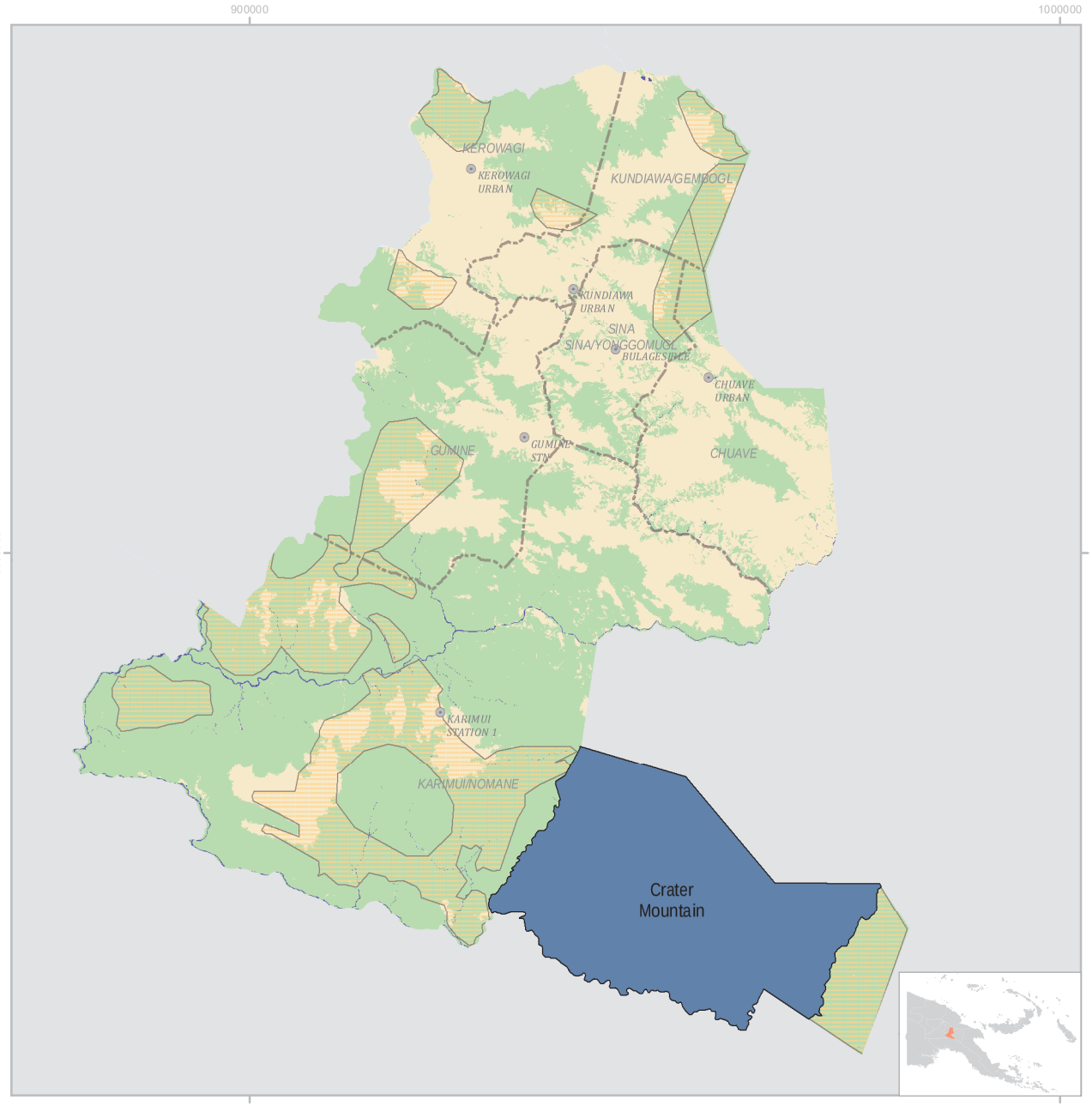
Brief Report on Logging Constraints of Chimbu (Simbu) Province



The dominate constraint present in most districts is 'Serious Slope', it accounts for a total of 64% of all constraints present in the province. The majority of 'Serious Slope' is centred along the shared borders of Sina Sina/Yonggomugl, Chuave, Gumine and Karimui/Nomane districts. The second largest constraint to commercial timber production is 'Extreme Altitude', as it accounts for 28% of all constraints. In particular, 'Extreme Altitude' is mostly present in Kerowagi, Kundiawa/Gembogl, and Gumine as these districts are more mountainous.



TERRESTRIAL PROTECTED AREAS, CHIMBU PROVINCE



Key

	Concessions	Forest Base Map Class
Terrestrial Protected Area	Current	Forest including Forest Plantations
	Expired	Other Landuse & Land Cover
	Proposed	Lake & Larger Rivers

N

1 cm = 8 km

0 8 16 24 Kilometers

Information on Terrestrial Protected Areas in Chimbu Province

Name	Crater Mountain WMA
Protected Area ID	7
Protected Area Type	Wildlife Management Area
Province	Chimbu
Location	Crater Mountain
Area (ha)	89, 928
Longitude	145° 5' 18" E
Latitude	7° 18' 1" S

Note:
Crater Mountain Wildlife Management Area is located in three different provinces:

1. Chimbu
=> 89, 928 ha

2. Eastern Highlands
=> 52, 848 ha

3. Gulf
=> 130, 958 ha

Total Area: 273, 734 ha

9. Western Highlands Province

General information/Overview

1. Location

Western Highlands Province is located in the highlands of PNG and consists of valleys and mountain ranges. The province is well known for its coffee plantation and shares the border with Jiwaka province.

Provincial Administration Centre:	Mt. Hagen
Land area:	432, 998 ha
Population:	362, 850 (2011)
Number of District:	4 (Dei, Mount Hagen, Mul-Baiyer, Tambul-Nebilyer)
Number of Local Level Governments (LLGs):	9 LLGs

2. Forest Information

Forest Area:	142, 262 ha

Provincial Tree

The provincial tree is '*PNG Oak*' (scientifically known as *Castanopsis accuminatissima*) and is commonly found in Lower Montane to Montane forest.

Significance of Provincial tree:

It is a hardwood timber species and is commonly used for construction of homes, fences, furniture and bridges. The fruits and nuts are edible while sap from the bark has medicinal properties for herbal remedy. The leaves are used for decorations for special occasions such as cultural dances and as well burnt to repel insects.

Scientific name: *Castanopsis accuminatissima*	Family: *Fagaceae*	Common Name/Trade name: *PNG Oak*

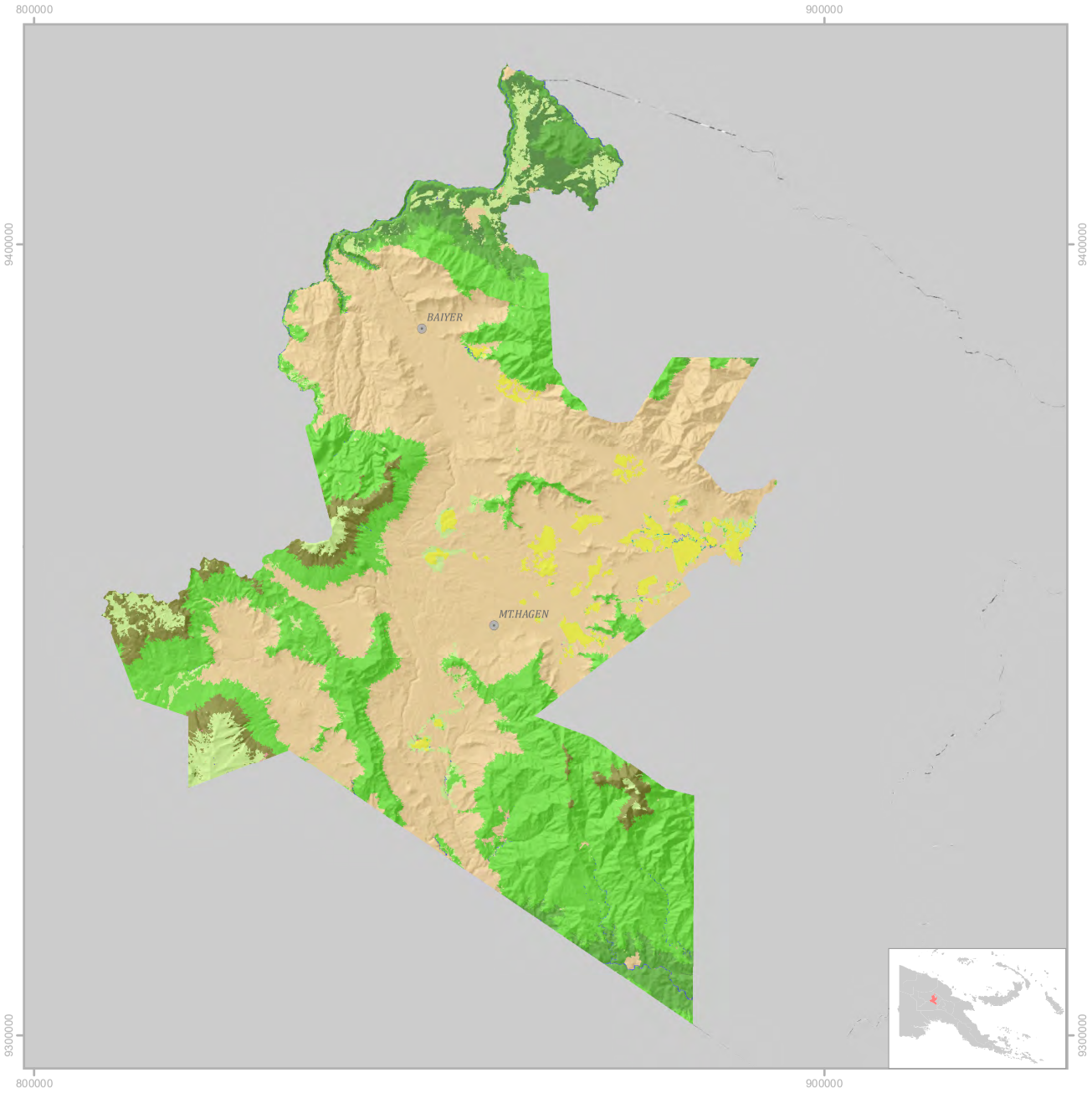
Description

A large canopy tree with markedly fluted straight bole. Outer bark grey or pale brown, rough, fissured and cracked. Inner bark red or pale brown, fibrous with non-sticky colourless sap. Leaves: simple, upper surface is green and lower is pale green or brownish green. Flowers: male and female flowers on the same plant. Small pale yellow, green or brown (pale fawn-coloured) flowers. Fruit/Seed- small brown nut with a single seed.

Tree	Bark	Leaf/Leaves
 Source: https://www.123rf.com/photo_46757006_fresh-green-leaves-of-castanopsis-trees.html?fromid=WEpHMFpyU2dVSzdaMDBDM2JvVEI3dz09	 Source: http://www.pngplants.org/PNGtrees/TreeDescriptions/Castanopsis_acuminatissima_Bl_A_DC.html	 Source: http://www.pngplants.org/PNGtrees/TreeDescriptions/Castanopsis_acuminatissima_Bl_A_DC.html

Note:	Flower	Fruit/Seed
Short description was from the PNG Plant database website (link below) Source: http://www.pngplants.org/PNGtrees/TreeDescriptions/Castanopsis_acuminatissima_Bl_A_DC.html	 Source: https://memim.com/castanopsis-acuminatissima.html  Source: http://www.biotik.org/laos/species/c/casac/casac_07_en.html	 Source: https://www.flickr.com/photos/jackforest/23546258383/in/photostream/

VEGETATION AND LAND COVER MAP OF WESTERN HIGHLANDS PROVINCE (2012 FOREST BASEMAP VERSION 1.1)



Land Use and Land Cover Classes

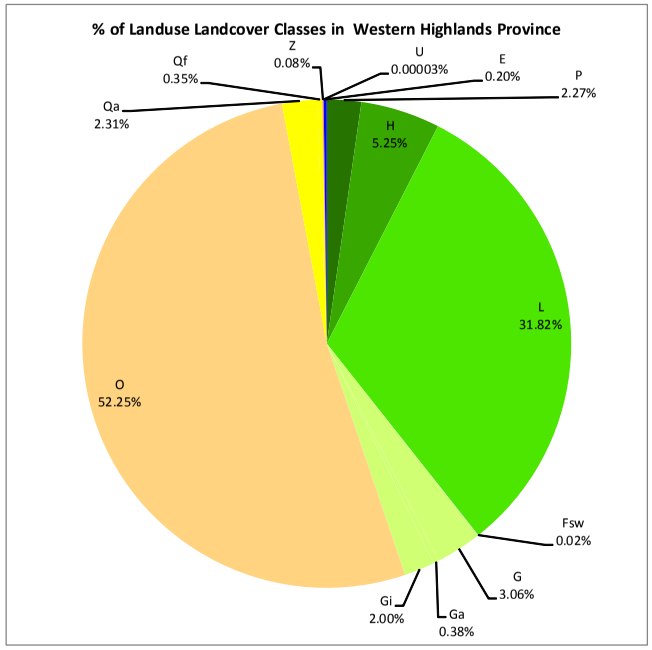
- P: Low Altitude Forest on Plains & Fans
- H: Low Altitude Forest on Uplands
- L: Lower Montane Forest
- Mo: Montane Forest
- Fsw: Swamp Forest
- G: Grassland
- Ga: Alpine grassland
- Gi: Subalpine grassland
- O: Agriculture Land Use
- Qa: Agriculture Plantation
- Qf: Forest Plantation
- Z: Bare areas
- U: Settlement & larger urban centres
- E: Lakes & larger rivers

N

1 cm = 8 km

0 8 16 24

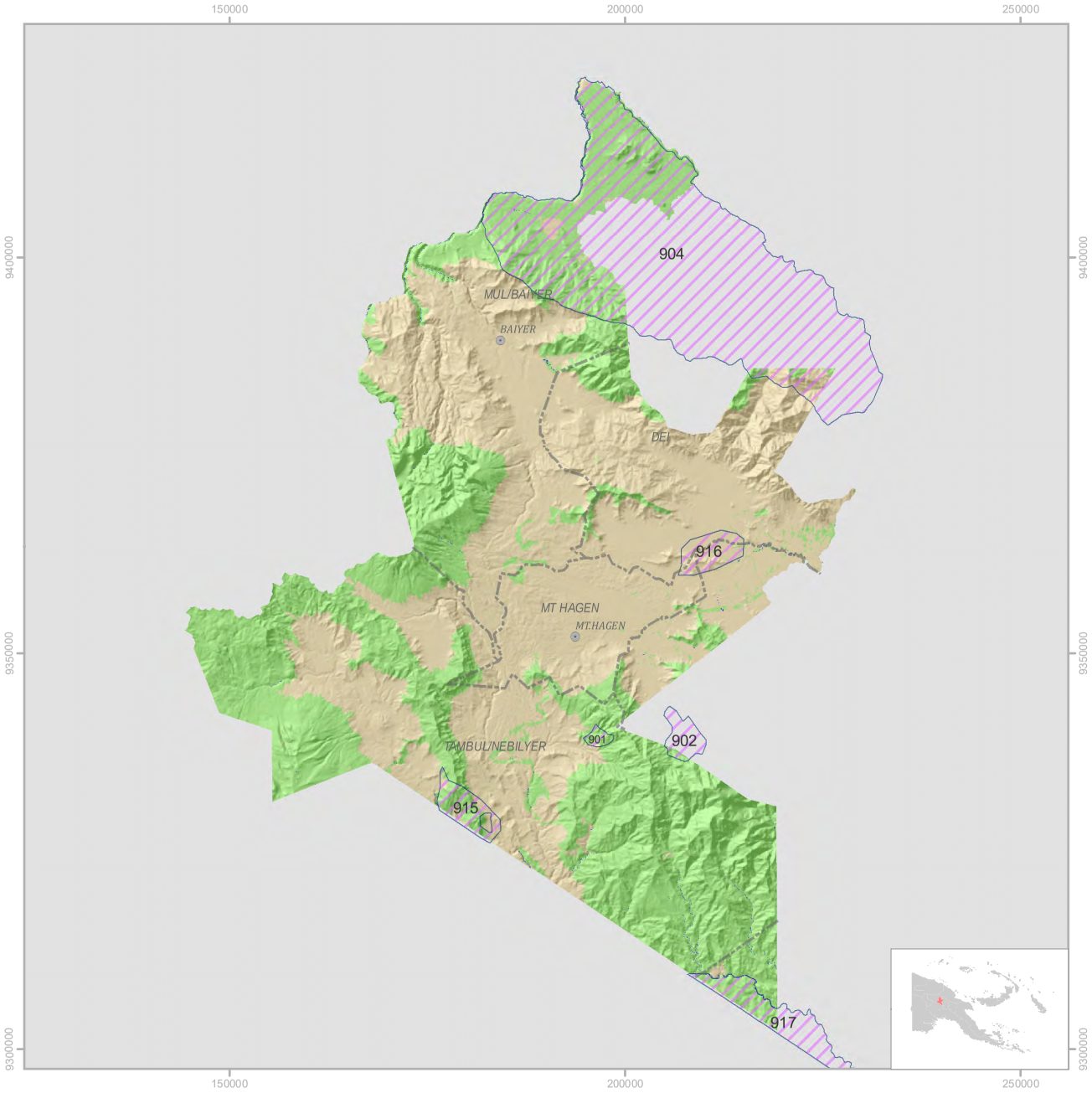
Kilometers



Pie Chart showing percentage in Landuse, Landcover of Western Highlands Province.

**Note: District informatio is not shown for Western Highlands Province.*

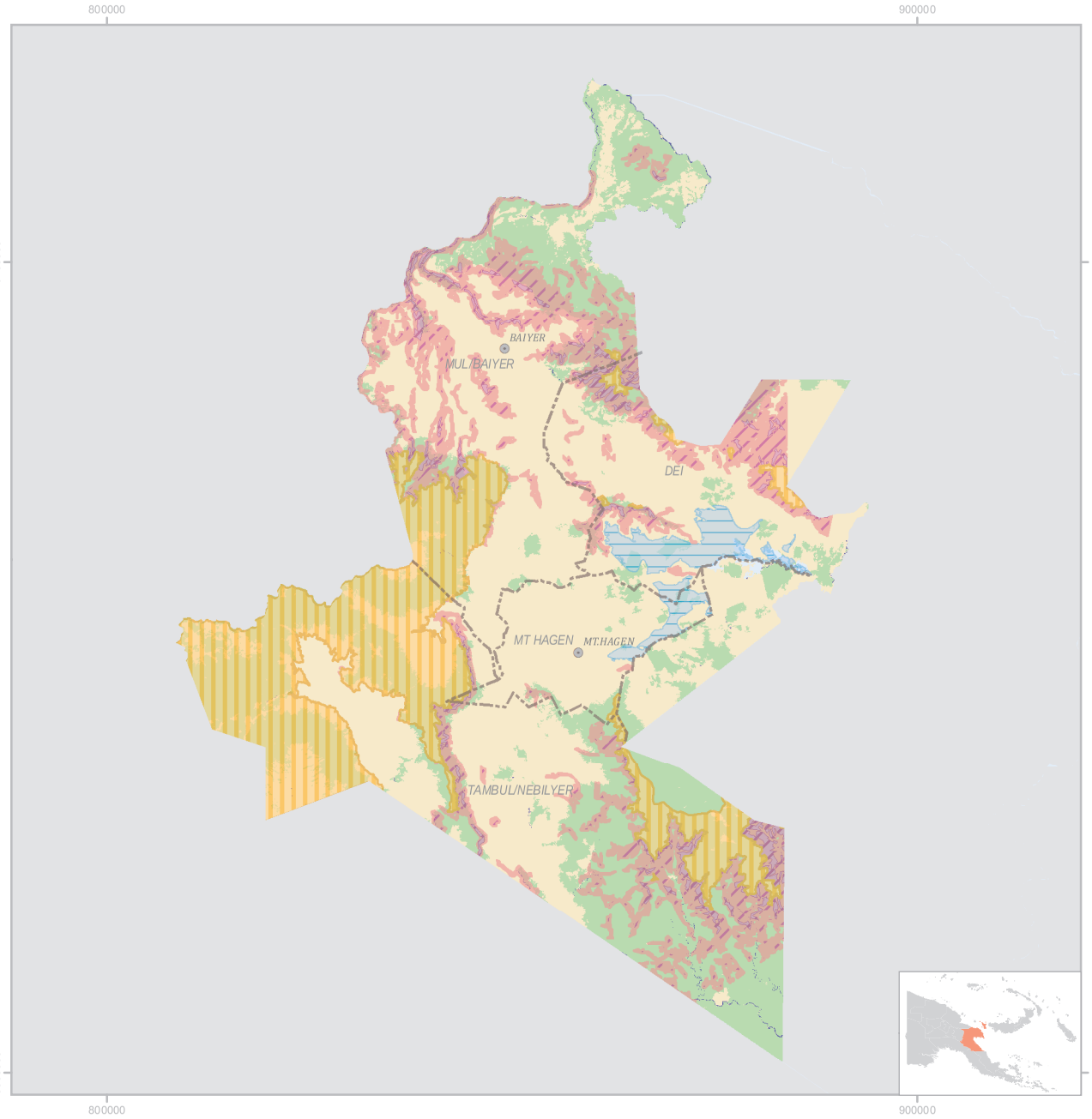
TIMBER CONCESSION MAP OF WESTERN HIGHLANDS PROVINCE



PLAN_ID	NAME	AREA (ha)	CONCESSION TYPE	STATUS
901	KUM NO 2 TRP	608.59	TRP	Expired
902	KUNA RIVER TRP	2,217.12	TRP	Expired
916	WAGHI PLANTATIONS	3,356.56		Expired
915	EAST KAMBIA	3,197.99	TRP	Expired
904	JIMI RIVER TRP	89,666.35	TRP	Expired
917	East Pangi	6,820.68	TRP	Expired

Table showing Timber Concessions of Western Highlands Province. Information updated as at 2016.

CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, WESTERN HIGHLANDS PROVINCE



Key

- Extreme Altitude
- Extreme Slope
- Serious Slope
- Serious Inundation
- Forest including Forest Plantations
- Other Landuse & Land Cover
- Lake & Larger Rivers

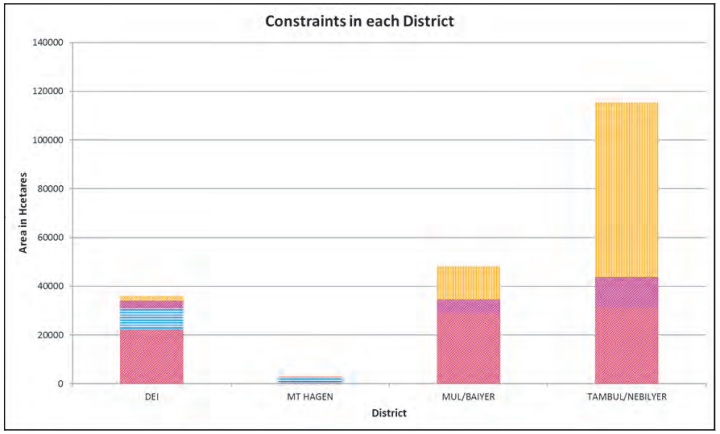
N

1 cm = 8 km

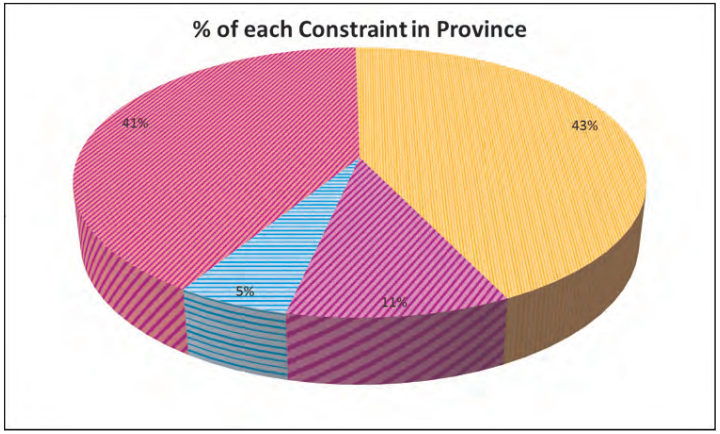
0 8 16 24 Kilometers

PAPUA NEW GUINEA FOREST AUTHORITY

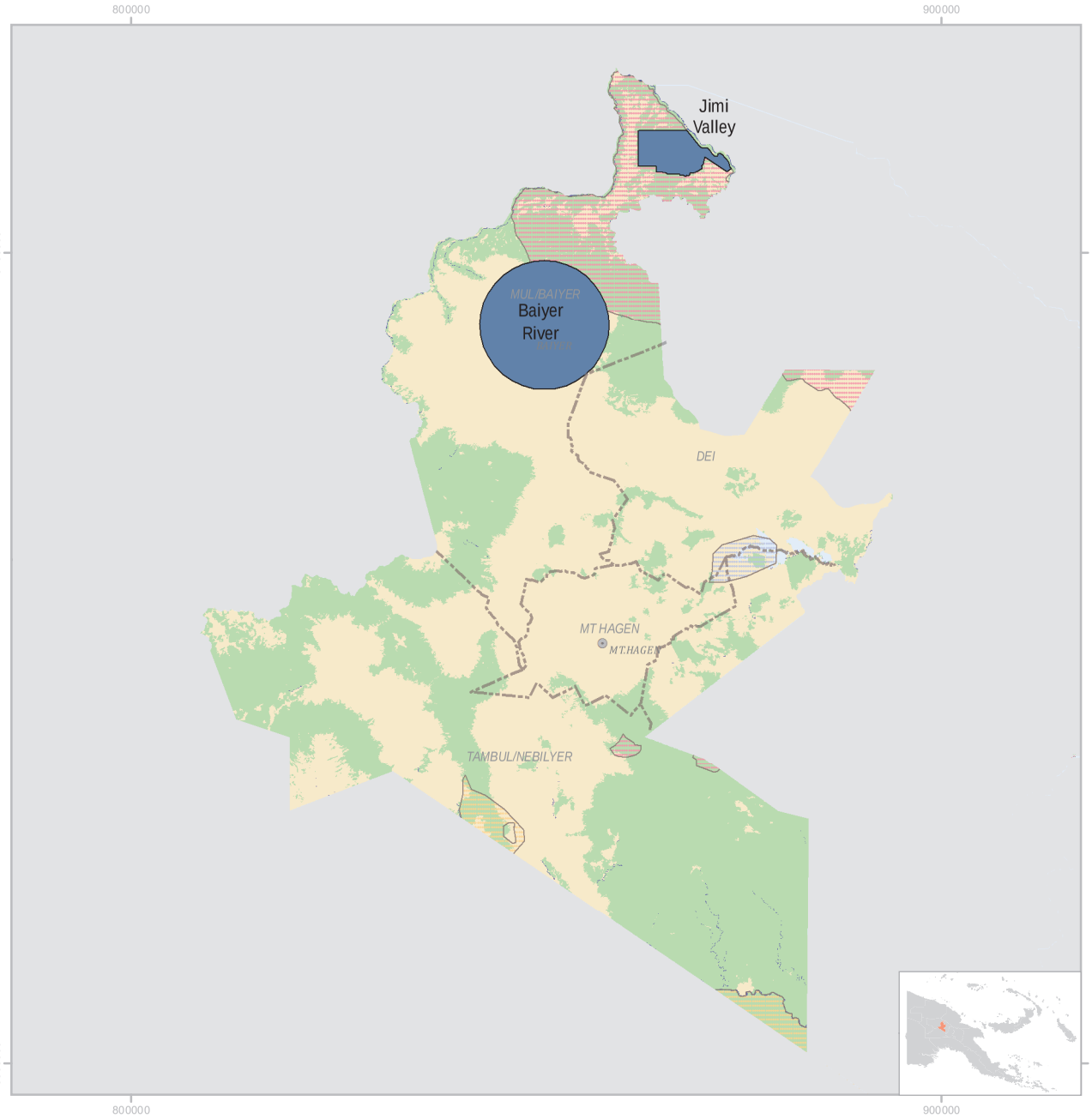
Brief Report on Logging Constraints of Western Highlands Province



Of the 4 districts in Western Highlands province, the least constrained is Mt. Hagen and the district with the largest percentage of constraints to commercial timber production is Tambul/Nebilyer. The primary constraint is 'Extreme Altitude', which amounts to 43% of all constraints present in the province. 'Extreme Altitude' is primarily found in the north-western side of Tambul/Nebilyer and along the south-western end of Mul/Baiyer. The second most frequent constraint is 'Serious Slope', which constitutes to 41% of all constraints. 'Serious Slope' is most present in the northern region of the province and in the south-eastern end of Tambul/Nebilyer.



TERRESTRIAL PROTECTED AREAS, WESTERN HIGHLANDS PROVINCE



Key

Terrestrial Protected Area	Concessions	Forest Base Map Class
	Current	Forest including Forest Plantations
	Expired	Other Landuse & Land Cover
	Proposed	Lake & Larger Rivers

N

1 cm = 8 km

0 8 16 24 Kilometers

Information on Terrestrial Protected Areas in Western Highlands Province

Name	Baiyer River Santuary
Protected Area ID	2
Protected Area Type	Sanctuary
Province	Western Highlands
Location	Baiyer River
Area (ha)	19, 858
Longitude	144° 10' 0"
Latitude	6° 30' 0"
Name	**Jimi Valley National Park**
Protected Area ID	12
Protected Area Type	National Park
Province	Western Highlands
Location	Jimi Valley
Area (ha)	4, 206
Longitude	144° 18' 38"
Latitude	6° 41' 33"
Name	**Mt Wilhelm National Reserve**
Protected Area ID	30
Protected Area Type	National Reserve
Province	Western Highlands
Location	Mt Wilhelm
Area (ha)	809
Longitude	145° 3' 10"
Latitude	6° 12' 18"

10. Sandaun (West Sepik) Province

General information/Overview

1. Location

Sandaun (West Sepik) Province is on the northwest mainland of PNG and the landform comprises of plains, floodplains, swamps and hills. The province shares the border with Irian Jaya province of Indonesia.

Provincial Administration Centre:	Vanimo
Land area:	3, 592, 766 ha
Population:	248, 411 (2011)
Number of District:	4 (Aitape-Lumi, Telefomin, Nuku, Vanimo-Green River)
Number of Local Level Governments (LLGs):	18 LLGs

2. Forest Information

Forest Area:	2, 985, 102 ha

Provincial Tree

The provincial tree is '*Kwila*'[11] (scientifically known as *Intsia palembanica*) and is commonly found in Low Altitude Forest on Plains and Fans, and Low Altitude Forest on Uplands.

Significance of Provincial tree:

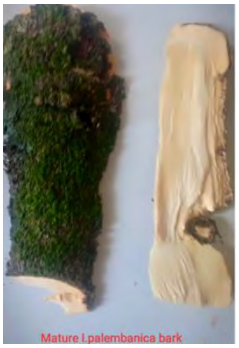
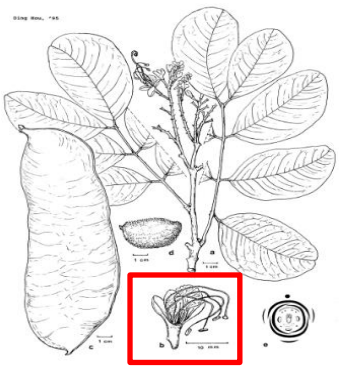
It is a hard wood species (strong and natural durability) and one of the major commercial species exported in round log form. Kwila has various uses such as construction for posts and timber for homes, bridges, etc.

[11] There are two species of Intsia (Kwila); *I.palembanica* and *I.bijuga* where West Sepik has chosen *I. palembanica palembanica* and Madang has chosen *I.bijuga.*

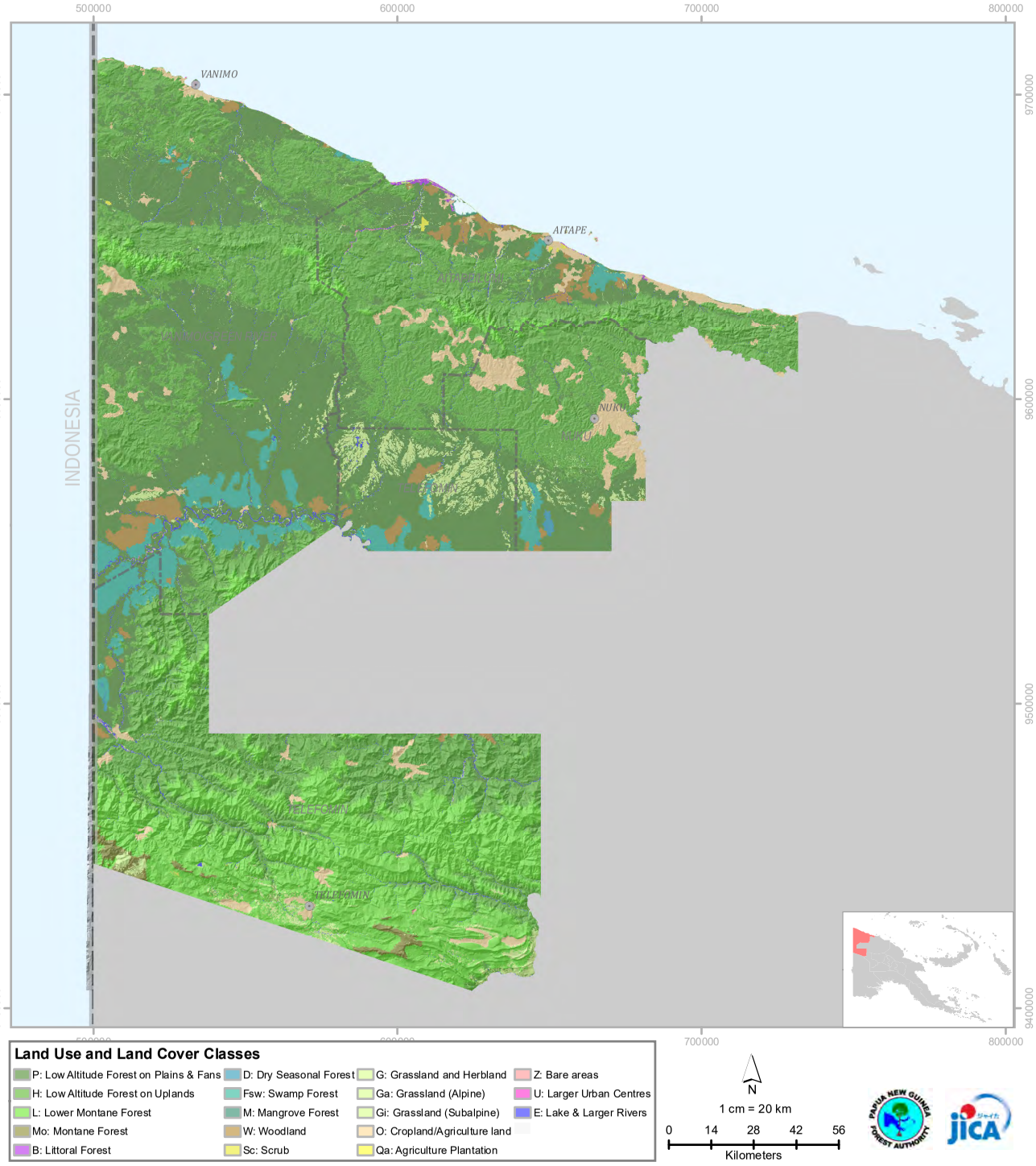
Scientific name: *Intsia palembanica*	Family: *Fabaceae*	Common Name/Trade name: *Kwila*

Description

Kwila is a large canopy tree, straight cylindrical bole and buttress present. Outer bark is brown in colour, Leaves; spiral, compound pinnate (two or more pairs of leaflets), thickly leathery and glossy. Flowers: small pale yellowish-white., Fruit/Seed: a long green pod/legume (immature) containing 3 to more seeds which turns brown or black when it matures.

Tree	Bark	Leaf/Leaves
 Source: https://www.cabi.org/isc/datasheet/28751#toPictures	  Photo source: Saki S, Acting Project Supervisor, Provincial Forest Office, Vanimo, Sandaun Province	 Source: https://www.cabi.org/isc/datasheet/28751#toPictures  Source: https://florafaunaweb.nparks.gov.sg/special-pages/plant-detail.aspx?id=2972
Note: Short description was from different source. Intsia palembanica Miq. a. Flowering branch; b. flower with one calyx lobe removed (highlighted in red); c. pod; d. seed (a:Koster BW 11084.; b:van Royen 5007.; c, d:Meijer SAN 19871.). Drawing Ding Hou Source: http://portal.cybertaxonomy.org/flora-malesiana/node/7509#	Flower 	Fruit/Seed  Source: https://florafaunaweb.nparks.gov.sg/special-pages/plant detail.aspx?id=2972

VEGETATION AND LAND COVER MAP OF WEST SEPIK PROVINCE (2012 FOREST BASEMAP VERSION 1.1)



Land Use and Land Cover Classes

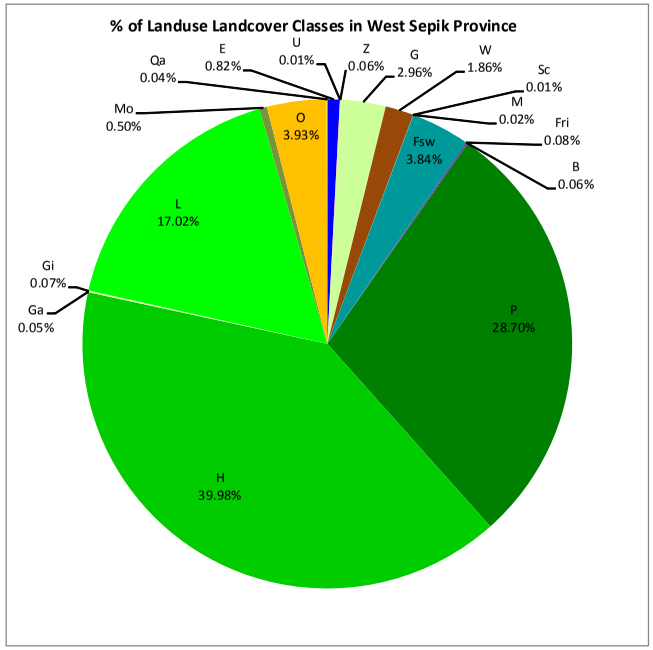
P: Low Altitude Forest on Plains & Fans	D: Dry Seasonal Forest	G: Grassland and Herbland	Z: Bare areas
H: Low Altitude Forest on Uplands	Fsw: Swamp Forest	Ga: Grassland (Alpine)	U: Larger Urban Centres
L: Lower Montane Forest	M: Mangrove Forest	Gi: Grassland (Subalpine)	E: Lake & Larger Rivers
Mo: Montane Forest	W: Woodland	O: Cropland/Agriculture land	
B: Littoral Forest	Sc: Scrub	Qa: Agriculture Plantation	

N

1 cm = 20 km

0 14 28 42 56

Kilometers

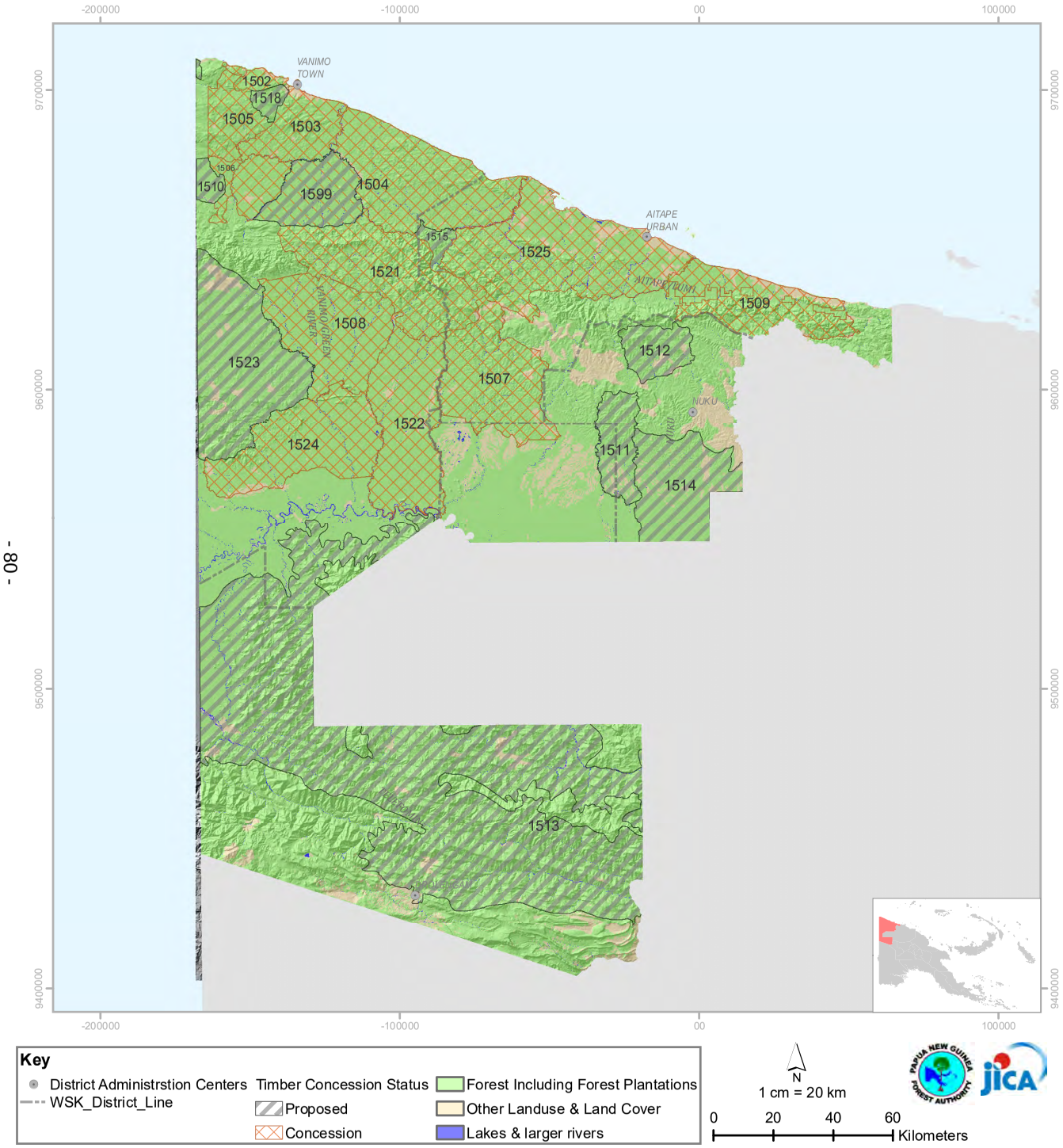


Pie Chart showing percentage in Landuse, Landcover of West Sepik Province.

% of area of Landuse and Cover				
Code	**Aitape Lumi**	**Nuku**	**Telefomin**	**Vanimo Green River**
P	22.59%	24.79%	13.75%	47.99%
H	59.81%	52.58%	29.39%	37.28%
L	2.65%	1.03%	38.94%	2.11%
Mo			1.24%	
B	0.38%			
Fri		0.63%	0.05%	
Fsw	1.34%	2.63%	2.73%	6.36%
M	0.11%			
W	3.59%	0.99%	1.11%	2.07%
Sc			0.02%	
G	1.50%	2.59%	5.03%	1.18%
Ga			5.03%	
Gi			0.18%	
O	6.89%	14.45%	1.75%	1.94%
Qa	0.22%			0.01%
Z	0.14%		0.03%	0.02%
U	0.01%			0.01%
E	0.76%	0.30%	0.74%	1.02%
Land Area (ha)	583,665.40	351,911.15	1,451,105.93	1,271,733.33

Table showing percentage in Landuse, Landcover of districts in West Sepik Province. Percentage calculated from area in hectares.

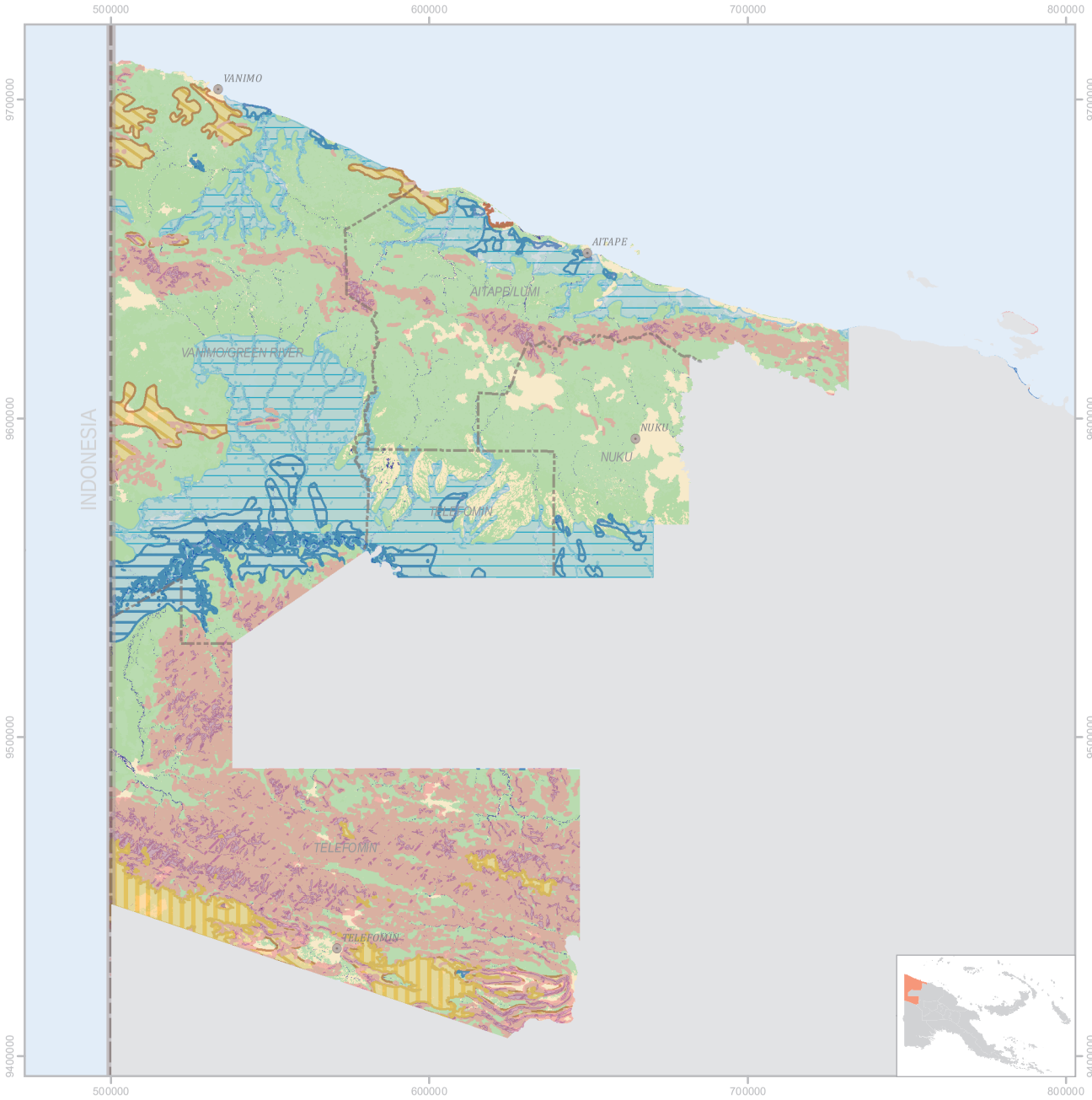
TIMBER CONCESSION MAP OF WEST SEPIK PROVINCE



PLAN_ID	NAME	AREA (ha)	Concession Type	STATUS
1,509	Aitape East Coast	86,677.38	FMA	Concession
1,524	Amanab 1&2	126,567.36	FMA	Concession
1,522	Amanab 6	129,702.79	FMA	Concession
1,523	Amanab 7	167,474.14		Proposed
1,508	Amanab Block 3-4	120,449.30	FMA	Concession
1,521	Amanab5	137,717.94	FMA	Concession
1,510	Arko-Samei	10,702.96		Proposed
1,511	Au East West	43,494.32		Proposed
1,505	Bewani	39,097.26	LFA	Concession
1,512	east west palai	34,703.16		Proposed
1,513	Idam Siawi	784,442.47		Proposed
1,514	Maimai Wanwan	100,506.74		Proposed
1,515	Make	10,198.03		Proposed
1,501	Musu Saberjin	1,805.29	TRP	Concession
1,506	Pegi Pulan	9,605.98	LFA	Concession
1,517	Schotiacho	1,045.90		Proposed
1,518	Sossi	9,263.15		Proposed
1,507	South West Wapei	117,131.91	FMA	Concession
1,503	VANIMO BLK 6	54,147.50	TRP	Concession
1,504	Vanimo Block 1-5	239,310.53	TRP	Concession
1,599	Vanimo Block2	59,676.72		Proposed
1,502	Waromo	8,854.69	TRP	Concession
1,525	Wes Romei Tadji	197,537.22	FMA	Concession

Table Showing Timber Concessions of West Sepik Province.
Information updated as at 2016.

CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, WEST SEPIK (SANDAUN) PROVINCE



Key

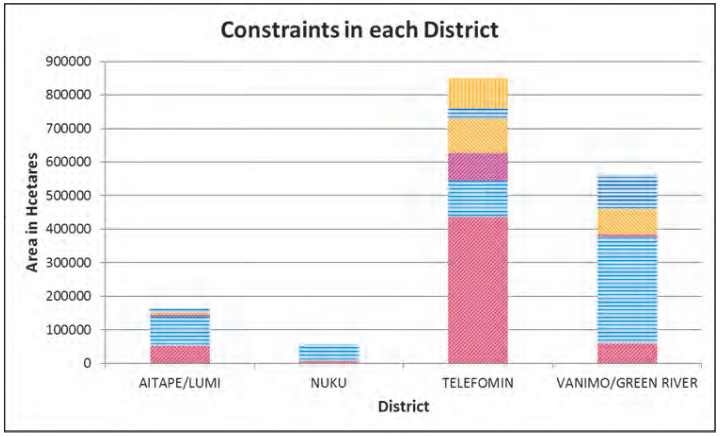
- Extreme Altitude
- Extreme Slope
- Serious Slope
- Extreme Karst
- Extreme Inundation
- Serious Inundation
- Mangrove
- Forest including Forest Plantations
- Other Landuse & Land Cover
- Lake & Larger Rivers

N

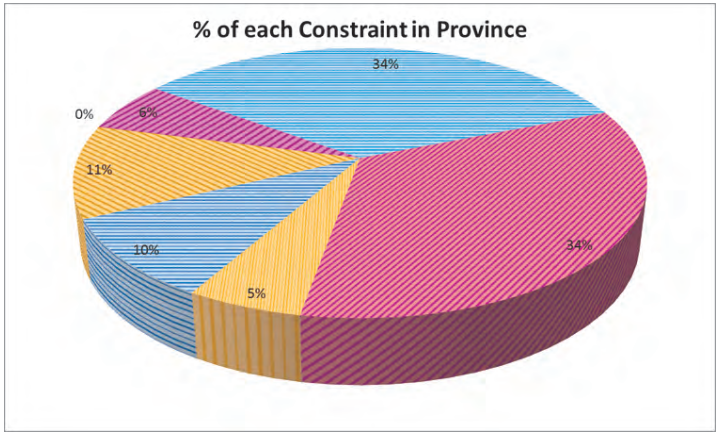
1 cm = 20 km

0 20 40 60 Kilometers

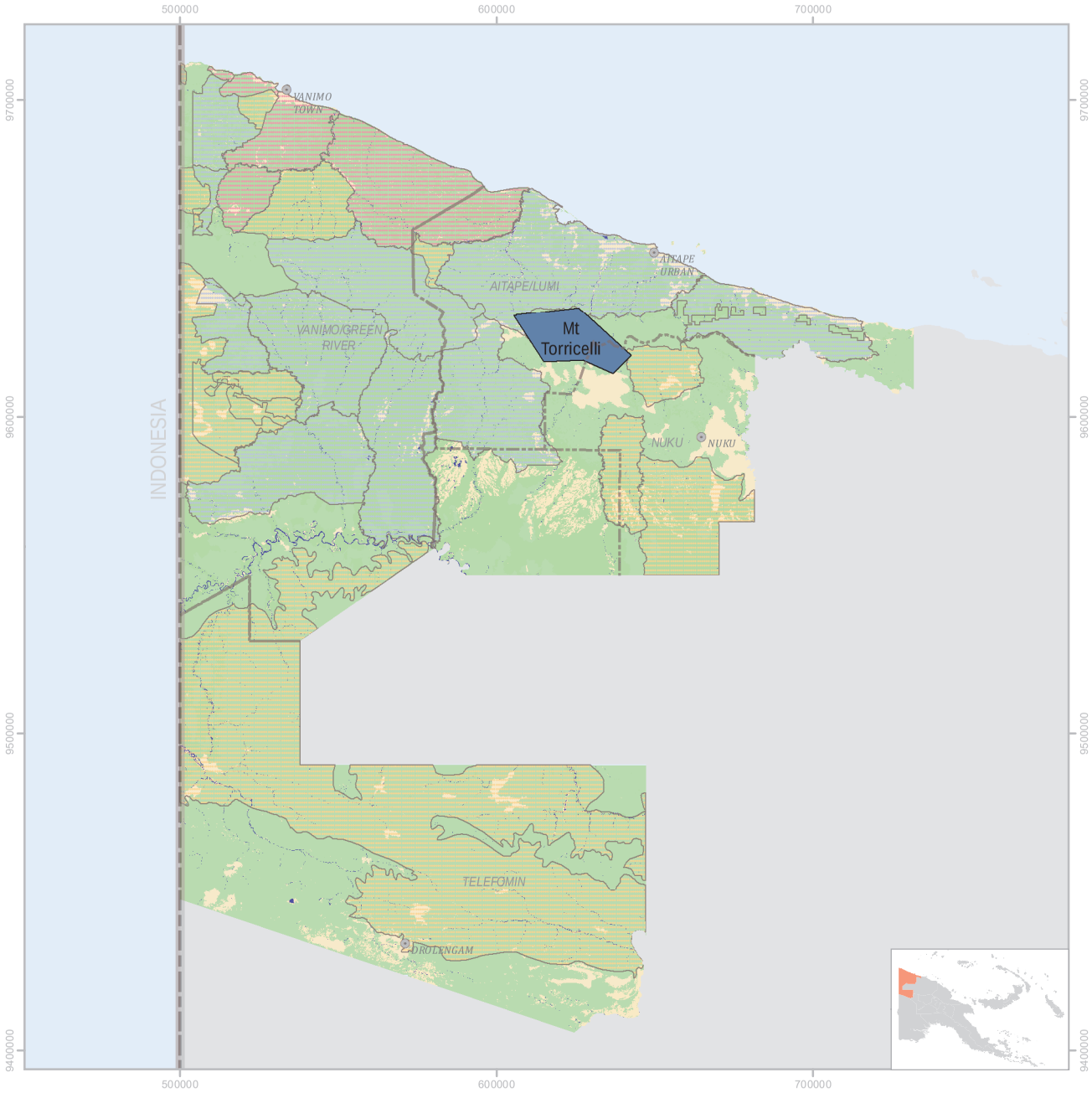
Brief Report on Logging Constraints of West Sepik (Sandaun) Province



West Sepik (Sandaun) Province is located at the north-western part of Papua New Guinea. The majority of the constraints in the province are the 'Serious Slope' and 'Extreme Slope' areas, found in the Telefomin District, and the 'Serious Inundation' and 'Extreme Inundation' areas in the Vanimo-Green River, Aitape-Lumi, and Nuku Districts. There are some inclined areas in the mid-northern part of the province, as well as 'Extreme Altitude' constrained areas along the edges in the southern and northern parts of the province. In the Aitape-Lumi District along the coast, are some of the 'Mangrove' constrained areas.



TERRESTRIAL PROTECTED AREAS, WEST NEW SEPIK PROVINCE



Key

Terrestrial Protected Area	Concessions	Forest Base Map Class
	Current	Forest including Forest Plantations
	Expired	Other Landuse & Land Cover
	Proposed	Lake & Larger Rivers

N

1 cm = 20 km

0 20 40 60 Kilometers

Information on Terrestrial Protected Areas in West New Sepik Province

Name	Mt Torricelli Proposed Conserevation Area
Protected Area ID	<NA>
Protected Area Type	Conserevation Area
Province	West Sepik
Location	Mt Torricelli
Area (ha)	43, 744
Longitude	142° 6' 48" E
Latitude	4° 36' 21" S

11. East Sepik Province

General information/Overview

1. Location

East Sepik Province is on the northwest of mainland of PNG and dominated by coastal plains and islands, the ranges in the northern part of the province, hill from the south and in the middle of the province is dominated by plains, floodplains, swamps and lakes of the Sepik River and its tributaries.

Provincial Administration Centre:	Wewak
Land area:	4, 368, 599 ha
Population:	450, 530 (2011)
Number of District:	6 (Ambunti-Dreikikir, Angoram, Maprik, Wewak, Wosera-Gawi, Yangoru-Saussia)
Number of Local Level Governments (LLGs):	26 LLGs

2. Forest Information

Forest Area:	2, 899, 490 ha

Provincial Tree

The provincial tree is *'Eaglewood'* (scientifically known as *Gyrinops leddermanii)* and is commonly found in Low Altitude Forest on Plains and Fans, and Low Altitude Forest on Uplands.

Significance of Provincial tree:

It is a rare, valuable tree species and is highly sought for its resin that is used in the production of aromatic oils, perfumes, etc. Very little is known on its cultural values however, the local people are generating an income from selling the trunk and bark that are used to produce fragrance oil.

Scientific name:	Family:	Common Name/Trade name:
Gyrinops leddermanii	***Thymelaeaceae***	***Eaglewood/agarwood/gaharu***

Description

A small sub-canopy tree with straight cylindrical bole. Outer bark slightly white or pale brown, slightly rough, peeling (papery) and inner bark pale brown, fibrous and pleasant aromatic from the bark. Leaf; spiral, simple, upper surface of leaf is dark green glossy and underneath is light green shiny in colour, stringy-thread like feature when leaf is snapped. Flowers small yellow or pale green trumpet-like (tubular). Fruit: green when immature, pale to yellowish green when mature, non-fleshy. Seeds: contains 1-2 black seeds.

Tree

Source: http://forestpathology.cfans.umn.edu/Papua%20New%20Guinea%20Agarwood%20Research.htm

Bark

Source: http://www.pngplants.org/PNGtrees/TreeDescriptions/Gyrinops_ledermannii_Domke.html

Leaf/Leaves

Photo source: EKaidong, Adaptation and Low Carbon Growth Officer, FPPD, HQ

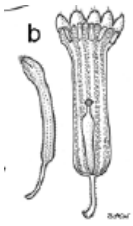
Note:

Short description was from the PNG Plant database website (link below)

http://www.pngplants.org/PNGtrees/TreeDescriptions/Gyrinops_ledermannii_Domke.html

b. Flower bud
source: B. Gunn, et, al (2004) "Eaglewood in Papua New Guinea", RMAP Working Paper No. 51

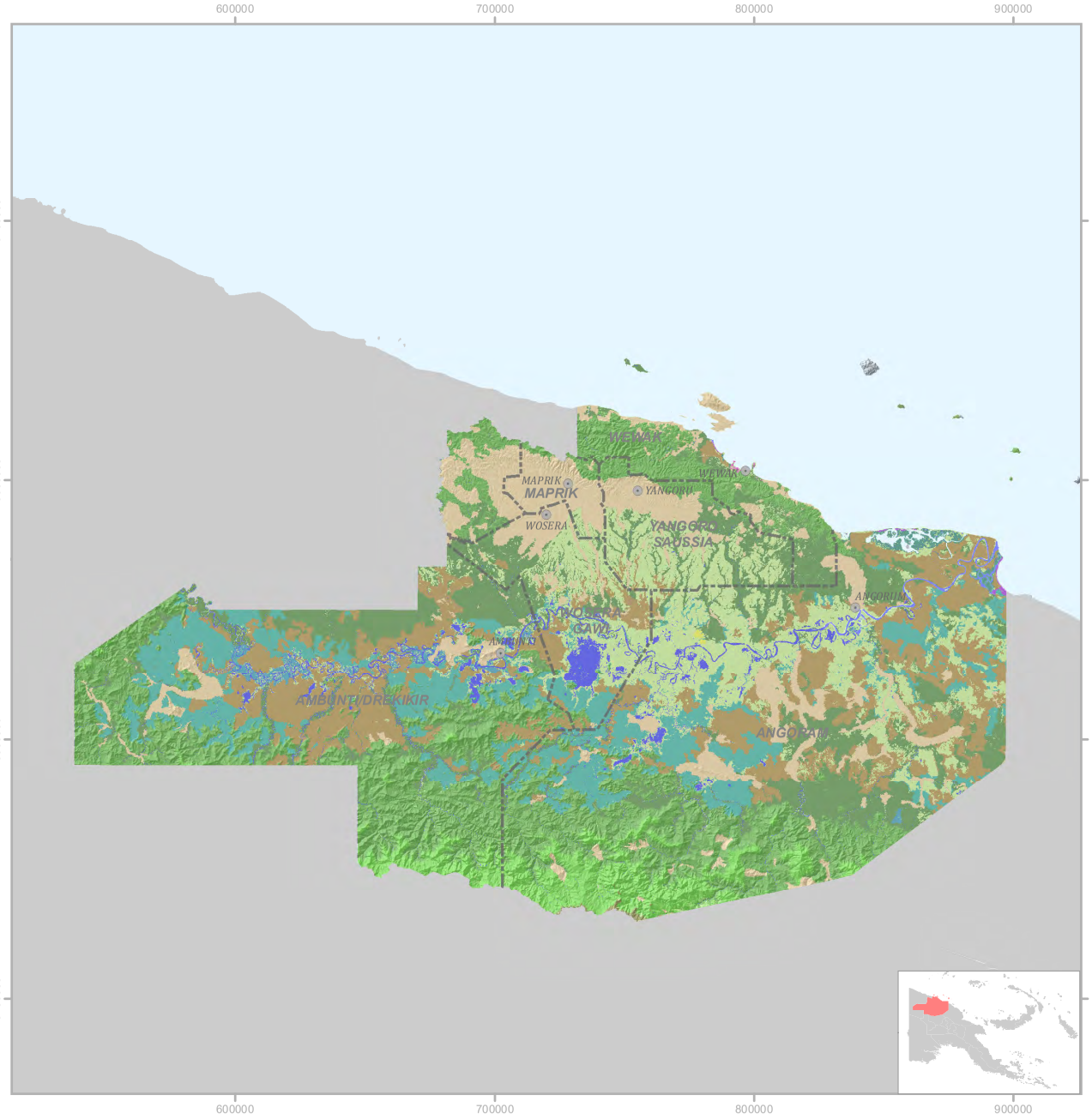
Flower



Fruit/Seed

Source: http://www.pngplants.org/PNGtrees/TreeDescriptions/Gyrinops_ledermannii_Domke.html

VEGETATION AND LAND COVER MAP OF EAST SEPIK PROVINCE (2012 FOREST BASEMAP VERSION 1.1)



Land Use and Land Cover Classes

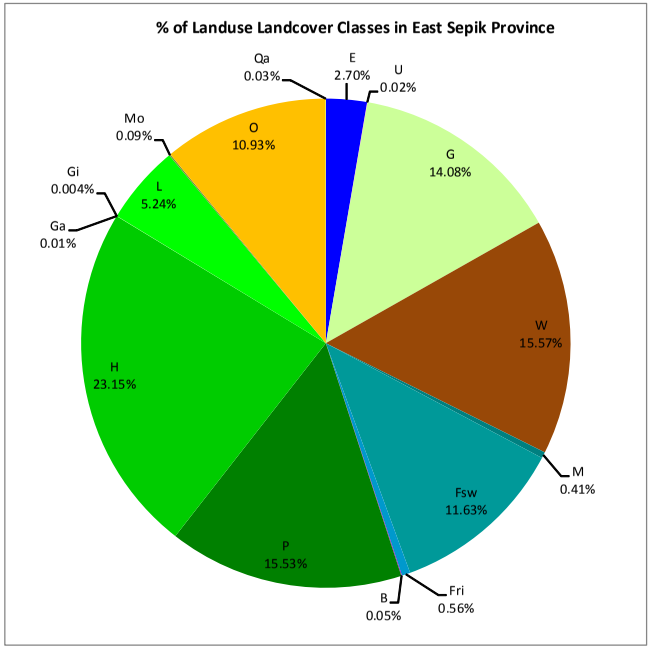
P: Low Altitude Forest on Plains & Fans	B: Littoral Forest	W:Woodland	O: Agriculture Land Use
H: Low Altitude Forest on Uplands	Fri: Seral Forest	G: Grassland	Qa: Agriculture Plantation
L: Lower Montane Forest	Fsw: Swamp Forest	Ga: Alpine grassland	U: Settlement & larger urban centres
Mo: Montane Forest	M: Mangrove	Gi: Subalpine grassland	E: Lakes & larger rivers

N

1 cm = 25 km

0 25 50 75

Kilometers

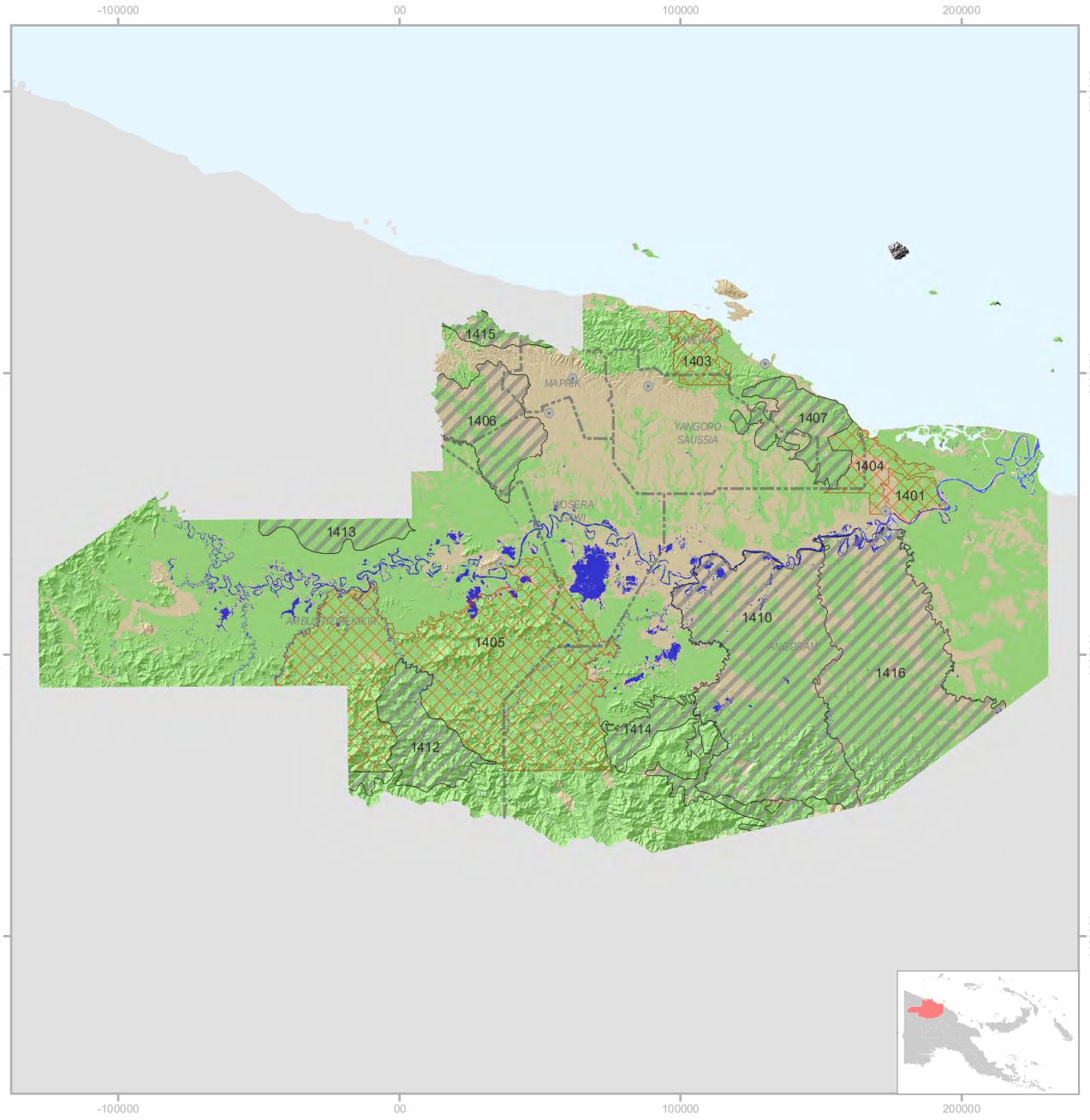


Pie Chart showing percentage in Landuse, Landcover of East Sepik Province.

% of Landuse Lancover						
Code	**Ambunti Drekirkir**	**Angoram**	**Maprik**	**Wewak**	**Wosera Gawi**	**Yangoro Saussia**
P	13.40%	15.03%	1.52%	22.99%	19.05%	25.49%
H	33.36%	17.72%	11.52%	53.83%	1.71%	9.19%
L	3.69%	8.72%	0.05%	0.14%		0.004%
Mo		0.20%				
B		0.10%		0.07%		
Fri	1.54%	0.06%			0.05%	
Fsw	16.47%	11.80%			8.75%	
M		0.88%		0.08%		
W	18.08%	18.16%		1.88%	12.61%	1.89%
G	2.90%	17.57%	6.96%	3.30%	33.61%	39.54%
Ga	0.00%	0.02%				
Gi		0.01%				
O	7.74%	7.33%	79.94%	17.23%	15.20%	23.69%
Qa		0.06%			0.03%	
U				0.28%		
E	2.81%	2.34%	0.01%	0.20%	8.98%	0.20%
Land Area (ha)	1,492,785.61	1,989,989.56	84,650.56	225,628.69	314,167.77	259,466.57

Table showing percentage in Landuse, Landcover of Districts in East Sepik Province. Percentage calculated from area in hectares.

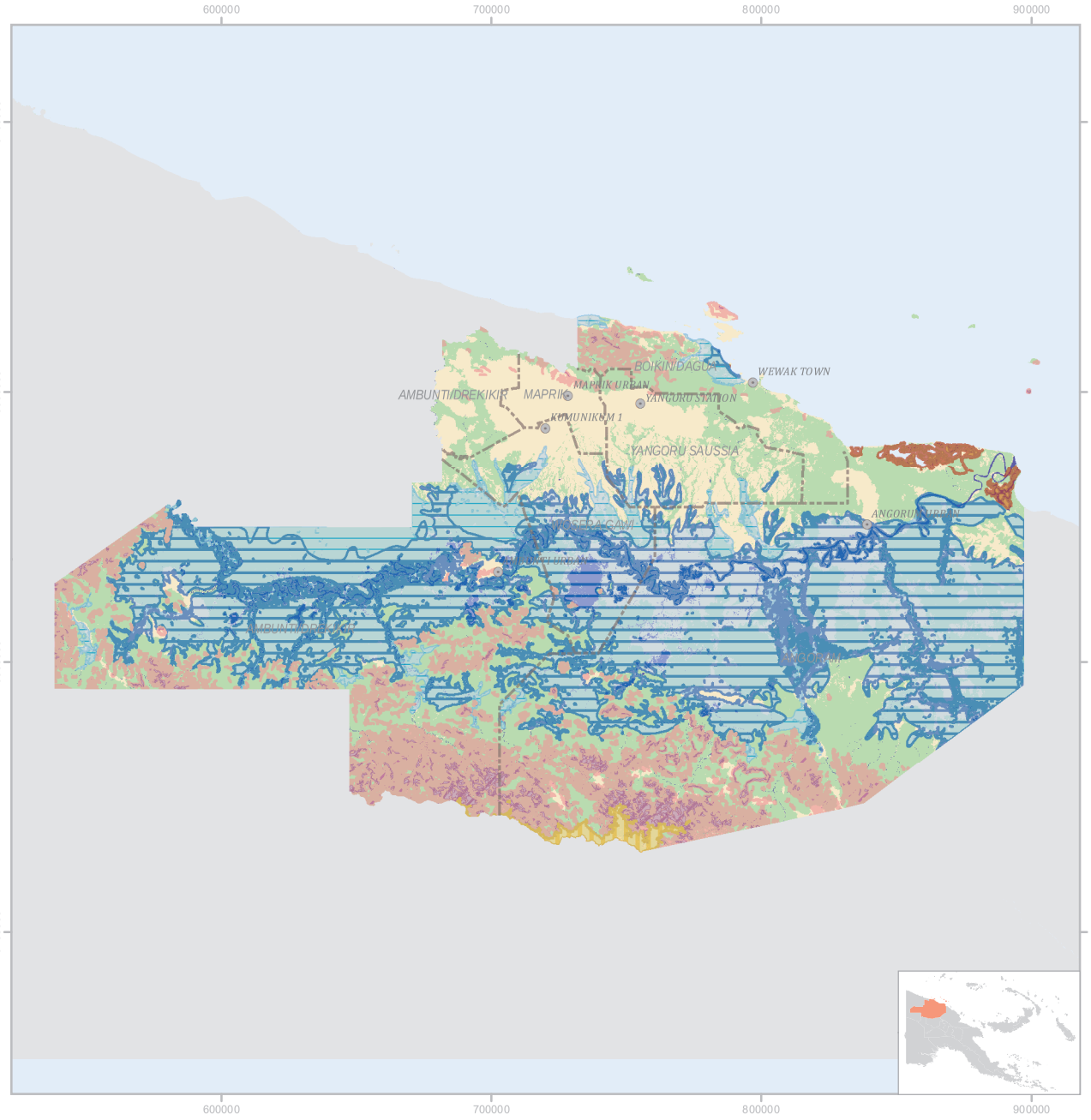
TIMBER CONCESSION MAP OF EAST SEPIK PROVINCE



PLAN_ID	NAME	AREA (ha)	CONCESSION TYPE	STATUS
1403	Hawain	41,665.30	LFA	Concession
1404	Lower Sepik	46,410.99	LFA	Concession
1405	April Salume	521,708.28	FMA	Concession
1401	Angoram	25,781.97	TRP	Concession
1410	Yuat Amboin	397,009.79		Proposed
1406	Nungwaia Bongos	110,522.77		Proposed
1416	Keram Yuat	364,875.26		Proposed
1413	Border (Nuku)	45,380.81		Proposed
1412	April River	99,142.68		Proposed
1414	Karawari	79,912.47		Proposed
1415	Wamsis East	21,597.89		Proposed
1407	Japaraka Urimo Sossoya	80,246.62		Proposed

Table showing Timber Concessions of East Sepik Province.
Information updated as at 2016.

CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, EAST SEPIK PROVINCE



Key

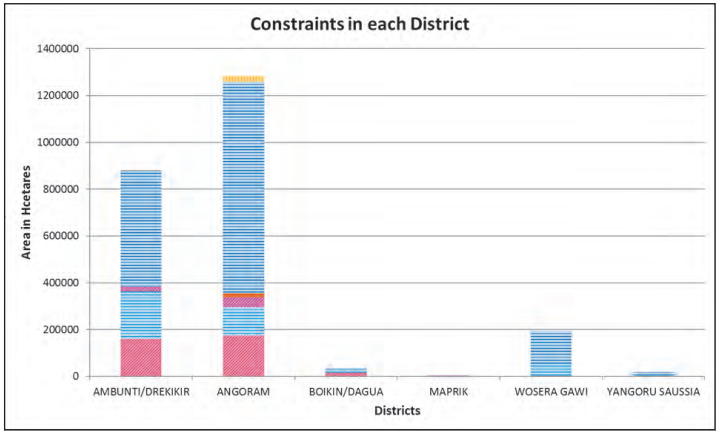
- Extreme Altitude
- Extreme Slope
- Serious Slope
- Extreme Inundation
- Serious Inundation
- Mangrove
- Forest including Forest Plantations
- Other Landuse & Land Cover
- Lake & Larger Rivers

N

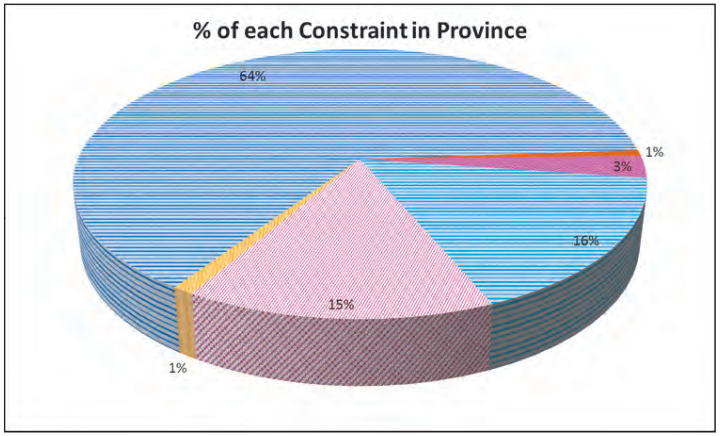
1 cm = 24 km

0 24 48 72 Kilometers

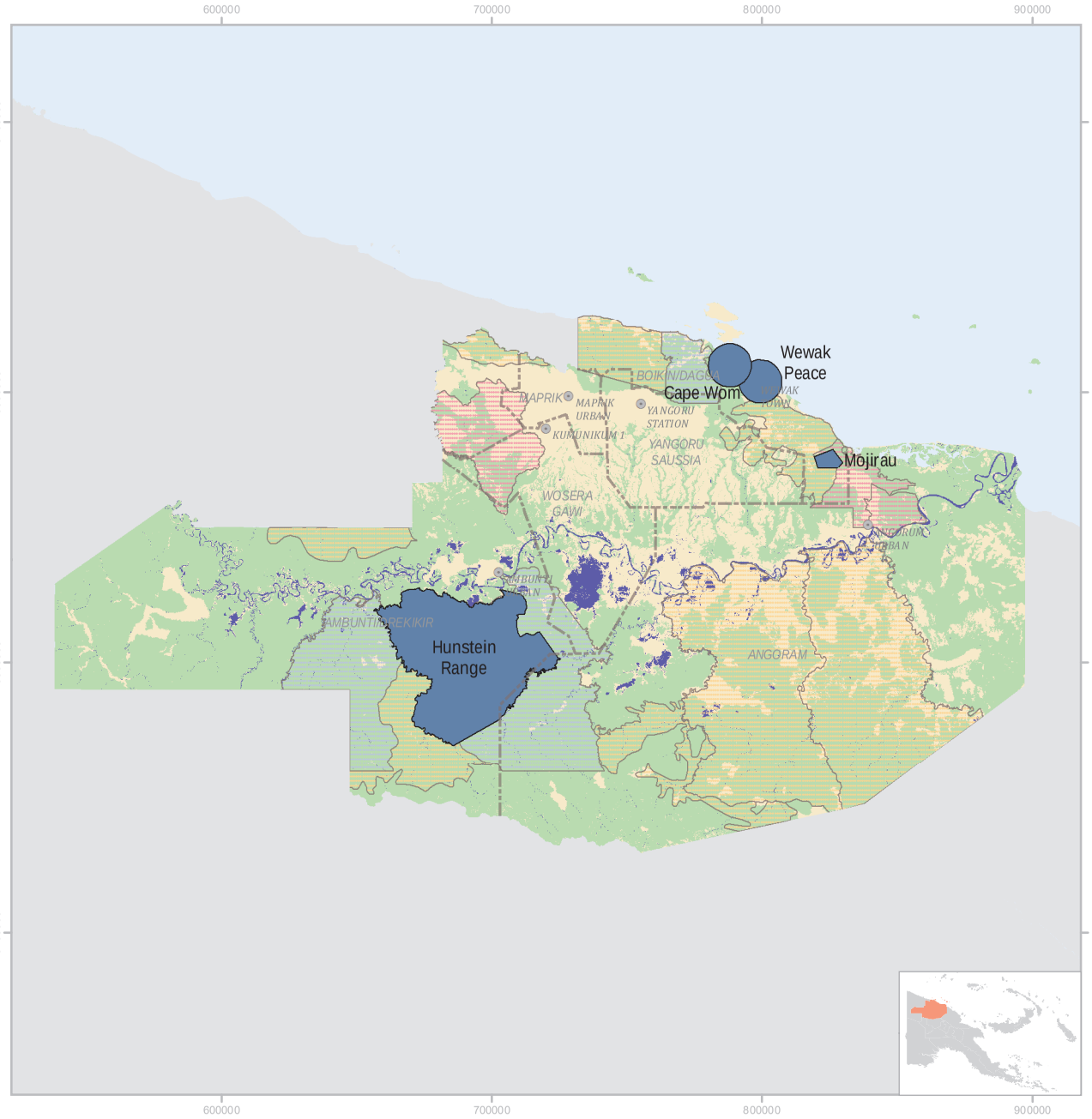
Brief Report on Logging Constraints of East Sepik Province



The predominant constraint found in East Sepik Province is the 'Serious Inundation' and the 'Extreme Inundation', which runs right through the centre of the province from the eastern side to the western side (from Angoram to Wosera-Gawi and then to Ambunti-Drekikir). The sloped and elevated constrained areas are mainly found along the southern part of the province (bordering with the Highlnds Region) and also some small areas north of the province in the Boikin-Dagua District. The 'Mangrove' constrained areas can be found situated along the coastline in the Angoram District.



TERRESTRIAL PROTECTED AREAS, EAST SEPIK PROVINCE



Key

	Concessions	Forest Base Map Class
Terrestrial Protected Area	Current	Forest including Forest Plantations
	Expired	Other Landuse & Land Cover
	Proposed	Lake & Larger Rivers

N

1 cm = 24 km

0 24 48 72 Kilometers

Information on Terrestrial Protected Areas in East Sepik Province

Name	Cape Wom Memorial Park
Protected Area ID	5
Protected Area Type	National Park
Province	East Sepik
Location	Cape Wom
Area (ha)	19, 933
Longitude	143° 35' 25" E
Latitude	4° 28' 34" S
Name	**Hunstein Range WMA**
Protected Area ID	10
Protected Area Type	Wildlife Management Area
Province	East Sepik
Location	Hunstein Range
Area (ha)	228, 270
Longitude	142° 42' 35" E
Latitude	5° 29' 39" S
Name	**Mojirau WMA**
Protected Area ID	26
Protected Area Type	Wildlife Management Area
Province	East Sepik
Location	Mojirau
Area (ha)	5, 330
Longitude	143° 55' 7" E
Latitude	4° 9' 37" S
Name	**Wewak Peace Memorial Park**
Protected Area ID	52
Protected Area Type	Memorial Park
Province	East Sepik
Location	Wewak Peace
Area (ha)	19, 928
Longitude	143° 41' 32" E
Latitude	4° 25' 23" S

12. Madang Province

General information/Overview

1. Location

Madang Province is located on the central north of the mainland of PNG and the landform is dominated by mountains ranges, floodplains, coastal limestone plains, hills and volcanic islands; Manam, Karkar and Long islands.

Provincial Administration Centre:	Madang
Land area:	2, 890, 325 ha
Population:	493, 906 (2011)
Number of District:	6 (Bogia, Madang, Middle Ramu, Rai Coast, Sumkar, Usino Bundi)
Number of Local Level Governments (LLGs):	16 LLGs

2. Forest Information

Forest Area:	2, 118, 089 ha

Provincial Tree

The provincial tree is '*Kwila*' (scientifically known as *Intsia bijuga*) and is commonly found in Low Altitude Forest on Plains and Fans, Low Altitude Forest on Uplands.

Significance of Provincial tree:

It is a hard wood species which is one of the major commercial species exported in round log form.

Kwila has a significant cultural value to the local people. During feasts or ceremonial occasions, food stuff is hung onto the prepared pole for exchange/distribution to the people within or from other villages/clans.

Scientific name:	Family:	Common Name/Trade name:
Intsia bijuga	***Fabaceae***	***Kwila***

Description

A large canopy tree with straight cylindrical bole and buttress present, Outer bark slightly red or bluish grey brown with rough or smooth, scaly or flaky texture. Inner bark white, yellowish brown or green, with non-sticky colourless sap. Leaves: spirally, compound pinnate (two pairs of leaflets), opposite, upper surface dark glossy green and beneath pale green. Flower: small white, pink to reddish flowers. Fruit/Seed: a long green pod/legume (immature) containing 1 to 8 seeds which turns brown or black when it matures.

Tree

Bark

Photo source: KDamas, Senior Botanist, FRI, Lae, Morobe Province

Leaf/Leaves

Note:

Short description was from the PNG Plant database website (link below)

http://www.pngplants.org/PNGtrees/Tree Descriptions/Intsia_bijuga_Kuntze.html

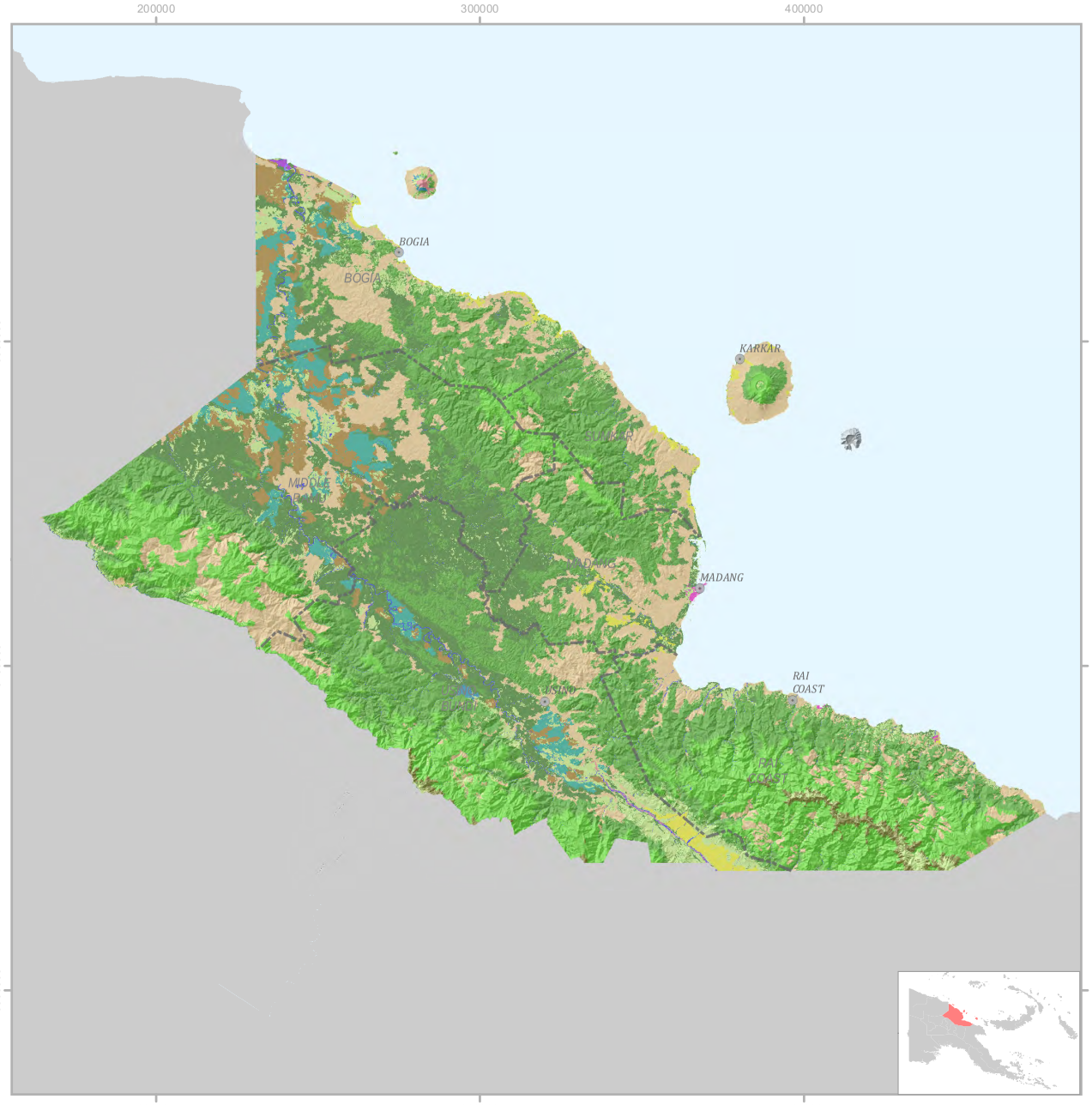
Photo source (tree, leaves, flowers and fruit): EKaidong, Adaptation and Low Carbon Growth Officer, FPPD, HQ

Flower

Fruit/Seed

Source: http://www.fiapng.com/Nursery_techniques.pdf

VEGETATION AND LAND COVER MAP OF MADANG PROVINCE (2012 FOREST BASEMAP VERSION 1.1)



Land Use and Land Cover Classes

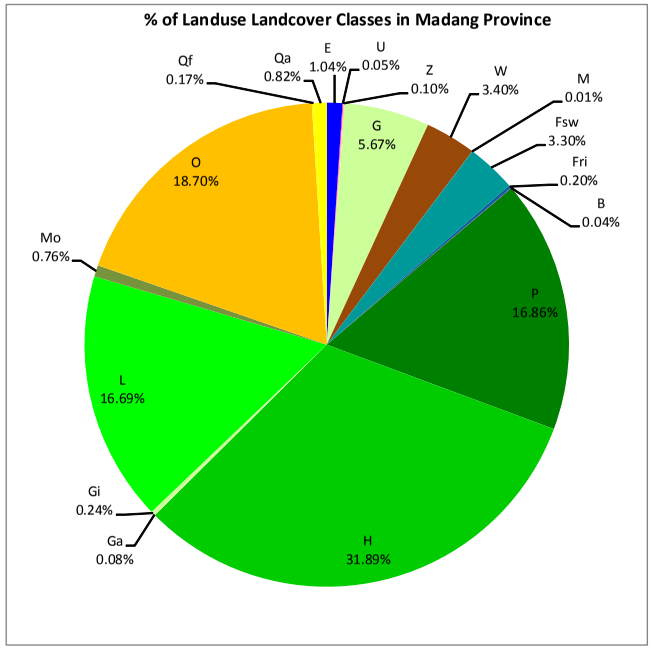
P: Low Altitude Forest on Plains & Fans	Fri: Seral Forest	Ga: Alpine grassland	Z: Bare areas
H: Low Altitude Forest on Uplands	Fsw: Swamp Forest	Gi: Subalpine grassland	U: Settlement & larger urban centres
L: Lower Montane Forest	M: Mangrove	O: Agriculture Land Use	E: Lakes & larger rivers
Mo: Montane Forest	W:Woodland	Qa: Agriculture Plantation	
B: Littoral Forest	G: Grassland	Qf: Forest Plantation	

N

1 cm = 20 km

0 20 40 60

Kilometers

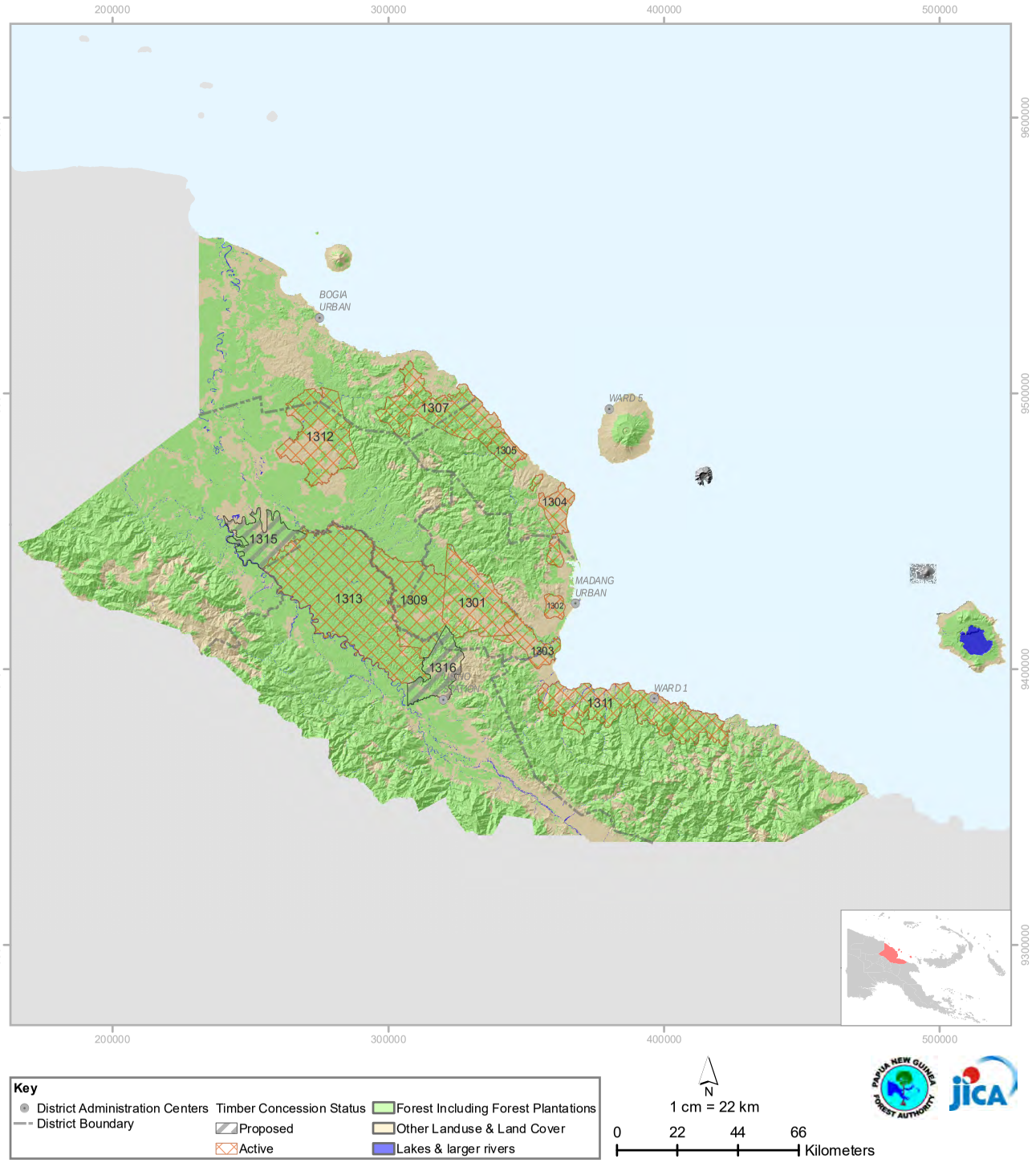


Pie Chart showing percentage in Landuse, Landcover of Madang Province.

% of Landuse Landcover						
Code	**Bogia**	**Madang**	**Markham**	**Middle Ramu**	**Rai Coast**	**Sumkar**
P	18.27%	17.96%	1.84%	26.11%	1.64%	4.67%
H	27.18%	43.66%	13.66%	21.23%	34.14%	50.46%
L	0.98%	3.34%	50.22%	14.95%	38.55%	7.04%
Mo			3.95%		3.06%	
B	0.26%					
Fri	0.15%		0.26%		0.67%	
Fsw	7.34%			6.18%		
M		0.06%				
W	7.98%		0.41%	7.33%		
G	8.21%	2.37%	10.14%	4.83%	4.51%	1.48%
Ga			0.70%	0.0003%	0.37%	
Gi			2.24%		1.00%	
O	27.21%	30.21%	11.74%	18.62%	13.83%	33.46%
Qa	1.37%	1.61%	3.19%		0.07%	2.47%
Qf			0.18%		0.06%	0.11%
Z	0.37%		0.67%			
U		0.39%			0.05%	
E	0.66%	0.40%	0.80%	0.75%	2.02%	0.31%
Land Area (ha)	371,749.71	268,341.26	800,396.49	778,814.44	566,445.89	189,308.71

Table showing percentage in Landuse, Landcover of Districts in Madang Province. Percentage calculated from area in hectares.

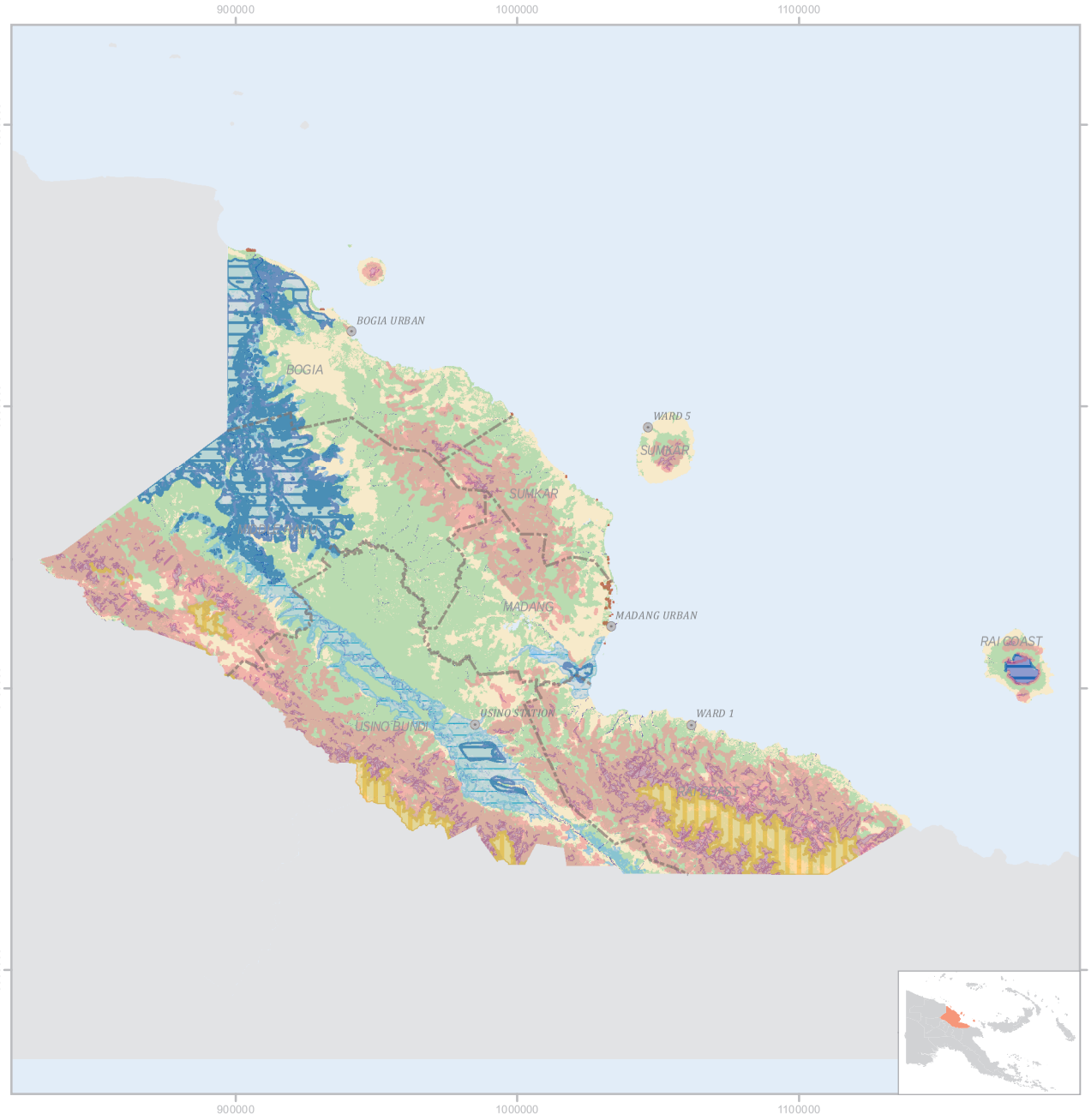
TIMBER CONCESSION MAP OF MADANG PROVINCE



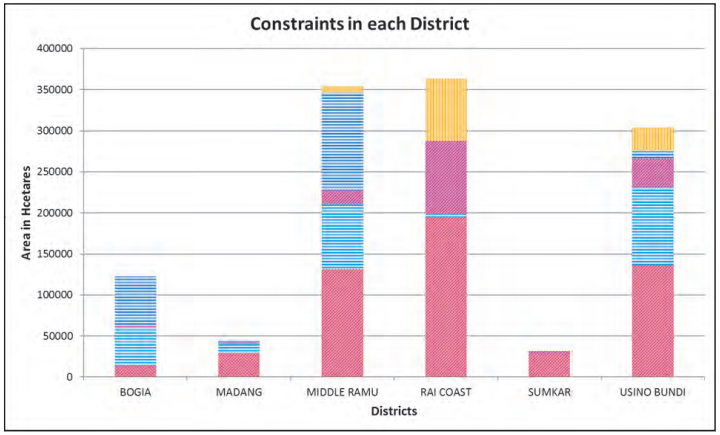
PLAN_ID	NAME	AREA (ha)	CONCESSION TYPE	STATUS
1309	Sogeram	59,675.14	TRP	Concession
1312	Josephstaal	62,083.56	FMA	Concession
1301	Gogol	52,845.85	TRP	Concession
1302	Gum	5,434.18	TRP	Concession
1308	Barum	1,422.07	TRP	Concession
1307	Kumil	56,797.54	TRP	Concession
1310	Far North Coast Blk 3	3,597.86	TRP	Concession
1303	Naru	16,113.81	TRP	Concession
1311	Rai Coast	75,745.97	TRP	Concession
1315	Middle Ramu Block 3	30,804.42	PFD	Proposed
1313	Middle Ramu Block 1	158,343.57	PFD	Concession
1316	Sogi Forest Area	28,729.69		Proposed
1305	Far North Coast	10,765.25	TRP	Concession
1304	North Coast	18,049.89	TRP	Concession

Table showing Timber Concessions of Madang Province.
Information updated as at 2016.

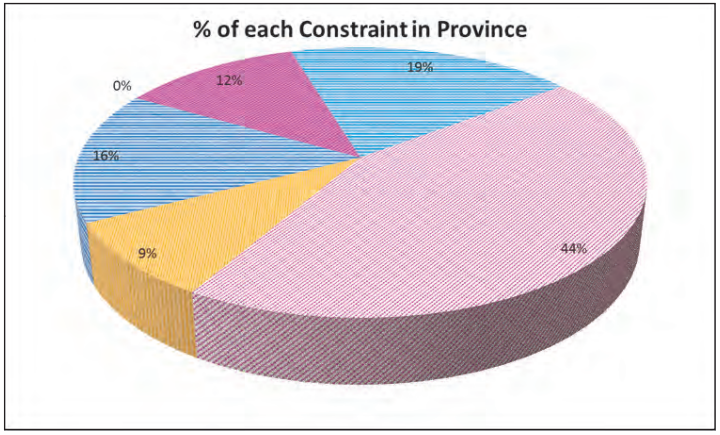
CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, MADANG PROVINCE



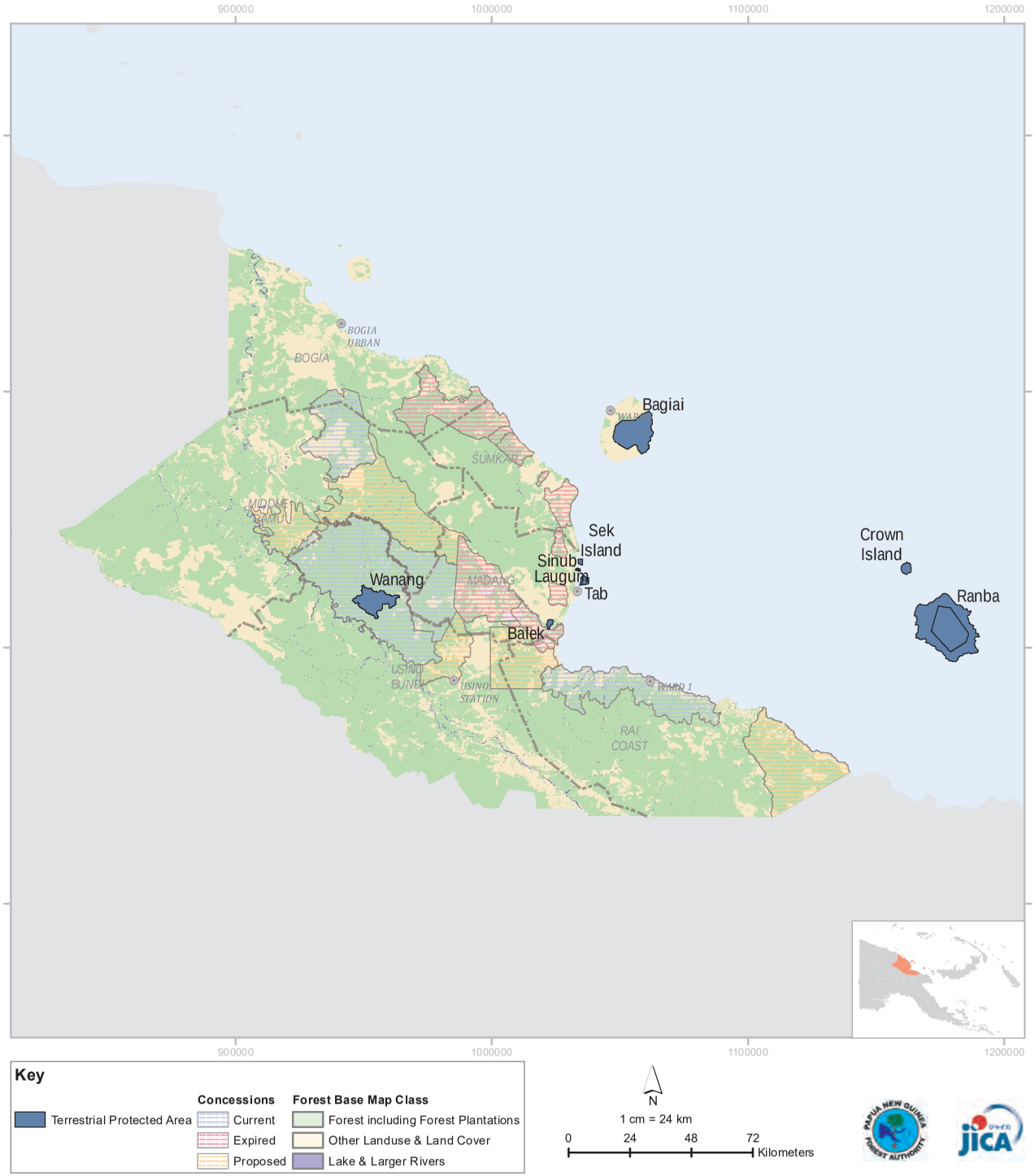
Brief Report on Logging Constraints of Madang Province



A lot of the 'Serious Slope' and 'Extreme Altitude' constrained areas in Madang Province are found towards the middle of the Island of New Guinea in the Rai Coast, Middle Ramu, and Usino Bundi Districts. There are is also a mountainous area ('Serious Slope') stretching over the Sumkar, Madang and Bogia districts in the mid-Northern part of the province. The inundated areas ('Serious Inundationa' and 'Extreme Inundation') can be found along the base of the inclined areas in the Usino Bundi and Middle Ramu Districts as well stretching up all the way into the Bogia District. This has left the geographical centre of the province to be generally free of these logging constraints.



TERRESTRIAL PROTECTED AREAS, MADANG PROVINCE



Information on Terrestrial Protected Areas in Madang Province

Name	Bagiai WMA	Ranba WMA
Protected Area ID	1	41
Protected Area Type	WMA	Wildlife Management Area
Province	Madang	Madang
Location	Bagiai	Ranba
Area (ha)	16, 885	25, 678
Longitude	146° 0' 12" E	147° 5' 42" E
Latitude	5° 20' 57" S	6° 40' 35" S
Name	Balek Wildlife Sanctuary	Sek Island
Protected Area ID	3	43
Protected Area Type	Wildlife Sanctuary	Wildlife Management Area
Province	Madang	Madang
Location	Balek	Sek Island
Area (ha)	575	300
Longitude	145° 42' 36" E	145° 48' 58" E
Latitude	6° 40' 36" S	6° 53' 40" S
Name	Crown Island Wildlife Sanctuary	Sinub
Protected Area ID	6	44
Protected Area Type	Wildlife Sanctuary	Wildlife Management Area
Province	Madang	Madang
Location	Crown Island	Sinub
Area (ha)	1365	17
Longitude	146° 57' 31" S	145° 48' 43" E
Latitude	6° 52' 52" E	6° 52' 5" S
Name	Laugum	Tab
Protected Area ID	20	46
Protected Area Type	Wildlife Management Area	Wildlife Management Area
Province	Madang	Madang
Location	Laugum	Tab
Area (ha)	87	1, 005
Longitude	145° 48' 17" E	145° 49' 47" E
Latitude	6° 52' 2" S	6° 49' 44" S
Name	Ranba Wildlife Sanctuary	Wanang Proposed Protected Areas
Protected Area ID	40	<NA>
Protected Area Type	Wildlife Sanctuary	Protected Area
Province	Madang	Madang
Location	Ranba	Wanang
Area (ha)	15, 701	10, 657
Longitude	147° 6' 36" E	145° 5' 36" E
Latitude	6° 40' 12" S	6° 45' 4" S

13. Morobe Province

General information/Overview

1. Location

Morobe Province lies in the central north of mainland PNG and is dominated by mountains, valleys, coastal plains. The Markham Valley runs in the middle of the province and the border of Madang Province.

Provincial Administration Centre:	Lae
Land area:	3, 368, 621 ha
Population:	674, 810 (2011)
Number of District:	9 (Bulolo, Finschhafen, Huon, Kabwum, Lae, Markham, Menyamya, Nawae, Tewae-Siassi)
Number of Local Level Governments (LLGs):	33 LLGs

2. Forest Information

Forest Area:	2, 458, 844 ha

Provincial Tree

The provincial tree is '*Mersawa'* (scientifically known as *Anisoptera thurifera*) and is commonly found in Low Altitude Forest on Plains and Fans, and Low Altitude Forest on Uplands.

Significance of Provincial tree:

It is a hard wood species which is one of the major commercial species exported in round log form.

The local people use it mostly for building homes, fences and gather grubs in dead mersawa logs.

Scientific name: *Anisoptera thurifera*	Family: *Dipterocarpaceae*	Common Name/Trade name: *PNG Mersawa*

Description

A large canopy tree with straight cylindrical bole and has a low buttress. Bark Outer bark is white or grey with rough, scaly or slightly flaky texture. Leaves: spiral, simple, upper surface dark green (glossy) and under surface green or pale brown. Flowers: small white flowers with distinct sepals and petals. Fruit/Seed: pale brown, non-fleshy, nut (with 2 sepal-forming long wings) and containing a single seed.

Tree

Source: http://www.phytoimages.siu.edu//users/pelserpb/1_16_18/16Jan18/Anisopterathurifera3.jpg

Bark

Photo source: KDamas, Senior Botanist, FRI, Lae, Morobe Province

Leaf/Leaves

Source: http://www.pngplants.org/PNGtrees/TreeDescriptions/Anisoptera_thurifera_Blume.html

Note:

Short description was from the PNG Plant database website (link below)

http://www.pngplants.org/PNGtrees/TreeDescriptions/Anisoptera_thurifera_Blume.html

Source (flower): http://tropical.theferns.info/plantimages/9/5/957138ff2c56bbd81b59917d9c1c6adef99b3a7f.jpg

Flower

Fruit/Seed

Source: http://www.phytoimages.siu.edu/imgs/pelserpb/r/Dipterocarpaceae_Anisoptera_thurifera_86652.html

VEGETATION AND LAND COVER MAP OF MOROBE PROVINCE (2012 FOREST BASEMAP VERSION 1.1)

Land Use and Land Cover Classes

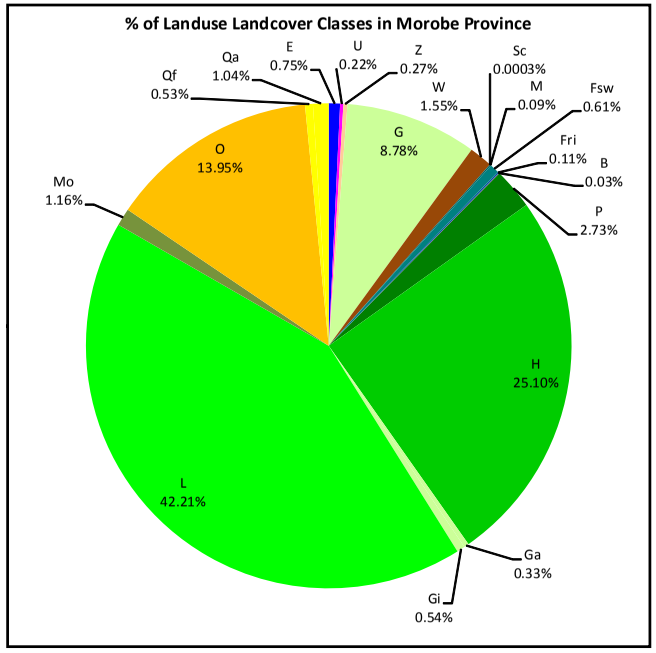
- P: Low Altitude Forest on Plains & Fans
- H: Low Altitude Forest on Uplands
- L: Lower Montane Forest
- Mo: Montane Forest
- B: Littoral Forest
- Fri: Seral Forest
- Fsw: Swamp Forest
- M: Mangrove
- W:Woodland
- Sc: Scrub
- G: Grassland
- Ga: Alpine grassland
- Gi: Subalpine grassland
- O: Agriculture Land Use
- Qa: Agriculture Plantation
- Qf: Forest Plantation
- Z: Bare areas
- U: Settlement & larger urban centres
- E: Lakes & larger rivers

N

1 cm = 20 km

0 20 40 60

Kilometers

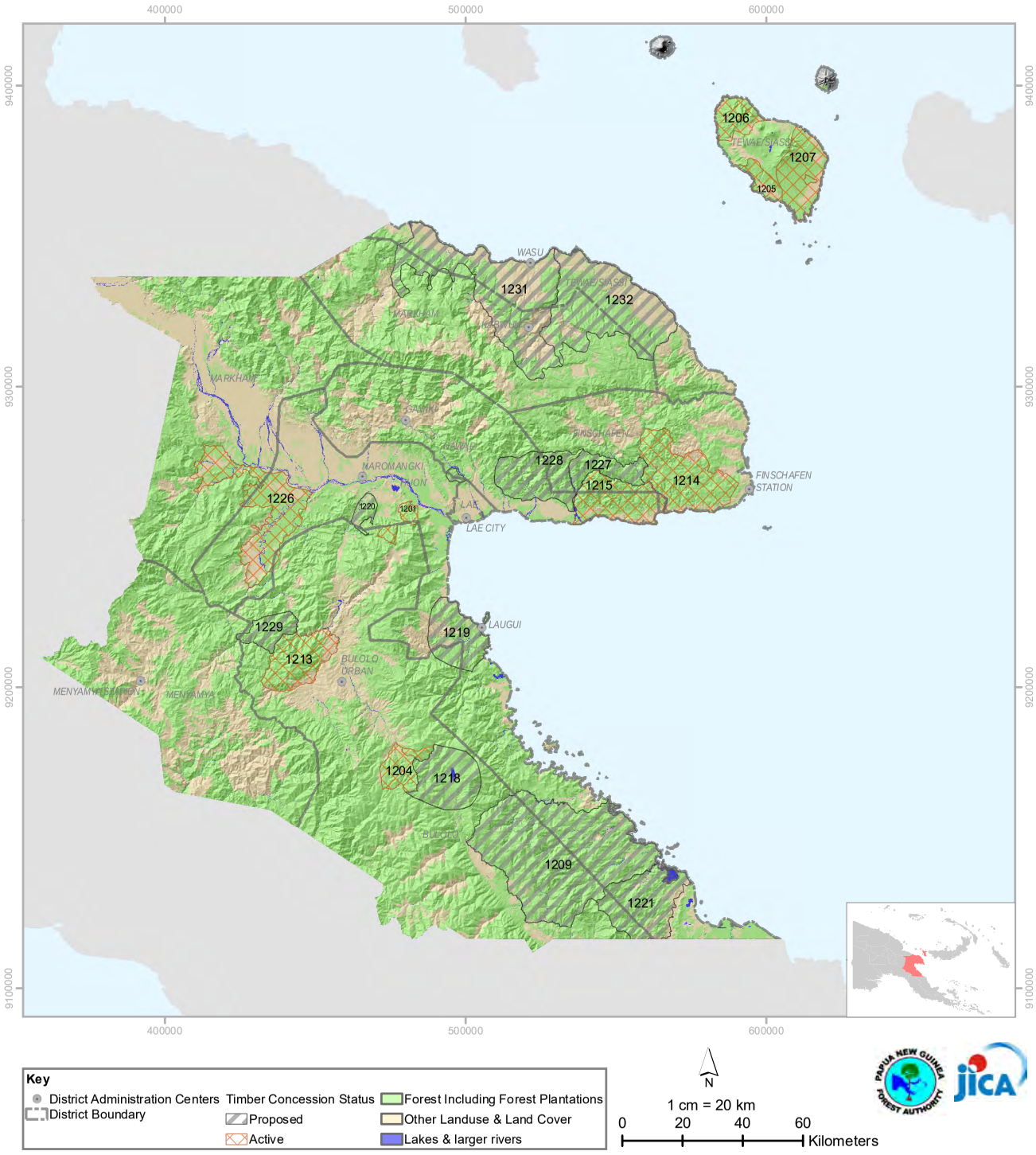


Pie Chart showing pecentage in Landuse, Landcover of Morobe Province.

% of Landuse Lancover							
Code	**Bulolo**	**Finchafen**	**Huon**	**Lae**	**Menyamya**	**Nawae**	**Tawae Siassi**
P	0.50%	1.74%	5.46%	2.74%		3.31%	10.40%
H	17.49%	39.43%	44.79%	25.11%	14.81%	30.71%	40.83%
L	66.15%	32.75%	9.88%	42.21%	50.08%	36.77%	12.08%
Mo	0.48%	0.89%		1.16%	0.19%	0.18%	
B			0.19%	0.03%			
Fri			0.29%	0.11%			
Fsw	0.01%		3.41%	0.61%			0.50%
M		0.01%	0.31%	0.09%			0.38%
W	0.02%		8.65%	1.55%			
Sc			0.002%	0.0004%			
G	6.74%	1.43%	12.32%	8.79%	7.87%	7.41%	13.20%
Ga	0.57%	0.06%		0.33%	0.01%	0.06%	
Gi	0.01%	0.03%		0.54%	0.02%		
O	5.74%	23.22%	10.84%	13.95%	26.80%	20.13%	22.31%
Qa	0.02%		1.42%	1.04%		0.53%	0.01%
Qf	1.80%		0.09%	0.53%			
Z			0.51%	0.26%		0.04%	
U	0.11%		0.18%	0.22%	0.01%		
E	0.35%	0.45%	1.65%	0.75%	0.19%	0.86%	0.30%
Land Area (ha)	875,487.60	241,097.18	560,941.20	3,368,653.40	367,147.36	249,837.00	254,956.20

Table showing pecentage in Landuse, Landcover of Districts in Morobe Province. Percentage calculated from area in hectares.

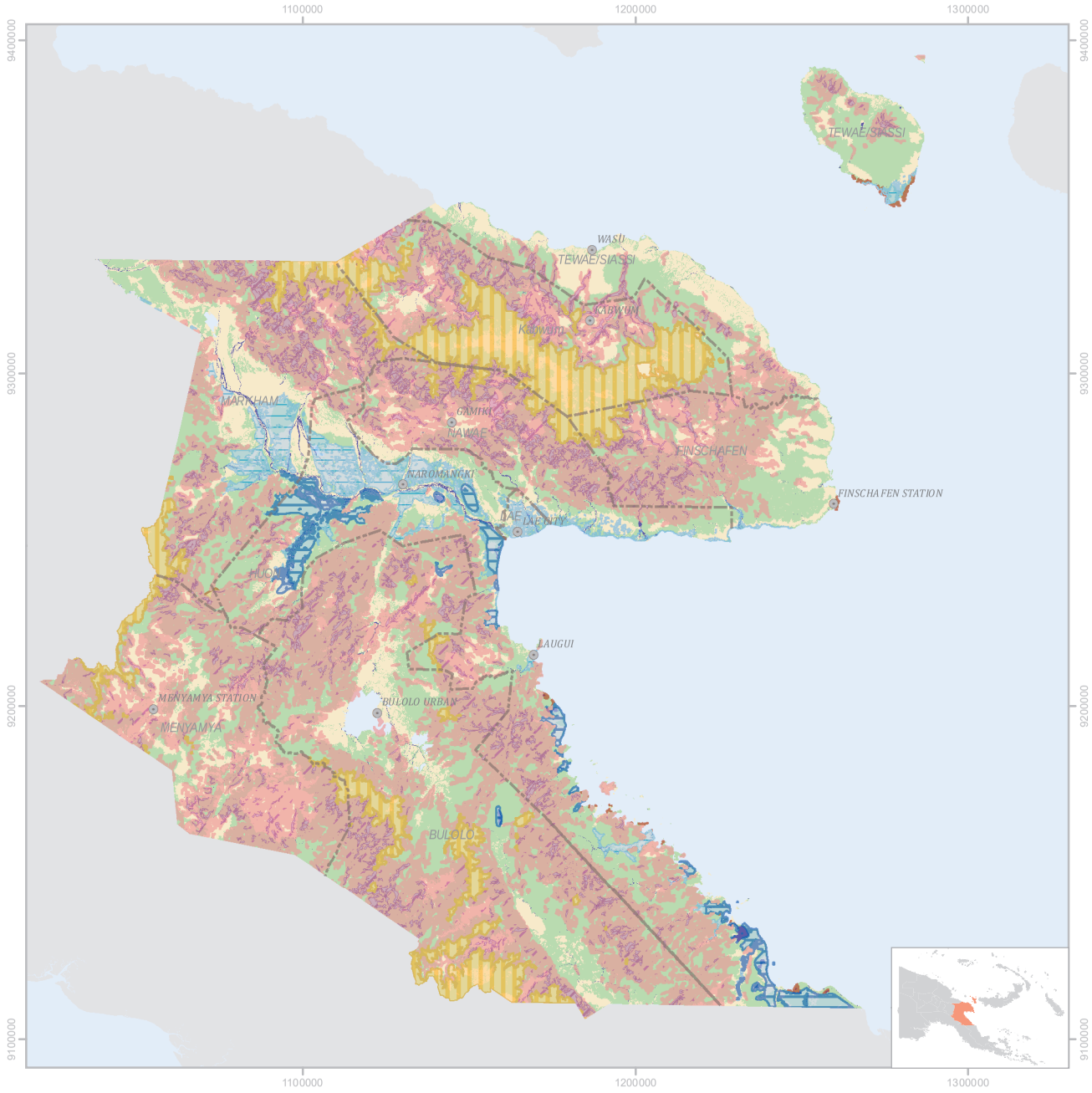
TIMBER CONCESSION MAP OF MOROBE PROVINCE



PLAN_ID	NAME	AREA (ha)	CONCESSION TYPE	STATUS
1213	Watut West	33273.49	TRP	Concession
1204	Wau Area 4, Block A	13460.87	TRP	Concession
1211	Oomsis Block 10A	2725.97	TRP	Concession
1201	Oomsis Block 2	3654.32	TRP	Concession
1203	Were Were	2767.75	TRP	Concession
1209	Morobe Coast	169028.24		Proposed
1207	Umboi Block 3 (KAIMANGA)	32033.39	TRP	Concession
1206	Umboi Block 2 (KOWAI)	15985.53	TRP	Concession
1205	Umboi Block 1 (BUNSIL)	9412.62	TRP	Concession
1214	MONGI BUSIGA	52786.71	FMA	Concession
1215	BUHEM MONGI	37545.01	FMA	Concession
1218	Lake Trist	37106.19	PFD	Proposed
1219	Salamaua	33157.33	PFD	Proposed
1220	Wampit A&B	6394.06	PFD	Proposed
1221	Maziye/Dzia	49467.88		Proposed
1296	Bunsi-Awom	1878.91		Proposed
1226	Watut Ongawafa	60556.31	FMA	Concession
1229	Watut West Extension	14802.59		Proposed
1228	Yagoman Timber Area	38001.62		Proposed
1227	Borong Timber Area	17999.88		Proposed
1231	Timbe-Kwama Forest Area	109951.77		Proposed
1232	Kwama-Masaweng Forest Area	95967.03		Proposed

Table showing Timber Concessions of Morobe Province.
Information updated as at 2016.

CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, MOROBE PROVINCE



Key

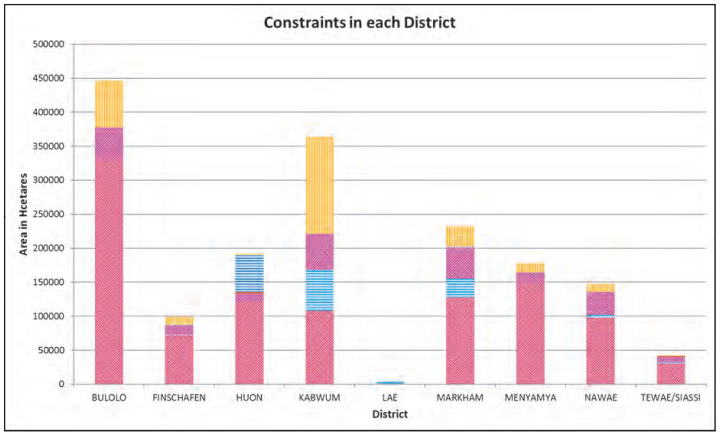
- Extreme Altitude
- Extreme Slope
- Serious Slope
- Extreme Karst
- Extreme Inundation
- Serious Inundation
- Mangrove
- Forest including Forest Plantations
- Other Landuse & Land Cover
- Lake & Larger Rivers

N

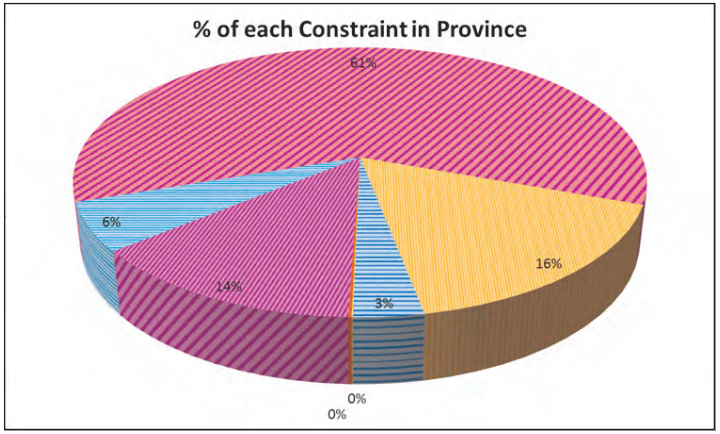
1 cm = 19 km

0 19 38 57 Kilometers

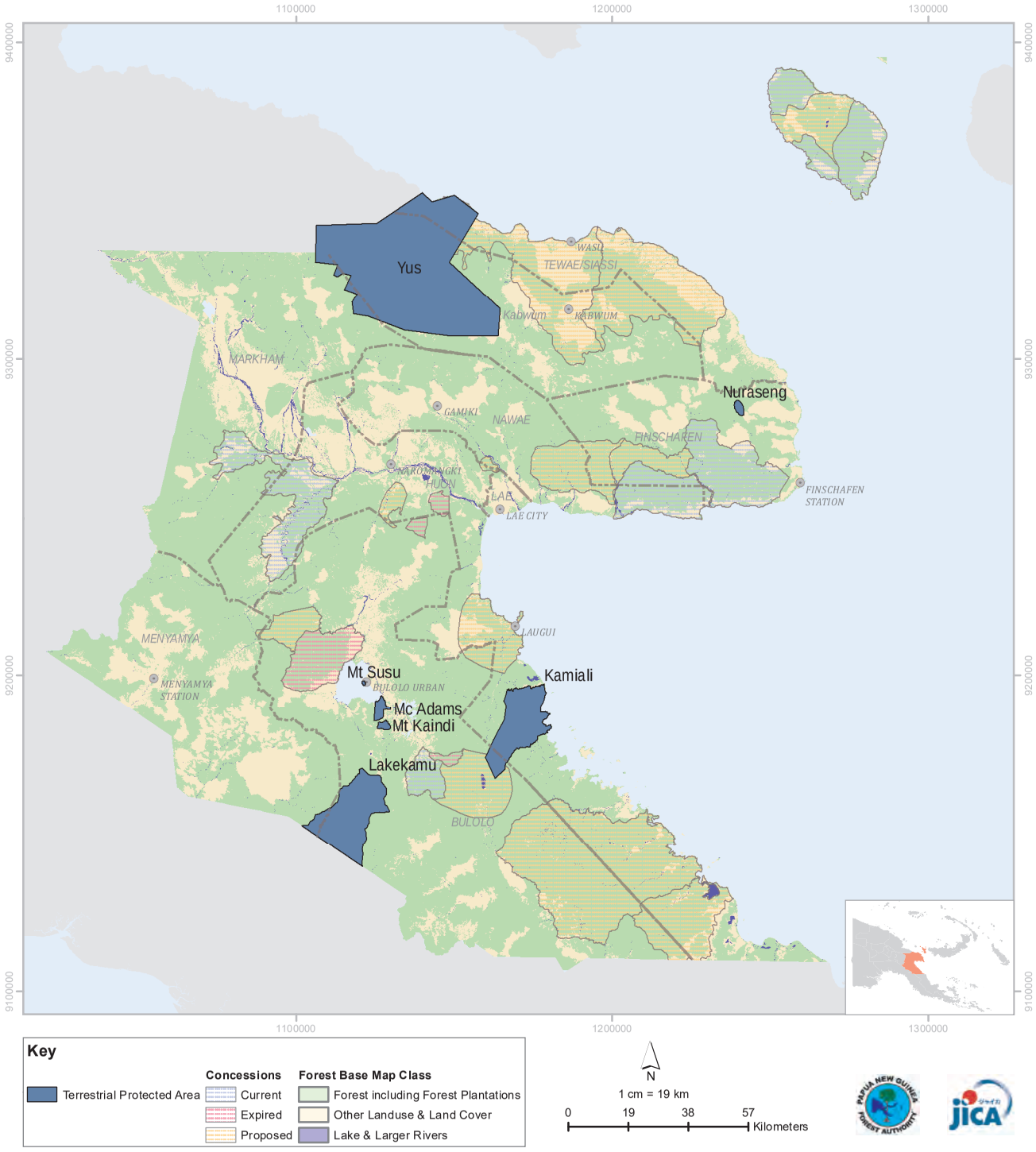
Brief Report on Logging Constraints of Morobe Province



In Morobe, more than half of the total constraint area are classified as 'Serious Slope' which is dispersed across the provincial land mass, with the majority found in the Bulolo District. The 'Extreme Altitude', 'Extreme Slope', 'Serious Inundation' and 'Extreme Inundation' account for the remaining percentage of constraints. The 'Mangrove' and 'Karst' constraints make up less than 1% of the total constraints in the province. Lae District, being an urban area, does not have any of the constraints, except for 'Serious Inundation', which is also predominantly found in the Huon, Kabwum and Markham Districts. The areas of 'Extreme Altitude' are mostly found in the Bulolo and Kabwum Districts.



TERRESTRIAL PROTECTED AREAS, MOROBE PROVINCE



Key

Terrestrial Protected Area	Concessions	Forest Base Map Class
	Current	Forest including Forest Plantations
	Expired	Other Landuse & Land Cover
	Proposed	Lake & Larger Rivers

N

1 cm = 19 km

0 19 38 57 Kilometers

Information on Terrestrial Protected Areas in Morobe Province

Name	Kamiali WMA
Protected Area ID	13
Protected Area Type	Wildlife Management Area
Province	Morobe
Location	Kamiali
Area (ha)	30, 148
Longitude	147° 3' 38" E
Latitude	8° 39' 37" S
Name	Lakekamu Proposed CA
Protected Area ID	<NA>
Protected Area Type	Conservation Area
Province	Morobe
Location	Lakekamu
Area (ha)	37121
Longitude	146° 35' 17" E
Latitude	8° 23' 52" S
Name	Mc Adams National Park
Protected Area ID	24
Protected Area Type	National Park
Province	Morobe
Location	Mc Adams
Area (ha)	2, 106
Longitude	146° 40' 0" E
Latitude	8° 42' 10" S
Name	Mt Kaindi WMA
Protected Area ID	28
Protected Area Type	Wildlife Management Area
Province	Morobe
Location	Mt Kaindi
Area (ha)	861
Longitude	146° 40' 42" E
Latitude	8° 39' 15" S
Name	Mt Susu National Reserve Park
Protected Area ID	29
Protected Area Type	National Park
Province	Morobe
Location	Mt Susu
Area (ha)	118
Longitude	146° 37' 8" E
Latitude	8° 46' 36" S
Name	Nuraseng WMA
Protected Area ID	35
Protected Area Type	Wildlife Management Area
Province	Morobe
Location	Nuraseng
Area (ha)	1, 019
Longitude	147° 40' 38" E
Latitude	7° 34' 20" S
Name	Yus CA
Protected Area ID	56
Protected Area Type	Conservation Area
Province	Morobe
Location	Yus
Area (ha)	163, 941
Longitude	146° 44' 28" E
Latitude	7° 57' 20" S

14. West New Britain Province

General information/Overview

1. Location

West New Britain Province is approximately located about 150km north-east of mainland PNG and is on the western half of the New Britain Island.

Provincial Administration Centre:	Kimbe
Land area:	2, 034, 000 ha
Population:	264, 264 (2011)
Number of District:	2 (Talasea, Kandrian/Gloucester)
Number of Local Level Governments (LLGs):	11 LLGs

2. Forest Information

Forest Area:	1, 710, 512 ha

Provincial Tree

The provincial tree is '*Malas*' (scientifically known as *Homalium foetidum*) and is commonly found in Low Altitude Forest on Plains and Fans, and in Low Altitude Forest on Uplands.

Significance of Provincial tree:

It is a hard wood species and one of the major commercial species exported in round log form.

Malas is one of the dominant tree species in the province and is of high demand both economically and socially. In the social norm, the bole/stem and branches of the tree are used for different purposes; for instance, the bole/stem is carved for paddles, spear, digging stick, carving (wood carved figurines or totems) and posts for houses. Whereas, branches/boles are used for firewood and fencing.

Scientific name: *Homalium foetidum*	Family: *Salicaceae*	Common Name/Trade name: *Malas*

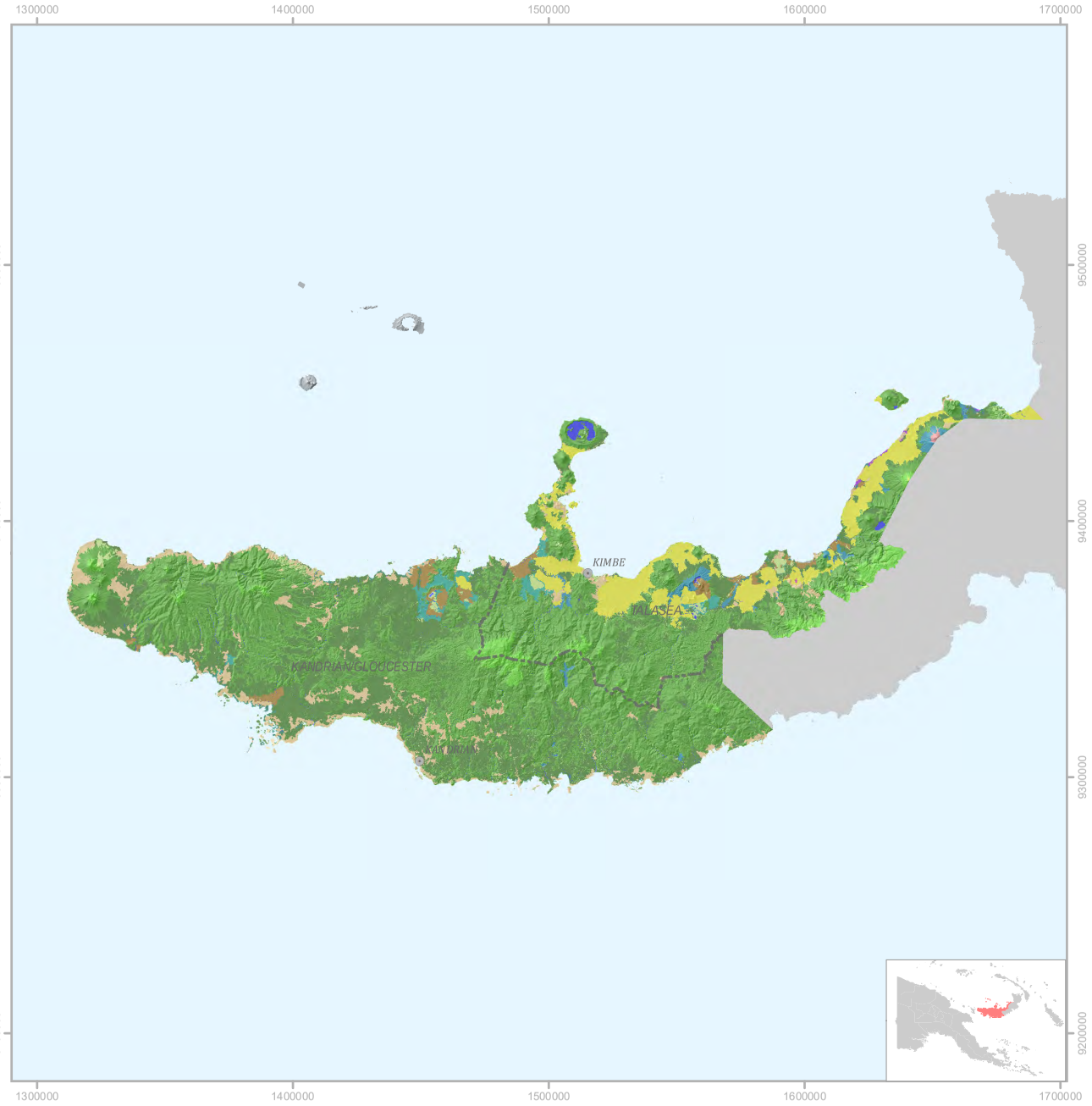
Description

A large canopy tree with a straight cylindrical bole and has a low solid buttress. Outer bark is grey or whitish, rough, scaly or flaky. Inner bark blaze orange, pale yellowish, strongly aromatic, unpleasant. Exudate: having colourless non-sticky sap. Leaves: simple, upper surface of leaf is dark green and beneath is green. Juvenile leaves reddish. Flower; small white flowers or cream-colored, sweetly aromatic. Fruit: non-fleshy (leathery), green when immature and turns red or brown when it matures.

Tree	Bark	Leaf/Leaves
 Photo source: KDamas, Senior Botanist, FRI, Lae, Morobe Province	  Source: http://www.pngplants.org/PNGtrees/TreeDescriptions/Homalium_foetidum_Benth.html	 Source: http://wesvironslangsgis.blogspot.com/2016/04/new-britain-island-tree-species.html?m=1  Source:http://v3.boldsystems.org/index.php/Taxbrowser_Taxonpage?taxid=446331

	Flower	Fruit/Seed
Note: Short description was from the PNG Plant database website and few of the photos (link below) http://www.pngplants.org/PNGtrees/TreeDescriptions	 http://tropical.theferns.info/image.php?id=Homalium+foetidum	**Not available*

VEGETATION AND LAND COVER MAP OF WEST NEW BRITAIN PROVINCE (2012 FOREST BASEMAP VERSION 1.1)



Land Use and Land Cover Classes

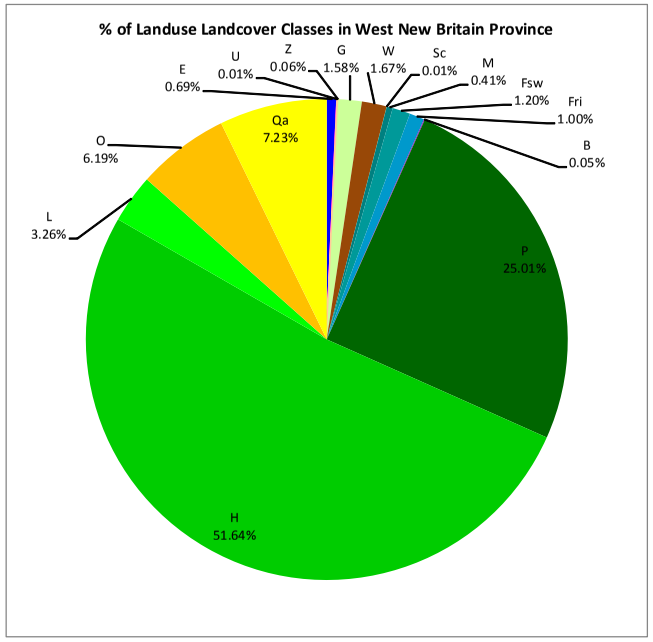
P: Low Altitude Forest on Plains & Fans	Fri: Seral Forest	Sc: Scrub	Z: Bare areas
H: Low Altitude Forest on Uplands	Fsw: Swamp Forest	G: Grassland	U: Settlement & larger urban centres
L: Lower Montane Forest	M: Mangrove	O: Agriculture Land Use	E: Lakes & larger rivers
B: Littoral Forest	W: Woodland	Qa: Agriculture Plantation	

N

1 cm = 25 km

0 14 28 42 56

Kilometers

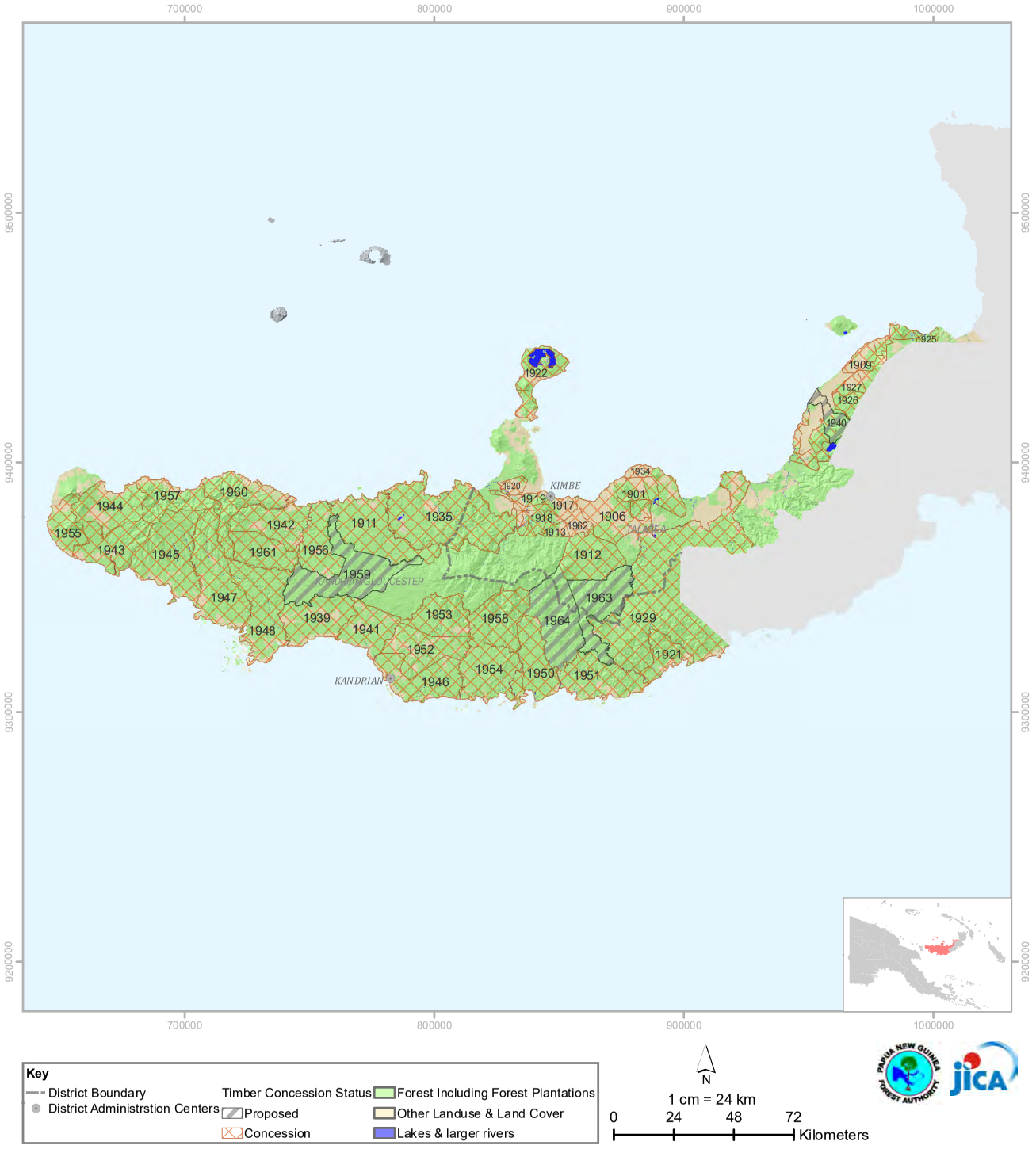


Pie Chart showing percentage in Landuse, Landcover of West New Britain Province.

% of area of Landuse and Cover		
Code	**Kandrian Glouchester**	**Talasea**
P	32.10%	11.75%
H	53.40%	48.99%
L	1.83%	5.98%
B		0.15%
Fri	0.17%	2.56%
Fsw	1.06%	1.46%
M	0.46%	0.18%
W	1.38%	2.16%
Sc		0.02%
G	1.18%	2.12%
O	7.87%	2.79%
Qa	0.16%	20.41%
Z		0.15%
U	0.01%	0.02%
E	0.39%	1.26%
Land Area (ha)	1,315,750.21	706,509.24

Table showing percentage in Landuse, Landcover of Districts West New Britain Province.
Percentage calculated from area in hectares.

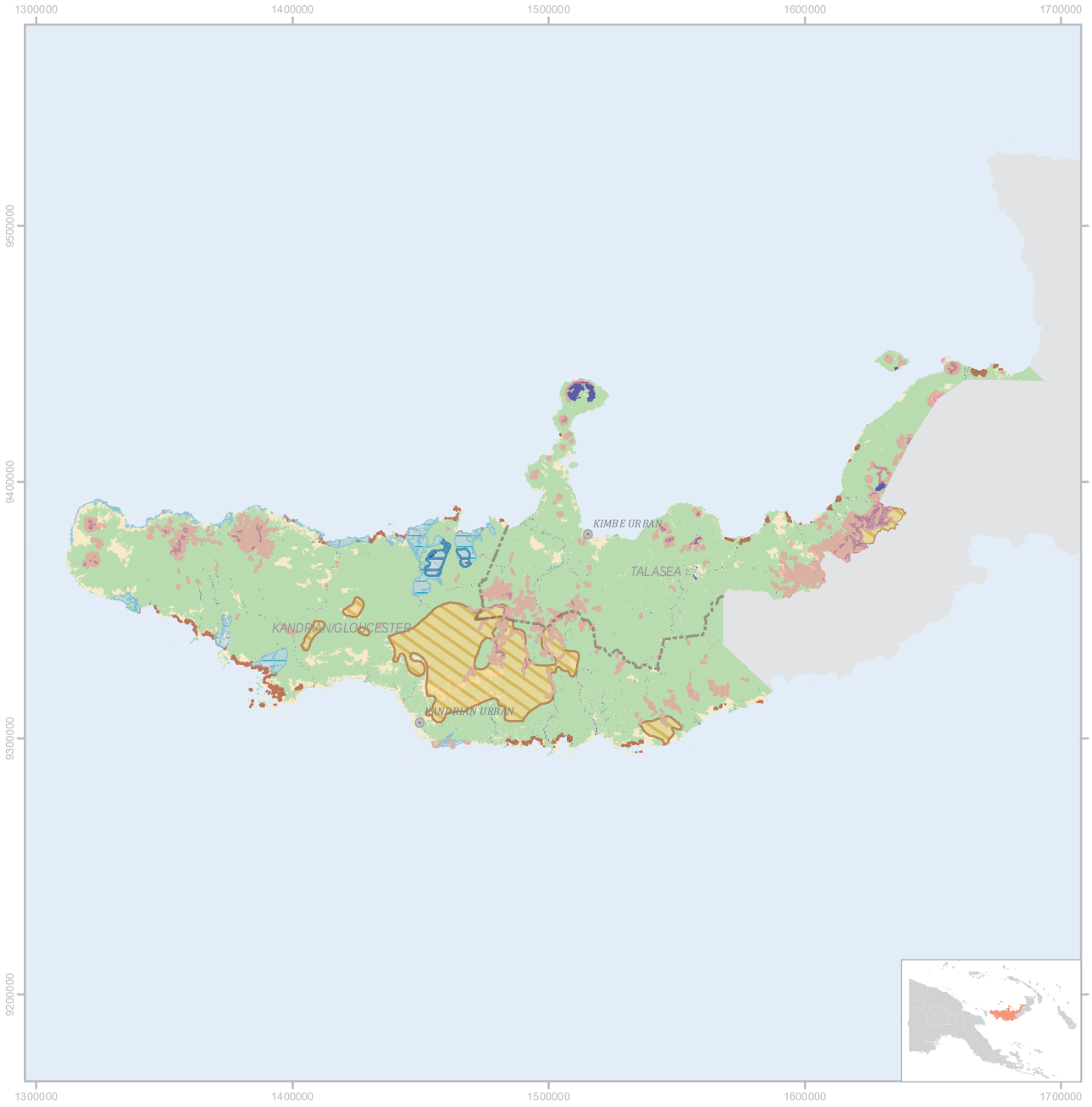
TIMBER CONCESSION MAP OF WEST NEW BRITAIN PROVINCE



PLAN_ID	NAME	AREA (ha)	CONCESSION TYPE	STATUS
1964	Agulu Reserve	56,513.97		Proposed
1912	Mosa Laeim	37,113.03	TRP	Concession
1952	Passismanua Inland	39,886.56	LFA	Concession
1953	PASSISMANUA LFA EXT	32,583.94	LFA	Concession
1923	Ulamona Ext.	507.16	TRP	Concession
1930	Hargy	14,763.76	TRP	Concession
1933	Sisimi	1,737.94	TRP	Concession
1904	Uletevasa	1,542.55	TRP	Concession
1902	Witori	4,560.48	TRP	Concession
1901	Mami	9,002.03	TRP	Concession
1905	Malalimi	4,372.52	TRP	Concession
1920	South Bagum	5,545.97	TRP	Concession
1962	Mosa	8,025.50	TRP	Concession
1918	Kisang	8,480.26	TRP	Concession
1915	Malum	2,748.03	TRP	Concession
1916	Bunga	1,615.45	TRP	Concession
1914	Toa	1,402.37	TRP	Concession
1913	Keveloha	5,152.94	TRP	Concession
1944	Lolo blk 1	39,613.37	LFA	Concession
1957	Rottock Bay	32,601.29	FMA	Concession
1922	Bulu	17,538.86	TRP	Concession
1908	Wangore	7,105.96	TRP	Concession
1955	Lolo Block 2 ext	23,674.56	LFA	Concession
1943	Lolo Block 2	40,724.24	LFA	Concession
1945	West Arawa	68,446.62	TRP	Concession
1947	Central Arawe	63,907.51	TRP	Concession
1948	East Arawe	60,675.01	TRP	Concession
1939	Pulie Anu	42,870.74	LFA	Concession
1941	Alimbit Anu	32,547.43	LFA	Concession
1946	Alimbit Andru	43,715.43	LFA	Concession
1951	Awio Amgen	43,903.49	LFA	Concession
1921	Fulleborne Ext.	20,659.56	TRP	Concession
1911	Kapuluk Ext.	59,530.22	TP	Concession
1956	Aria Vanu Block 3	34,397.24	LFA	Concession
1942	Aria Vanu Block 1	40,049.67	LFA	Concession
1919	Bola	8,057.34	TRP	Concession
1917	Honde - Laulimi	10,919.09	TRP	Concession
1906	Galae	36,239.61	TRP	Concession
1903	Kako	1,526.40	TRP	Concession
1934	Bango	18,744.46	TRP	Concession
1931	Alolo	2,298.68	TRP	Concession
1932	Kau'uli	1,778.08	TRP	Concession
1909	IBANA	10,257.22	TRP	Concession
1910	North Ulamona	2,635.81	TRP	Concession
1925	Madedua	9,734.56	TRP	Concession
1924	IBANA EAST	6,229.70	TRP	Concession
1927	Gulagula	6,379.99	TRP	Concession
1926	Gigipuna	8,163.29	TRP	Concession
1928	Aliai	6,038.23	TRP	Concession
1929	Ania Kapiura	187,833.28	TRP	Concession
1954	Andru Johanna	43,932.77	LFA	Concession
1949	Autuvo	5,414.82	LFA	Concession
1950	Autuvo Ext.	35,625.93	LFA	Concession
1960	Vanu Tamu	43,979.00	FMA	Concession
1959	Gahomalasa	65,871.42		Proposed
1963	Asirim	46,588.99		Proposed
1961	Aria vanu blk 2	29,947.92	FMA	Concession
1935	Kapuluk	105,936.33		Concession
1940	Matututu TRP	13,373.80		Proposed
1958	Asengseng	43,258.54	FMA	Concession

Table showing Timber Concessions of West New Britain Province. Information updated as at 2016.

CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, WEST NEW BRITAIN PROVINCE



Key

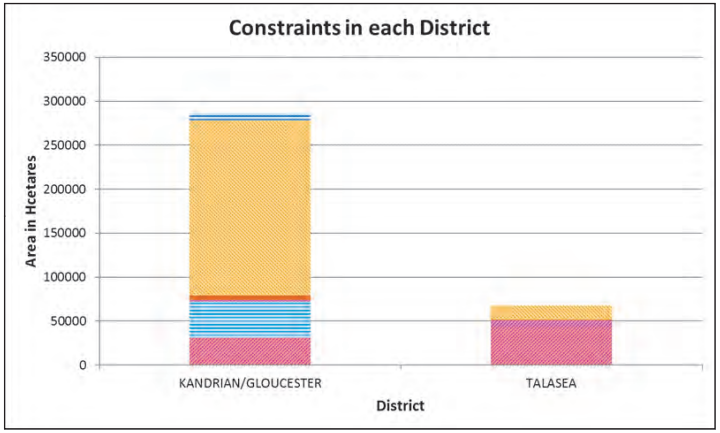
- Extreme Slope
- Serious Slope
- Extreme Karst
- Extreme Inundation
- Serious Inundation
- Mangrove
- Forest including Forest Plantations
- Other Landuse & Land Cover
- Lake & Larger Rivers

N

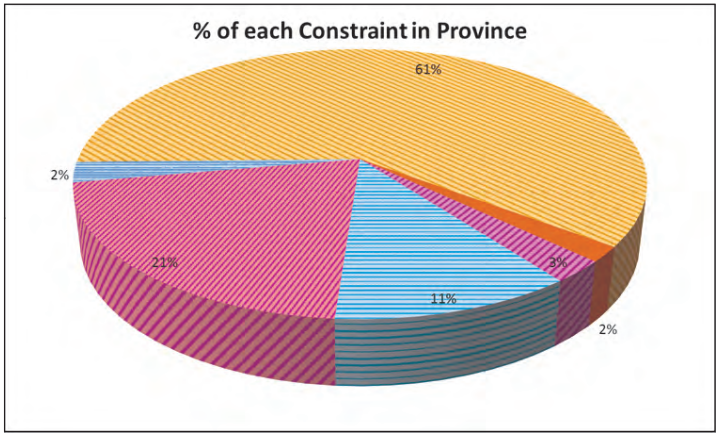
1 cm = 25 km

0 15 30 45 60 75 Kilometers

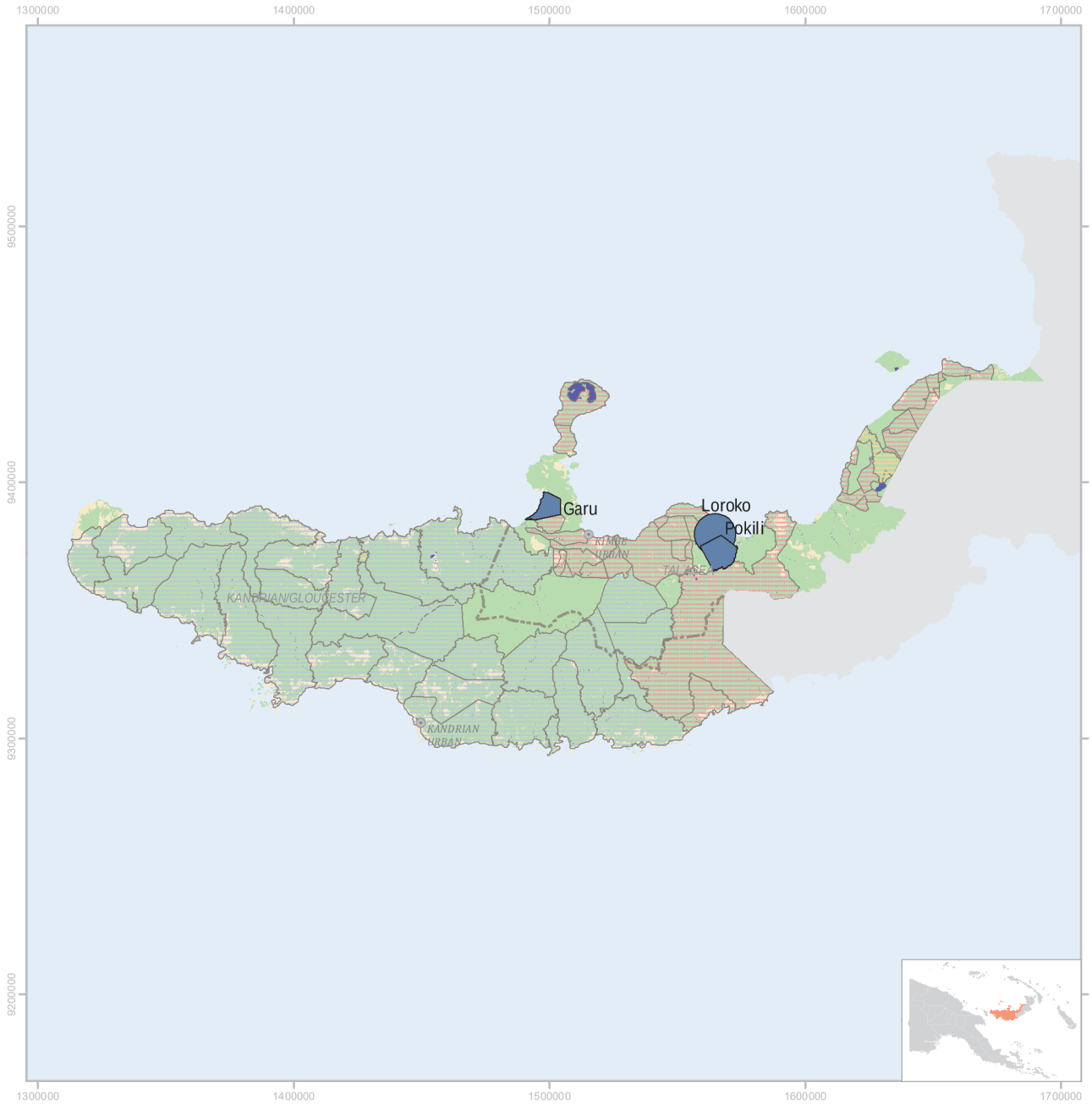
Brief Report on Logging Constraints of West New Britain Province



West New Britain province, unlike most other provinces, is not as heavily constrained. The most dominant constraint is 'Extreme Karst', which embodies 61% of the overall constraints found in the province. 'Extreme Karst' is mainly located in the centre of the Kandrian/Gloucester district. The second largest constraint is 'Serious Slope', however, this constraint is widely dispersed throughout the province, leaving much of the land available for commercial timber production.



TERRESTRIAL PROTECTED AREAS, WEST NEW BRITAIN PROVINCE



Information on Terrestrial Protected Areas in West New Britain Province

Name	Garu WMA
Protected Area ID	8
Protected Area Type	Wildlife Management Area
Province	West New Britain
Location	Garu
Area (ha)	7, 531
Longitude	149° 58' 56" E
Latitude	6° 33' 3" S
Name	**Loroko National Park**
Protected Area ID	22
Protected Area Type	National Park
Province	West New Britain
Location	Loroko
Area (ha)	19, 885
Longitude	150° 33' 60" E
Latitude	6° 28' 0" S
Name	**Pokili WMA**
Protected Area ID	39
Protected Area Type	Wildlife Managemenet Area
Province	West New Britain
Location	Pokili
Area (ha)	12, 187
Longitude	150° 35' 2" E
Latitude	6° 24' 9" S

15. East New Britain Province

General information/Overview

1. **Location**

East New Britain Province is located north-east of mainland of PNG and shares the border with West New Britain Province on the Island of New Britain.

Provincial Administration Centre:	Kokopo
Land area:	1, 529, 425 ha
Population:	328, 369 (2011)
Number of District:	4 (Gazelle, Kokopo, Pomio, Rabaul)
Number of Local Level Governments (LLGs):	18 LLGs

2. **Forest Information**

Forest Area:	1, 264, 344 ha

Provincial Tree

The provincial tree is 'Galip' (scientifically known as Canarium indicum) and is commonly found in Low Altitude Forest on Plains and Fans.

Significance of Provincial tree:

It is a valuable hard wood species which is one of the major commercial species exported in round log form. Nuts are popular among the local people for daily consumption when in season and as well are sold to generate an income for the locals.

Sap from the bark is used as herbal remedy for treatment of skin diseases, etc. The leaves are burnt emitting an unpleasant smell which repels insects such as mosquitoes.

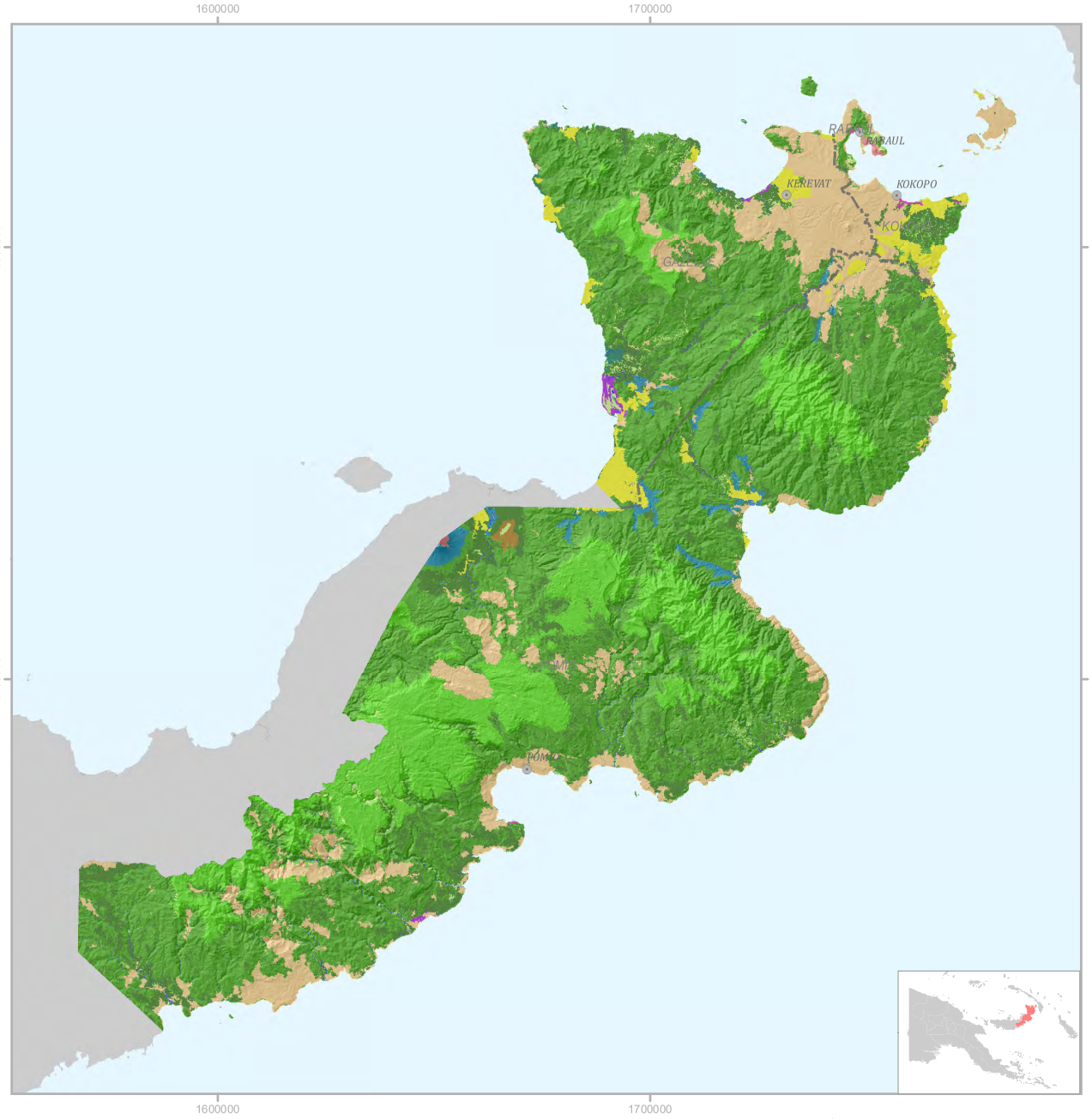
Scientific name: *Canarium indicum*	Family: *Burseraceae*	Common Name/Trade name: *Galip*

Description

A large canopy to sub-canopy tree with more or less fluted, straight bole and has a solid buttress. Outer bark is grey or brown, rough, scaly or flaky. Inner bark blaze pink or pale brown and fibrous. Leaves: compound pinnate (two or more pairs of leaflets), leaflets opposite, upper surface dark green and beneath is pale green. Flowers: male and female flowers on the same plant, small white or pale-yellow flowers. Fruit/seed; green when immature and turns blue- black when it matures. Seed: single white oily seed, covered in brown seed coat.

Tree	Bark	Leaf/Leaves
 Source: https://www.rarepalmseeds.com/canarium-indicum-ambae-giant	 Source: https://sites.google.com/site/efloraofindia/species/a---l/b/burseraceae/canarium/canarium-indicum	 Photo source: KDamas, Senior Botanist, FRI, Lae, Morobe Province
Note: Short description was from the PNG Plant database website and few of the photos (link below) http://www.pngplants.org/PNGtrees/TreeDescriptions	Flower	Fruit/Seed
	 Source: https://fr.wikipedia.org/wiki/Canarium_indicum	 Source: https://caloriebee.com/nutrition/Galip-Nut-Canarium-Indicum-Nutritional-Nut

VEGETATION AND LAND COVER MAP OF EAST NEW BRITIAN PROVINCE (2012 FOREST BASEMAP VERSION 1.1)



Land Use and Land Cover Classes

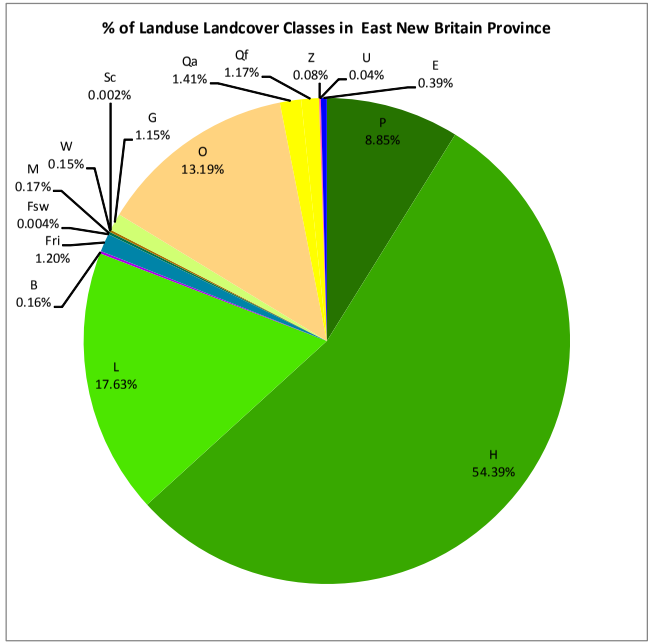
- P: Low Altitude Forest on Plains & Fans
- H: Low Altitude Forest on Uplands
- L: Lower Montane Forest
- B: Littoral Forest
- Fri: Seral Forest
- Fsw: Swamp Forest
- M: Mangrove
- W:Woodland
- Sc: Scrub
- G: Grassland
- O: Agriculture Land Use
- Qa: Agriculture Plantation
- Qf: Forest Plantation
- Z: Bare areas
- U: Settlement & larger urban centres
- E: Lakes & larger rivers

N

1 cm = 15 km

0 15 30 45

Kilometers

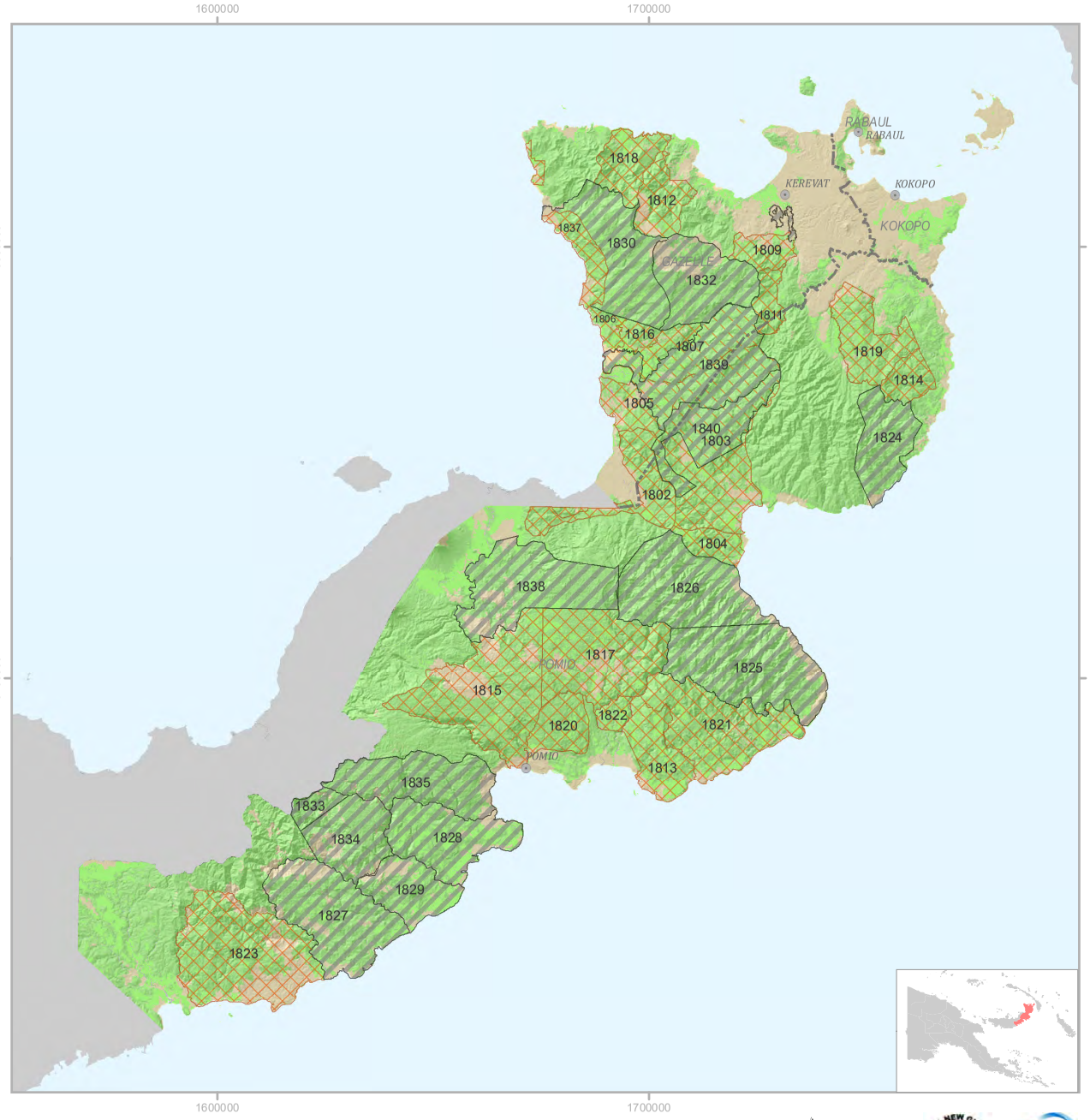


Pie Chart showing percentage in Landuse, Landcover of East New Britain Province.

% of Landuse Lancover				
Code	**Gazelle**	**Kokopo**	**Pomio**	**Rabaul**
P	8.65%	18.30%	8.63%	1.88%
H	56.45%	9.63%	55.59%	44.67%
L	5.38%		22.07%	
B	0.62%		0.03%	
Fri	0.72%		1.40%	
Fsw	0.02%			
M	0.72%	0.06%		
W			0.20%	
Sc			0.002%	
G	1.86%	2.51%	0.77%	11.85%
O	19.70%	42.47%	9.93%	32.10%
Qa	2.59%	18.75%	0.46%	1.14%
Qf	2.97%	7.19%	0.44%	
Z			0.04%	6.95%
U		0.91%	0.01%	1.38%
E	0.32%	0.17%	0.42%	0.03%
Land Area (ha)	334,200.24	39,305.16	1,140,332.36	9,984.37

Table showing percentage in Landuse, Landcover of Districts in East New Britain Province.
Percentage calculated from area in hectares.

TIMBER CONCESSION MAP OF EAST NEW BRITIAN PROVINCE



Key

- District Administration Centers
- District Boundary
- Timber Concession Status: Proposed, Active
- Forest Including Forest Plantations
- Other Landuse & Land Cover
- E: Lakes & larger rivers

N

1 cm = 15 km

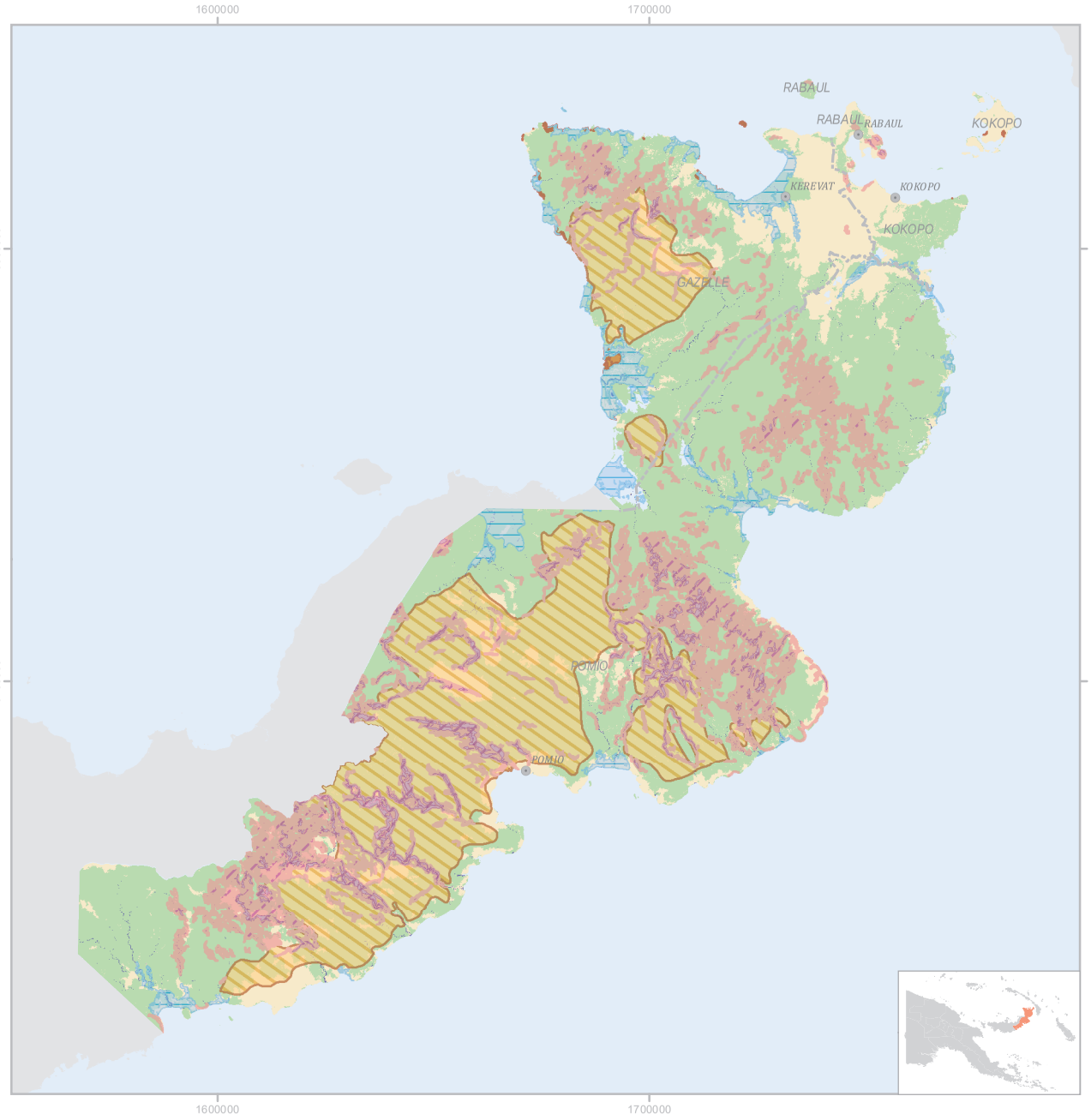
0 15 30 45

Kilometers

PLAN_ID	NAME	AREA (ha)	CONCESSION TYPE	STATUS
1819	Senbem Ext.	25,128.39	TRP	Concession
1812	Ramandu	16,045.39	TRP	Concession
1822	Bergberg Ext.	4,812.28	TRP	Concession
1817	Nutuve	52,920.97	TRP	Concession
1814	Gar	9,722.73	TRP	Concession
1820	Waterfall Bay	15,078.99	TRP	Concession
1811	Gaulim Ext.	7,982.55	TRP	Concession
1815	Inland Pomio	63,720.08	TRP	Concession
1813	Tokai Matong	22,148.40	TRP	Concession
1821	Cape Orford	46,001.07	TRP	Concession
1804	Tamoip	8,910.10	TRP	Concession
1803	Simbali	78,224.43	TRP	Concession
1806	Aghathat	4,879.01	TRP	Concession
1816	Aghathat Ext.	5,113.13	TRP	Concession
1807	Dengnangi	32,095.55	TRP	Concession
1801	Kaboku	1,249.25	TRP	Concession
1805	Loi River	17,641.92	TRP	Concession
1802	Molkolkol	23,602.53	TRP	Concession
1809	Vudal	9,781.07	TRP	Concession
1836	KEREVAT PLANTATION	1,785.54		Proposed
1823	Mukus - Tolo	64,129.59	FMA	Concession
1818	TARAIWARA	16,944.21	TRP	Concession
1835	Wunung Sigite	39,429.03		Proposed
1828	Melkoi Wunung Block A	35,254.75		Proposed
1829	Melkoi Wunung Block B	22,804.67		Proposed
1824	Cape Bogan	25,404.83		Proposed
1826	Wide Bay	50,008.32		Proposed
1827	Melkoi Block 3	49,742.17		Proposed
1833	Upper Nakanai Plateau	6,176.19		Proposed
1834	Lower Nakanai Plateau	27,238.12		Proposed
1825	Kolmal	57,314.68		Proposed
1832	Toriu Headwaters	34,594.89		Proposed
1830	Pondo Ext	40,190.03		Proposed
1810	Seraji	1,664.83	TRP	Concession
1837	Pondo TRP	12,158.11	TRP	Concession
1838	SuiKol	49,711.06		Proposed
1839	Dengnagi Block2	50,640.32		Proposed
1840	Simbali Block1	26,996.18		Proposed

Table showing Timber Concessions of East New Britain Province. Information updated as at 2016.

CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, EAST NEW BRITAIN PROVINCE



Key

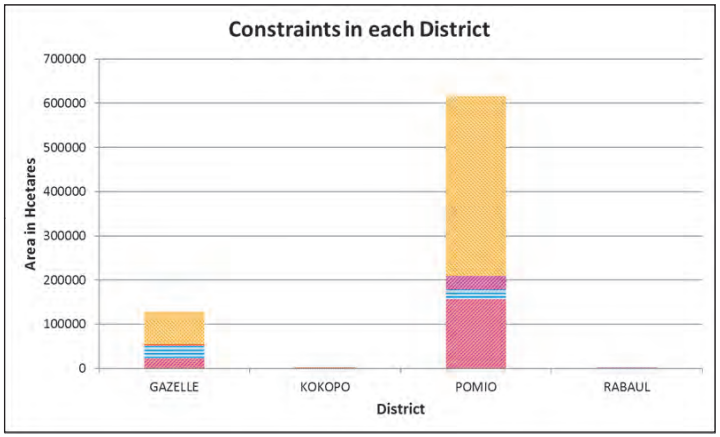
- Extreme Slope
- Serious Slope
- Extreme Karst
- Serious Inundation
- Mangrove
- Forest including Forest Plantations
- Other Landuse & Land Cover
- Lake & Larger Rivers

N

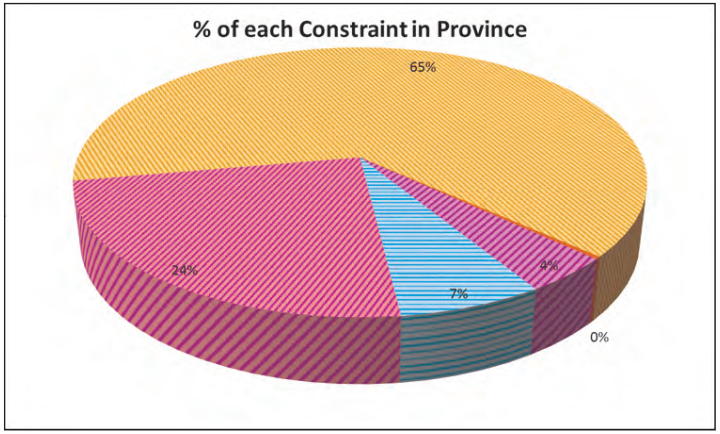
1 cm = 15 km

0 15 30 45 Kilometers

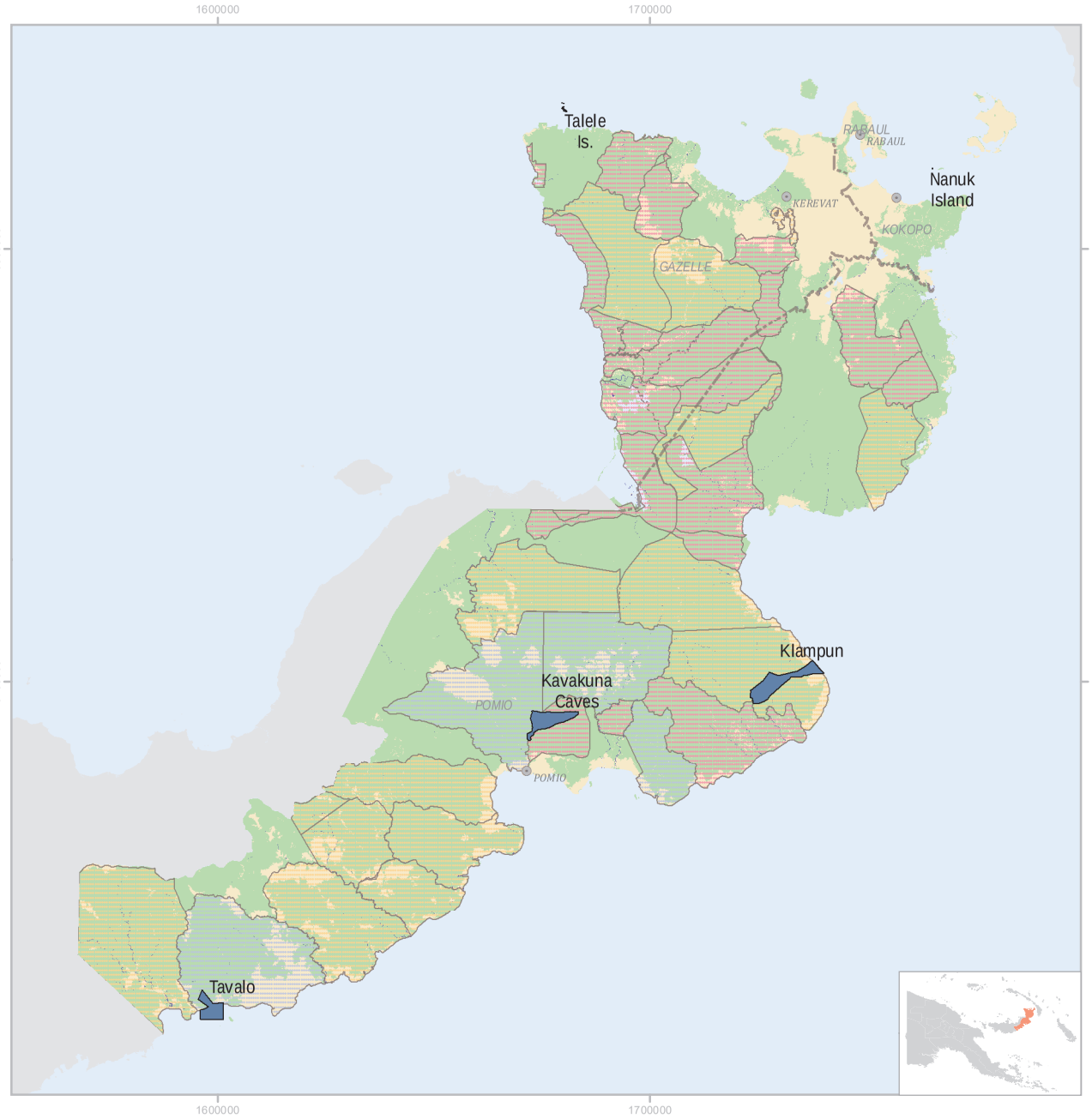
Brief Report on Logging Constraints of East New Britain Province



East New Britain's commercial timber production constraints are found entirely in Pomio and Gazelle; with the main constraint being 'Extreme karst'. 'Extreme Karst' accounts for 65% of all constraints in the province. The largest concentration of 'Extreme Karst' can be sited towards the South –West end of Pomio, as well as towards the North –West end of Gazelle. The second largest constraint to commercial timber production is 'Serious Slope' (24%). The majority of 'Serious Slope' can be found in Pomio, in particular, in the Centre, South-West and North-East end.



TERRESTRIAL PROTECTED AREAS, EAST NEW BRITAIN PROVINCE



Key

	Concessions	Forest Base Map Class
Terrestrial Protected Area	Current	Forest including Forest Plantations
	Expired	Other Landuse & Land Cover
	Proposed	Lake & Larger Rivers

N

1 cm = 15 km

0 15 30 45 Kilometers

Information on Terrestrial Protected Areas in East New Britain Province

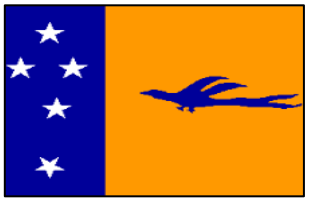
Name	Kavakuna Caves WMA
Protected Area ID	16
Protected Area Type	Wildlife Management Area
Province	East New Britain
Location	Kavakuna Caves
Area (ha)	3220
Longitude	151° 33' 35" E
Latitude	6° 35' 10" S
Name	**Klampun**
Protected Area ID	15
Protected Area Type	Wildlife Management Area
Province	East New Britain
Location	Klampun
Area (ha)	4, 591
Longitude	152° 1' 54" E
Latitude	6° 40' 17" S
Name	**Nanuk Island Reserve**
Protected Area ID	32
Protected Area Type	Reserve
Province	East New Britain
Location	Nanuk Island
Area (ha)	3
Longitude	152° 19' 38" E
Latitude	5° 43' 52" S
Name	**Talele Is. Nat. Park Reserve**
Protected Area ID	48
Protected Area Type	National Park / Reserve
Province	East New Britain
Location	Talele Is.
Area (ha)	31
Longitude	151° 34' 22" E
Latitude	5° 50' 30" S
Name	**Tavalo WMA**
Protected Area ID	49
Protected Area Type	Wildlife Management Area
Province	East New Britain
Location	Tavalo
Area (ha)	2, 308
Longitude	150° 52' 38" E
Latitude	7° 58' 40" S

Note:
Two of the protected areas in ENB are islands:

1. Nanuk Island.
=> 3 ha

2. Talele Island
=> 31 ha

16. New Ireland Province



General information/Overview

1. Location

New Ireland Province is located on north-east of mainland of PNG, consisting of small island groups and made up of coastal limestone plains, floodplains and hills.

Provincial Administration Centre:	Kavieng
Land area:	939, 696 ha
Population:	194, 067 (2011)
Number of District:	2 (Kavieng, Namatanai)
Number of Local Level Governments (LLGs):	10 LLGs

2. Forest Information

Forest Area:	812, 915 ha

Provincial Tree

The provincial tree is '*Taun*[12]' (scientifically known as *Pometia pinnata*) and is commonly found in Low Altitude Forest on Plains and Fans, and Low Altitude Forest on Uplands. The province has two species; *(P. pinnata form pinnata* and *P. pinnata form nov*.) .

Significance of Provincial tree:

It is a hard wood species which is one of the major commercial species exported in round log form (*P. pinnata form pinnata*) and consumed by the local people as a food source (*P.pinnata form nov*.).

Taun is a valuable and high demand species in terms of economical and as well social aspects. The fruits are edible when ripe and the seeds are soaked in brine and cooked in mumu pits. The leaves are used in preparation of mumu to give flavor to the food. As well the leaves are used for wrapping up bananas and covering it with the bark to allow the fruit to ripen. Tree bark is used as herbal remedy for treatment of dysentery (diarrhea) and treated bark is mixed with coconut to produce oil for ceremonies (traditional dancing), feasts, etc.

[12] In PNG there are five different forms of Taun (Pometia pinnata form pinnata, P.pinnata form glabra, P. pinnata form tomentose, P. pinnata form repanda and P.pinnata form nov.-new form). The presumed new form P. pinnata form nov to is found in the New Guinea Islands which is the edible one.

Scientific name:	Family:	Common Name/Trade name:
Pometia pinnata	***Sapindaceae***	***Taun***

Description

Taun is a large canopy tree with cylindrical, straight bole (trunk) sometimes twisted and flutted and has a buttress. Outer bark is reddish brown, slightly rough/smooth and scaly or flaky. Inner bark pale brown or pinkish and non-aromatic. Exudate colourless and not sticky. Leaf; compound (two or more leaflets), upper surface of leaf is dark green and underneath is pale green. Flower: Juvenile leaves reddish, small yellowish on branched axis. Fruit: round/oblong, green when immatures and turns red when it matures; Fruit is single seeded; seed is encompassed by thin fleshy aril. Other varieties edible.

Tree	Bark	Leaf/Leaves
 Source: L Thomson & R Thaman, "Species Profiles for Pacific Island Agroforestry": Pometia pinnata (2006)	 	 Source: https://www.loupiote.com/photos/6626464019.shtml?s=72157628694663763 
Note: Short description was from the PNG Plant database website and few of the photos (link below) http://www.pngplants.org/PNGtrees/TreeDescriptions Photo source (Bark, leaves and flowers): KDamas , Senior Botanist, FRI, Lae, Morobe Province	Flower	Fruit/Seed
		 Source: http://www.fiapng.com/Nursery_techniques.pdf

VEGETATION AND LAND COVER MAP OF NEW IRELAND PROVINCE (2012 FOREST BASEMAP VERSION 1.1)

Land Use and Land Cover Classes

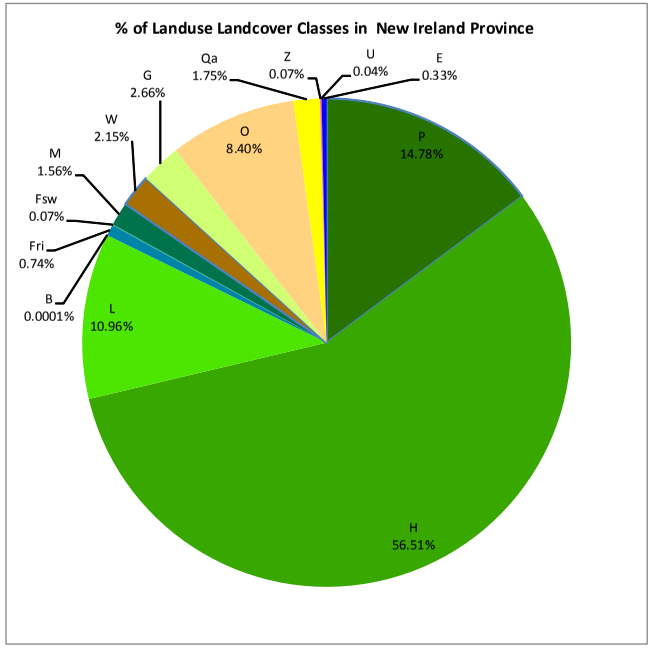
- P: Low Altitude Forest on Plains & Fans
- H: Low Altitude Forest on Uplands
- L: Lower Montane Forest
- Fri: Seral Forest
- Fsw: Swamp Forest
- M: Mangrove
- W:Woodland
- G: Grassland
- O: Agriculture Land Use
- Qa: Agriculture Plantation
- U: Settlement & larger urban centres
- E: Lakes & larger rivers

N

1 cm = 30 km

0 30 60 90

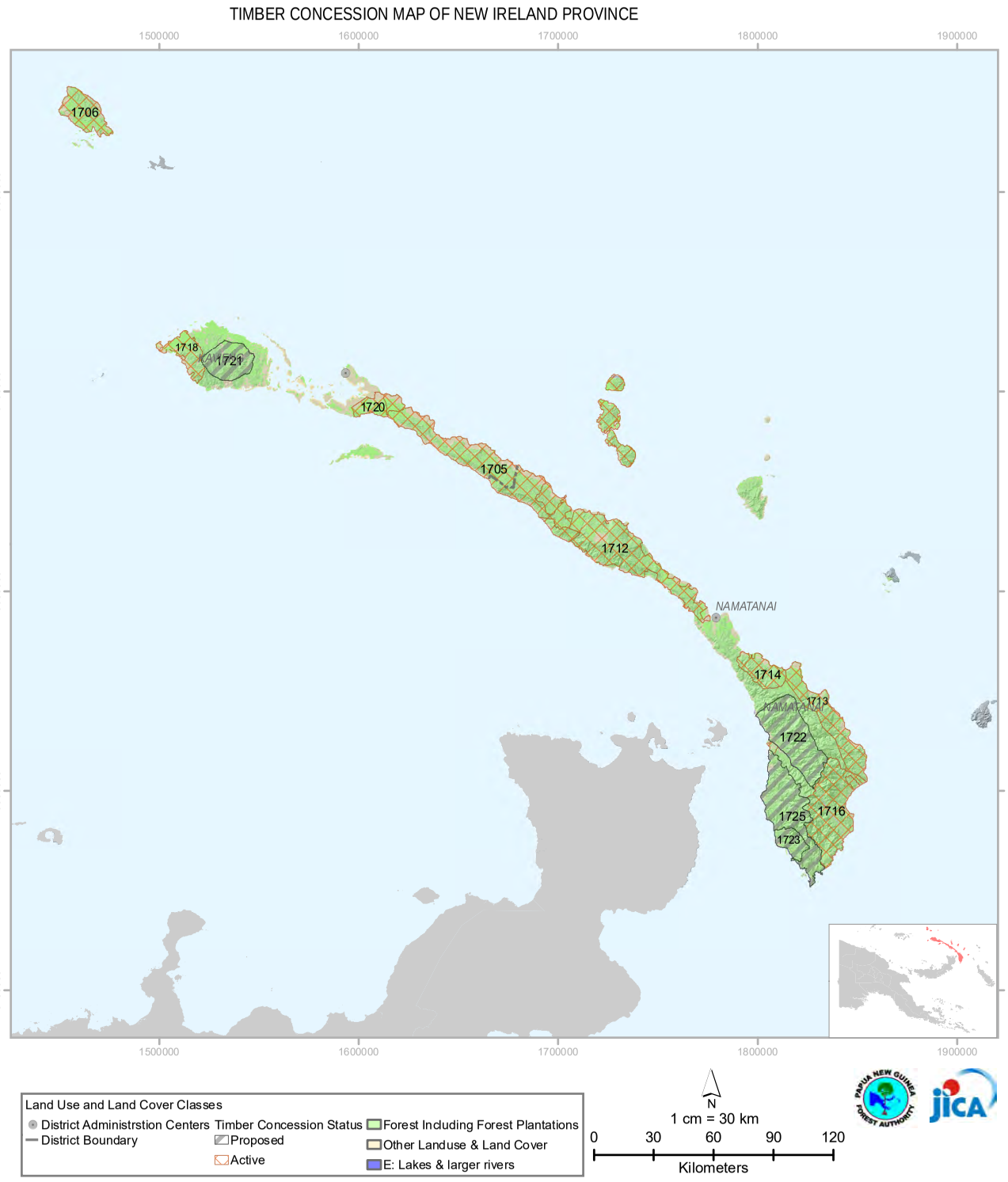
Kilometers



Pie Chart showing percentage in Landuse, Landcover of Manus Province.

% of Landuse Lancover		
Code	**Kavieng**	**Namatanai**
P	16.31%	8.42%
H	62.36%	64.00%
L	1.71%	16.17%
Fri	0.81%	1.08%
Fsw	0.08%	
M	1.71%	0.24%
W	2.37%	0.17%
G	3.06%	1.52%
O	9.25%	6.31%
Qa	1.93%	1.65%
U	0.04%	0.02%
E	0.36%	0.42%
Land Area (ha)	851,482.20	636,851.80

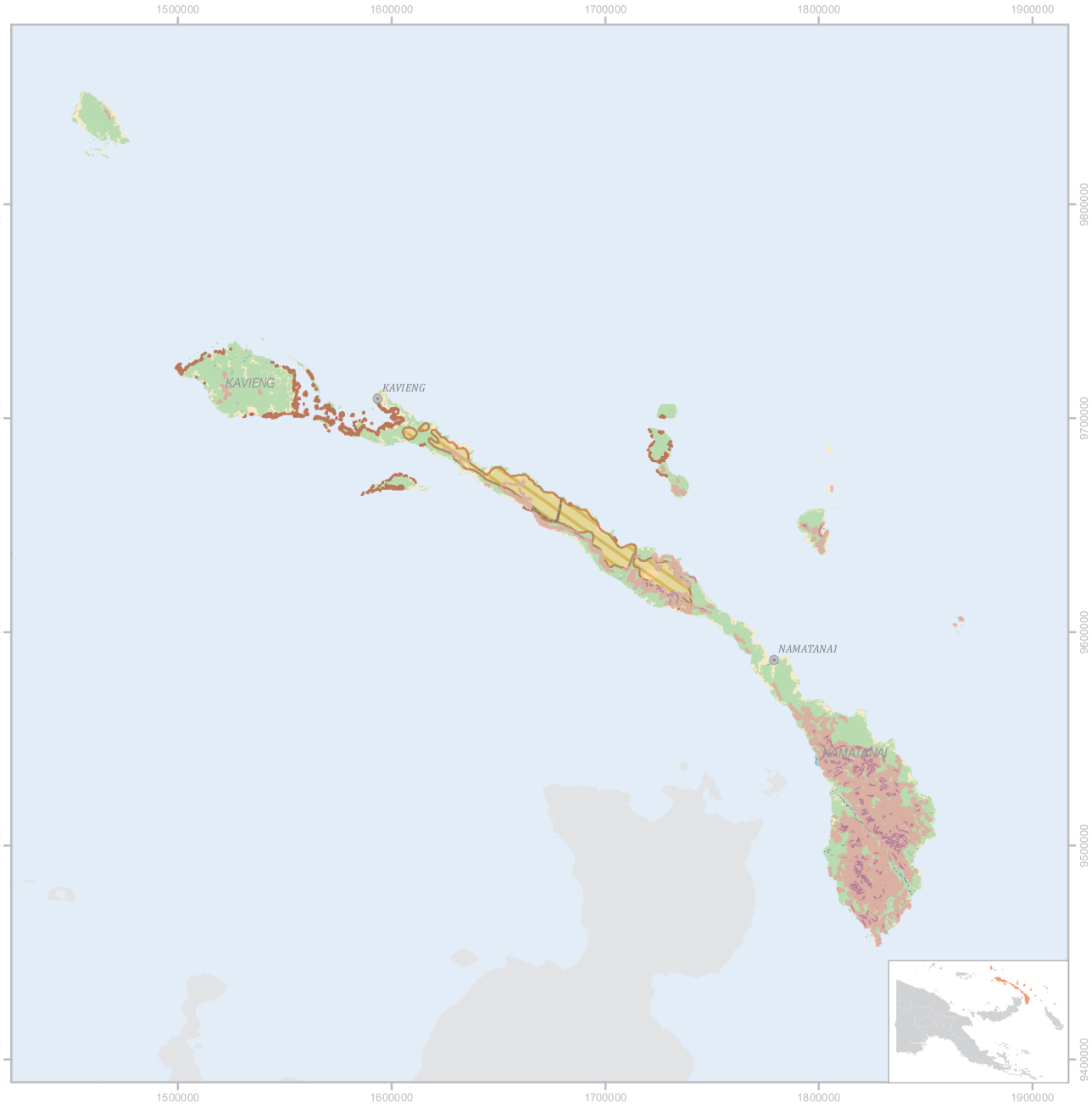
Table showing percentage in Landuse, Landcover of New Ireland Province Districts. Percentage calculated from area in hectares.



PLAN_ID	NAME	AREA (ha)	CONCESSION TYPE	STATUS
1706	Mussau Island	33,903.66	TRP	Concession
1715	Lenai	2,330.08	TRP	Concession
1713	Danfu	56,575.05	TRP	Concession
1714	Danfu Ext	25,065.82	TRP	Concession
1719	Uganai	8,471.52	LFA	Concession
1705	Nakmai	109,482.81	LFA	Concession
1720	West Kaut	13,435.63	TRP	Concession
1718	Umbukul	25,761.15	TRP	Concession
1701	Kaut	6,700.26	TRP	Concession
1712	Central New Ireland	99,062.32	TRP	Concession
1716	Lak	81,408.72	TRP	Concession
1708	Konos	10,813.30	TRP	Concession
1723	Lamassa	16,309.36		Proposed
1721	Central New Hanover	36,956.26		Proposed
1702	Kamdaru	1,856.78	TRP	Concession
1722	Kamdaru Huru	72,973.57		Proposed
1725	Lak-Kandas	72,592.61		Proposed
1724	Tarbar	28,969.66	LFA	Concession

Table showing Timber Concessions of New Ireland Province. Information updated as at 2016.

CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, NEW IRELAND PROVINCE



Key

- Extreme Slope
- Serious Slope
- Extreme Karst
- Serious Inundation
- Mangrove
- Forest including Forest Plantations
- Other Landuse & Land Cover
- Lake & Larger Rivers

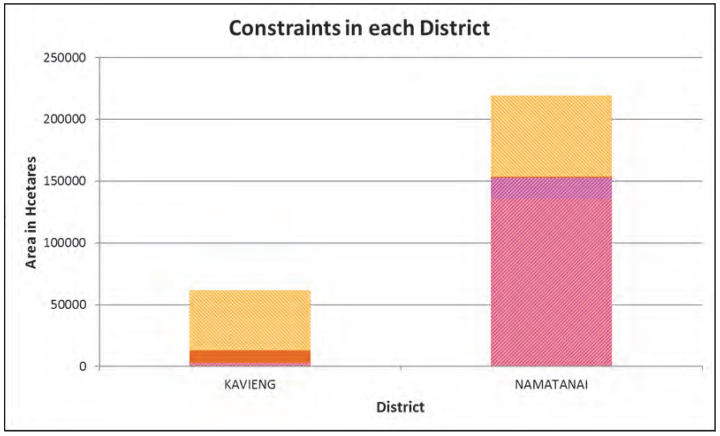
N

1 cm = 30 km

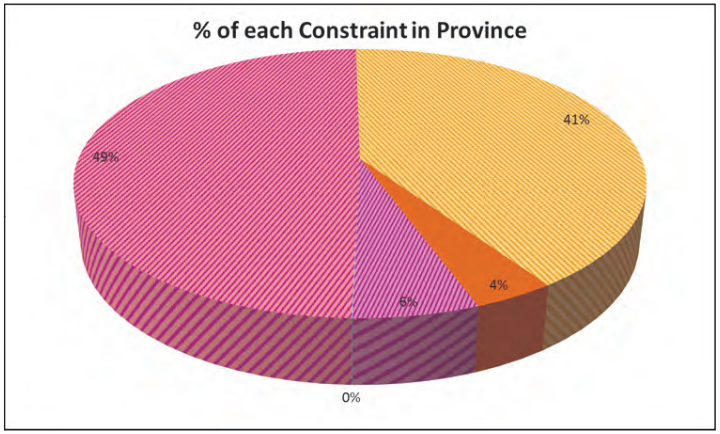
0 30 60 90 Kilometers

PAPUA NEW GUINEA FOREST AUTHORITY

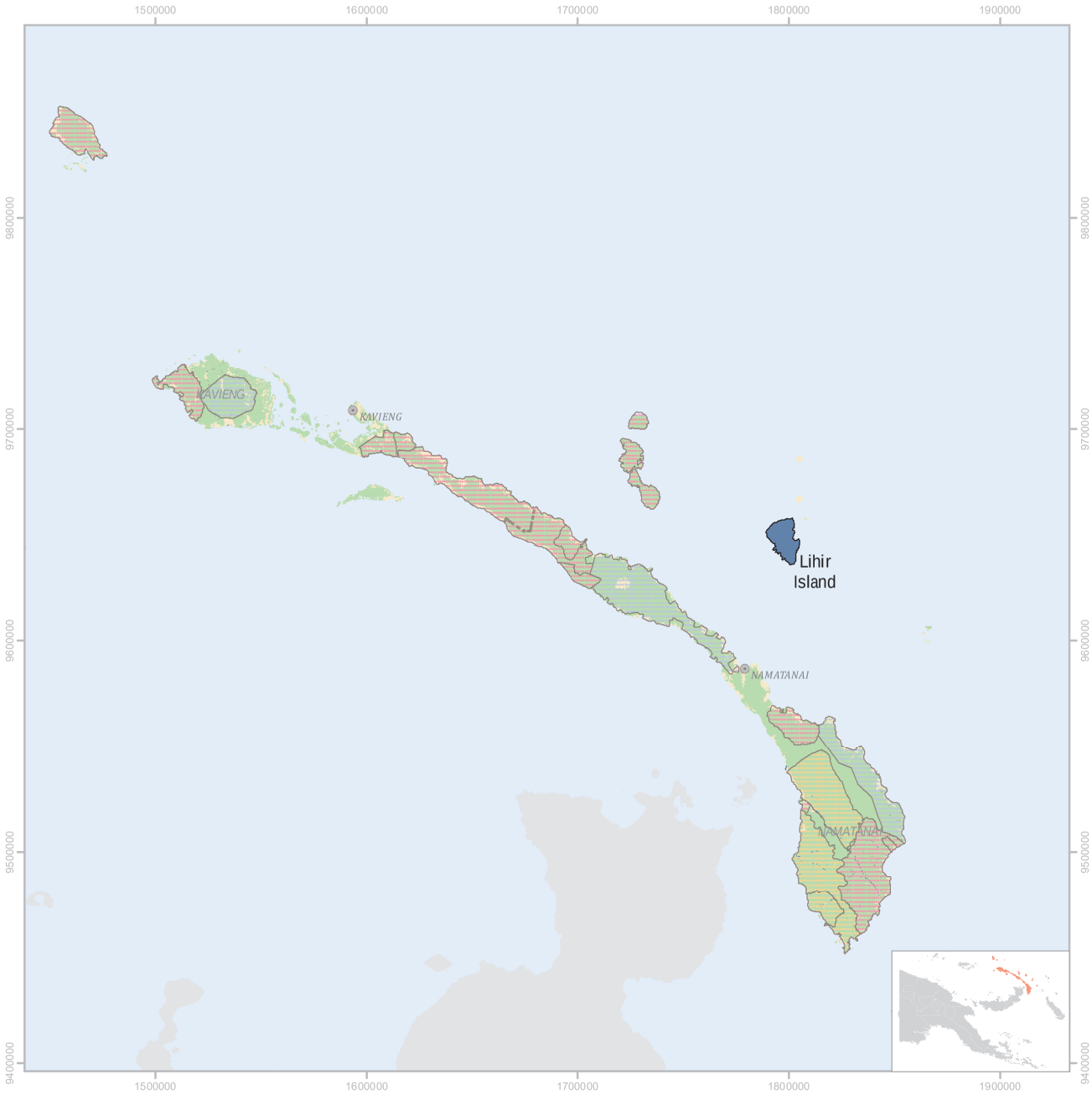
Brief Report on Logging Constraints of New Ireland Province



New Ireland province has two (2) main constraints to commercial timber production; 'Serious Slope' and 'Extreme Karst'; both combined make up 90% of all constraints found in the province. 'Serious Slope' is the predominate constraint in the province as it constitutes to 49%. The majority of 'Serious Slope' is situated chiefly in the southern end of Namatanai. The second largest constraint is 'Extreme Karst', which is mainly situated along the border between Kavieng and Namatanai and constitutes to 41%.



TERRESTRIAL PROTECTED AREAS, NEW IRELAND PROVINCE



Key

Terrestrial Protected Area	Concessions	Forest Base Map Class
	Current	Forest including Forest Plantations
	Expired	Other Landuse & Land Cover
	Proposed	Lake & Larger Rivers

N

1 cm = 30 km

0 30 60 90 Kilometers

Information on Terrestrial Protected Areas in New Ireland Province

Name	Lihir Island
Protected Area ID	21
Protected Area Type	Wildlife Managemenet Area
Province	New Ireland
Location	Lihir Island
Area (ha)	20, 208
Longitude	152° 35' 51" E
Latitude	4° 52' 45" S

17. Autonomous Region of Bougainville

General information/Overview

1. Location

Autonomous Region of Bougainville is far east of mainland of PNG and dominated by volcanic peaks, limestone plains, volcanic plains and fans, valleys, floodplains and swamps.

Provincial Administration Centre:	Buka
Land area:	937, 460 ha
Population:	249, 358 (2011)
Number of District:	3 (Central Bougainville, North Bougainville, South Bougainville)
Number of Local Level Governments (LLGs):	12 LLGs

2. Forest Information

Forest Area:	388, 913 ha

Provincial Tree

The provincial tree is '*Breadfruit*' (scientifically known as Artocarpus altilis) and is commonly found in Low Altitude Forest on Plains and Fans.

Significance of Provincial tree:

It is a hardwood but non-timber species and mostly cultivated near homes mainly for the consumption of the fruit and seeds when in season. As well the fruit and seeds are sold in local markets; a source of income.

Scientific name: *Canarium indicumArtocarpus altilis*	Family: *BurseraceaeMoraceae*	Common Name/Trade name: *GalipBreadfruit*

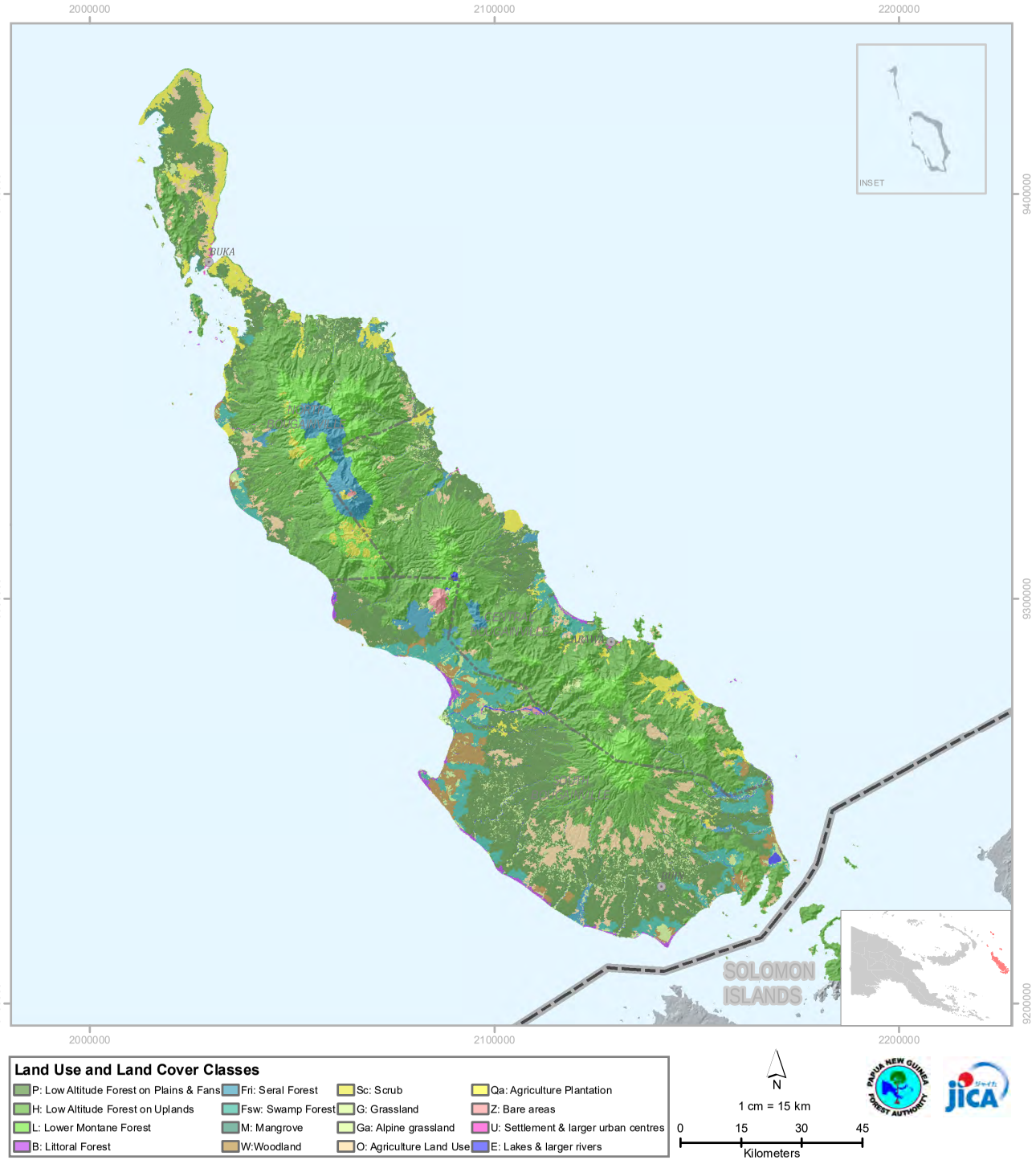
Description

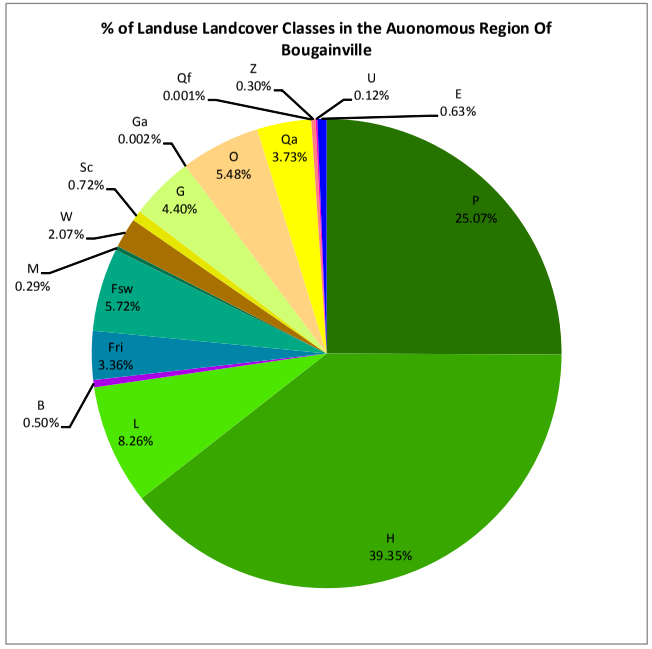
Galip is a large canopy to sub-canopy tree, straight bole and has a solid buttress. Outer bark is grey or brown and rough. Inner bark blaze pale yellow and bark exudate: white/milky flowing sap. Leaves: clustered at the end of branches, simple (a leaf composed of single leaf blade, upper surface dark green and beneath is green. Flowers: male and female flowers on the same plant. Fruit; green, fleshy and is about 100-500 mm in length with a width of 30-40mm (size). Seeds: contains about 20-60 seeds covered in brown seed coat.

Tree	Bark	Leaf/Leaves
		

Note:	Flower	Fruit/Seed
Short description was from the PNG Plant database website. http://www.pngplants.org/PNGtrees/TreeDescriptions/Artocarpus_altilis_Parkinson_Fosberg.html Photo source (tree, bark, leaves, flower, fruit and seed): http://tropical.theferns.info/image.php?id=Artocarpus+altilis#plantimages/e/e/eeaf79d02d560abfd6d247111e55621a5d113c1e.jpg	 Developing male flower (left of centre) with female flower above	 

VEGETATION AND LAND COVER MAP OF AUTONOMOUS REGION OF BOUGAINVILLE (2012 FOREST BASEMAP VERSION 1.1)



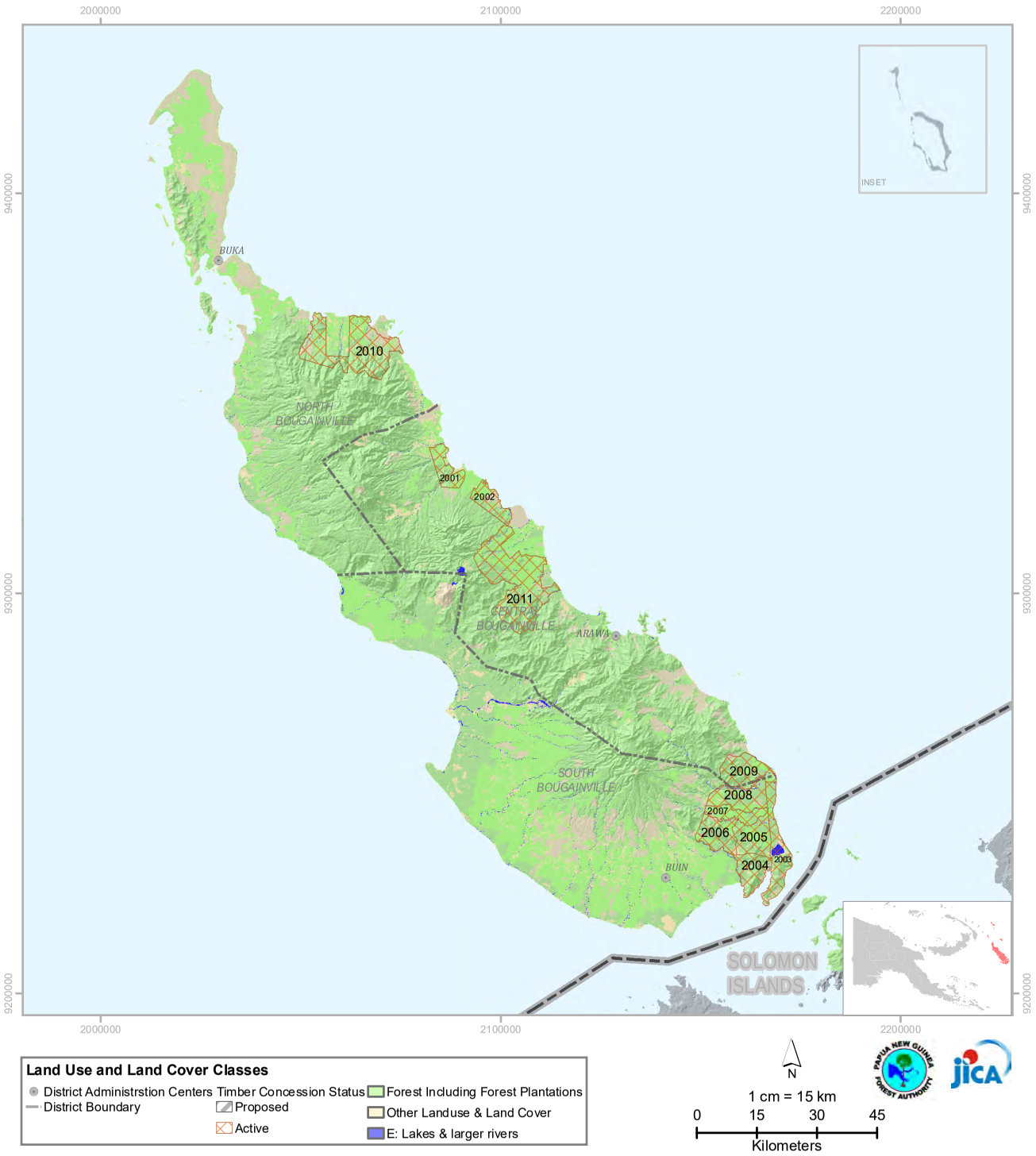


Pie Chart showing percentage in Landuse, Landcover of the Autonomous Region of Bougainville

% of Landuse Lancover			
Code	**Central Bougainville**	**North Bougainville**	**South Bougainville**
P	10.89%	20.68%	40.09%
H	59.63%	40.75%	21.92%
L	11.65%	12.08%	2.73%
B	0.16%	0.04%	0.88%
Fri	4.19%	4.22%	2.07%
Fsw	3.00%	1.54%	11.10%
M		0.83%	0.01%
W	0.21%	0.28%	4.94%
Sc	0.28%	2.17%	0.01%
G	2.85%	3.53%	6.23%
Ga	0.01%		
O	2.83%	5.20%	7.93%
Qa	3.74%	8.37%	0.28%
Z	0.07%		0.71%
U	0.07%	0.10%	0.02%
E	0.42%	0.20%	1.08%
Land Area (ha)	299,153.39	271,346.51	360,322.15

Table showing percentage in Landuse, Landcover of Districts in the Autonomous Region of Bougainville.
Percentage calculated from area in hectares.

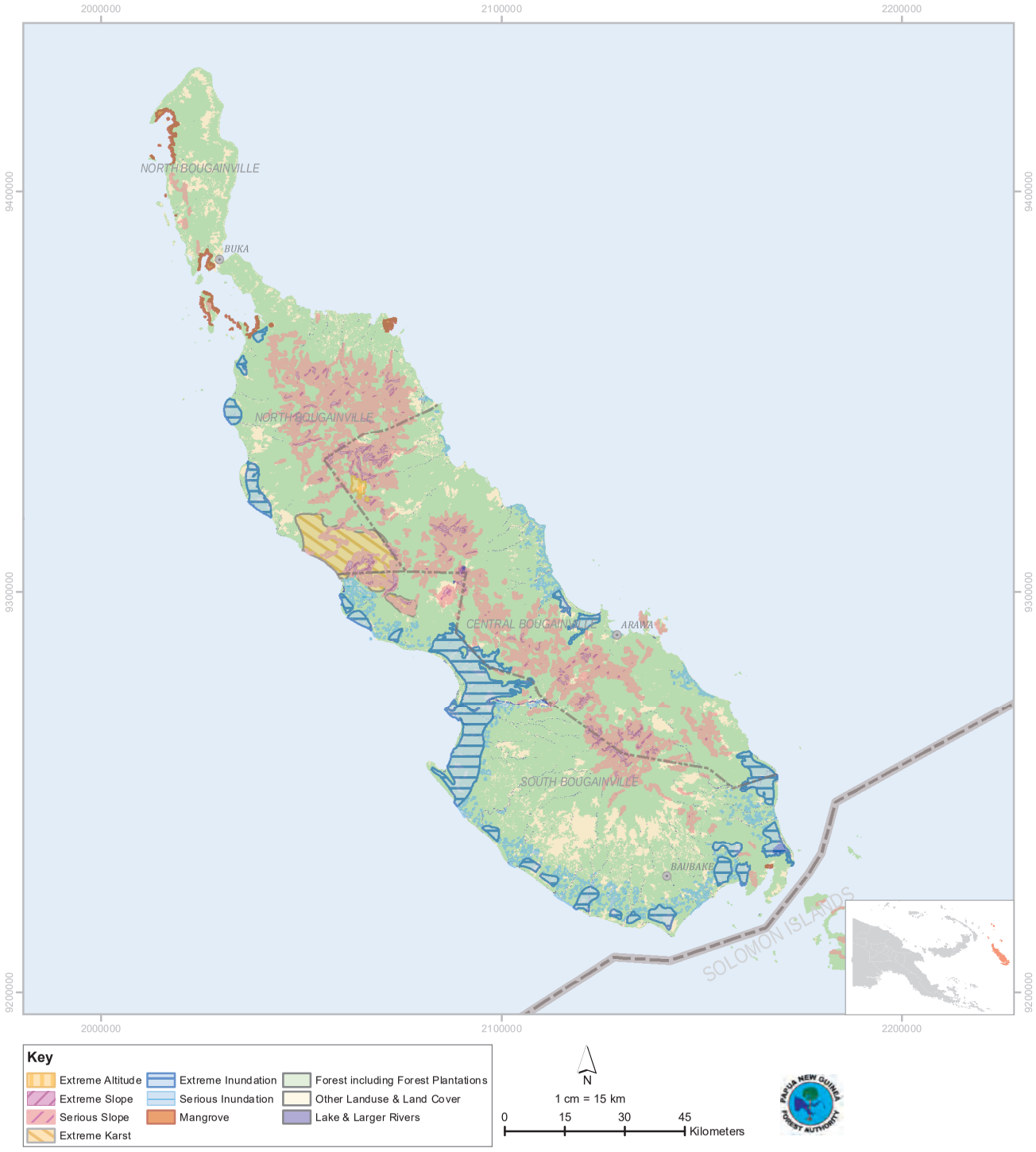
TIMBER CONCESSION MAP OF AUTONOMOUS REGION OF BOUGAINVILLE



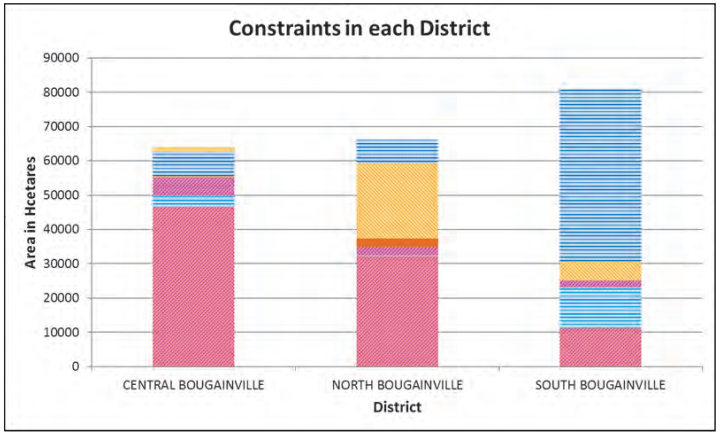
PLAN_ID	NAME	AREA (ha)	CONCESSION TYPE	STATUS
2006	Tonolei block 4	6,869.89	TRP	Concession
2005	Tonolei block 3	7,256.59	TRP	Concession
2004	Tonolei block 2	6,032.81	TRP	Concession
2002	Numanuma	4,735.06	TRP	Concession
2001	Wakunai	4,551.86	TRP	Concession
2011	Manetai	24,402.36	TRP	Concession
2010	Tinputz	19,688.71	TRP	Concession
2009	Tonolei block 7	7,828.52	TRP	Concession
2003	Tonolei block 1	8,781.94	TRP	Concession
2008	Tonolei block 6	7,681.89	TRP	Concession
2007	Tonolei block 5	4,195.61	TRP	Concession

Table showing Timber Concessions of the Autonomous Region of Bougainville. Information updated as at 2016.

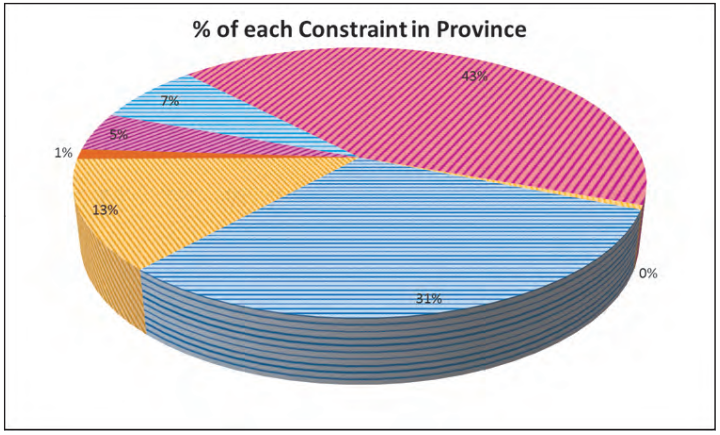
CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, AUTONOMOUS REGION OF BOUGAINVILLE



Brief Report on Logging Constraints of Autonomous Region of Bougainville



'Extreme Inundation' can be found predominantly along the southern coast of Bougainville and accounts for the second largest percentage of constraints to commercial timber production within the province. The chief constraint throughout the province is 'Serious Slope', which accounts for 43% of the entirety of constraints found in the province. The majority of 'serious slope' can be found primarily in Central Bougainville, in particular, along the shared borders of Central Bougainville and North and South Bougainville.



18. Manus Province

General information/Overview

1. Location

Manus Province is the smallest province both in land and population. It is far north of mainland of PNG, dominated by hills and mountain peaks, coastal areas of limestone plains, swamps and floodplains.

Provincial Administration Centre:	Lorengau
Land area:	193, 077 ha
Population:	60, 485 (2011)
Number of District:	1 (Lorengau)
Number of Local Level Governments (LLGs):	12 LLGs

2. Forest Information

Forest Area:	171, 117 ha

Provincial Tree

The provincial tree is '*Calophyllum*' (scientifically known as *Calophyllum soulattri*) and is commonly found in Low Altitude Forest on Uplands.

Significance of Provincial tree:

Calophyllum is the dominant tree species in the province and accounts for over 98 % of round log exports. It is a hard wood species and is one of the major commercial species exported in round log form. The local people commonly use the tree for timber in the construction of houses, bridges and various uses. As well carving of wooden bowls, paddles, handles for axes and tools for beating the sago.

Scientific Name: *Calophyllum soulattri*	Family: *Calophyllaceae*	Common name/Trade Name: *Calophyllum*

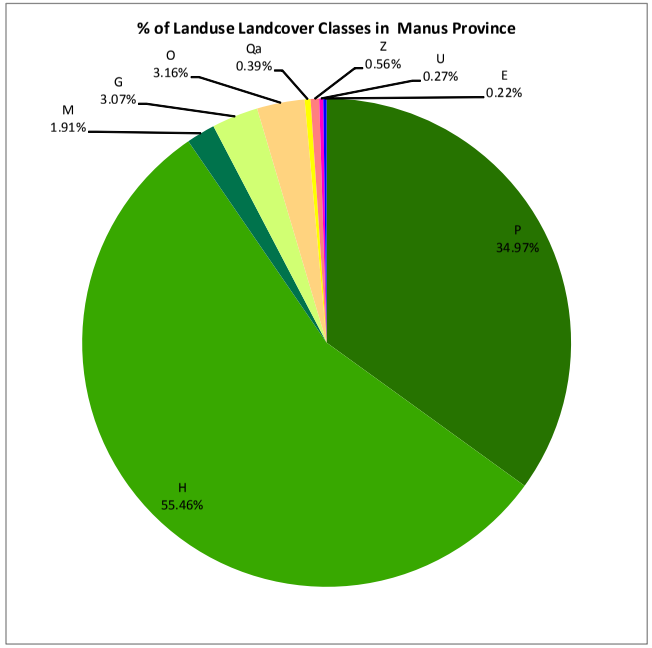
Description

A large to sub canopy tree with straight cylindrical bole (trunk). Outer bark is yellow or brown, rough or smooth (when immature), scaly or flaky. Inner bark is (blaze) pink and slightly fibrous and non- aromatic. White Exudate: sticky, white / milky or yellowish and changes colour to yellowish brown when exposed to air. Leaf is simple, opposite, upper surface and lower surface is pale green. Flowers: white. Fruit: small dark green when immature and turns blue, black when it matures (ripens).

Tree	Bark	Leaf/Leaves
 Source: https://florafaunaweb.nparks.gov.sg/special-pages/plant-detail.aspx?id=2776	 Source: http://www.pngplants.org/PNGtrees/TreeDescriptions/Calophyllum_soulattri_Burm_f.html  Photo source: KDamas, Senior Botanist, FRI, Lae, Morobe Province	 Photo source: KDamas, Senior Botanist, FRI, Lae, Morobe Province

Note: Short description was from the PNG Plant database website (link below) http://www.pngplants.org/PNGtrees/TreeDescriptions	Flower	Fruit/Seed
	 Source: https://florafaunaweb.nparks.gov.sg/special-pages/plant-detail.aspx?id=2776	 Source: http://tropical.theferns.info/viewtropical.php?id=Calophyllum+soulattri

VEGETATION AND LAND COVER MAP OF MANUS PROVINCE (2012 FOREST BASEMAP VERSION 1.1)

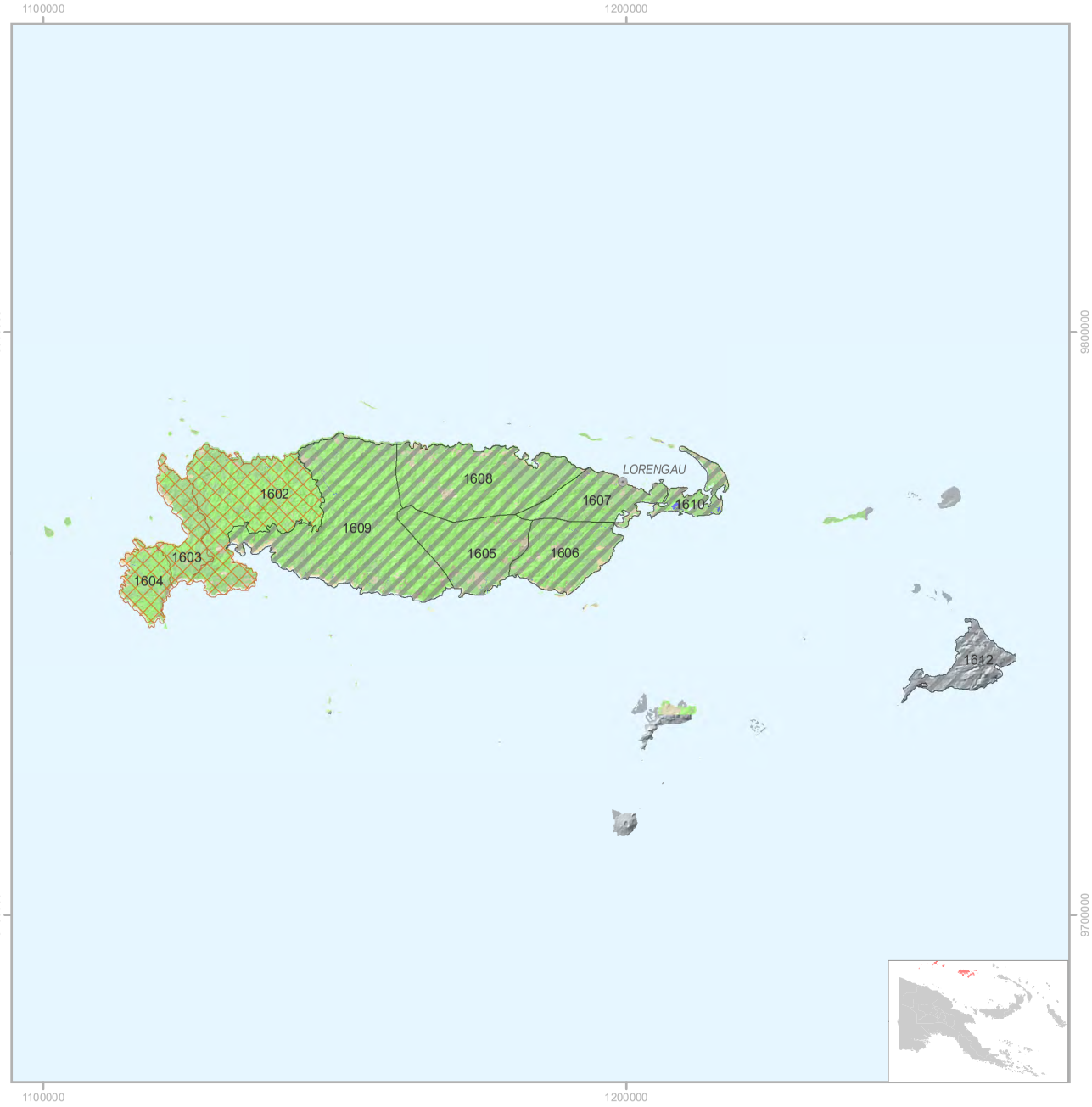


Pie Chart showing percentage in Landuse, Landcover of Manus Province.

% of Landuse Landcover	
Code	**Manus**
P	34.97%
H	55.46%
L	0.00%
Mo	0.00%
D	0.00%
B	0.00%
Fri	0.00%
Fsw	0.00%
M	1.91%
W	0.00%
Sa	0.00%
Sc	0.00%
G	3.07%
Ga	0.00%
Gi	0.00%
O	3.16%
Qa	0.39%
Qf	0.00%
Z	0.56%
U	0.27%
E	0.22%
Land Area (ha)	193,143.99

Table showing percentage in Landuse, Landcover of districts in Manus Province. Percentage calculated from area in hectares.

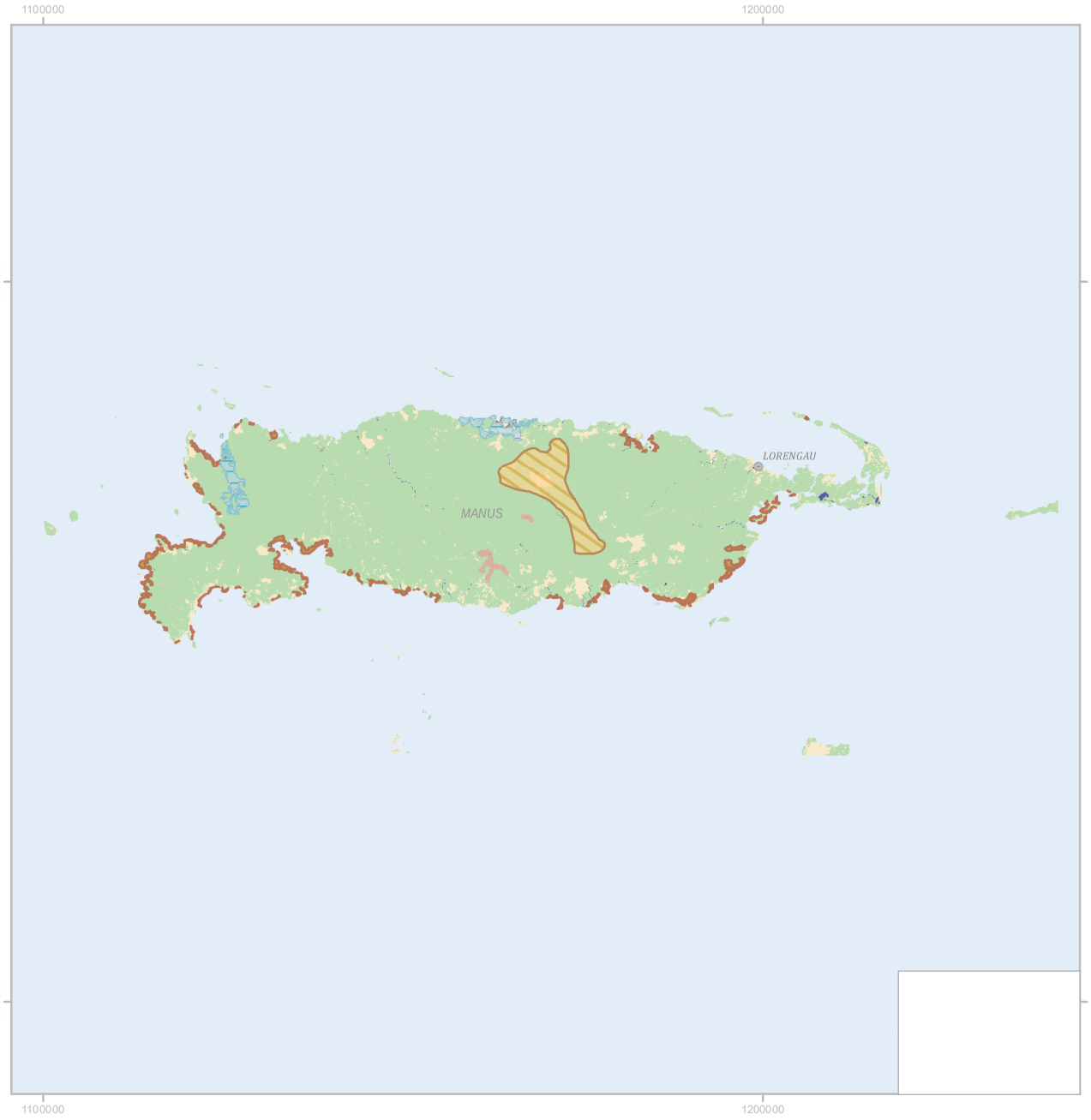
TIMBER CONCESSION MAP OF MANUS PROVINCE



PLAN_ID	NAME	AREA (ha)	CONCESSION TYPE	STATUS
1602	Manus West Coast	32,296.15	TRP	Concession
1603	Jaha	10,068.86	LFA	Concession
1604	Kali Bay	8,713.70	LFA	Concession
1609	BLOCK 7	51,545.67		Proposed
1608	BLOCK 6	30,926.96		Proposed
1607	BLOCK 5	13,070.44		Proposed
1606	BLOCK 4	16,409.85		Proposed
1605	BLOCK 3	19,999.22		Proposed
1610	Los Negros Island	5,482.25		Proposed
1612	Rambutyo Island	9,735.34		Proposed

Table showing Timber Concessions of Manus Province.
Information updated as at 2016.

CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, MANUS PROVINCE

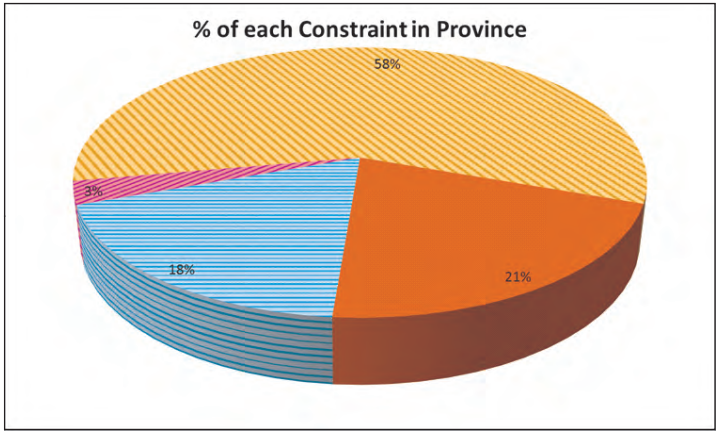


Brief Report on Logging Constraints of Manus Province

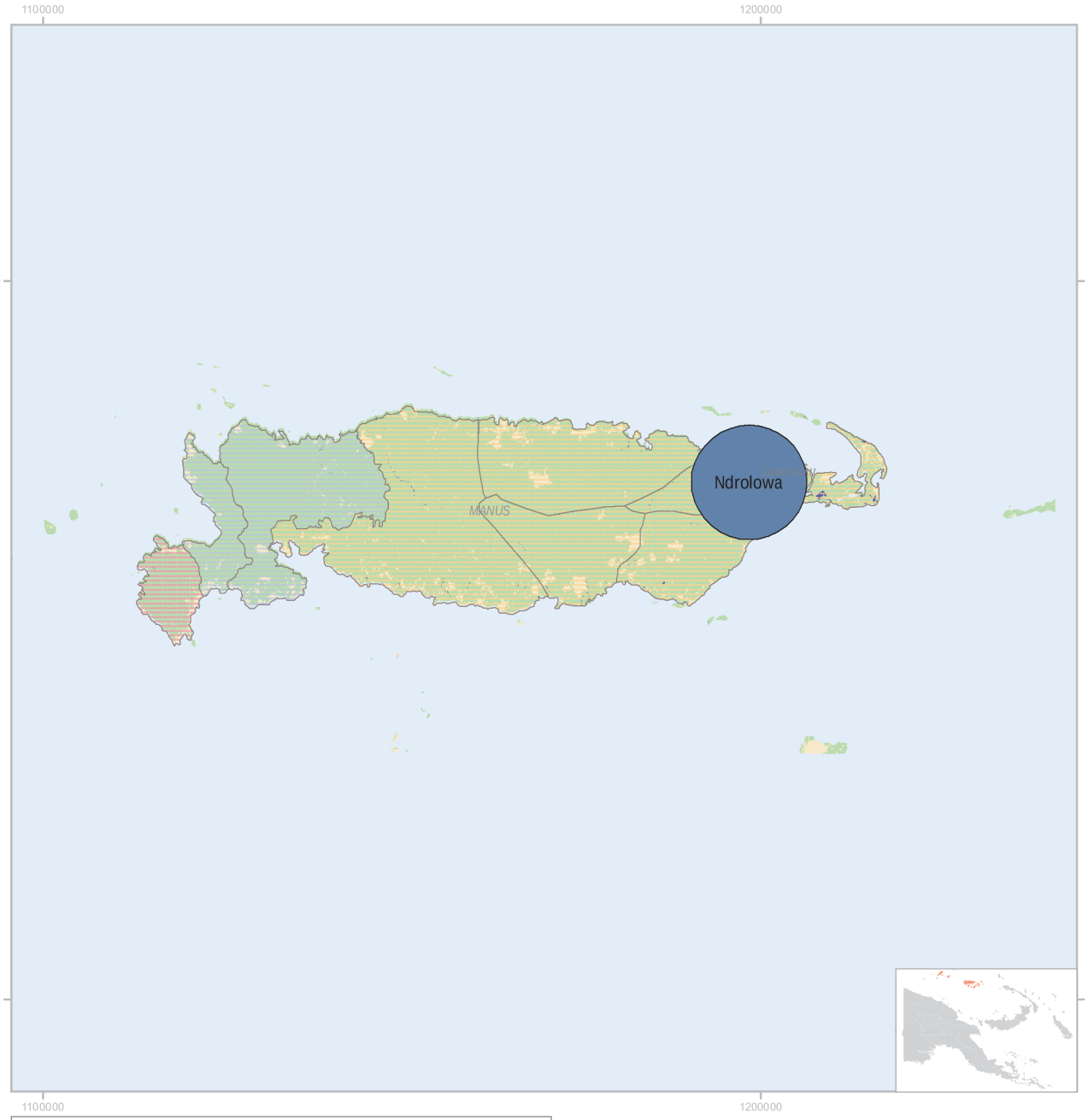
Constraint	Area (Ha)
Extreme Karst	7880
Mangrove	2828
Serious Inundation	2463
Serious Slope	374

The dominant constraint in the province is 'Extreme Karst', it is situated primarily in the centre of the province and constitutes to about 58% of all constraints. The province is abundantly surrounded by Mangroves; most cases, these mangroves exist naturally, however, in more recent times, as a countermeasure to face the threat of coastal flooding, some areas along the southern coast of the province have undergone mangrove seedling plantation projects, for this reason, 'Mangroves' is the second largest constraint to commercial timber production in the province, as it constitutes to 21%.

Source (https://png.wcs.org/initiatives/mangrove-rehabilitation-and-protection.aspx)



TERRESTRIAL PROTECTED AREAS, MANUS PROVINCE



Key

Terrestrial Protected Area	Concessions	Forest Base Map Class
	Current	Forest including Forest Plantations
	Expired	Other Landuse & Land Cover
	Proposed	Lake & Larger Rivers

N

1 cm = 9 km

0 9 18 27 Kilometers

Information on Terrestrial Protected Areas in Manus Province

Name	Ndrolowa WMA
Protected Area ID	33
Protected Area Type	Wildlife Management Area
Province	Manus
Location	Ndrolowa
Area (ha)	19, 887
Longitude	147° 16' 0" E
Latitude	3° 57' 0" S

19. Enga Province

General information/Overview

1. Location

Enga Province is located in the highlands of PNG and consists of mountain ranges, valleys and large swamp areas. The Lagaip River links into the Fly River and Coral Sea of Western Province and Lai River into the Sepik River of East Sepik province and the Bismarck Sea.

Provincial Administration Centre:	Wabag
Land area:	1, 173, 438 ha
Population:	432, 045 (2011)
Number of District:	5 (Kandep, Kompiam, Lagaip-Porgera, Wapenamanda, Wabag)
Number of Local Level Governments (LLGs):	14 LLGs

2. Forest Information

Forest Area:	640, 090 ha

Provincial Tree

The provincial tree is '*Papuacedrus*' (scientifically known as *Papuacedrus papuana* formerly known as *Librocedrus papuanus*) and is commonly found in Lower Montane forest and Montane forest.

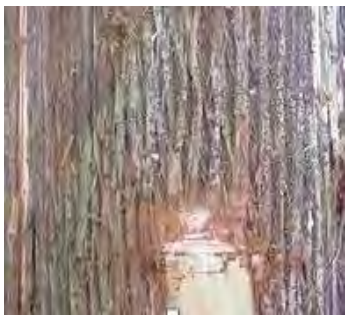
Significance of Provincial tree:

It is one of the soft wood species and is an important tree to the people of Enga because of its various cultural and other uses for instance, timber for homes, furniture, fences, etc. The leaves are used as decorations in special occasions such as cultural dances or other traditional ceremonies and as well the leaves are burnt to repel insects, the bark of the tree is prepared and used as flooring for homes. It is commonly grown as ornaments around homes of many rural communities.

Scientific name: *Papuacedrus papuana*	Family: *Cupressaceae*	Common Name/Trade name: *Papuacedrus*

Description

A large to sub-canopy tree with straight cylindrical bole. Outer bark is grey or brown to black, texture is rough, fissured to peeling. Inner bark white, pink or pale brown, fibrous and has sticky pale brown exudate. Leaves (modified – non true leaves) clustered, opposite, simple, upper surface dull green and under surface blue-green or dull green. Flowers: male and female flowers on different plants, small green. Fruit/Seed- reddish brown or bluish green containing 1- 2 seeds.

Tree	Bark	Leaf/Leaves
	 Source: http://www.pngplants.org/PNGtrees/TreeDescriptions/Papuacedrus_papuana_F_Muell_Li_var_papua.html	 Source: https://pnglng.com/media/PNG-LNG-Media/Files/Environment/Identification-Guide-to-Flora-and-Fauna-of-Hides-Ridge_FINAL.pdf

Note:

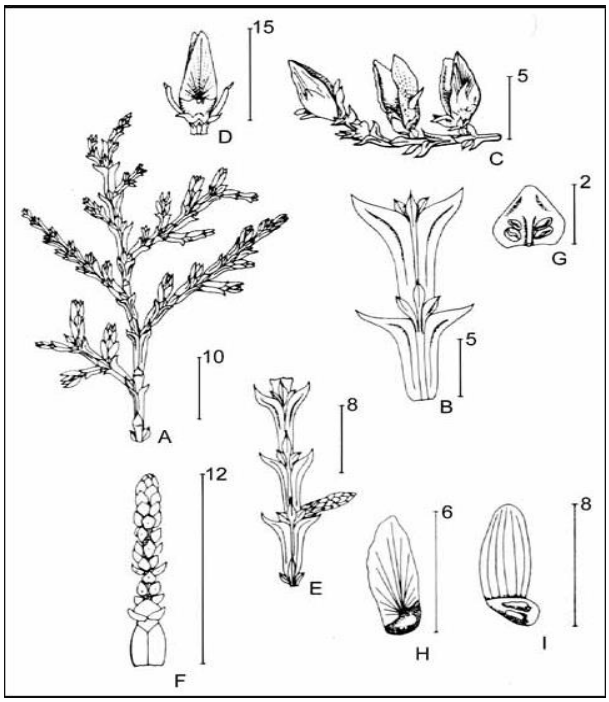
Short description was from the PNG Plant database website (link below)

http://www.pngplants.org/PNGtrees/TreeDescriptions/Papuacedrus_papuana_F_Muell_Li_var_papua.html

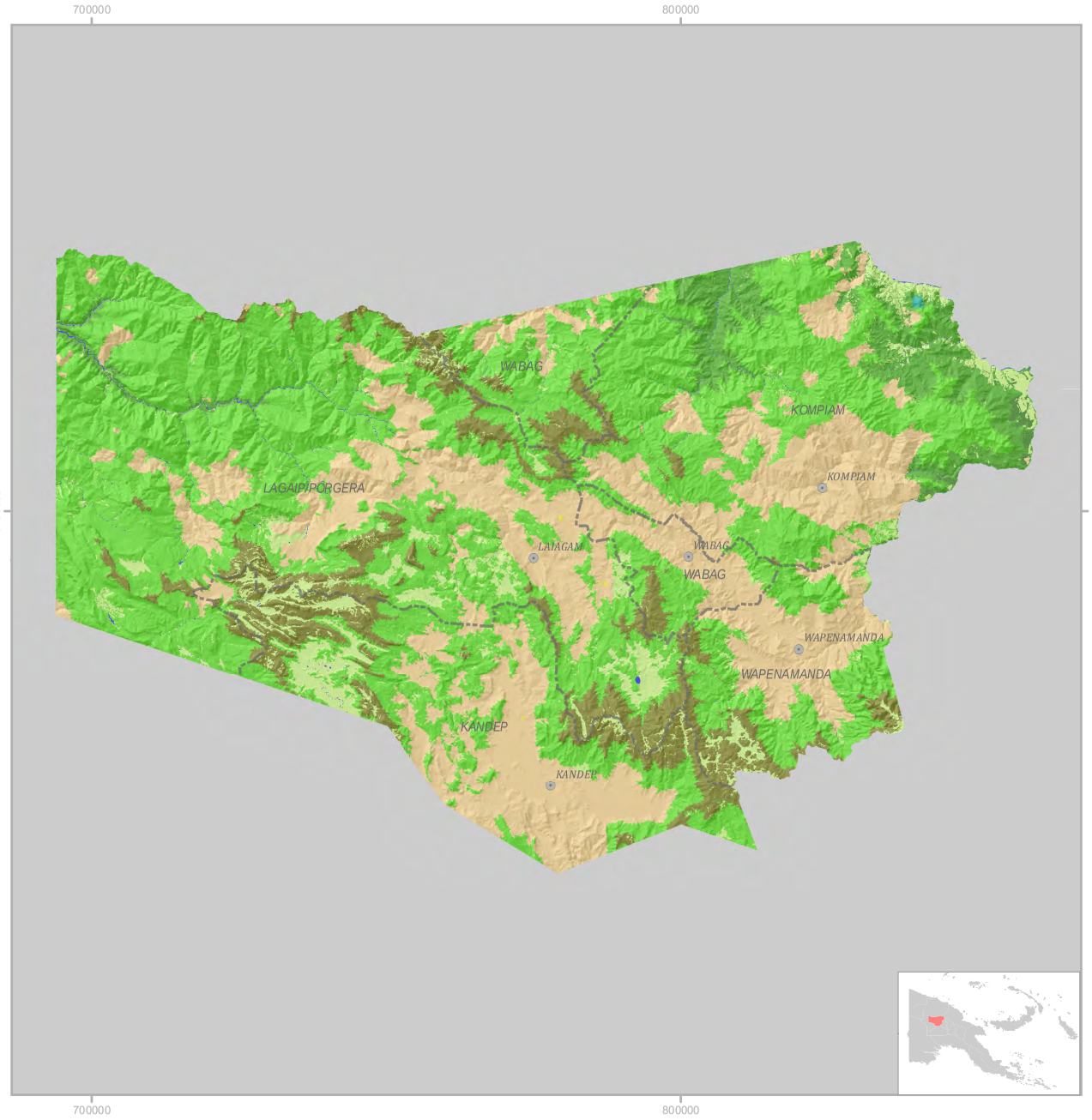
Flower, fruit/seed
"Papuacedrus papuana (F. Mueller) Li. A-B. part of branchlet, C. part of branchlet with fruit, D. fruit, E. part of branchlet with male cone, F. male cone, G. microsporophyll, H-I. seeds." (van Royen 1979

Source:
https://www.conifers.org/cu/Papuacedrus.php

Flower	Fruit/Seed



VEGETATION AND LAND COVER MAP OF ENGA PROVINCE (2012 FOREST BASEMAP VERSION 1.1)



Land Use and Land Cover Classes

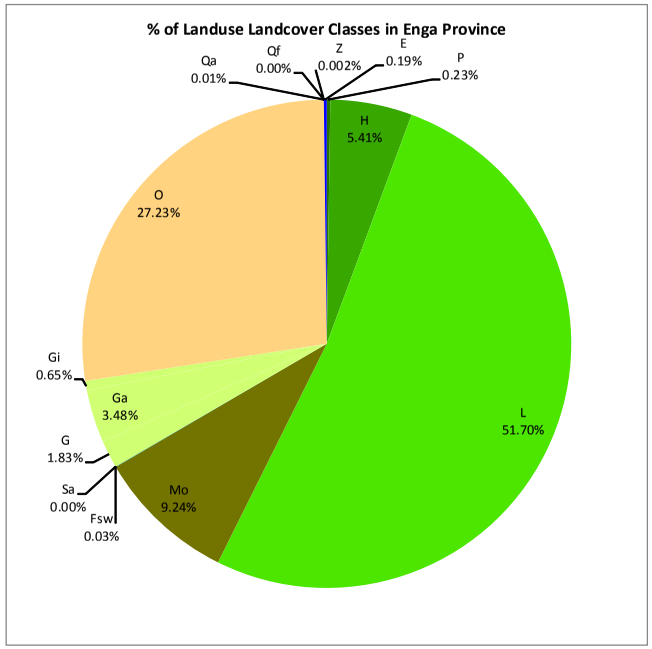
P: Low Altitude Forest on Plains & Fans	Fsw: Swamp Forest	Gi: Subalpine grassland	Z: Bare areas
H: Low Altitude Forest on Uplands	Sa: Savanna	O: Agriculture Land Use	E: Lakes & larger rivers
L: Lower Montane Forest	G: Grassland	Qa: Agriculture Plantation	
Mo: Montane Forest	Ga: Alpine grassland	Qf: Forest Plantation	

N

1 cm = 11 km

0 11 22 33

Kilometers

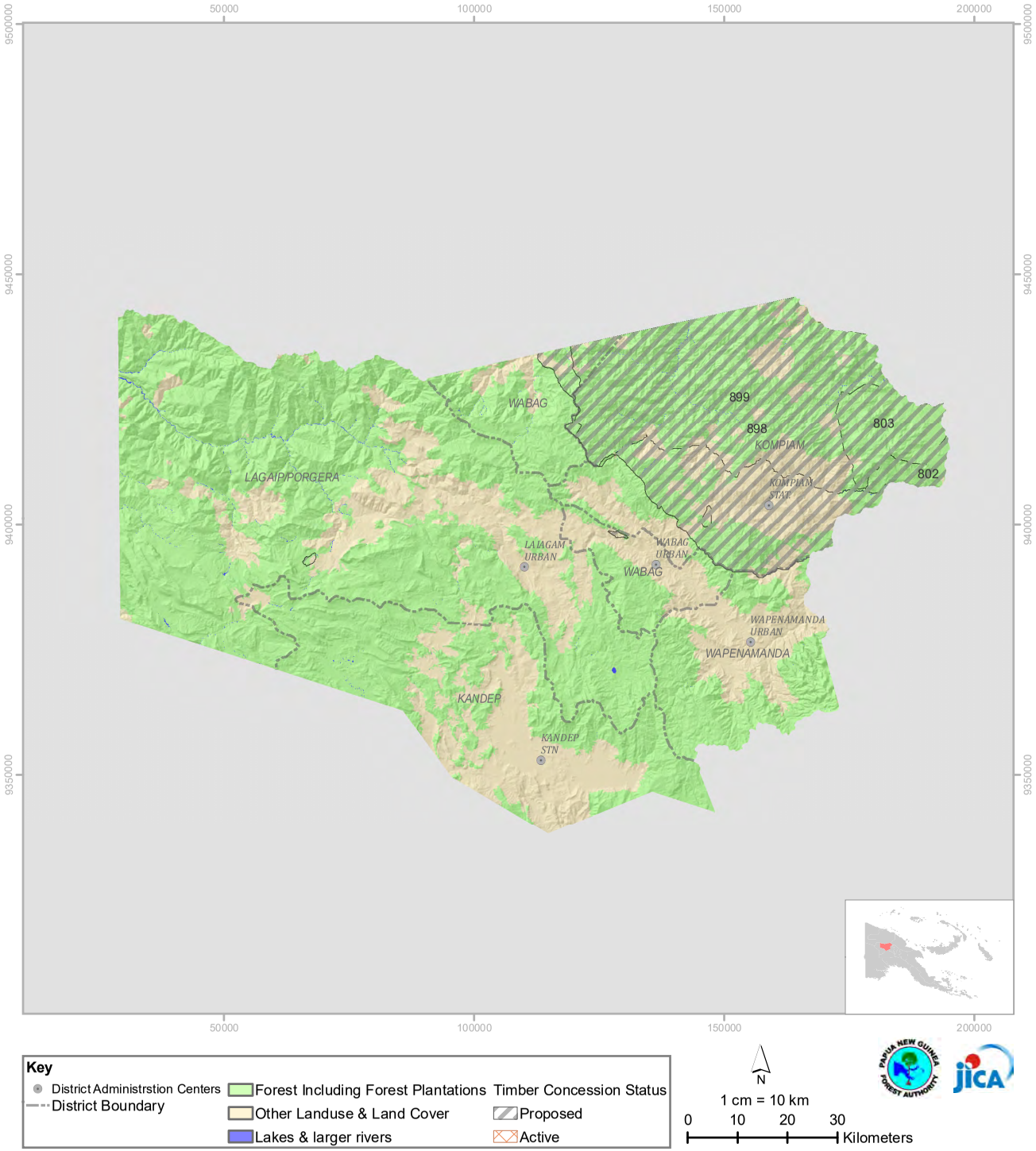


Pie Chart showing percentage in Landuse, Landcover of Enga Province.

% of Landuse Lancover				
Code	**Kandep**	**Lagaip Pogera**	**Wabag**	**Wapenamanda**
P		0.02%		
H		1.68%	0.05%	0.05%
L	34.48%	71.22%	52.85%	39.73%
Mo	16.37%	10.02%	14.09%	14.71%
Fsw	0.01%			
G	0.41%	1.35%	0.97%	1.76%
Ga	7.87%	4.71%	1.37%	2.81%
Gi	1.60%	0.63%	0.51%	1.11%
O	39.20%	10.02%	30.01%	39.78%
Qa		0.03%		
Qf	0.01%			
Z				0.02%
E	0.05%	0.32%	0.14%	0.03%
Land Area (ha)	201,994.16	433,750.92	94,852.04	101,647.87

Table showing percentage in Landuse, Landcover of Districts in Enga Province. Percentage calculated from area in hectares.

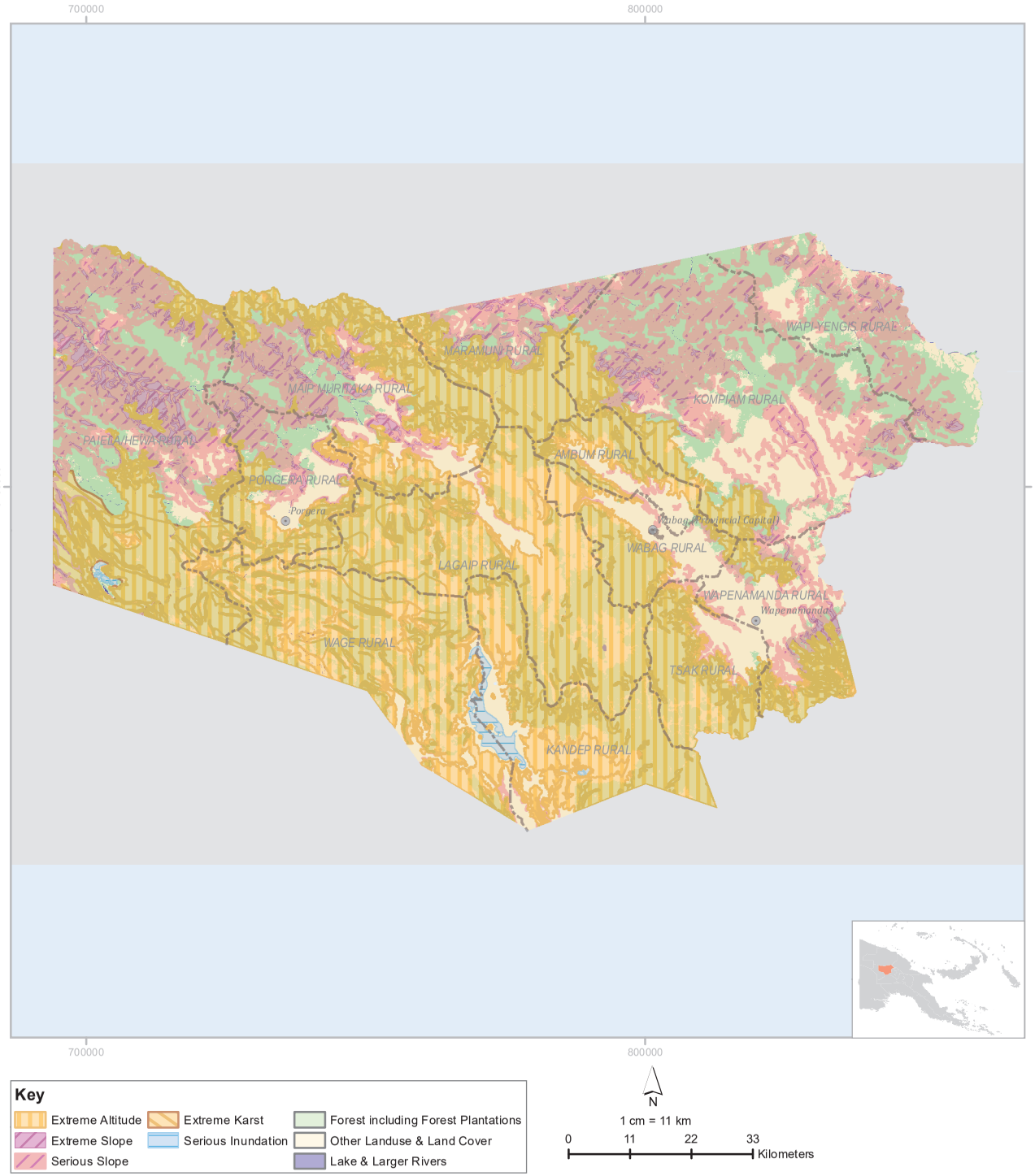
TIMBER CONCESSION MAP OF ENGA PROVINCE



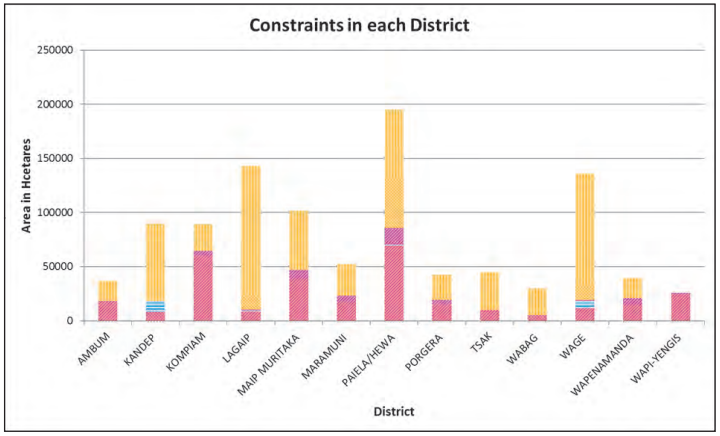
PLAN_ID	NAME	AREA (ha)	CONCESSION TYPE	STATUS
805	Pogera	387.37	TRP	Proposed
800	Meriamanda	620.12	TRP	Proposed
803	Waripa	29,668.63	TRP	Proposed
802	Domisau	9,341.83	TRP	Proposed
801	Kiaimanda	281.09	TRP	Proposed
899	Sautaru	165,431.53		Proposed
898	KOMPIAM	273,038.08		Proposed

Table showing Timber Concessions of Enga Province.
Information updated as at 2016.

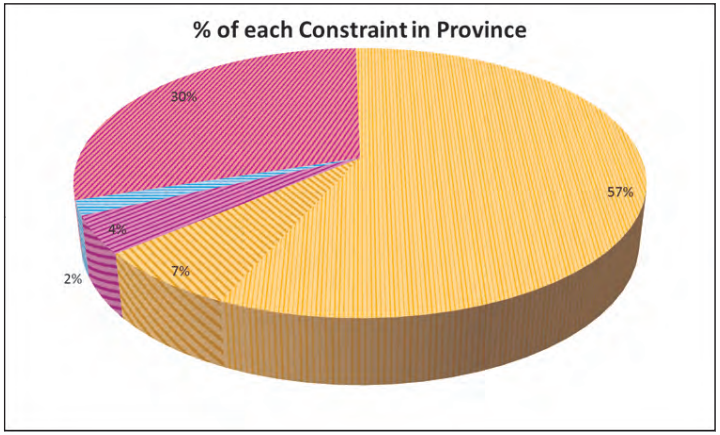
CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, ENGA PROVINCE



Brief Report on Logging Constraints of Enga Province



Enga Province, being located in the Highlands Region, has a lot of its constrained areas classified as 'Extreme Altitude' and 'Serious Slope'. This can be seen right through out all the districts in the province. There are a few 'Extreme Slope' constrained areas in the Kompiam, Maip-Muritaka, Maramuni, Paiela-Hewa, Pogera, and Wapenamanda Districts. The province also has some 'Extreme Karst' and 'Serious Inundation' constrained areas in the Kandep and Wage Districts.



20. National Capital District

General information/Overview

1. Location

National Capital District (NCD) is located on the southern coast of mainland PNG. The landform is relatively flat with scattered hills. It is located completely within Central Province and does not share a common border with any other province.

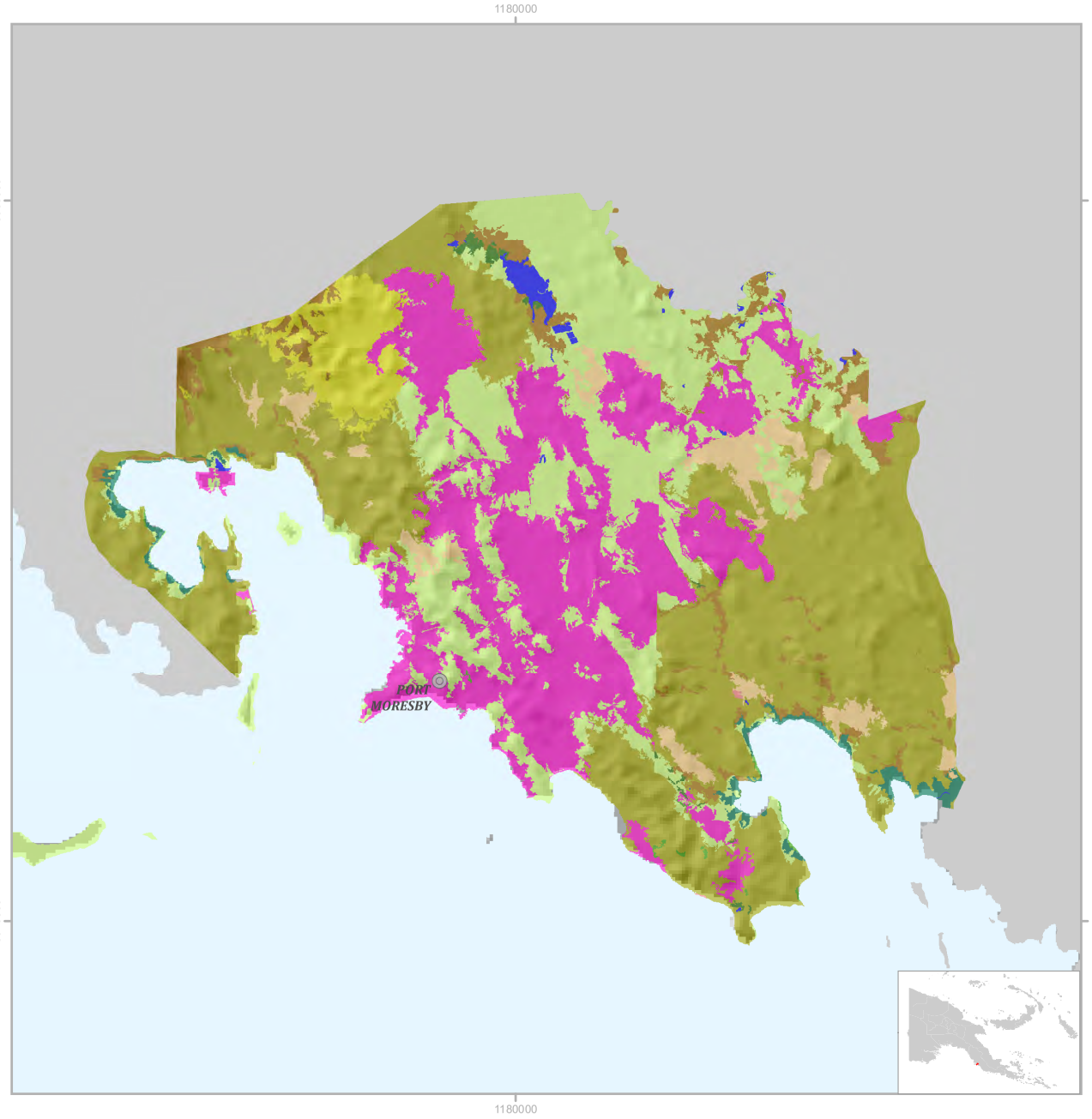
National Capital:	Port Moresby
Land area:	26, 114 ha
Population:	364, 125 (2011)
Number of District:	3 (Moresby North-East, Moresby North-West, Moresby South)
Number of Local Level Governments (LLGs):	8 LLGs

2. Forest Information

Forest Area:	12, 442 ha

Note: NCD has not selected a Provincial Tree.

VEGETATION AND LAND COVER MAP OF NATIONAL CAPITAL DISTRICT (2012 FOREST BASEMAP VERSION 1.1)



Land Use and Land Cover Classes

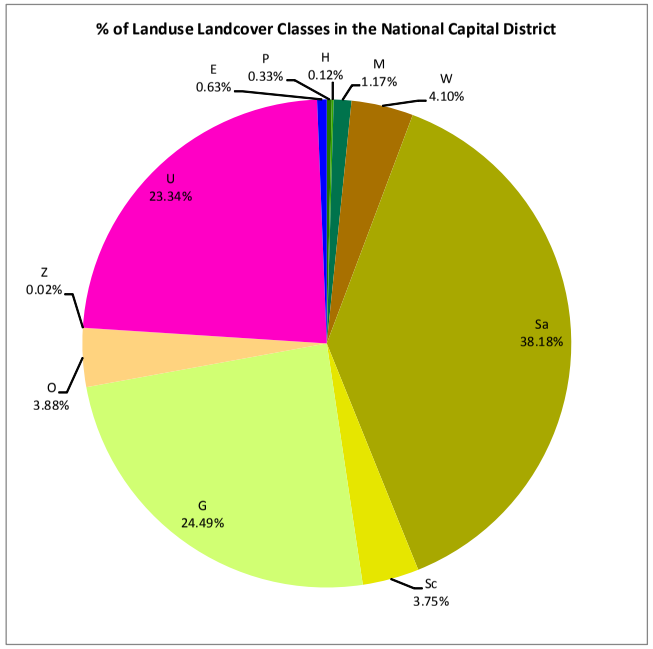
- P: Low Altitude Forest on Plains & Fans
- W:Woodland
- G: Grassland
- U: Settlement & larger urban centres
- H: Low Altitude Forest on Uplands
- Sa: Savanna
- O: Agriculture Land Use
- E: Lakes & larger rivers
- M: Mangrove
- Sc: Scrub
- Z: Bare areas

N

1 cm = 1.8 km

0 1.8 3.6 5.4

Kilometers



Pie Chart showing percentage in Landuse, Landcover of National Capital District.

% of Launduse Landcover	
Code	**National Capital District**
P	0.33%
H	0.12%
M	1.17%
W	4.10%
Sa	38.18%
Sc	3.75%
G	24.49%
O	3.88%
Z	0.02%
U	23.34%
E	0.63%
Land Area (ha)	26,114.30

Table showing percentage in Landuse, Landcover of National Capital District. Percentage calculated from area in hectares.

21. Hela Province

General information/Overview

1. Location

Hela Province is located in the highlands of PNG and consists of mountain ranges and valleys. The province was once under the provincial administration of the Southern Highlands province.

Provincial Administration Centre:	Tari
Land area:	1,055,593 ha
Population:	249, 449 (2011)
Number of District:	3 (Komo-Magarima, Koroba-Kopiago, Tari-Pori)
Number of Local Level Governments (LLGs):	11 LLGs

2. Forest Information

Forest Area:	633, 156 ha

Provincial Tree

The provincial tree is 'Brown Pine' (scientifically known as *Podocarpus nerifolius*) and is commonly found in the Altitude forest on uplands, Lower Montane forest and Montane forest.

Significance of Provincial tree:

It is soft wood species and the people of Hela used brown pine for various uses such as timber for the construction of homes. Culturally, the leaves are used for dressing/decorations by the men during cultural dances or ceremonies and as well burnt to repel insects.

Scientific name: *Podocarpus neriifolius*	Family: *Podocarpaceae*	Common Name/Trade name: *Brown Pine*

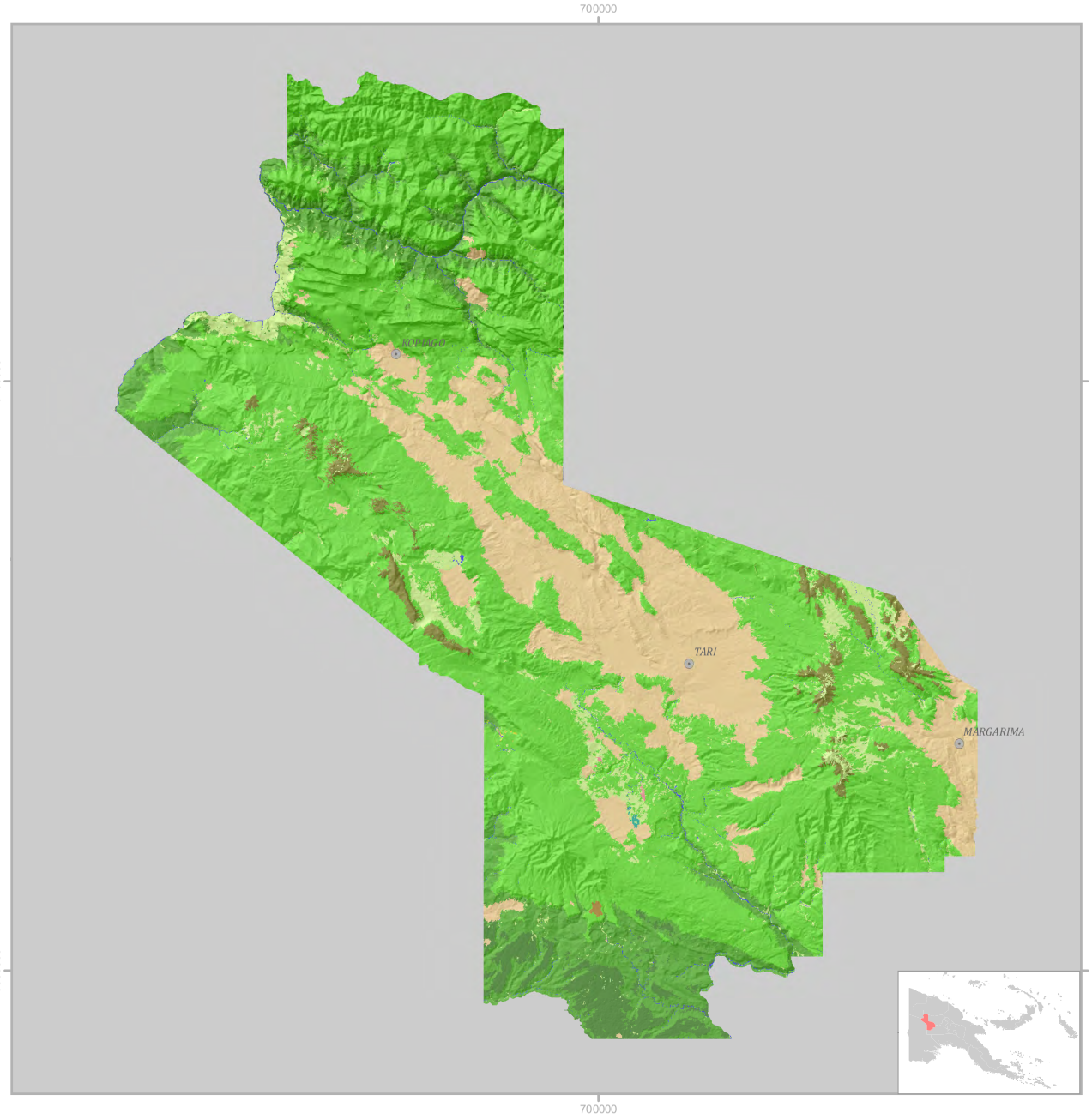
Description

A large canopy tree with straight cylindrical bole. Outer bark is grey, pale brown, or black with rough, scaly or flaky, peeling texture. Inner bark red or brown, fibrous with non-sticky colourless exudate. Leaf is simple, long narrow, spirally arranged, upper surface green and lower surface pale green. Flowers: male and female flowers on different plant. Flowers: small. Fruit/Seed: a green nut (immature) turns bluish when mature and contains a single seed.

Tree	Bark	Leaf/Leaves
 Source: http://tropical.theferns.info/viewtropical.php?id=Podocarpus+neriifolius	 Source: http://www.pngplants.org/PNGtrees/TreeDescriptions/Podocarpus_neriifolius_D_Don.html	 Source: http://www.pngplants.org/PNGtrees/TreeDescriptions/Podocarpus_neriifolius_D_Don.html

Note:	Flower	Fruit/Seed
Short description was from the PNG Plant database website (link below) Source http://www.pngplants.org/PNGtrees/TreeDescriptions/Castanopsis_acuminatissima_Bl_A_DC.html Male Cones Source: http://tropical.theferns.info/viewtropical.php?id=Podocarpus+neriifolius	 Source: https://florafaunaweb.nparks.gov.sg/Special-Pages/plant-detail.aspx?id=3076 	 Source: https://www.flowersofindia.net/catalog/slides/Brown%20Pine.html

VEGETATION AND LAND COVER MAP OF HELA PROVINCE (2012 FOREST BASEMAP VERSION 1.1)



Land Use and Land Cover Classes

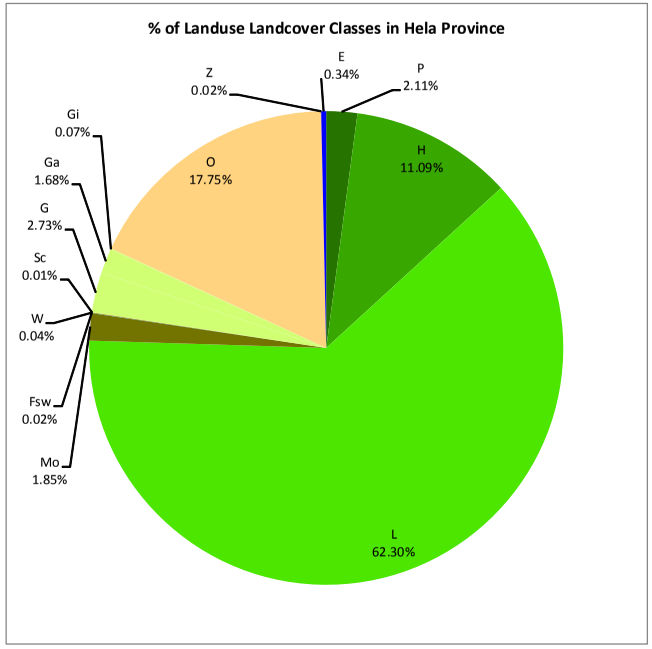
P: Low Altitude Forest on Plains & Fans	Fsw: Swamp Forest	Ga: Alpine grassland	E: Lakes & larger rivers
H: Low Altitude Forest on Uplands	W:Woodland	Gi: Subalpine grassland	
L: Lower Montane Forest	Sc: Scrub	O: Agriculture Land Use	
Mo: Montane Forest	G: Grassland	Z: Bare areas	

N

1 cm = 11 km

0 11 22 33

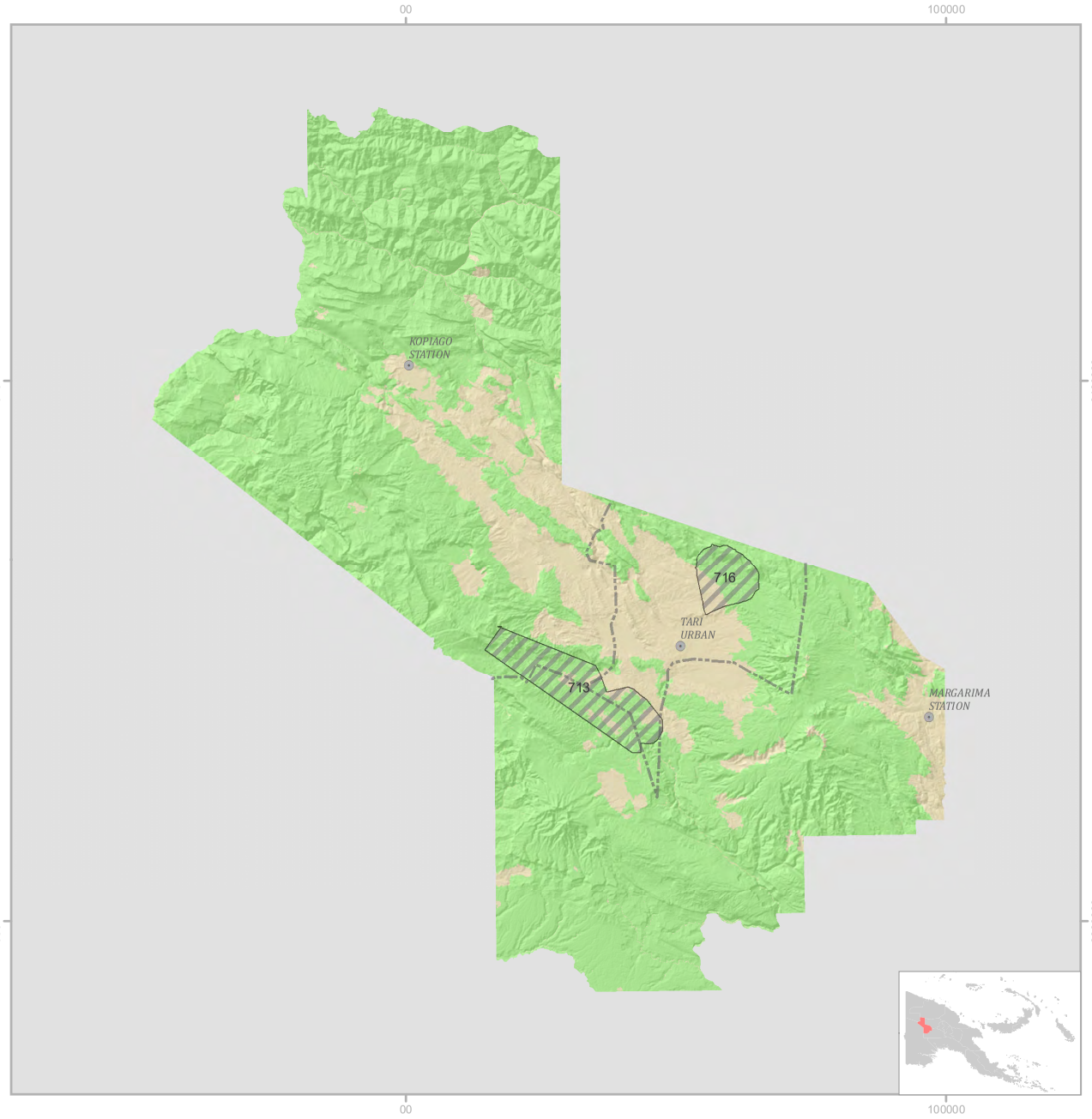
Kilometers



Pie Chart showing pecentage in Landuse, Landcover of Hela Province.

**Note: No District information is displayed for Hela Province.*

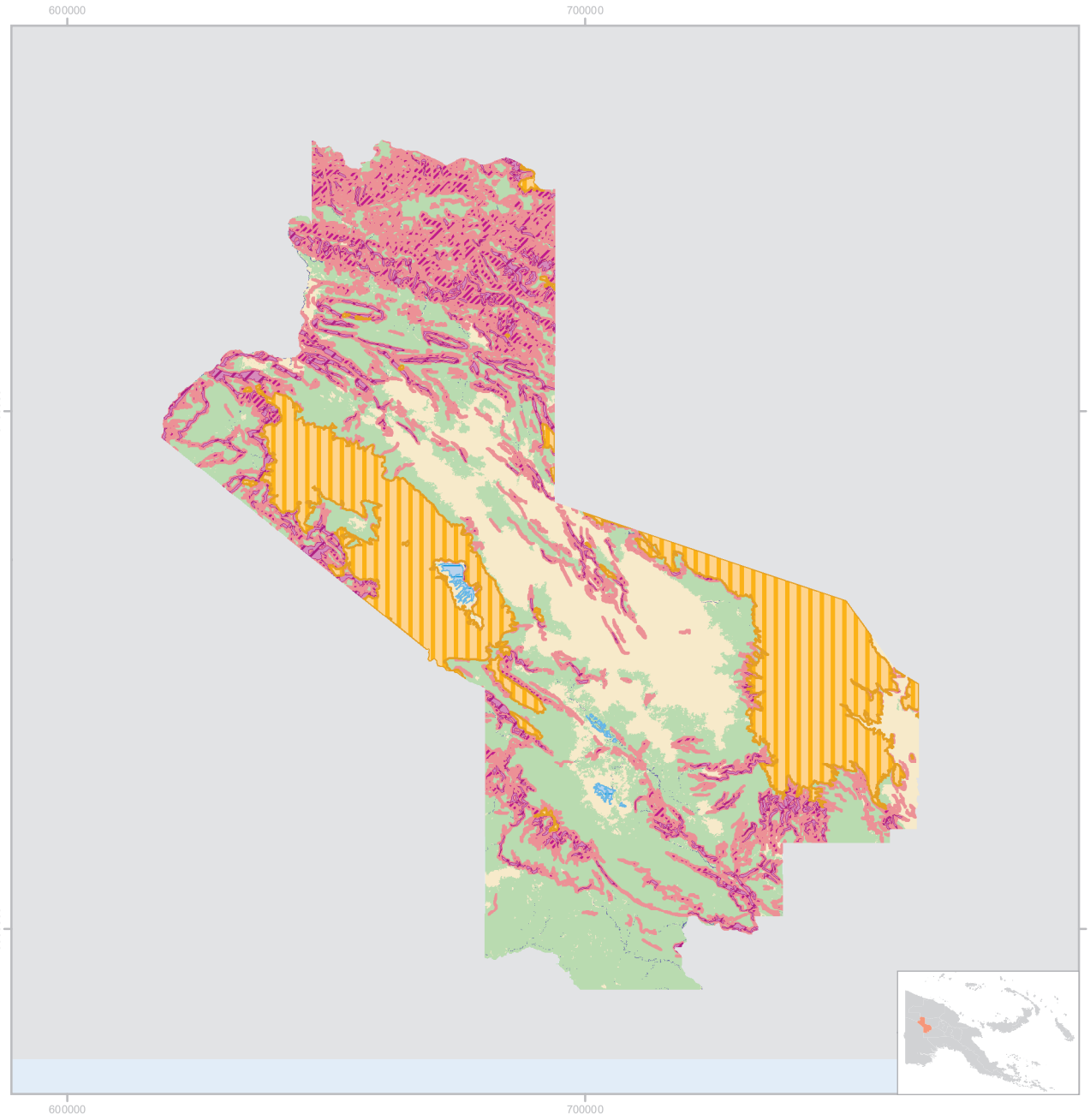
TIMBER CONCESSION MAP OF HELA PROVINCE



PLAN_ID	NAME	AREA (ha)	CONCESSION TYPE	STATUS
713	Nogoli	27,558.25		Proposed
716	Pi Tukure TA	10,867.94		Proposed

Table showing Timber Concessions of Hela Province.
Information updated as at 2016.

CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, HELA PROVINCE



Key

- Extreme Altitude
- Serious Inundation
- Forest including Forest Plantations
- Extreme Slope
- Other Landuse & Land Cover
- Serious Slope
- Lake & Larger Rivers

N

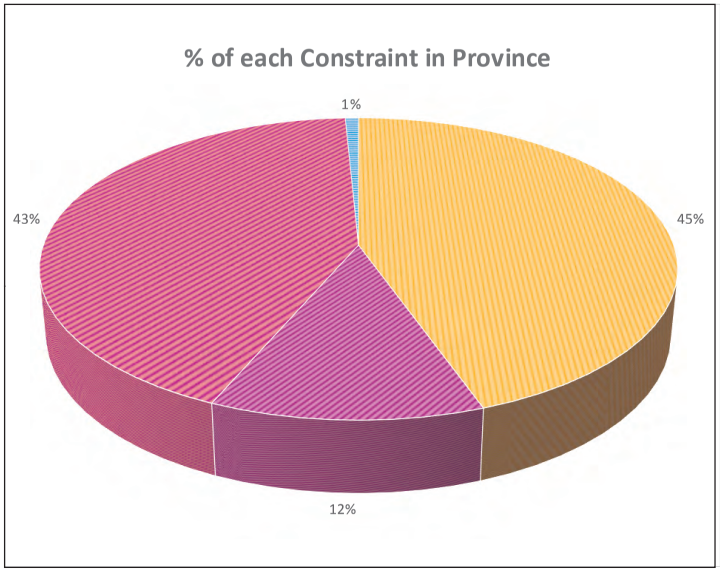
1 cm = 10 km

0 10 20 30 Kilometers

Brief Report on Logging Constraints of Hela Province

Hela District Information is unavailable at this point of time to PNGFA.

Hela Province is one of the newly established provinces in the country, being formerly part of the Southern Highlands region. The province, like all the other provinces in the Highlands Region, is very mountainous and rugged. As a result, it is difficult to conduct logging operations with many of the areas being limited by 'Extreme Altitude' and 'Serious Slope'. 'Extreme Altitude' comprises 45% of all constraints present in the province while 'Serious Slope' makes up 43%. However, there are some areas in the southern part of the province (where it shares its borders with the Gulf Province) that is not affected by any of the logging constraints.



22. Jiwaka Province

General information/Overview

1. Location

Jiwaka Province is located in the highlands of PNG and consists of mountain ranges and valleys. The province was once under the Western Highlands Provincial administration and is well known for its coffee plantations in particular in the Wahgi Valley.

Provincial Administration Centre:	Banz
Land area:	480, 522 ha
Population:	343, 987 (2011)
Number of District:	3 (Anglimp-South Waghi, Jimi, North Waghi)
Number of Local Level Governments (LLGs):	6 LLGs

2. Forest Information

Forest Area:	256, 300 ha

Provincial Tree

The provincial tree is '*Yar*' (scientifically known as *Casuarina*[13] *oligodon*) and is commonly found at altitude of 1,000m-2,500m (a.s.l). .

Significance of Provincial tree:

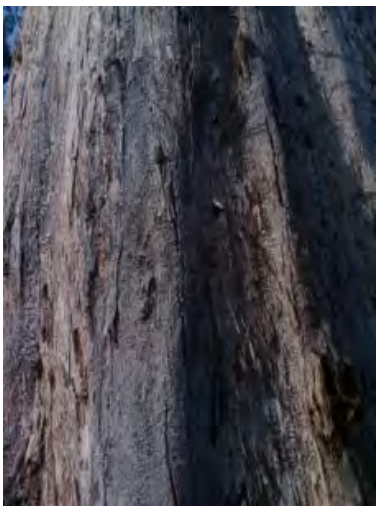
It is a hardwood species and cultivated as a shade tree for subsistence agriculture or single cash crop, for instance coffee but it has the ability in nitrogen fixing in particular for soil nutrients. Yar is commonly used by the people for various uses such as timber for the construction of homes, footbridges, fences and etc.. The leaves are used for decorations for special occasions such as cultural dances and traditional ceremonies. The leaves are also burnt to repel the insects. The tree is planted around homes as ornamentals.

[13] There are two types of Casuarina species in PNG; C, oligodon is common in the highlands and C. equisetifolia is found along the coasts or lowlands.

Scientific name:	Family:	Common Name/Trade name:
Casuarina oligodon	***Casuarinaceae***	***She Oak/Yar***

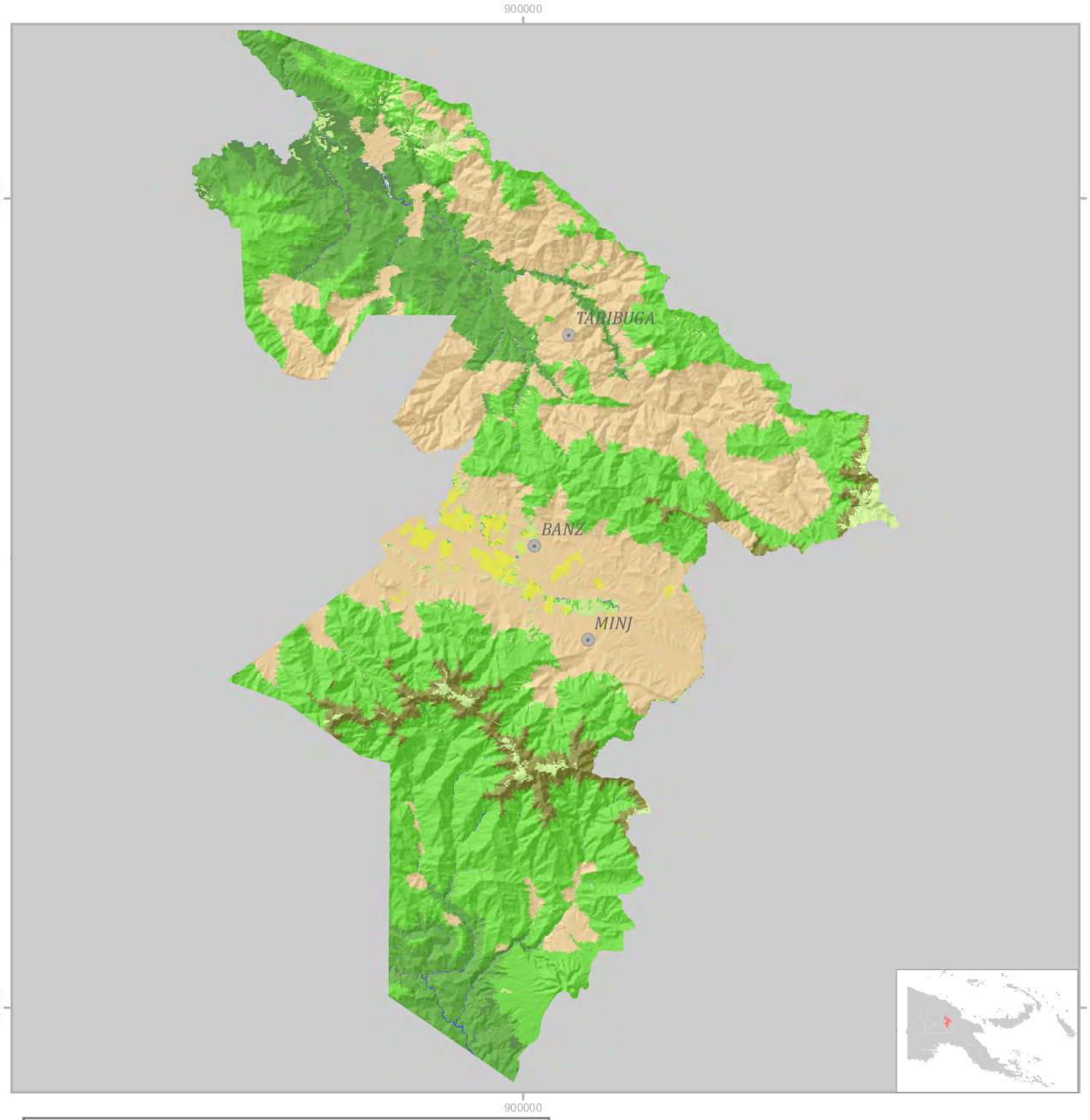
Description

A medium to large tree commonly grown in the highlands. Outer bark is grey-brown, fissured, peels off and inner bark is red. Leaves (modified – non true leaves) in whorls with six leaf scales on each whorl. Male spikes (long) at the end of branchlets with flower consisting of four scales and female flowers are red with cylindrically shaped (short) cones. The fruits (cones) are green to brown in colour which contains over 20 grey or yellow-brown winged seed.

Tree	Bark	Leaf/Leaves
		

Note:	Flower	Fruit/Seed
Short description Source: http://www.fiapng.com/Nursery_techniques.pdf Photo source (Tree, bark, leaves, flower and fruit): WAndasua, Acting Area Manager, Area Office-Highlands, Goroka, Eastern Highlands Province		

VEGETATION AND LAND COVER MAP OF JIWAKA PROVINCE (2012 FOREST BASEMAP VERSION 1.1)



Land Use and Land Cover Classes

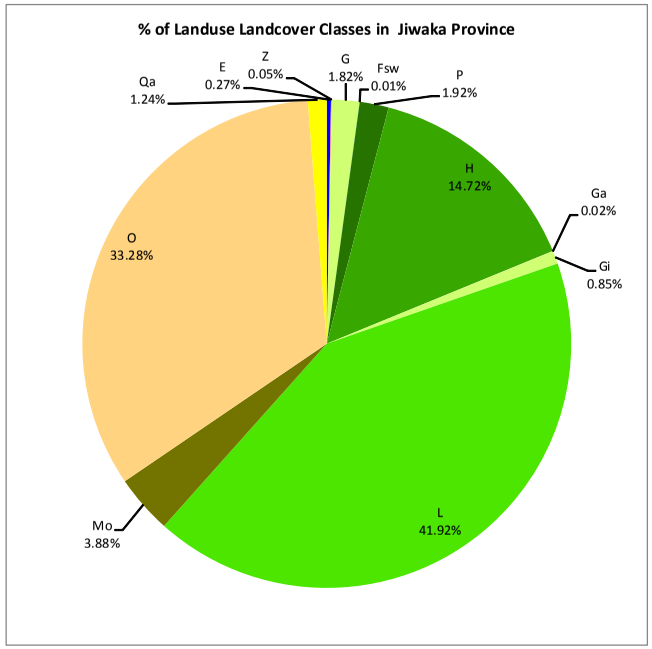
P: Low Altitude Forest on Plains & Fans	Fsw: Swamp Forest	O: Agriculture Land Use
H: Low Altitude Forest on Uplands	G: Grassland	Qa: Agriculture Plantation
L: Lower Montane Forest	Ga: Alpine grassland	Z: Bare areas
Mo: Montane Forest	Gi: Subalpine grassland	E: Lakes & larger rivers

N

1 cm = 8 km

0 8 16 24

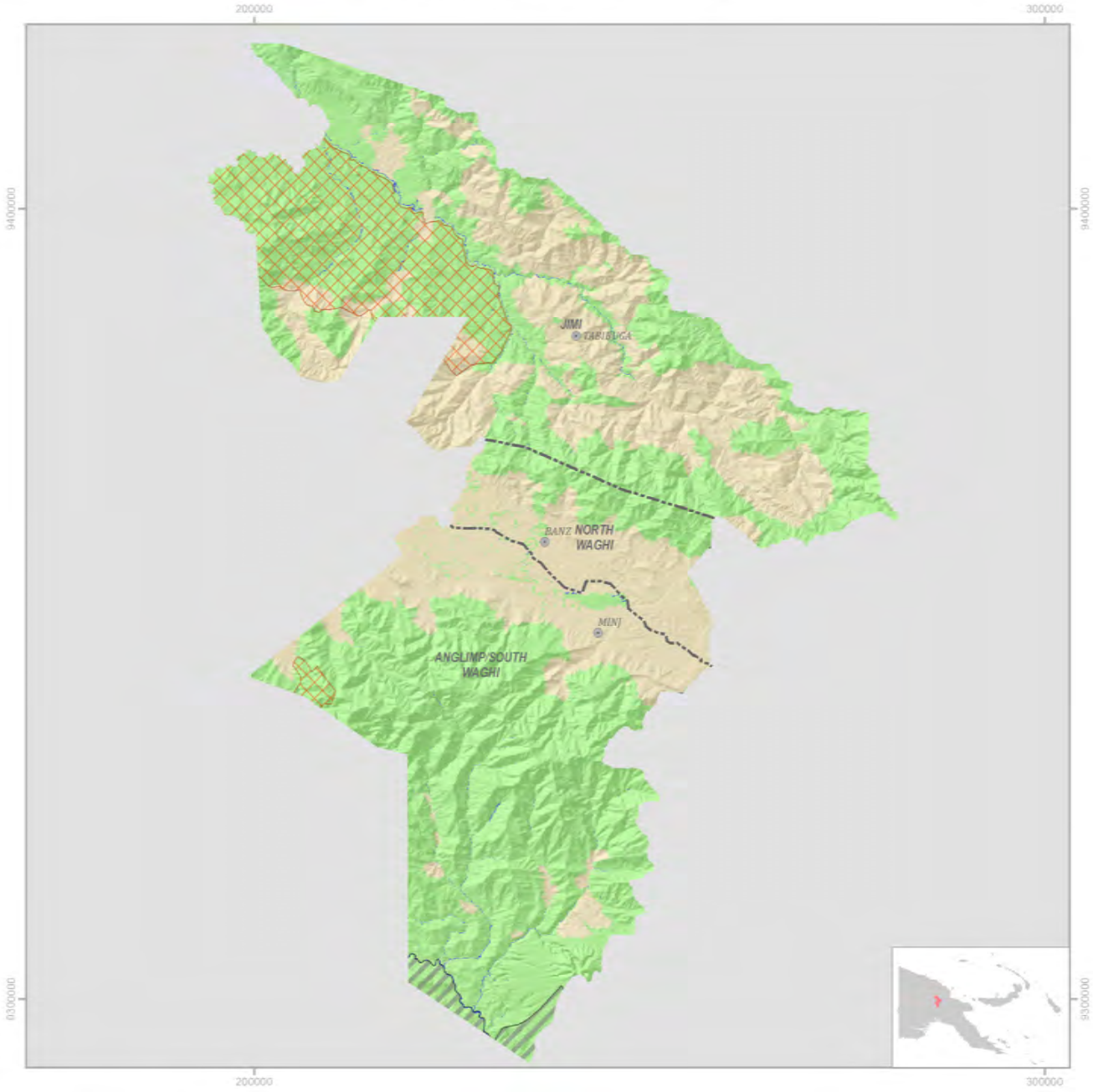
Kilometers



Pie Chart showing pecentage in Landuse, Landcover of Jiwaka Province.

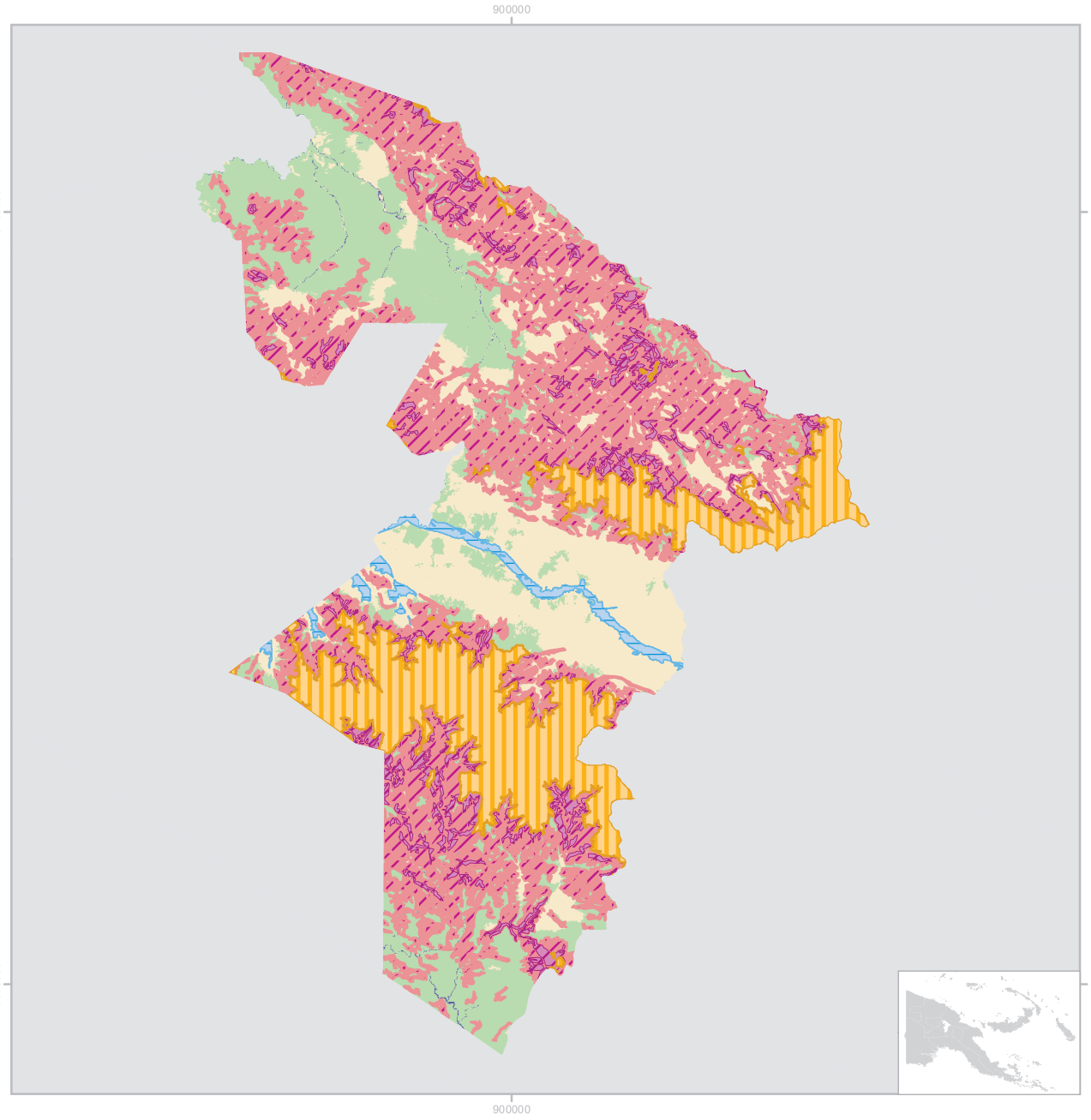
**Note: District information is not displayed.*

TIMBER CONCESSION MAP OF JIWAKA PROVINCE



Brief Report on Timber Concession of Jiwaka Province

CONSTRAINTS TO COMMERCIAL TIMBER PRODUCTION, JIWAKA PROVINCE



Key

- Extreme Altitude
- Extreme Slope
- Serious Slope
- Serious Inundation
- Forest including Forest Plantations
- Other Landuse & Land Cover
- Lake & Larger Rivers

N

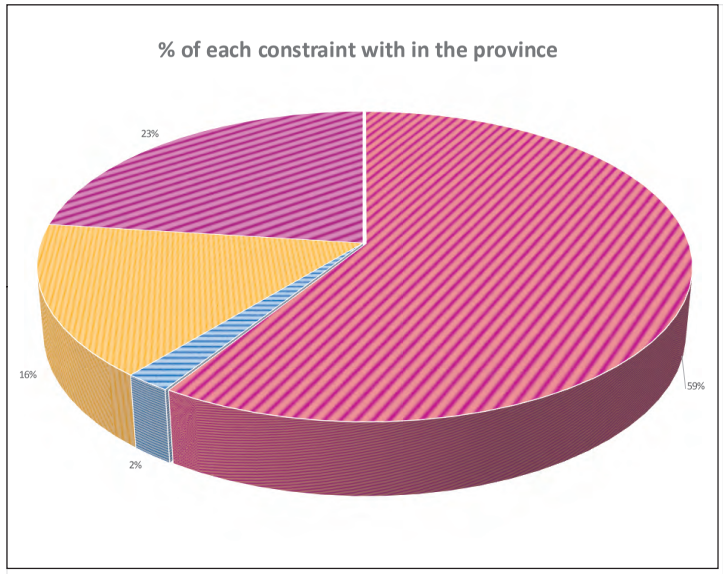
1 cm = 8 km

0 8 16 24 Kilometers

Brief Report on Logging Constraints of Jiwaka Province

Jiwaka District Information is unavailable at this point in time to PNGFA.

Jiwaka province is located on a very fertile land, the Waghi Valley. In-between the valley lays the Waghi River, which naturally is also where the constraint 'Serious Inundation' is primarily found. 'Serious Slope' is the chief constraint found in the province, as it accounts for 59% of all constraints; it is dominate on either side of the Waghi Valley and covers most of the provinces land mass. 'Extreme Slope' is the second most dominate constraint in the province and its placement is dispersed around the southern and northern regions of the province. Following is 'Extreme Altitude', which is most present



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