Closing Ceremony and final Workshop for Project Completion
5th - 6th March 2014
Holiday Inn Hotel, Port Moresby, PNG

Estimation of PNG Forest Biomass including Contribution to FRA2015

06th March 2014
(Revised on 17th March with basemap ver.1)

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Contents

Tiers = Ranks = levels

*Decision trees in GPG 2000 and 2003

- •Tier 3 are more complex approaches, possibly models. However should be compatible with lower tiers.
- •Tier 2 are similar but with country specific emission factors and other data
- •Tier 1 are simple methods with default values

FRA 2015 Biomass Tiers

Tier 3. Country specific national or sub-national biomass conversion expansion factors applied or other domestic or otherwise nationally relevant biomass studies.

Tier 2. Application of country specific national or sub-national biomass conversion factors from other country with similar climatic conditions and forest types.

Tier 1. International/regional default biomass expansion factors applied.

* *https://unfccc.int/files/meetings/.../**ipcc**_good_practice_guidance.ppt*

Step 1: Assessment of available data

- We try to estimate forest carbon stocks to aim to reach IPCC Tier2 level as much as possible.
- Newly created “PNG Forest Base Map 2012” is ready to use as country specific data for area calculation.
- However available data of carbon content of PNG forest is very limited as shown in below table.

5 carbon pools	Available data of PNG forest	Issues
Above Ground Biomass (AGB)	Bryan et al (2010) estimated average AGB using 22 unlogged forest data and 35 logged forest data of PNG.	✓ Average of all types of forest cannot applied to Tier2 level estimation.
	Fox et al (2010) estimated forest carbon in lowland forest using 125 permanent sample plots (PSPs).	✓ Forest carbon of other forest types are not estimated. ✓ Locations of PSPs can be biased.
Below Ground Biomass (BGB)	Scarce	
Litter	Scarce	
Dead wood	Scarce	
Soil organic matter	Scarce	

In consideration of data availability of PNG forest, we decided to use area of Forest Base Map 2012 as area data, and use IPCC Tier 1 default value as carbon content.

Step 2: Design of estimation method

Area

Classification of Global Ecological Zone (FAO)

Translated and applied to

Area of Forest Base Map 2012

X

Biomass by carbon pool

IPCC 2006 Guidelines

Above Ground Biomass: Tier1 Default value
Below Ground Biomass: Tier1 Default value

Litter:
Dead wood:
Soil organic matter:
} Excluded for Tier 1 approach

calculation

Total Forest Biomass in PNG

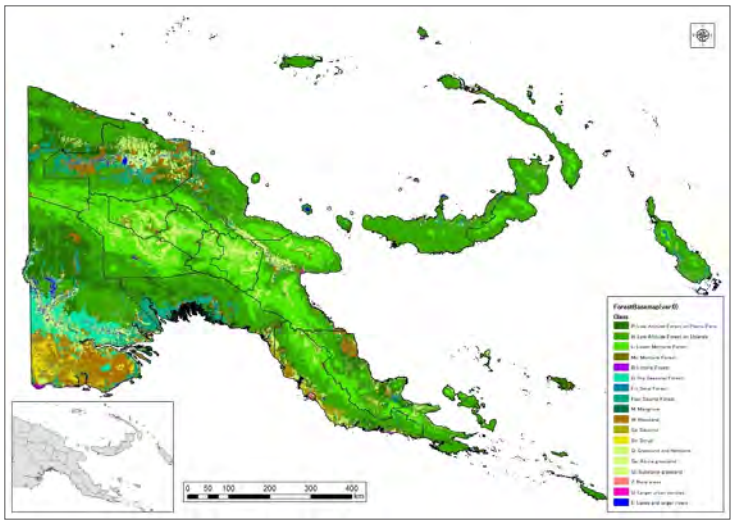
X 0.47 and 0.451 (IPCC default)

Total Forest Biomass Carbon Stock in PNG

Step 3: Calculation of Forest Area

- New Forest Base Map 2012 was developed using high resolution satellite imagery under JICA-PNGFA Project. Area of Forest types on Forest Base Map 2012 are calculated as in table below.

Forest Base Map 2012



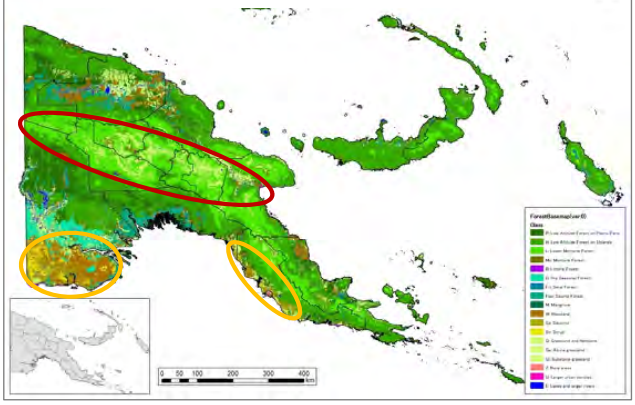
Area of Forest types of Forest Base Map 2012

Forest Base Map 2012 (PNGFA/JICA)		
Forest type		Area (ha)
P	Low Altitude Forest on Plains & Fans	8,807,748
H	Low Altitude Forest on Uplands	12,404,244
L	Lower Montane Forest	8,221,846
Mo	Montane Forest	358,050
D	Dry Seasonal Forest	957,387
B	Littoral Forest	69,994
Fri	Seral Forest	158,783
Fsw	Swamp Forest	2,070,809
M	Mangrove Forest	524,582
W	Woodland	3,091,027
Sa	Savanna	651,825
Sc	Scrub	394,340

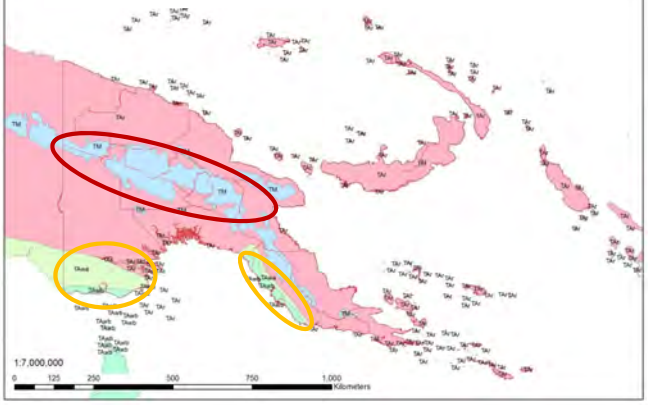
Step 4: Calculation of AGLB (Above Ground Living Biomass)

- Entire PNG is located in Tropical Ecological Zone. We assign most suitable forest type of Global Ecological Zone to each forest type of PNG Forest Base Map 2012 considering distribution and characteristic of forest.

Forest Base Map 2012 (PNGFA/JICA)



Global Ecological Zone (FAO)



		Forest Base Map 2012		Ecological Zone 2001	
	Lower rainfall area	D W Sa Sc	Dry seasonal forest Woodland Savanna Scrub	TAwa TAwb	Tropical moist deciduous forest Tropical dry forest
	High altitude area	L Mo	Lower montane forest Montane forest	TM	Tropical mountain systems

Step 4: Calculation of AGLB (Above Ground Living Biomass)

- In order to calculate AGLB, IPCC Tier 1 default values are applied.

Applied to forest other than mangrove

TABLE 4.12
TIER 1 ESTIMATED BIOMASS VALUES FROM TABLES 4.7–4.11 (EXCEPT TABLE 4.11B)
(VALUES ARE APPROXIMATE; USE ONLY FOR TIER 1)

Climate domain	Ecological zone (FAO Global Ecological Zone)	Above-ground biomass in natural forests (tonnes d.m. ha^{-1})	Above-ground biomass in forest plantations (tonnes d.m. ha^{-1})	Above-ground net biomass growth in natural forests (tonnes d.m. ha^{-1} yr^{-1})	Above-ground net biomass growth in forest plantations (tonnes d.m. ha^{-1} yr^{-1})
Tropical	Tropical rain forest TAr	300	150	7.0	15.0
	Tropical moist deciduous forest TAwa	180	120	5.0	10.0
	Tropical dry forest TAwb	130	60	2.4	8.0
	Tropical shrubland TBsh	70	30	1.0	5.0
	Tropical mountain systems TM	140	90	1.0	5.0
Sub-tropical	Subtropical humid forest	220	140	5.0	10.0
	Subtropical dry forest	130	60	2.4	8.0
	Subtropical steppe				

2006 IPCC Guidelines for National Greenhouse Gas Inventory (Volume 4, Chapter 4, page 4.63)

Applied to mangrove

Table 4.3 Above-ground biomass in mangroves (tonnes d.m. ha^{-1})[4]

Domain	Region	Above-ground biomass	95%CI	Range
Tropical	Tropical Wet	192 (n=49)[1]	187, 204	8.7-384

2013 Supplement to the 2006 IPCC Guidelines: Wetlands Supplement)(Chapter 4, page 4.13)

Step 4: Calculation of AGLB (Above Ground Living Biomass)

Comparison of characteristic and biomass/timber volume of each forest type between Forest Base Map 2012 (PNGFA/JICA) and Global Ecological Zone (FAO)

Forest Base Map 2012 (PNGFA/JICA)				Global Ecological Zone (FAO)			IPCC ABG (t/ha)
Forest types		Annual rainfall	PNGRIS volume	Forest types		Descriptions	
P	Low altitude forest on plains and fans	High	High	TAr	Tropical rain forest	Wet: 0 – 3 months dry. When dry period, during winter	300
H	Low altitude forest on uplands	High	High				
Fri	Seral forest	High	High				
Fsw	Swamp forest	High	High				
D	Dry seasonal forest	Low-Middle	Middle	TAwa	Tropical moist deciduous forest	Wet/dry: 3 – 5 months dry, during winter	180
B	Littoral forest	-	-				
W	Woodland	Low-High	Low- Middle	TAwb	Tropical dry forest	Dry/wet: 5 – 8 months dry, during winter	130
Sa	Savanna	Low	Low	TBsh	Tropical shrubland	Semi-Arid: Evaporation > Precipitation	70
Sc	Scrub	Low	Low				
L	Lower montane forest	High	High	TM	Tropical mountain systems	Approximate > 1000 m altitude (local variations)	140
Mo	Montane forest	High	-				
M	Mangrove	-	-				192

Source: Forest resources and vegetation mapping of PNG (Hammermaster et al.), Global **ecological** zoning for the global forest resources assessment (FAO)

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Step 4: Calculation of AGLB (Above Ground Living Biomass)

Area of each forest type (Forest Base Map 2012) X AGLB per ha (IPCC default value) = AGLB of each forest type

Forest Base Map 2012 (PNGFA/JICA)			Assigned forest type of Global ecological zone (FAO)		AGLB value (t/ha)		AGLB of each forest type (Mt)
Forest type		Area (ha)					
P	Low Altitude Forest on Plains & Fans	8,807,748	TAr	Tropical rain forest	300	=	2,642.32
H	Low Altitude Forest on Uplands	12,404,244					3,721.27
Fri	Seral Forest	158,783					47.63
Fsw	Swamp Forest	2,070,809					621.24
D	Dry Seasonal Forest	957,387	TAWa	Tropical moist deciduous forest	180		172.33
B	Littoral Forest	69,994					12.60
W	Woodland	3,091,027	TAWb	Tropical dry forest	130		401.83
Sa	Savanna	651,825	TBSh	Tropical shrubland	70		45.6 3
Sc	Scrub	394,340					27.60
L	Lower Montane Forest	8,221,846	TM	Tropical mountain systems	140		1,151.06
Mo	Montane Forest	358,050					50.13
M	Mangrove Forest	524,582			192		100.72

X

Step 5: Calculation of BGLB (Below Ground Living Biomass)

Area of each forest type (Forest Base Map 2012) X BGLB per unit area: AGLB per ha x R (ratio of BGB to AGB) = BGLB of each forest type

R: IPCC default value

Applied to forest other than mangrove

TABLE 4.4
RATIO OF BELOW-GROUND BIOMASS TO ABOVE-GROUND BIOMASS (R)

Domain	Ecological zone (FAO Global Ecological Zone)		Above-ground biomass	R [tonne root d.m. (tonne shoot d.m.)$^{-1}$]	References
Tropical	Tropical rainforest	TAr		0.37	Fittkau and Klinge, 1973
	Tropical moist deciduous forest	TAwa	above-ground biomass <125 tonnes ha^{-1}	0.20 (0.09 - 0.25)	Mokany *et al.*, 2006
			above-ground biomass >125 tonnes ha^{-1}	0.24 (0.22 - 0.33)	Mokany *et al.*, 2006
	Tropical dry forest	TAwb	above-ground biomass <20 tonnes ha^{-1}	0.56 (0.28 - 0.68)	Mokany *et al.*, 2006
			above-ground biomass >20 tonnes ha^{-1}	0.28 (0.27 - 0.28)	Mokany *et al.*, 2006
	Tropical shrubland	TBsh		0.40	Poupon, 1980
	Tropical mountain systems	TM		0.27 (0.27 - 0.28)	Singh *et al.*, 1994

2006 IPCC Guidelines for National Greenhouse Gas Inventory (Volume 4, Chapter 4, page 4.49)

Applied to mangrove

Table 4.5 Ratio of below-ground biomass to above-ground biomass (R) in mangroves[4]

Domain	Region	R [tonne root d.m. (tonne shoot d.m.)$^{-1}$]	95%CI[5]	Range
Tropical	Tropical Wet	0.49 (n=18)[1]	0.47, 0.51	0.04-1.1
	Tropical Dry	0.29 (n = 9)[2]	0.28, 0.30	0.09-0.79

2013 Supplement to the 2006 IPCC Guidelines: Wetlands (Wetlands Supplement) (Chapter 4, page 4.13)

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Step 5: Calculation of BGLB (Below Ground Living Biomass)

Area of each forest type (Forest Base Map 2012) X BGLB per unit area: AGLB per ha x R (ratio of BGB to AGB) = BGLB of each forest type

R: IPCC default value

Forest Base Map 2012 (PNGFA/JICA)			Global ecological zone (FAO)	AGLB (t/ha)	R	BGLB (t/ha)	BGLB of each forest type (Mt)
Type	Area (ha)						
P	8,807,748		TAr	300	0.37	111	977.66
H	12,404,244						1,376.87
Fri	158,783						17.62
Fsw	2,070,809						229.86
D	957,387	X	TAWa	180	0.24	43.2	41.36
B	69,994						3.02
W	3,091,027		TAWb	130	0.28	36.4	112.51
Sa	651,825		TBSh	70	0.40	28	18.25
Sc	394,340						11.04
L	8,221,846		TM	140	0.27	37.8	310.79
Mo	358,050						13.53
M	524,582			192	0.49	94.08	49.35

Step 6: Calculation of Total Living Biomass

AGLB + BGLB = Total Living Biomass

Forest Base Map 2012 (PNGFA/JICA)	AGLB (Mt)	BGLB (Mt)	Total Living Biomass (Mt)
P	2,642.32	977.66	3,619.98
H	3,721.27	1,376.87	5,098.14
Fri	47.63	17.62	65.26
Fsw	621.24	229.86	851.10
D	172.33	41.36	213.69
B	12.60	3.02	15.62
W	401.83	112.51	514.35
Sa	45.6 3	18.25	63.88
Sc	27.60	11.04	38.65
L	1,151.06	310.79	1,461.84
Mo	50.13	13.53	63.66
M	100.72	49.35	150.07
Total	8,994.37	3,161.88	12,156.25

Step 7: Calculation of Total Forest Biomass Carbon

Total Living Biomass x Carbon Fraction (CF) = Total forest biomass carbon

Applied to forest other than mangrove

TABLE 4.3
CARBON FRACTION OF ABOVEGROUND FOREST BIOMASS

Domain	Part of tree	Carbon fraction, (CF) [tonne C (tonne d.m.)$^{-1}$]	References
Default value	All	0.47	McGroddy *et al.*, 2004
	All	0.47 (0.44 - 0.49)	Andreae and Merlet, 2001; Chambers *et al.*, 2001; McGroddy *et al.*, 2004; Lasco

2006 IPCC Guidelines for National Greenhouse Gas Inventory (Volume 4, Chapter 4, page 4.48)

Applied to mangrove

Table 4.2 Carbon fraction of above-ground mangrove biomass (tonnes C (tonnes d.m.)$^{-1}$) [2]

Component	%C	95% CI[3]	Range
Leaves + wood[1]	45.1 (n = 47)	42.9, 47.1	42.2-50.2

[1]Spain and Holt, 1980; Gong and Ong, 1990; Twilley et al., 1992; Bouillon et al., 2007; Saenger, 2002; Alongi et al., 2003; 2004; Kristensen et al., 2008

2013 Supplement to the 2006 IPCC Guidelines: Wetlands (Wetlands Supplement) (Chapter 4, page 4.12)

Step 7: Calculation of Total Forest Biomass Carbon

Total Living Biomass **x** Carbon Fraction (CF) **=** Total forest biomass carbon

Forest Base Map 2012 (PNGFA/JICA)	Total Living Biomass (Mt)	CF	Total forest biomass carbon (Mt)
P	3,619.98		1,701.39
H	5,098.14		2,396.13
Fri	65.26		30.67
Fsw	851.10		400.02
D	213.69		100.43
B	15.62	0.47	7.34
W	514.35		241.74
Sa	63.88		30.02
Sc	38.65		18.16
L	1,461.84		687.07
Mo	63.66		29.92
M	150.07	0.451	67.68
Total	12,156.25		5,710.59

Comparison of our result with previous studies

	Total Forest Biomass Carbon (MtC)	Area data			Biomass data	
		Map	Forest type	Disturbance	Carbon value (AGLB + BGLB)	Source of data
JICA-PNGFA (2014)	5,711	Forest Base Map 2012 (36.4 mil ha)	All forest types (5 types)	Not considered	Tier1 default value: 46-146 tC/ha (5 classes)	IPCC (2006)
Bryan et al (2010)	4,770	UPNG Forest Map 2002 (28.2 mil ha)	1 type only (rain forest)	Considered (Unlogged, Logged)	All rain forests Unlogged: 168 tC/ha Logged: 76 tC/ha	22 PNG's unlogged forest data (Powell(1970) etc.) 35 PNG's logged forest data
Gibbs et al (2007)	4,154	Global land cover map 2000	All forest types (8 types, but not applicable to all types)	Not considered	Tropical: 120tC/ha Dry forest/woodland : 60tC/ha	Olson et al(1983)/ Gibbs(2006)
	8,037				Tropical Asia-Equatorial:250tC/ha Seasonal:150tC/ha	Houghton(1999)/ DeFreis et al(2002)
	7,075				Tropical Asia: 78-225tC/ha (4 classes)	IPCC (2006)
	5,160				Tropical Asia: 151tC/ha	Brown and Achard et al (2004)
Total range	4,154 - 8,037				Tropical equatorial forest: 164-358t/ha Tropical seasonal forest: 105-169t/ha Tropical dry forest: 78-120t/ha	

Summary

- Newly created Forest Base Map 2012 provides the most accurate estimate and recent total area of each forest type (reasonably strong activity data).
- On the other hand, information of five carbon pools of PNG forests is scarce (very weak emission factors). Therefore IPCC Tier 1 default value was used to estimate forest carbon.
- Our estimation of national forest carbon differ from previous studies to some extent. This is due to number of reasons including difference in forest definitions, in forest area and in data sources of emission factors.
- Our estimate of **5,711 MtC** as a total national forest carbon content is considered as the most reliable and internationally acceptable.

Future Activities

- To calculate forest carbon at IPCC Tier 2 Level, PNGFA is recommended to undertake some activities as shown below.;
  - Obtain data of **5 carbon pools** of each forest type in national scale.
  - Obtain country specific data of both forest area (activity data) and forest carbon contents (emission factor) of **disturbed forest**.
- Next JICA-PNGFA Project and National Forest Inventory supported by UN-REDD/FAO/EU will be able to contribute to obtain these data.

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Arigatou gozaimashita

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Technology of Forest Change Detection

06th March 2014

Masamichi HARAGUCHI

Team Leader of JICA Short-term Consultants
Kokusai Kogyo Co., Ltd (KKC)

JICA-PNGFA PROJECT for Capacity Development on Forest Resource Monitoring for Addressing Climate Change

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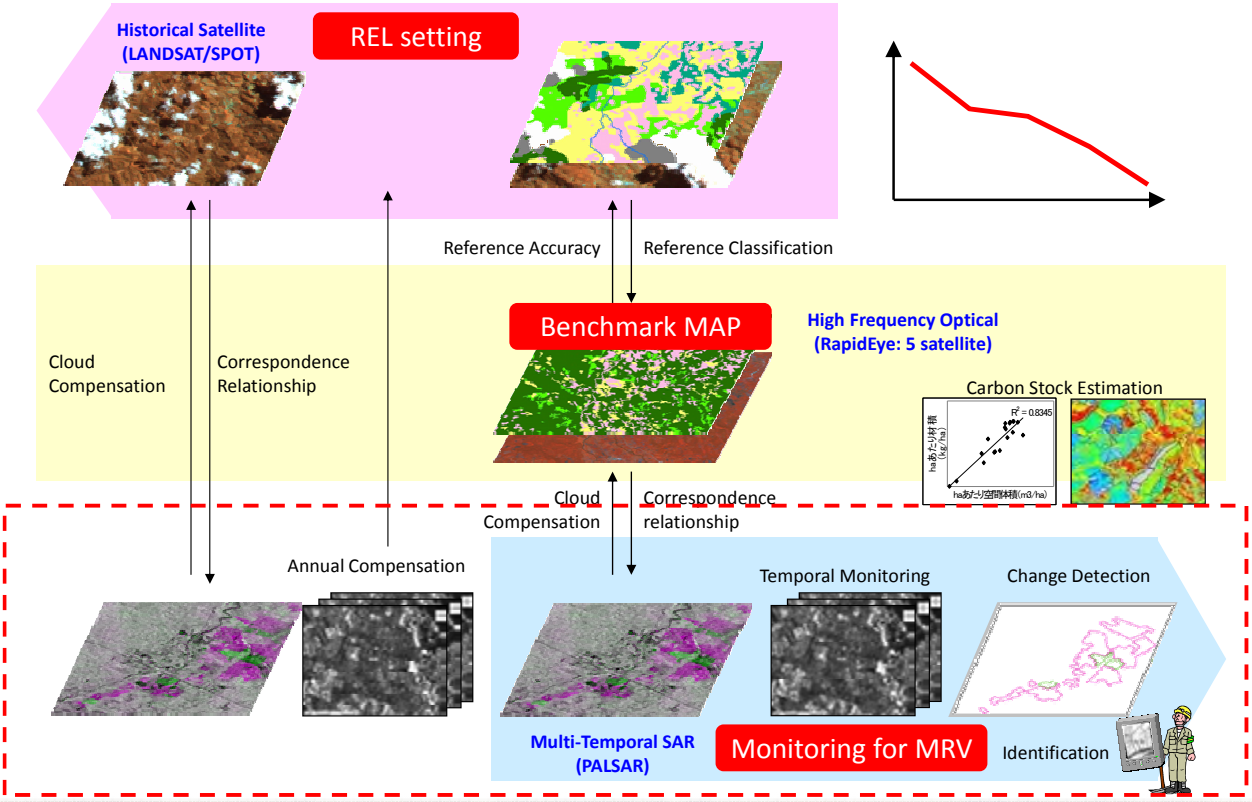
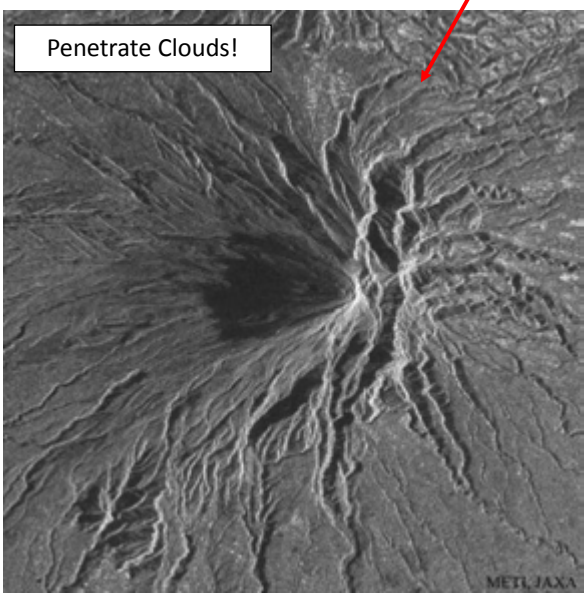
- Forest Change Assessment in PNG (National-level)
- Applying for Logging Concession Monitoring
- Applying for Forest Clearance Authority Monitoring

Forest Monitoring (Forest Change Detection)



Comparing Optical Satellite & Radar/SAR Satellite

Optical Satellite (AVNIR-2)



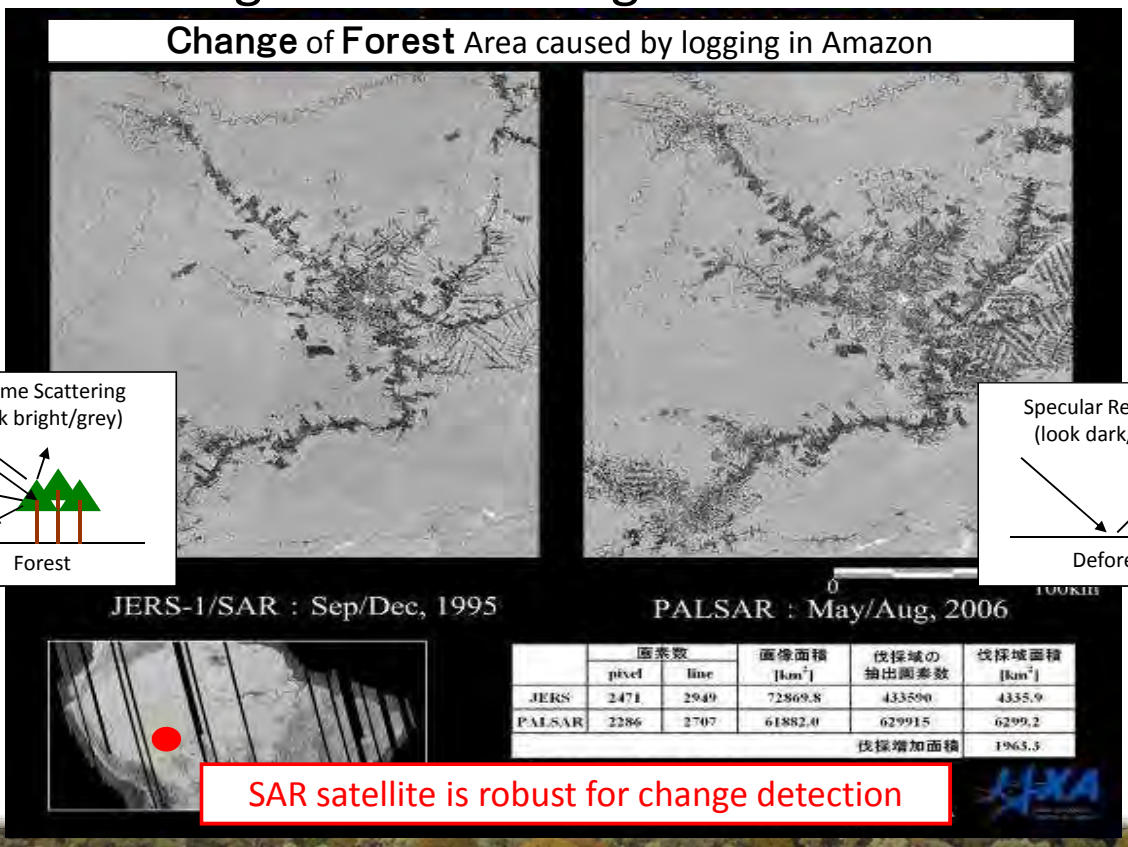
Radar/SAR Satellite (PALSAR)

SAR satellite can monitor in any weather/necessary time

Ref. JAXA Web

Detecting and Estimating Deforestation Area

Change of **Forest** Area caused by logging in Amazon



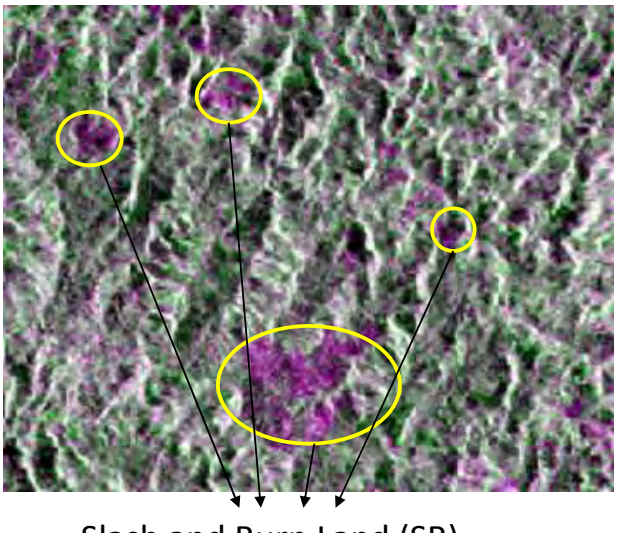
	画素数 pixel	画素数 line	画像面積 [km²]	伐採域の抽出画素数	伐採域面積 [km²]
JERS	2471	2949	72869.8	433590	4335.9
PALSAR	2286	2707	61882.0	629915	6299.2
				伐採増加面積	1963.3

SAR satellite is robust for change detection

Applying for Landuse Change (Example of Lao)

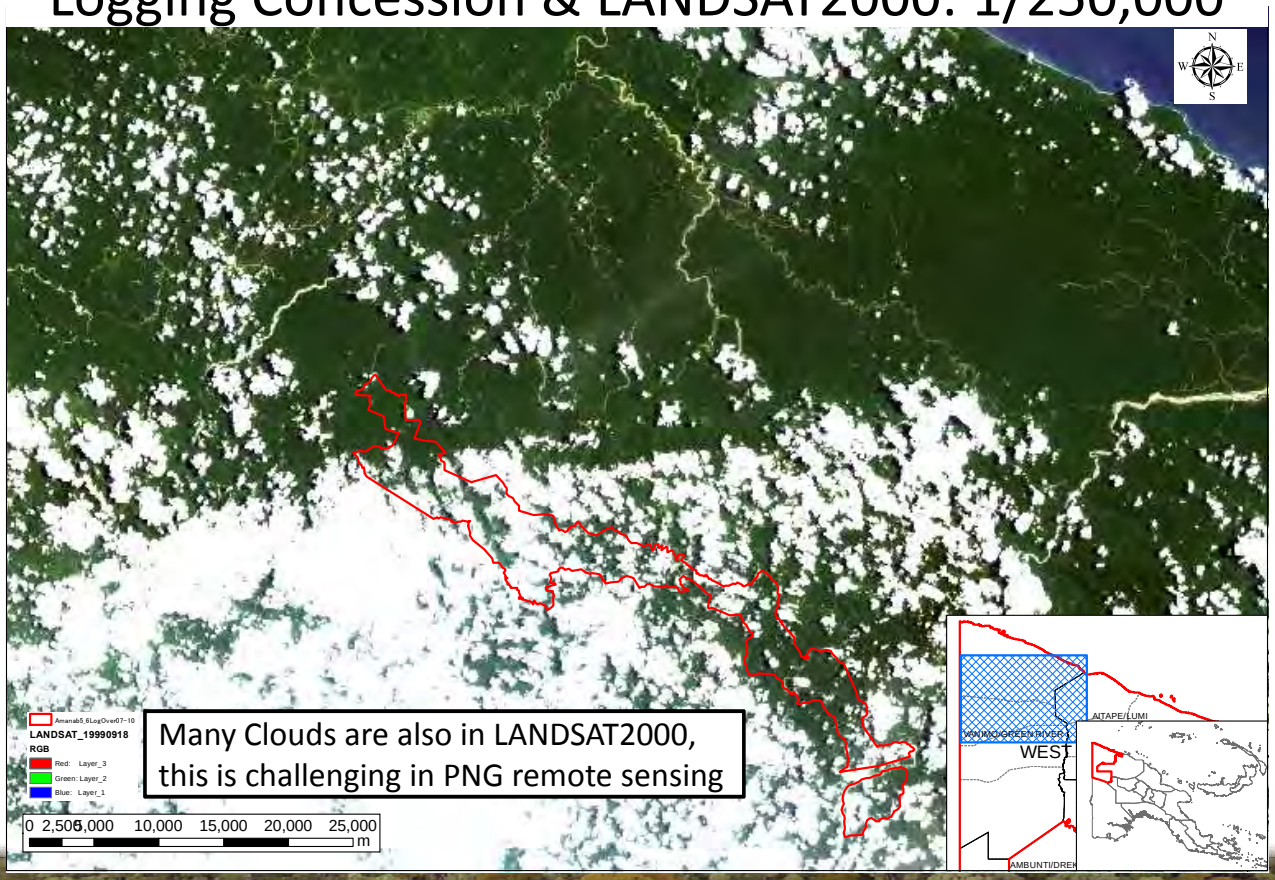
Crop Calendar

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Season	Dry				Rainy						Dry	
Crop Calendar	Logging		Slash & Burn		Planting	Growing				Harvesting		Abundant



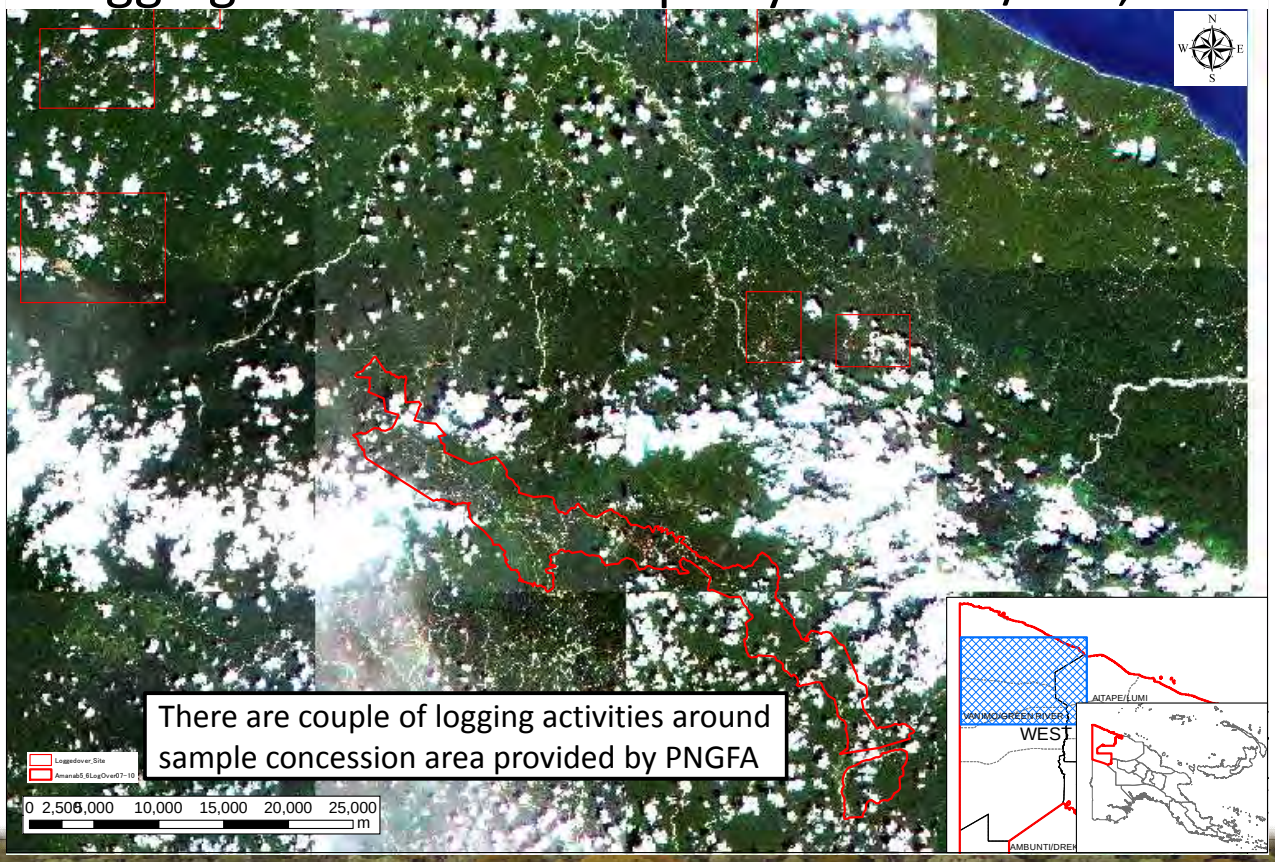
Slash and Burn Land (SB)

Logging Concession & LANDSAT2000: 1/250,000



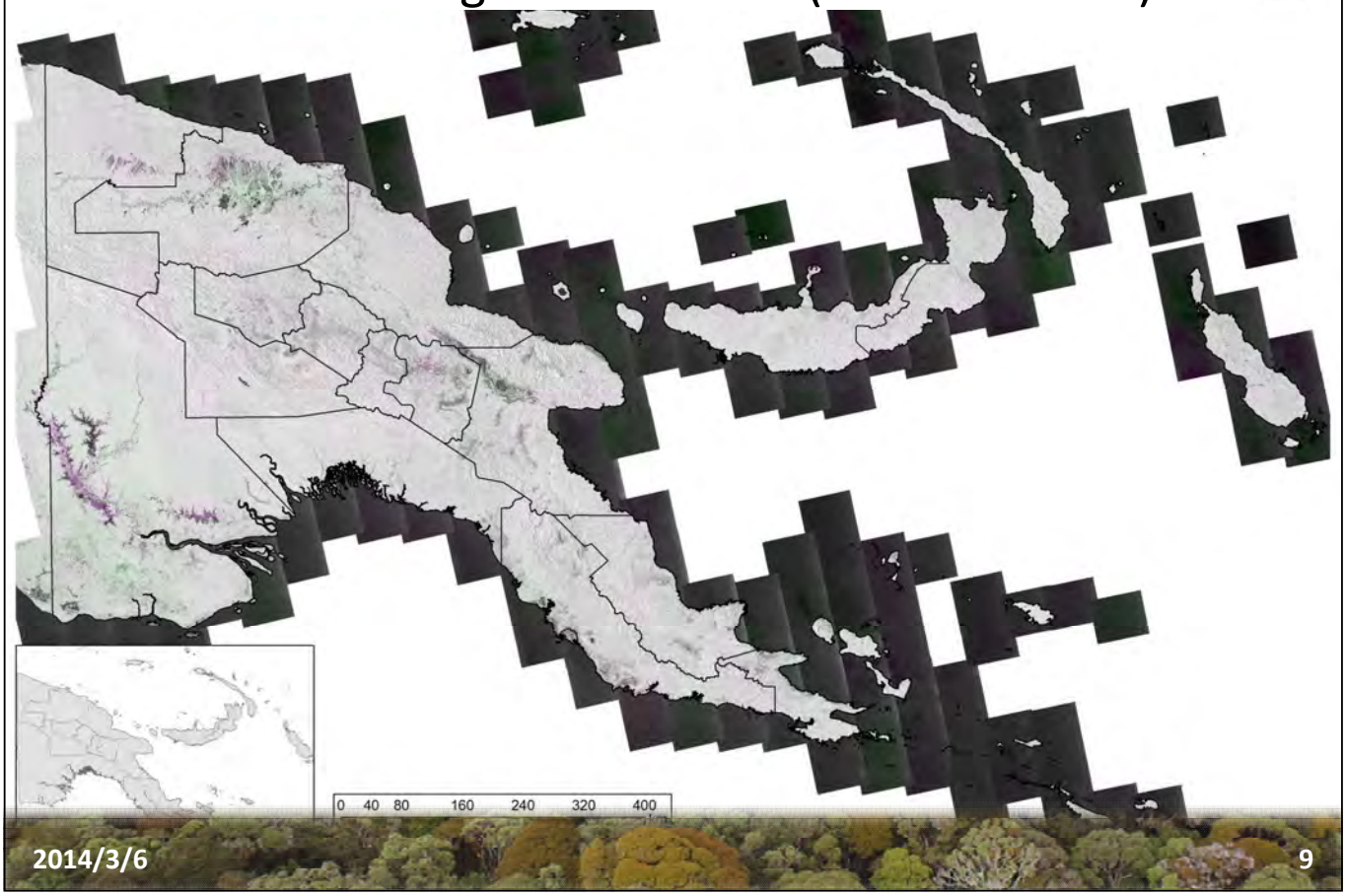
Many Clouds are also in LANDSAT2000, this is challenging in PNG remote sensing

Logging Concession & RapidEye2010: 1/250,000



There are couple of logging activities around sample concession area provided by PNGFA

Forest Change Assessment (National-level)



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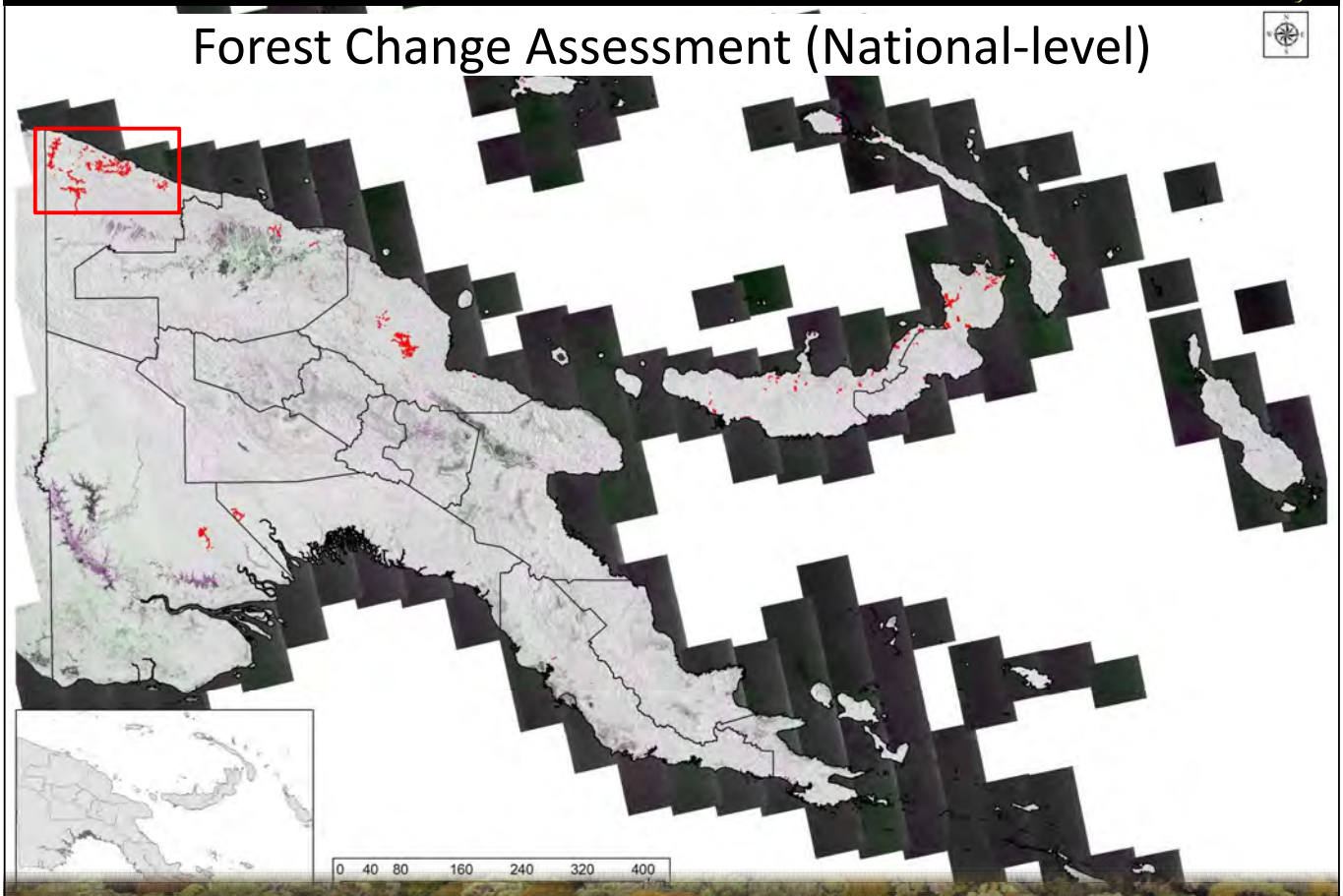
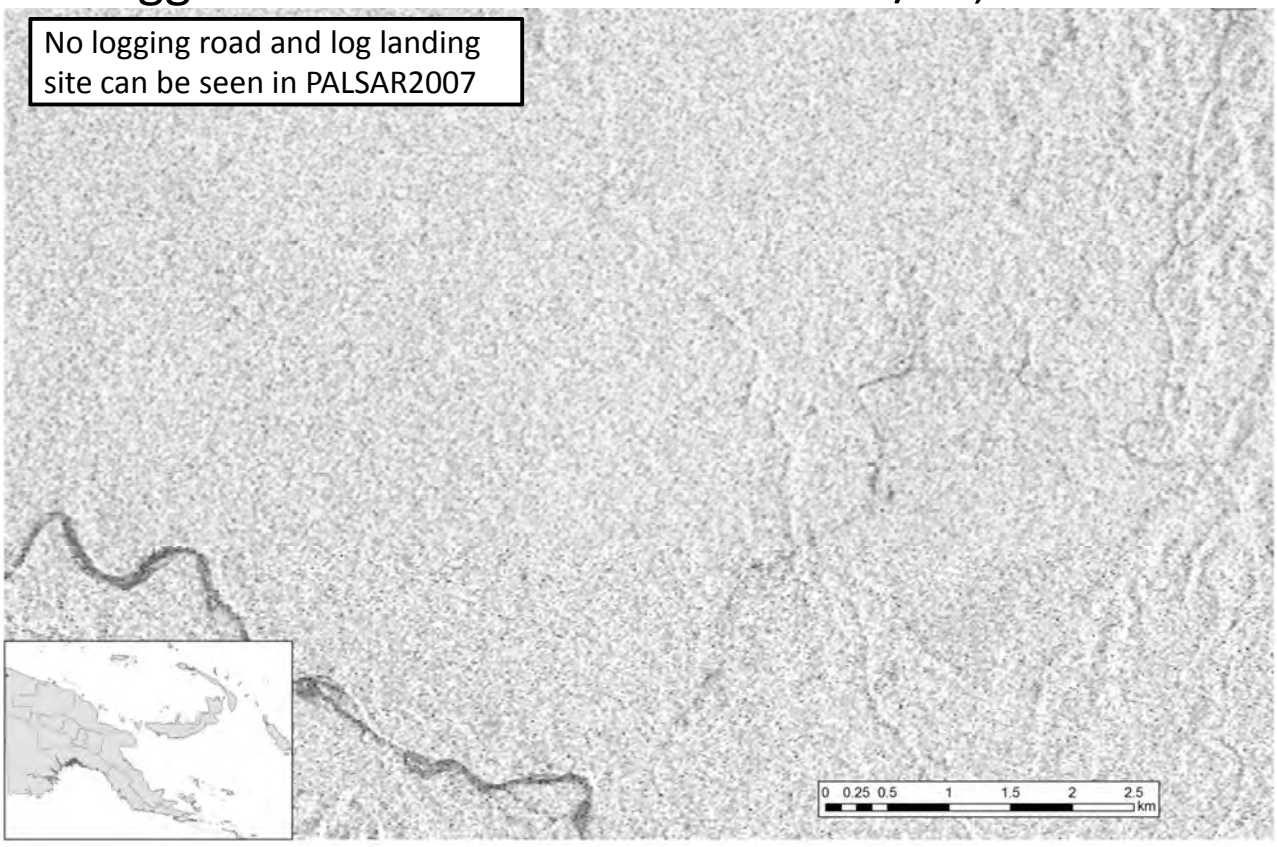
Forest Change Assessment (National-level)



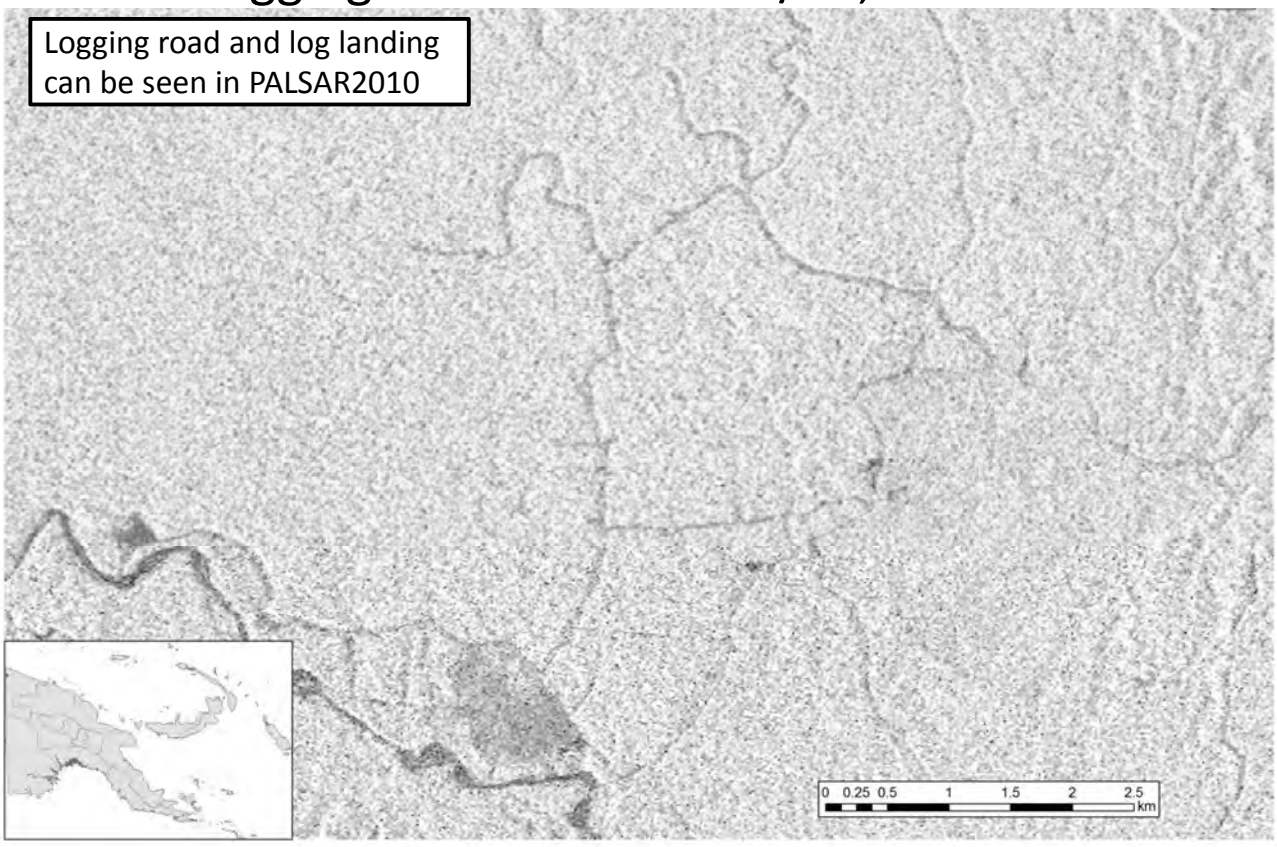
Logged-over Area & PALSAR2007: 1/25,000 level

No logging road and log landing site can be seen in PALSAR2007



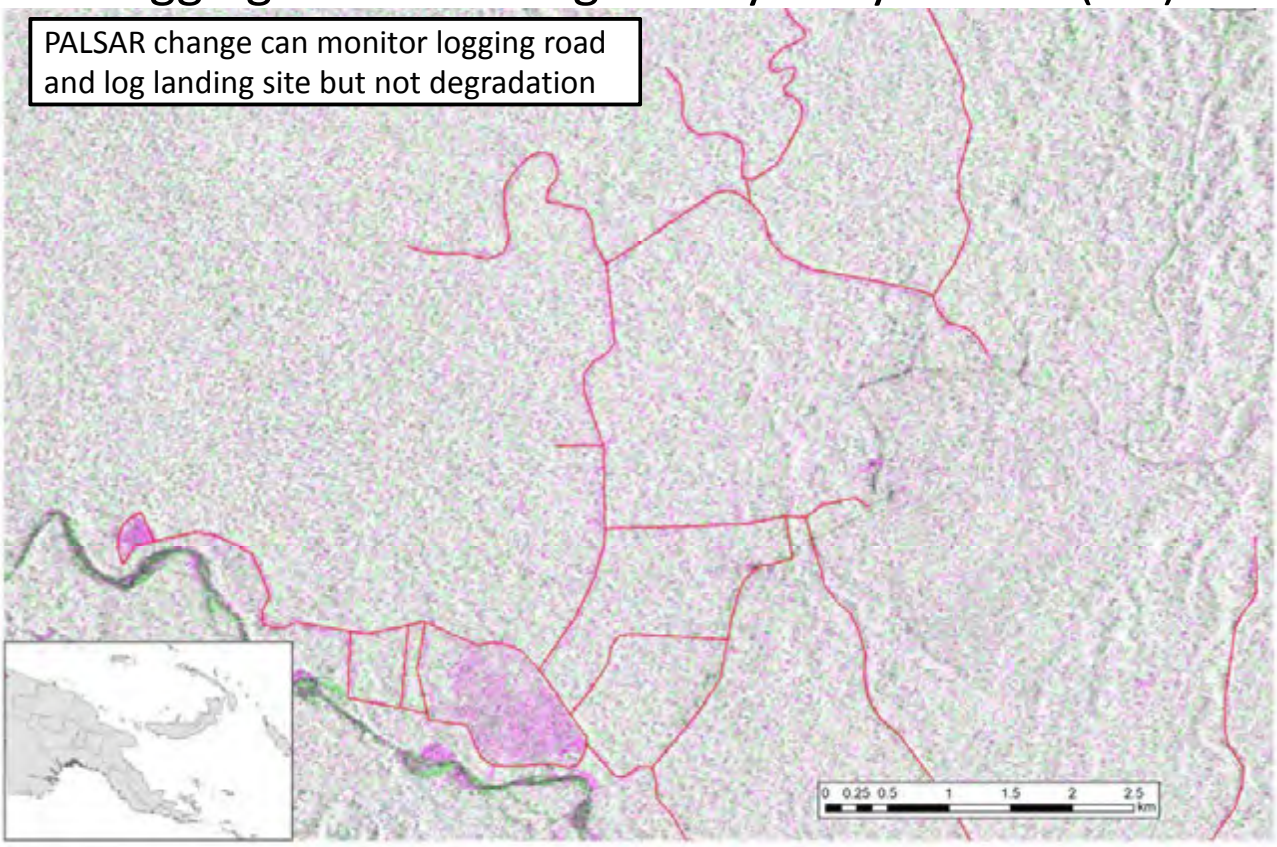
Logging & PALSAR2010: 1/25,000 level

Logging road and log landing can be seen in PALSAR2010



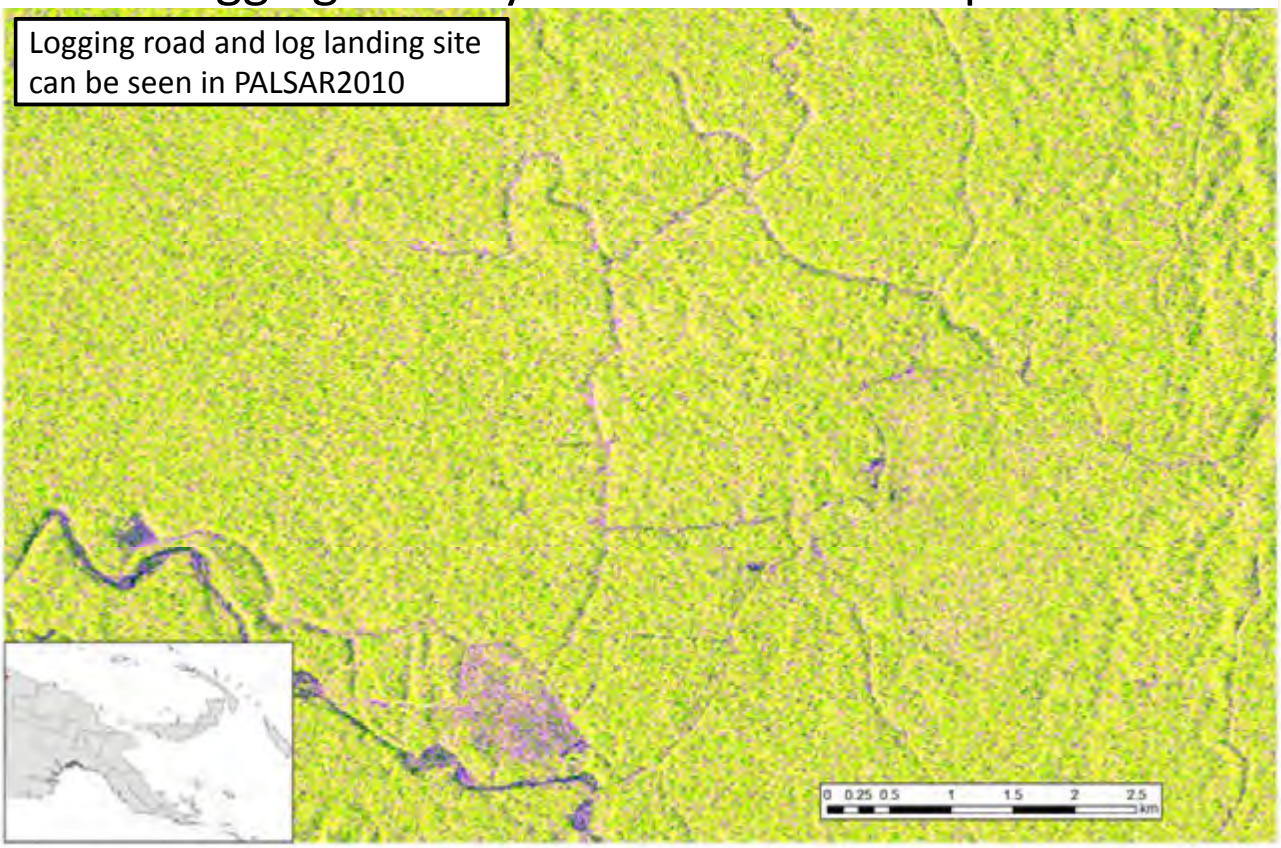
Logging Area & Change Analysis by PALSAR(HV)

PALSAR change can monitor logging road and log landing site but not degradation

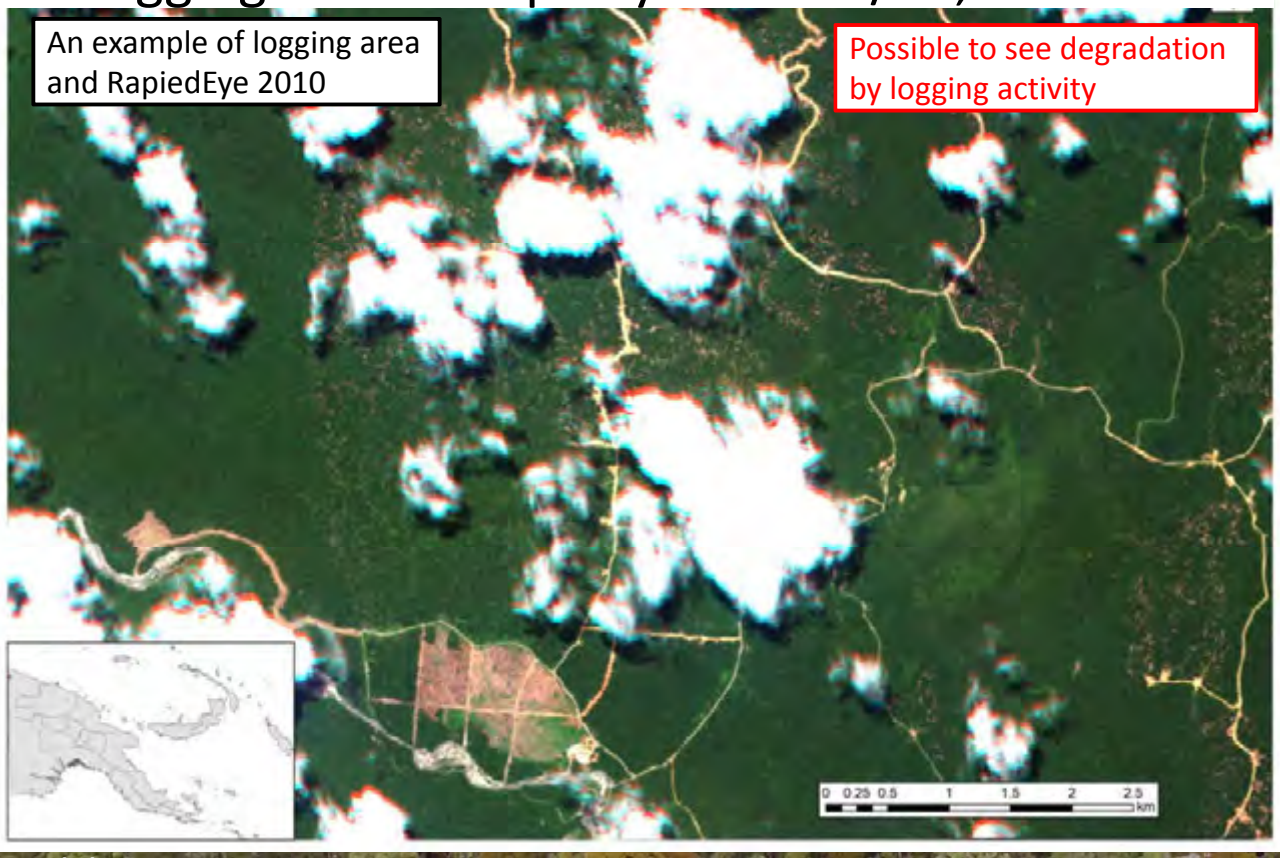


Logging Area by PALSAR Color Composite

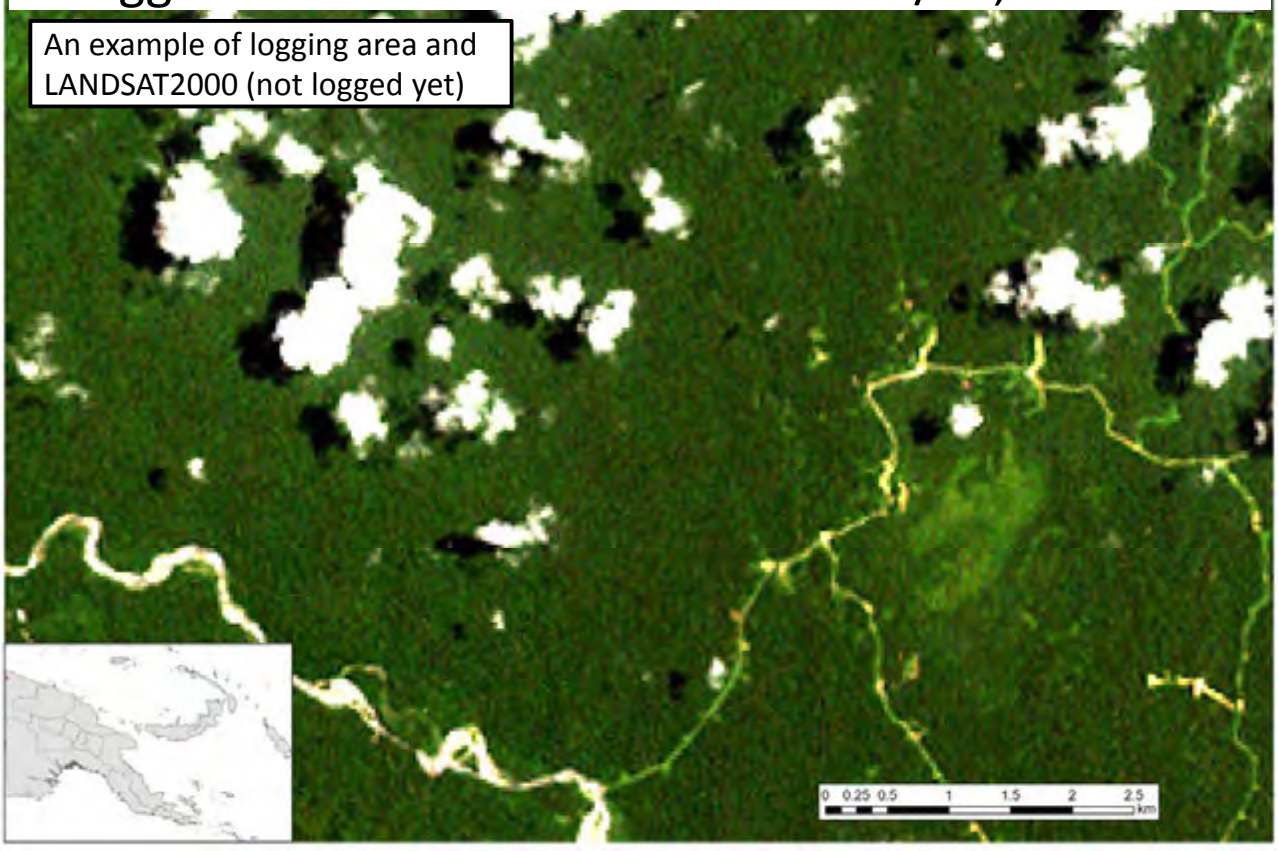
Logging road and log landing site can be seen in PALSAR2010



Logging Area & RapidEye2010: 1/25,000 level

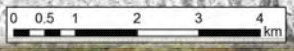


Logged-over Area & LANDSAT2000: 1/25,000 level



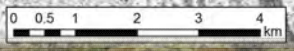
FCA Area & PALSAR2007: 1/35,000 level

No forest clearance can be seen in PALSAR2007



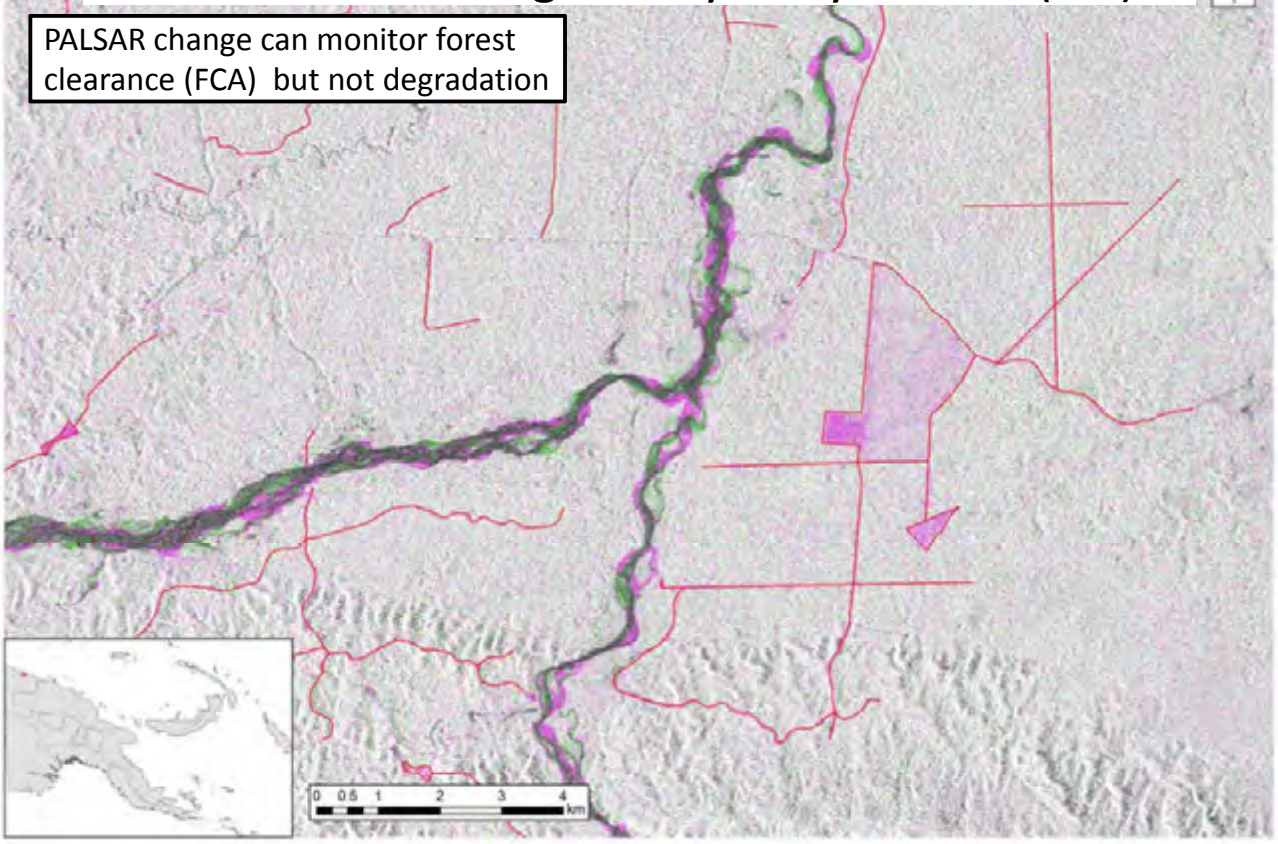
FCA Area & PALSAR2010: 1/35,000 level

Forest Clearance happened between 2007 and 2010



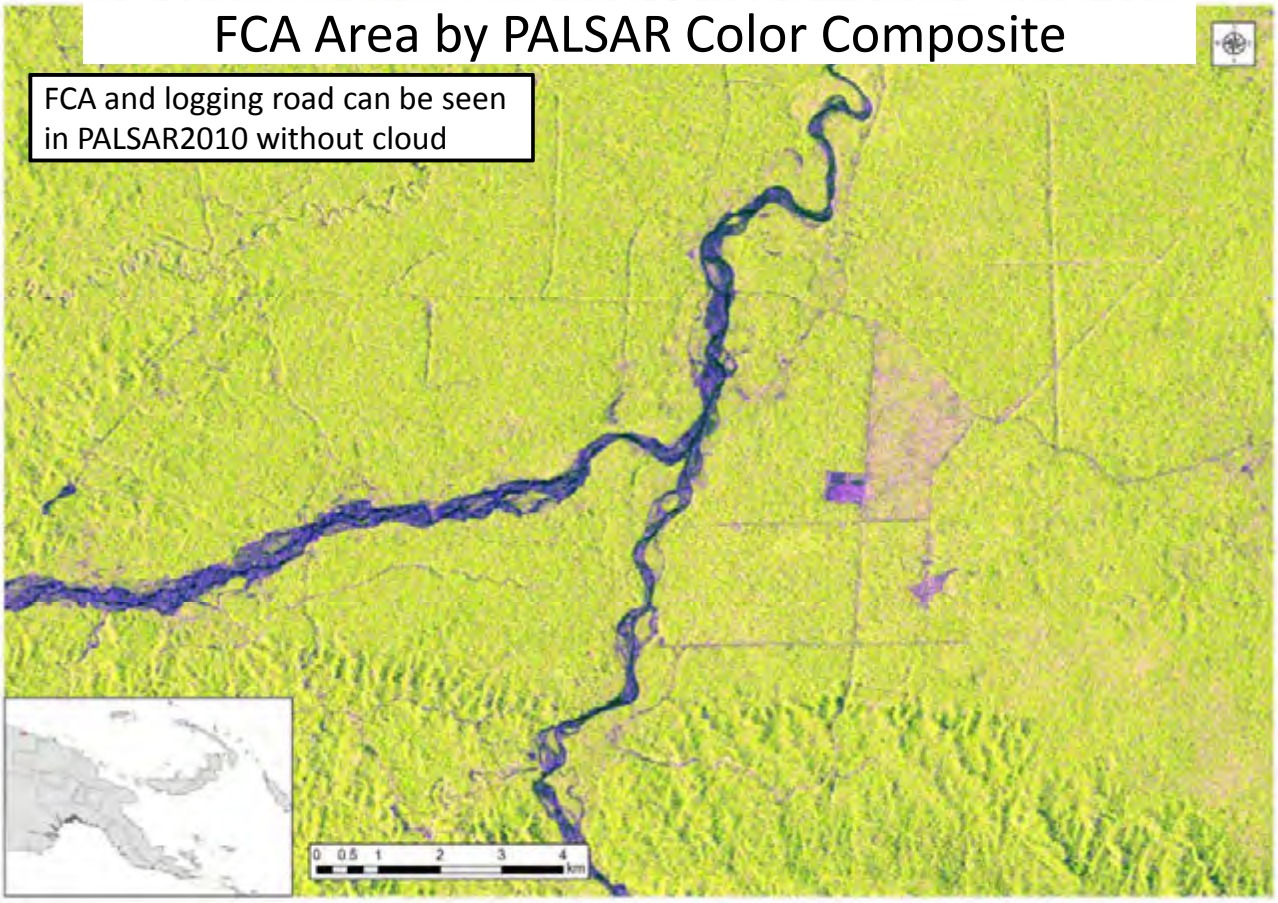
FCA Area & Change Analysis by PALSAR(HV)

PALSAR change can monitor forest clearance (FCA) but not degradation

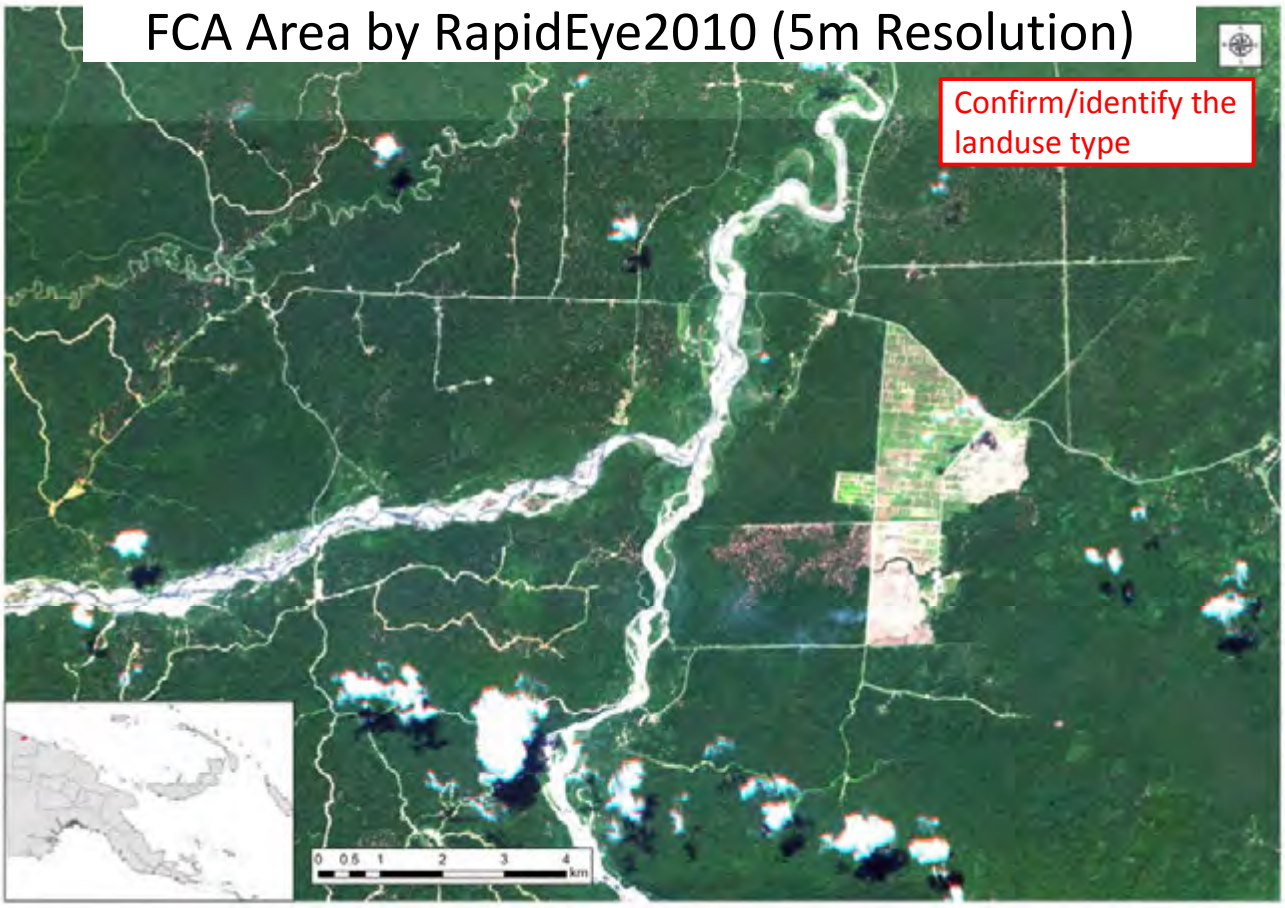


FCA Area by PALSAR Color Composite

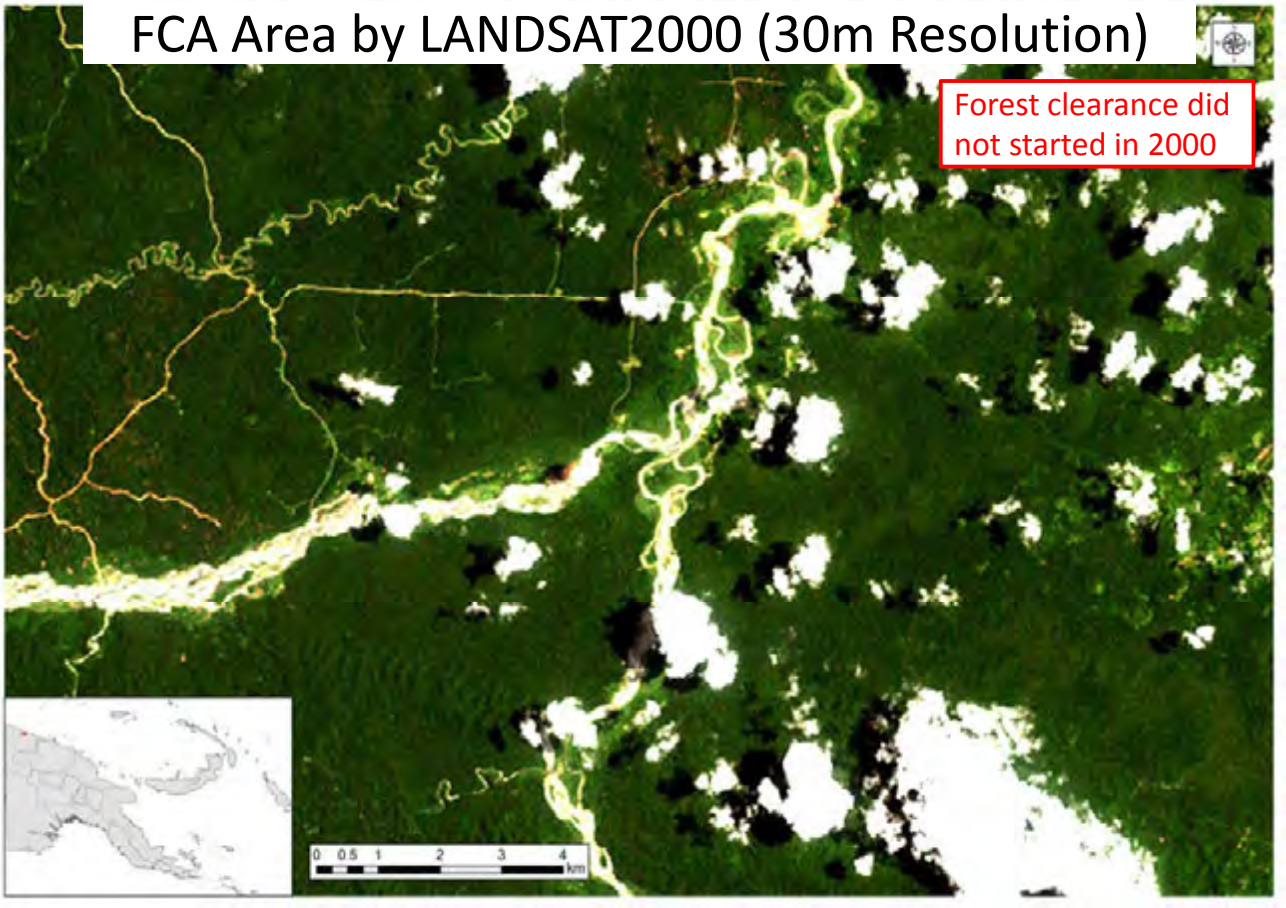
FCA and logging road can be seen in PALSAR2010 without cloud



FCA Area by RapidEye2010 (5m Resolution)



FCA Area by LANDSAT2000 (30m Resolution)



Summary

- There are some area where it is difficult to collect good quality data by optical satellite, even by RapidEye (5 constellation satellites)
- RapidEye shows good potential to monitor logging and forest clearance (FCA) activities in PNG, even selective logging site are visible with 5m resolution
- PALSAR(HV) shows good potential to monitor logging roads and forest clearance in PNG, but difficult to monitor degradation by selective logging site
- SAR satellite analysis is useful for screening, Identifying AOI (Area of Interest) for intensive monitoring (following case study presentation)
- Combined use of those remote sensing(SAR & Optical) and ground truth with local knowledge should be considered for PNG forest monitoring

JICA-PNGFA PROJECT for Capacity Development on Forest Resource Monitoring for Addressing Climate Change

Closing Ceremony and final Workshop for Project Completion
5th - 6th March 2014
Holiday Inn Hotel, Port Moresby, PNG

Tenkyu tru

(Picture: 2nd WS in Mar. 2013)

Closing Ceremony and final Workshop for Project Completion
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Holiday Inn Hotel, Port Moresby, PNG

Forest Change Detection Case Study: Milne Bay and West Sepik

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Assistant Cartographer
Inventory & Mapping Branch
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Outline

Introduction: Purpose

- Pilot REDD site for PNG FA to apply Tier 1 or the 'simple first order approach'
  - Approach 1, Level Assessment
  - Using default values
- Trial Land Representation 'Approach 1'
  - Tracking of LU conversions
  - Non-spatially explicit
  - Know areas of each transition
- Trial approach on Carbon stock change estimation
- Trial Basemap Version 0 with Landsat images for tracking and area calculation

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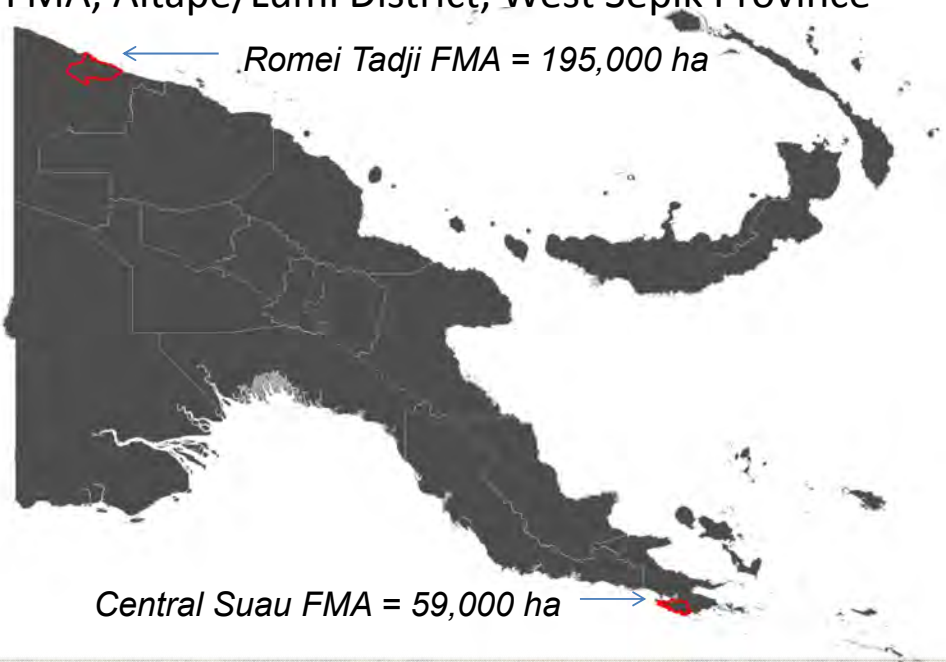
Introduction: Study Site

- Central Suau FMA, Alotau District, Milne Bay Province
- Romei Tadji FMA, Aitape/Lumi District, West Sepik Province



Data: Satellite Imagery

Time (Year)	Satellite	Resolution (m)	Band Composition	Path_Row ID	Application Sites
0 – (1990)	Landsat 5	25-30	3, 2, 1	94_67 and 93_67	Central Suau West Romei
1 – (2000)	Landsat 5	25-30	3, 2, 1	94_67 and 93_67	Central Suau West Romei
2 – (2005)	Landsat 5	25-30	3, 2, 1	94_67 and 93_67	Central Suau West Romei
3 – (2010)	RapidEye	5	3, 2, 1	6 tiles → 9 tiles →	Central Suau West Romei
4 – (2013)	Landsat 8	25-30	4, 3, 2	94_67 and 93_67	West Romei

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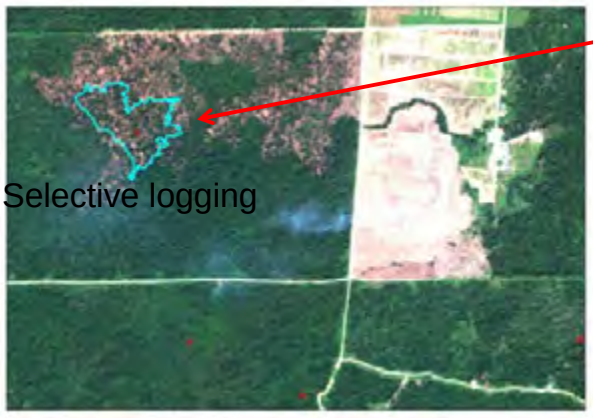
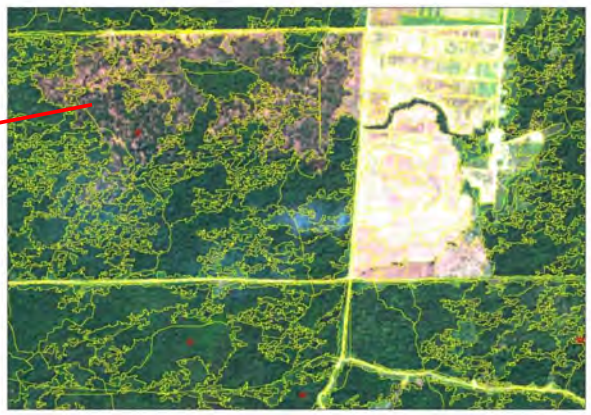
Data: 2012 Forest Basemap Version 0

- Developed using Object-Based classification using eCognition
- Segmentation →



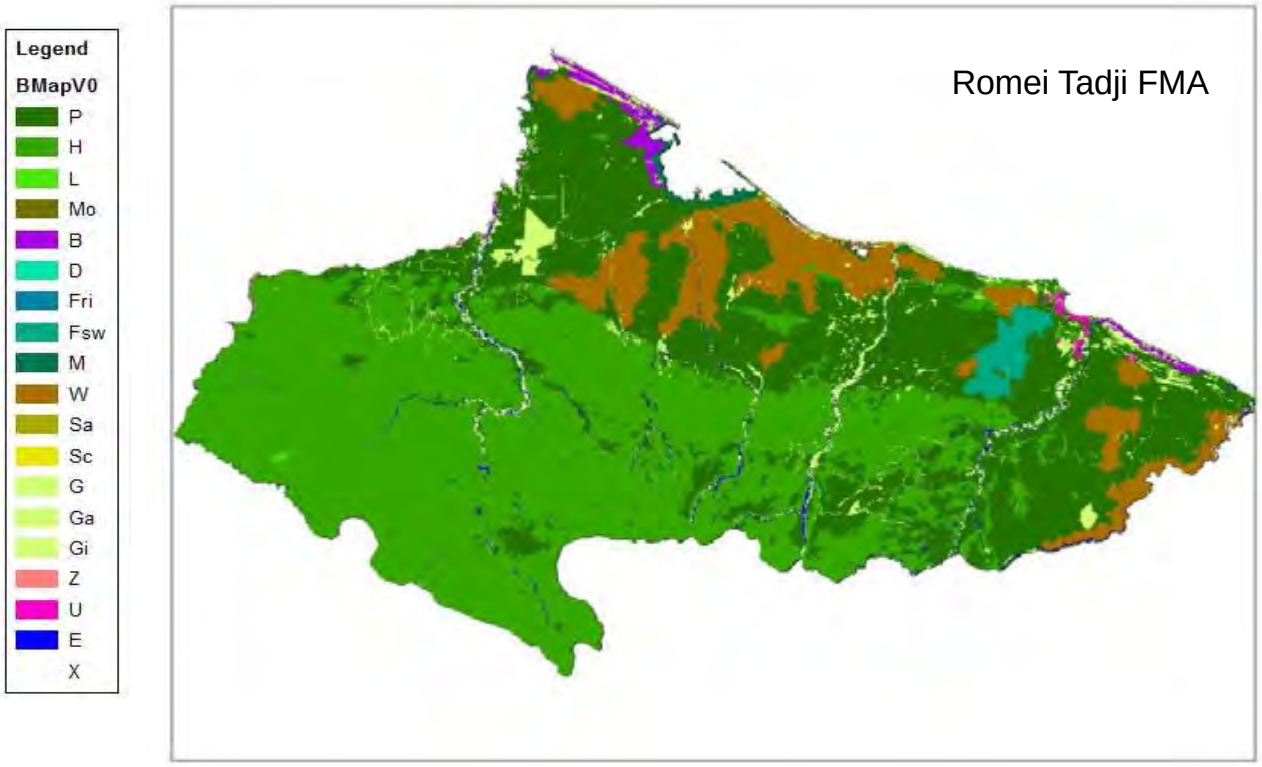
Imagery Only (Landsat 4/5)

Image with Basemap



Year 2010

Data: Project Site Reference Basemaps V0



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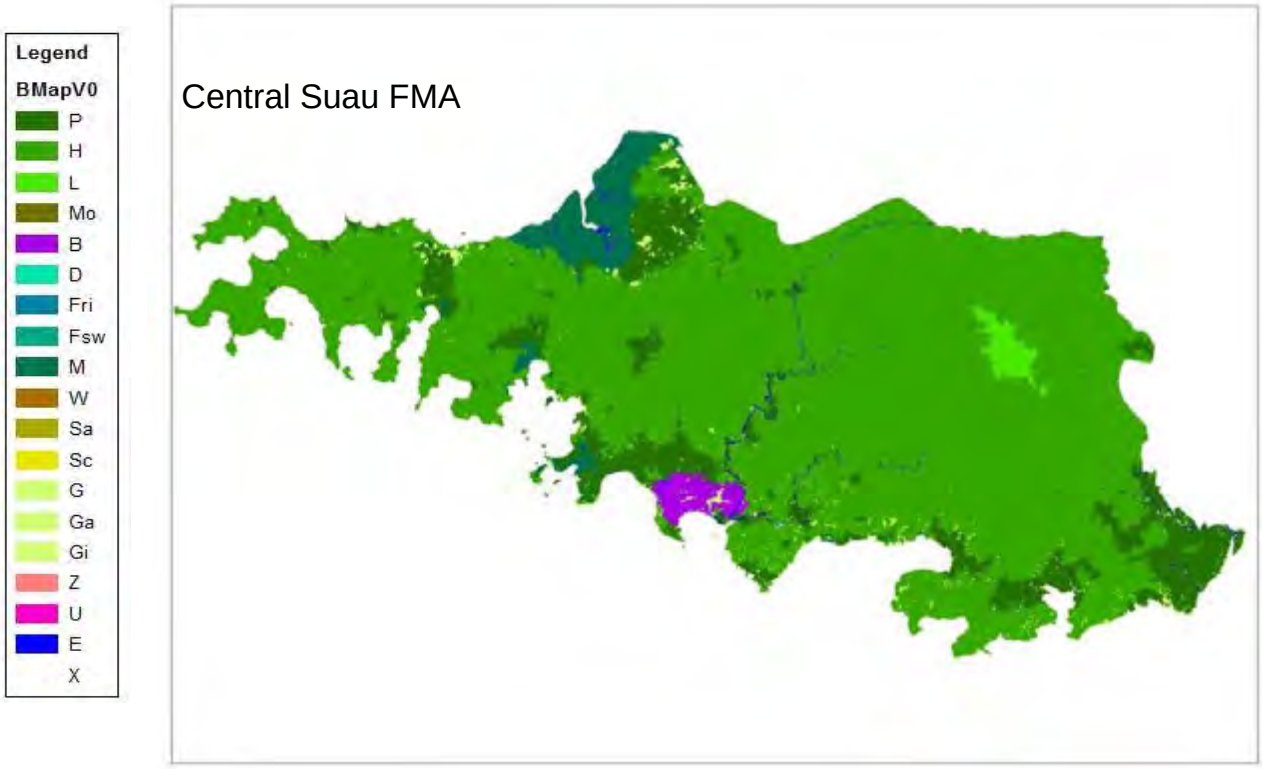
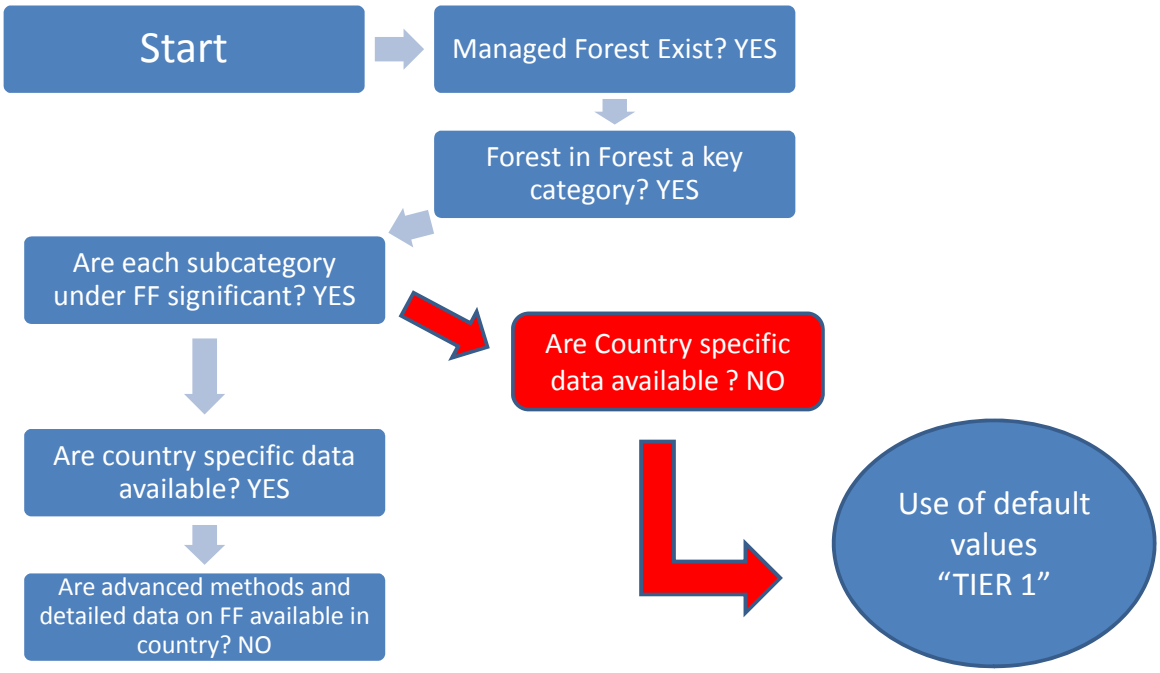
Data: Project Site Reference Basemaps V0



Methodology: Mapping Workflow

1. • Data sourcing
   • Site Familiarization
   • LU Classification
   • Disturbance levels confirmation
2. • Image processing – stacking, enhancement
   • Image interpretation
3. • Land use type selection per year using Base map segmentation polygons
   • Selection of polygon depended on identified change between Year x and Year y
4. • Attribute data integration with disturbance levels for concerned polygon
5. • 1990 – 2013 Change Detection Maps Based on Forest Disturbance levels Developed

Methodology: Choice for carbon values



Methodology: Choice for carbon estimation Approach

1. Stock Change Method (ton/ha)

2. Gain-Loss Method (ton/ha)

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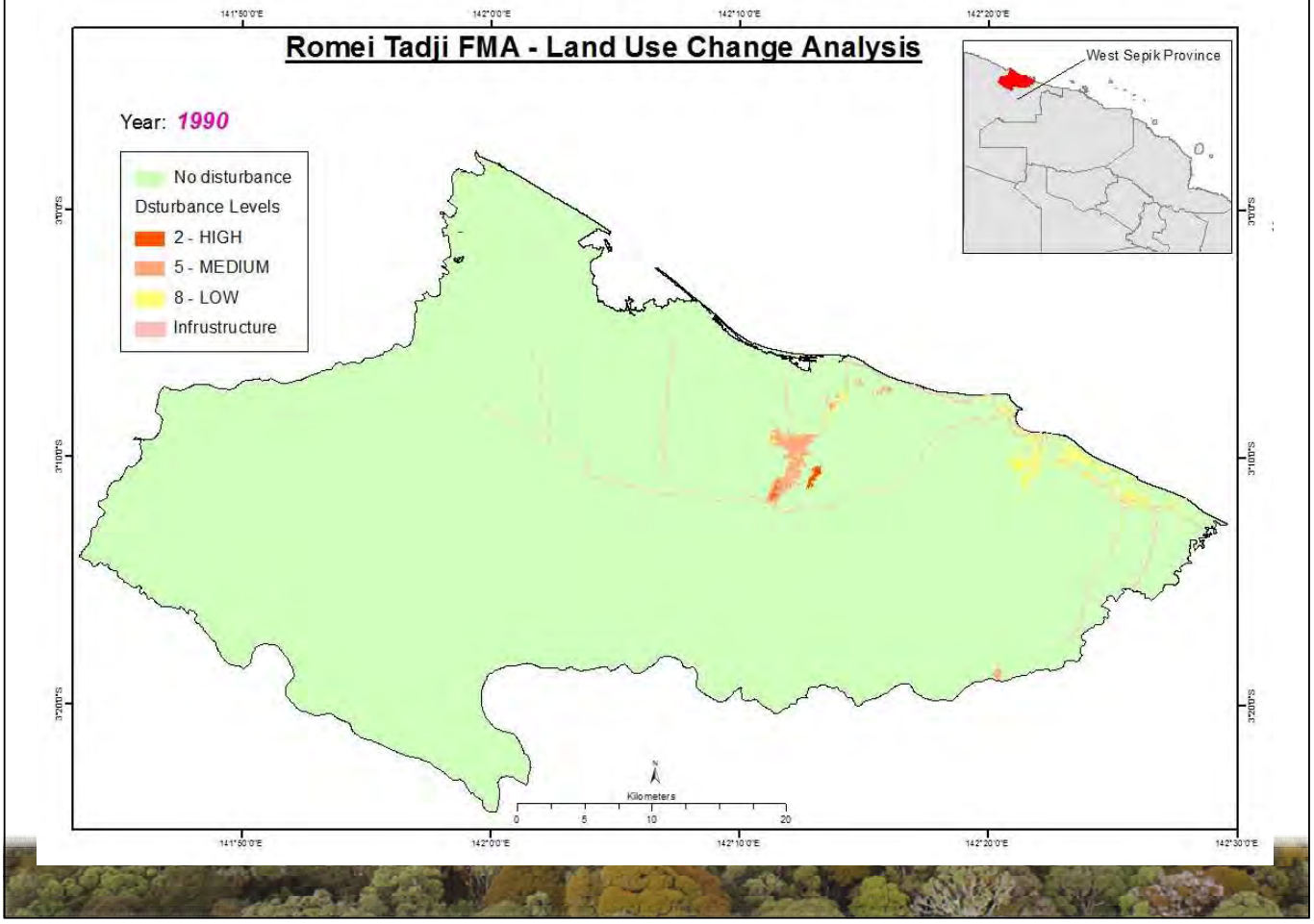
Methodology: Disturbance Levels

- Way for assigning biomass values to define amount of biomass lost between two time periods
- Only applied to forest land (P,H,L,B,….M, W)

Level	Class	Land Use	Example
NA		Permanent Road, Town (existing infrastructure in Time 0)	Non-forest (G,E,U,Z)
2	Very High	Clear felling	H2 or P2 (80% disturb)
3	High	Selective logging with logging road	H3 or P3 (70% disturb)
5	Medium	Flooding, Plantation	H5 or P5 (50% disturb)
8	Low	Subsistence agriculture	H8 or P8 (20% disturb)
Intact Forest			No disturbance



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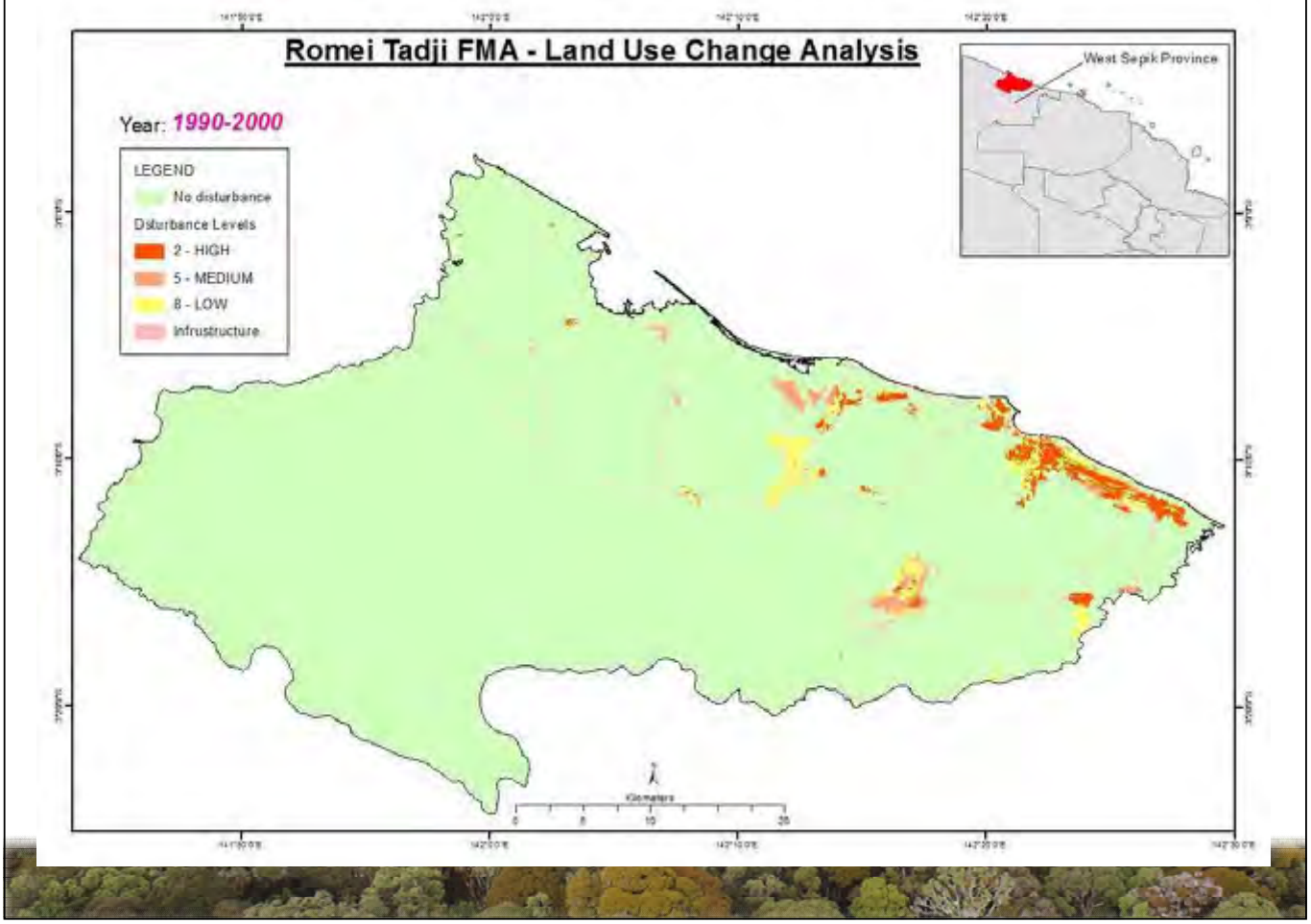

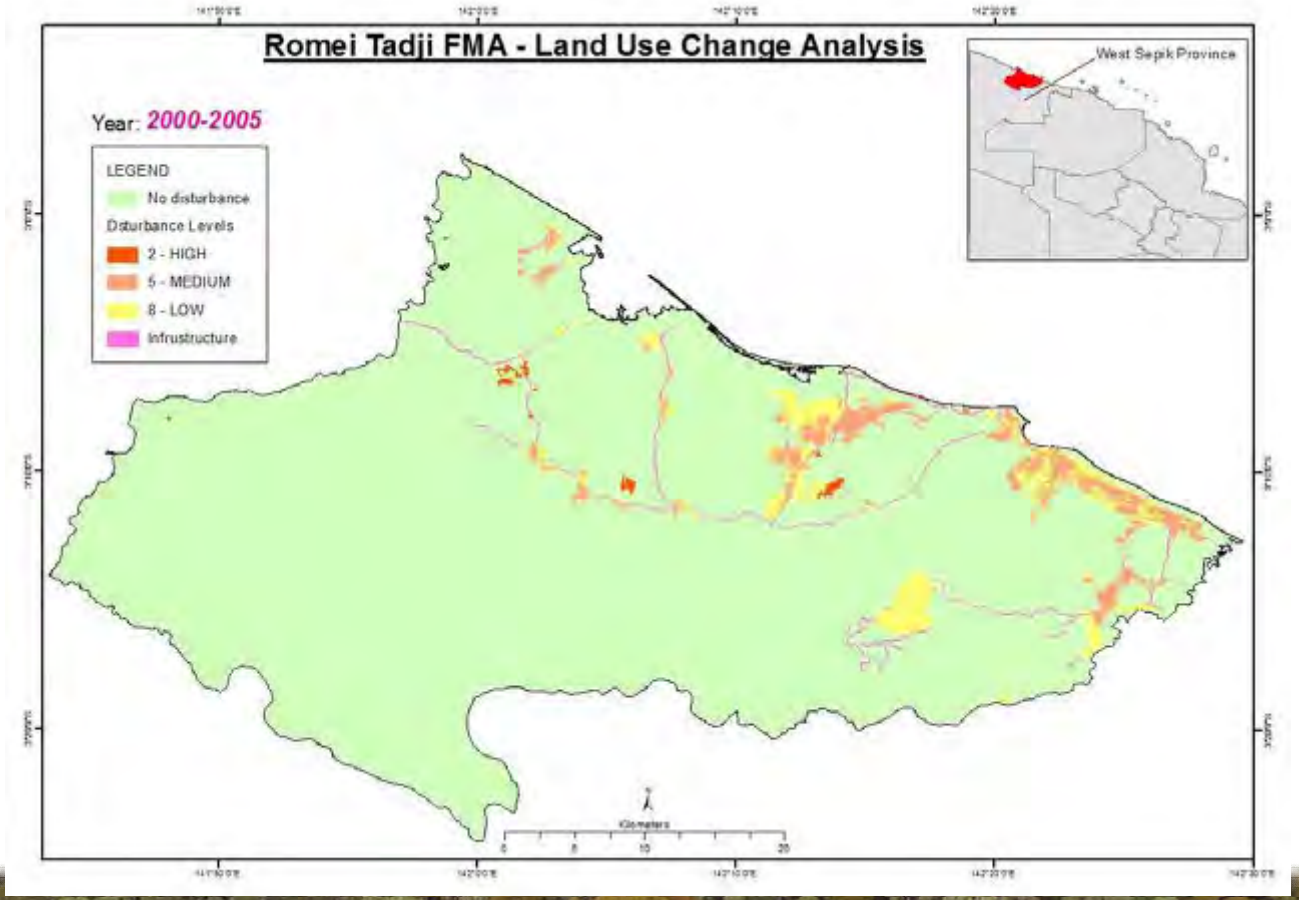

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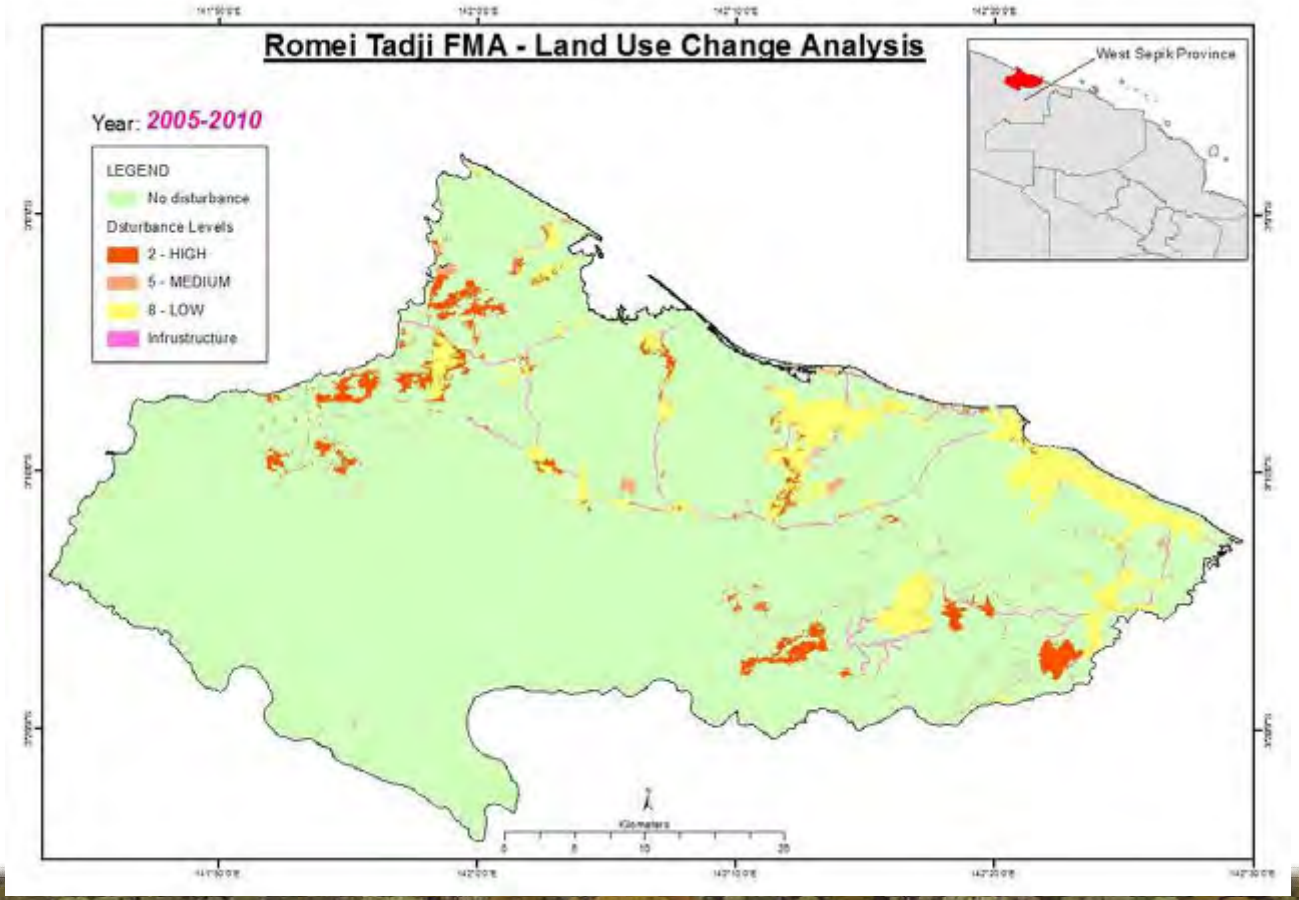

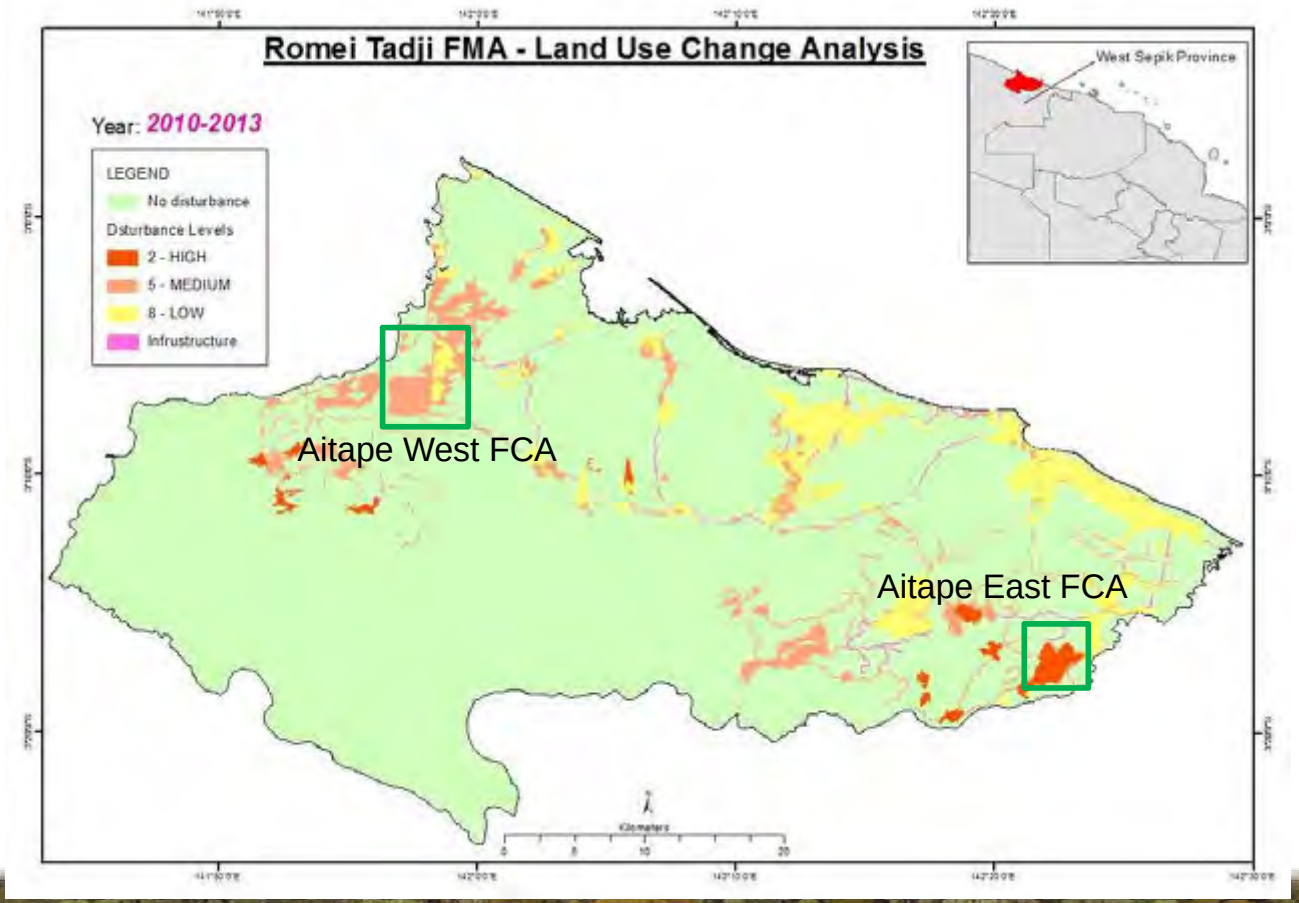

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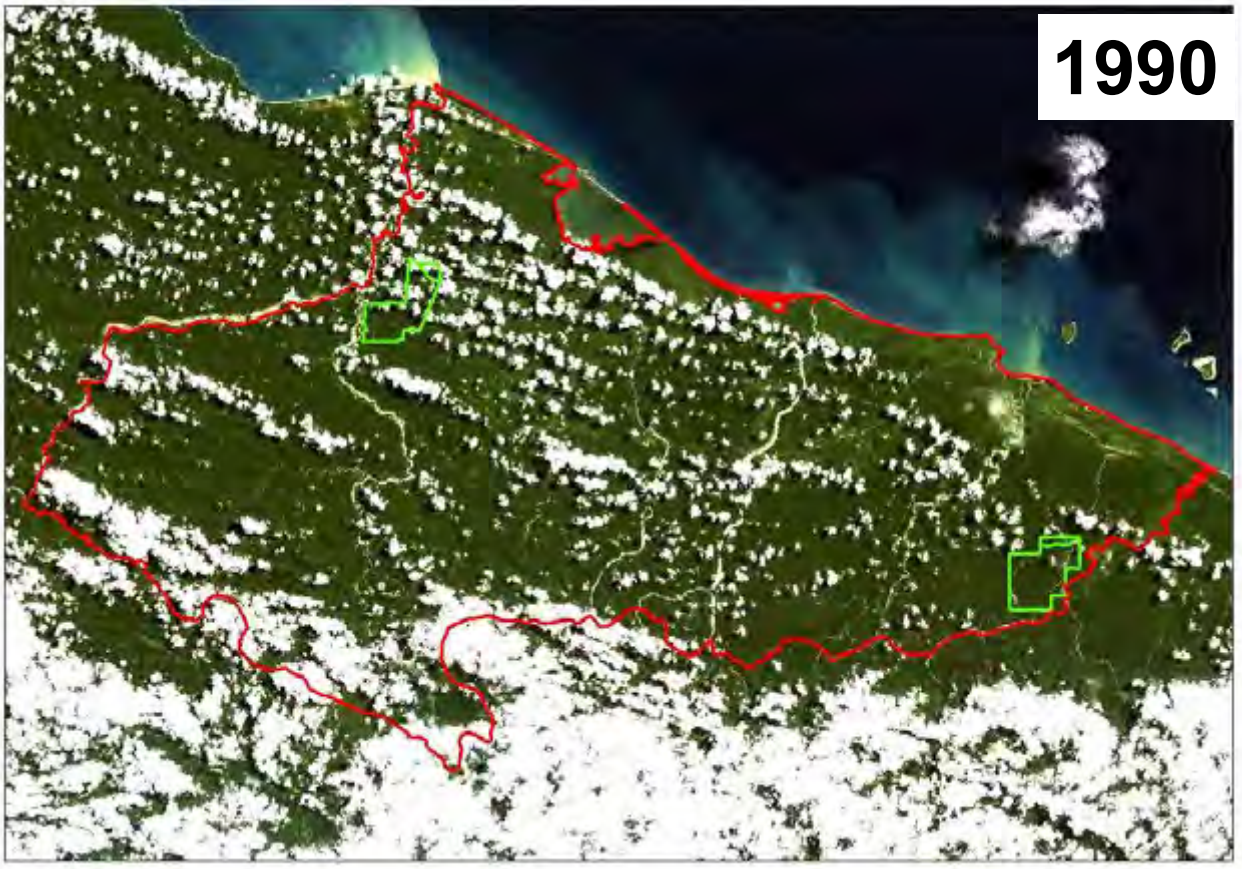

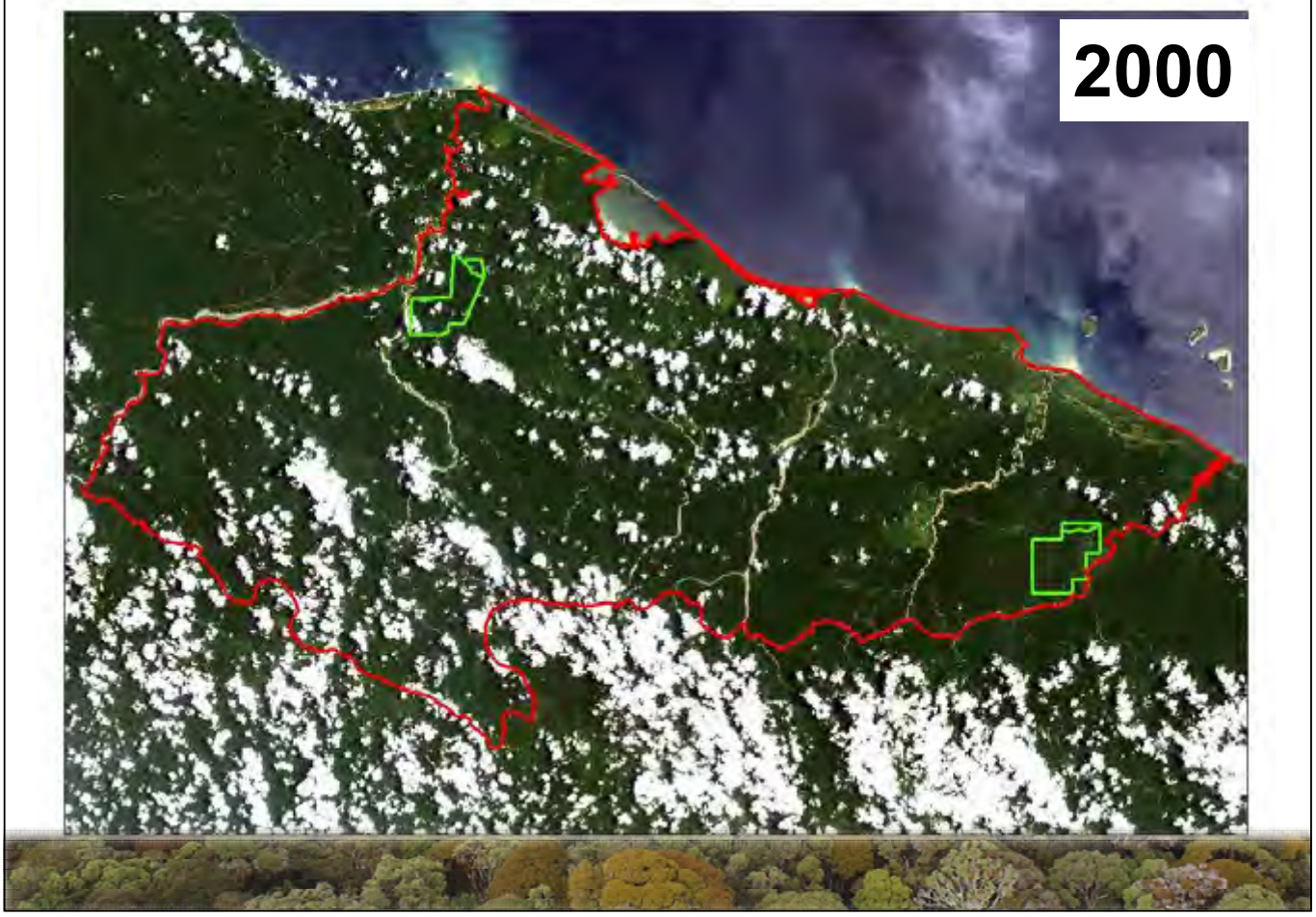

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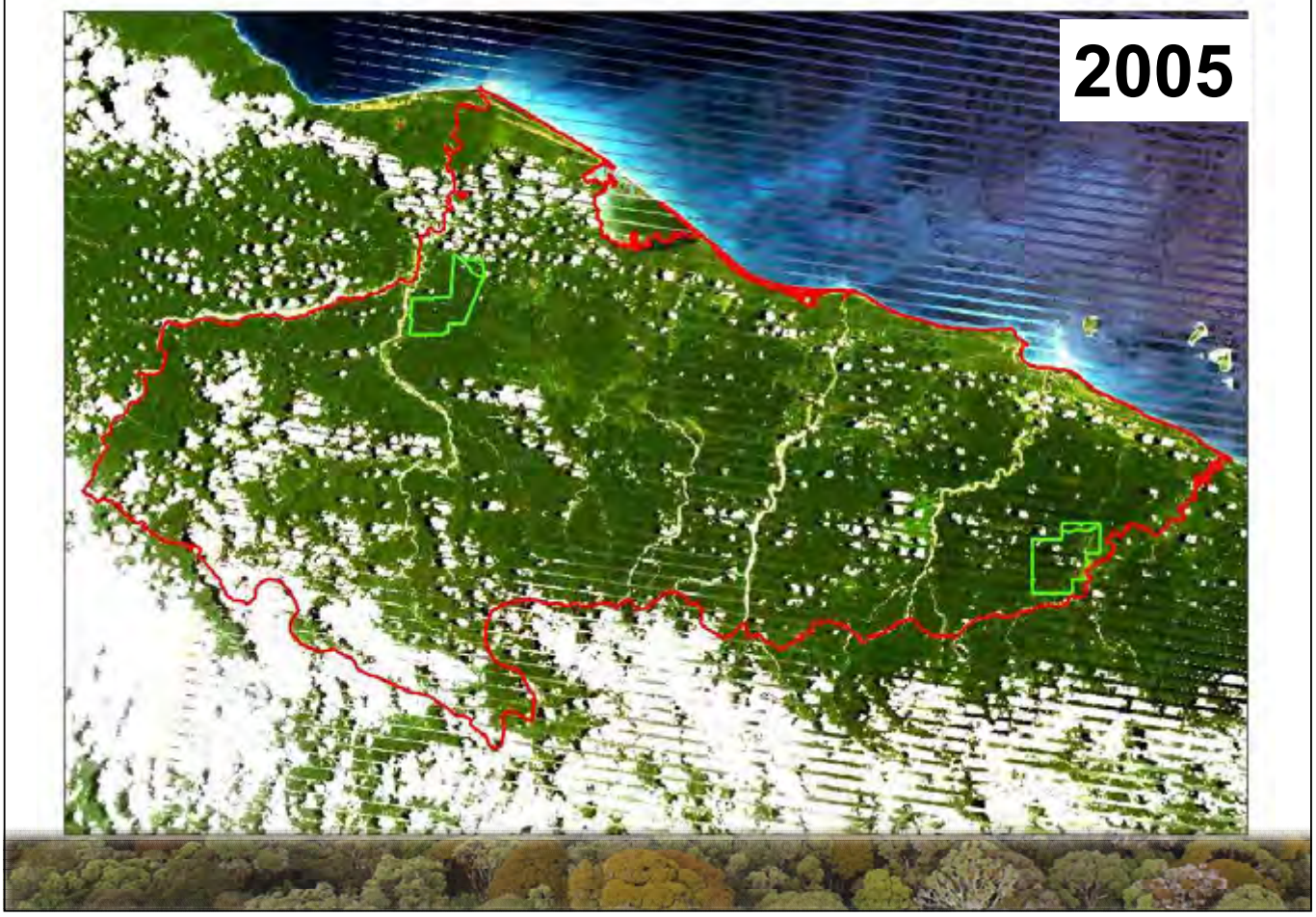

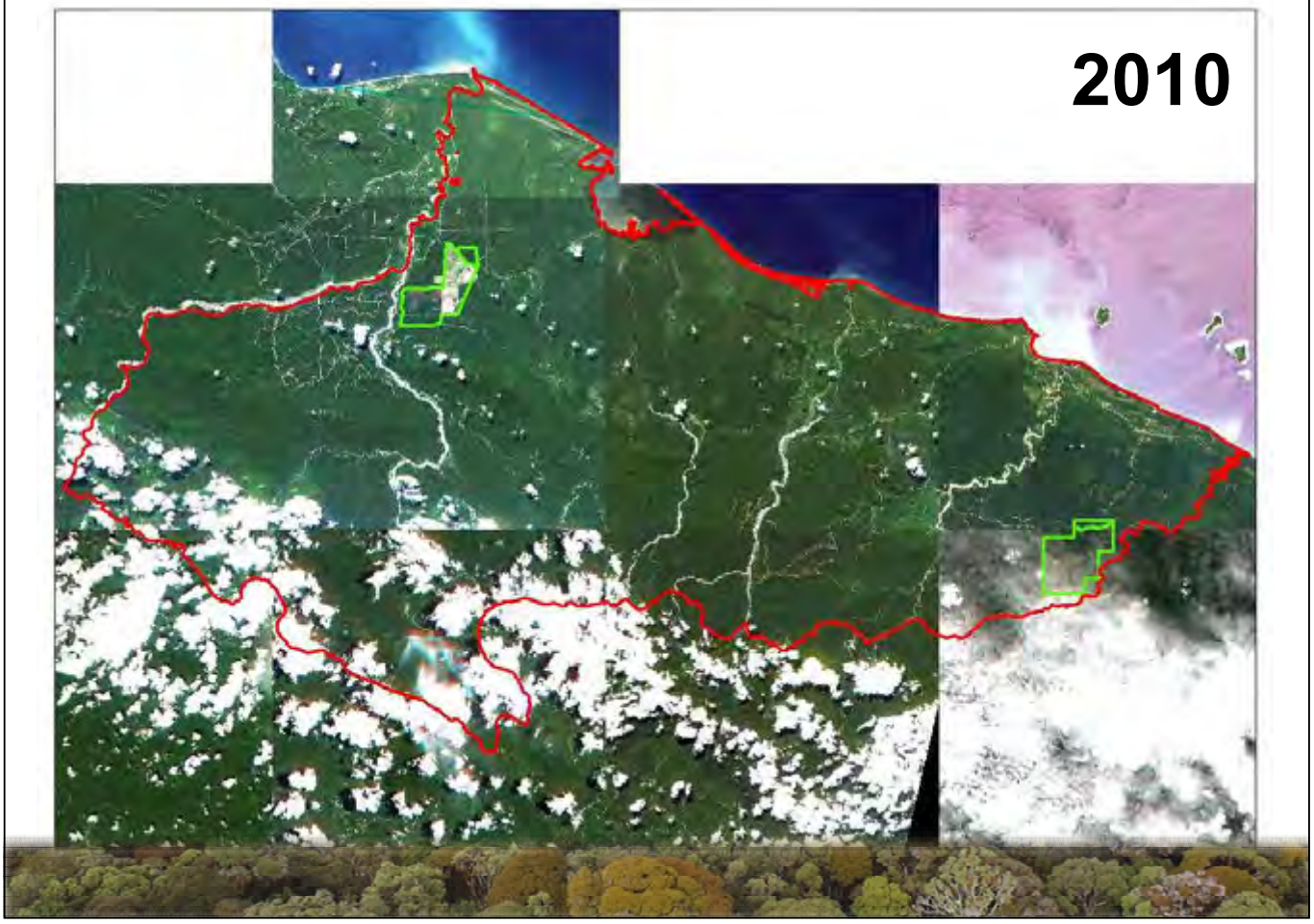

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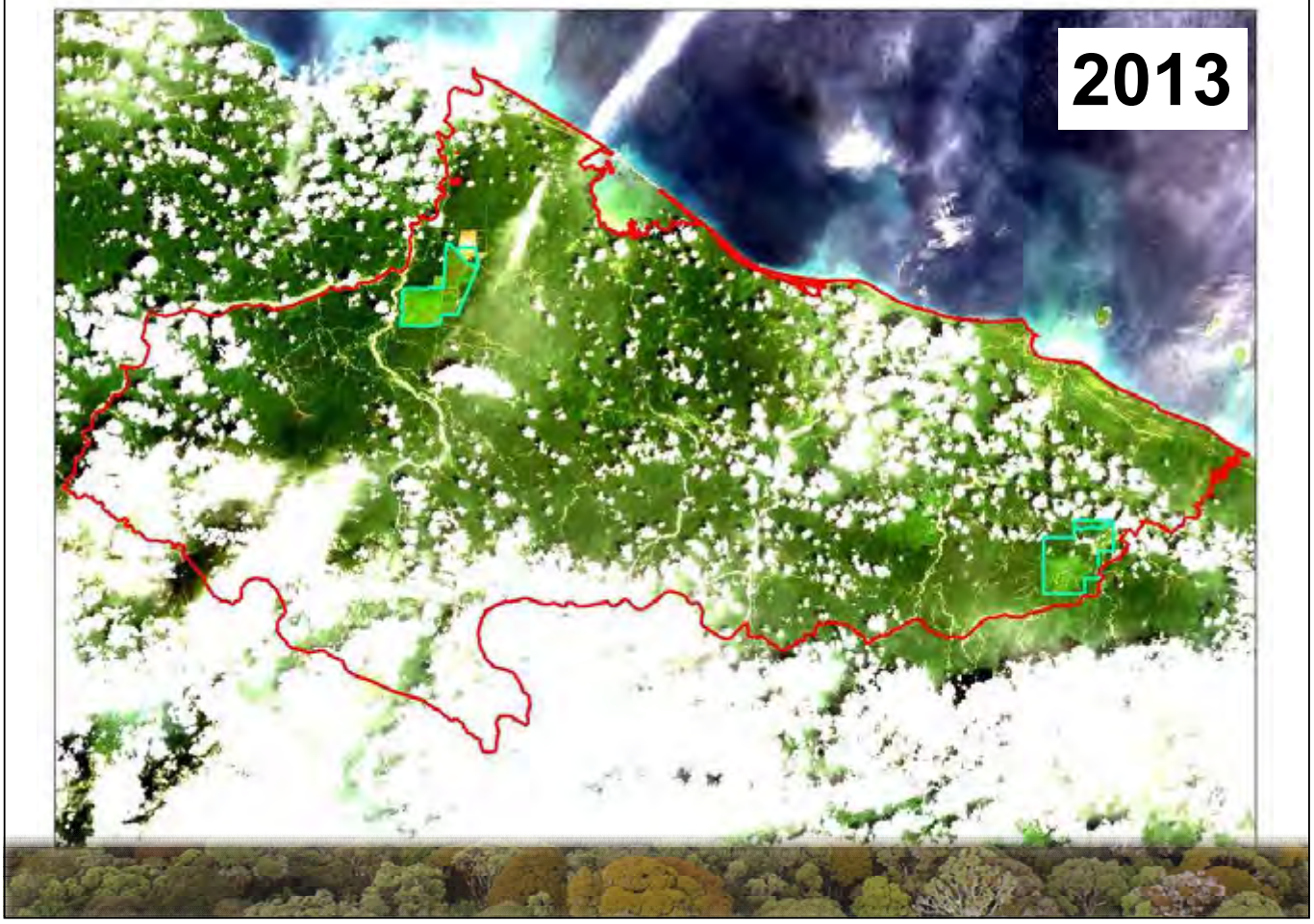

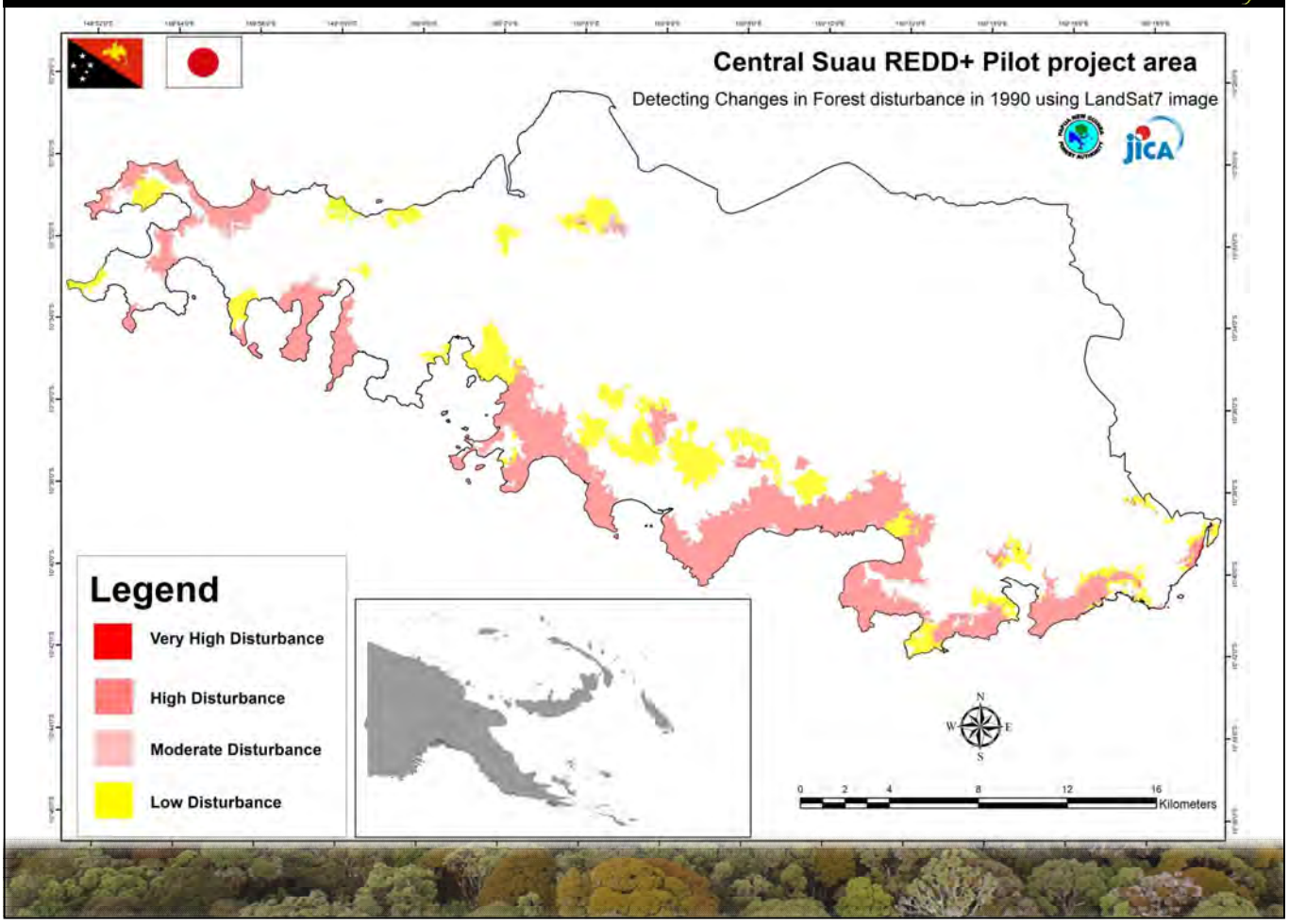

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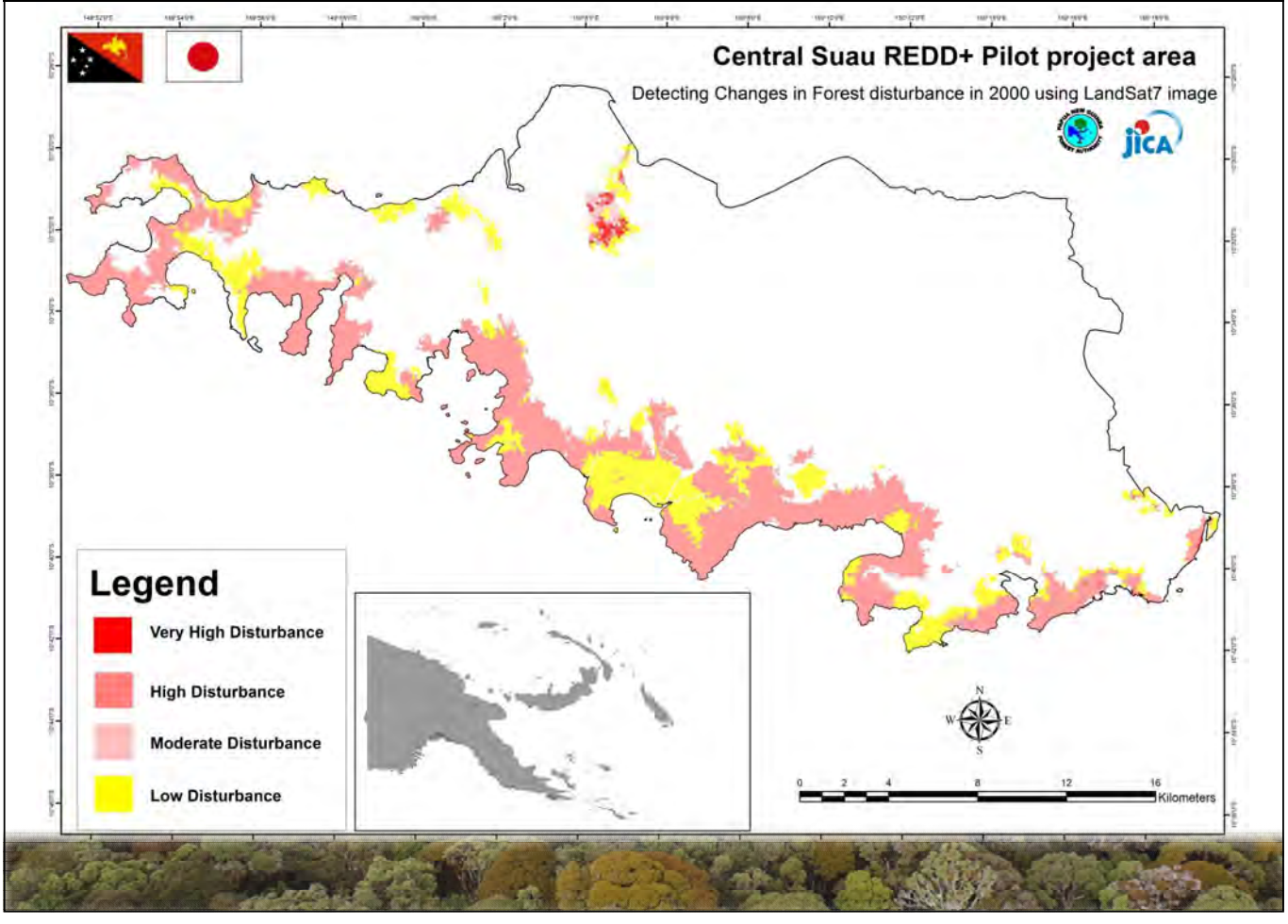

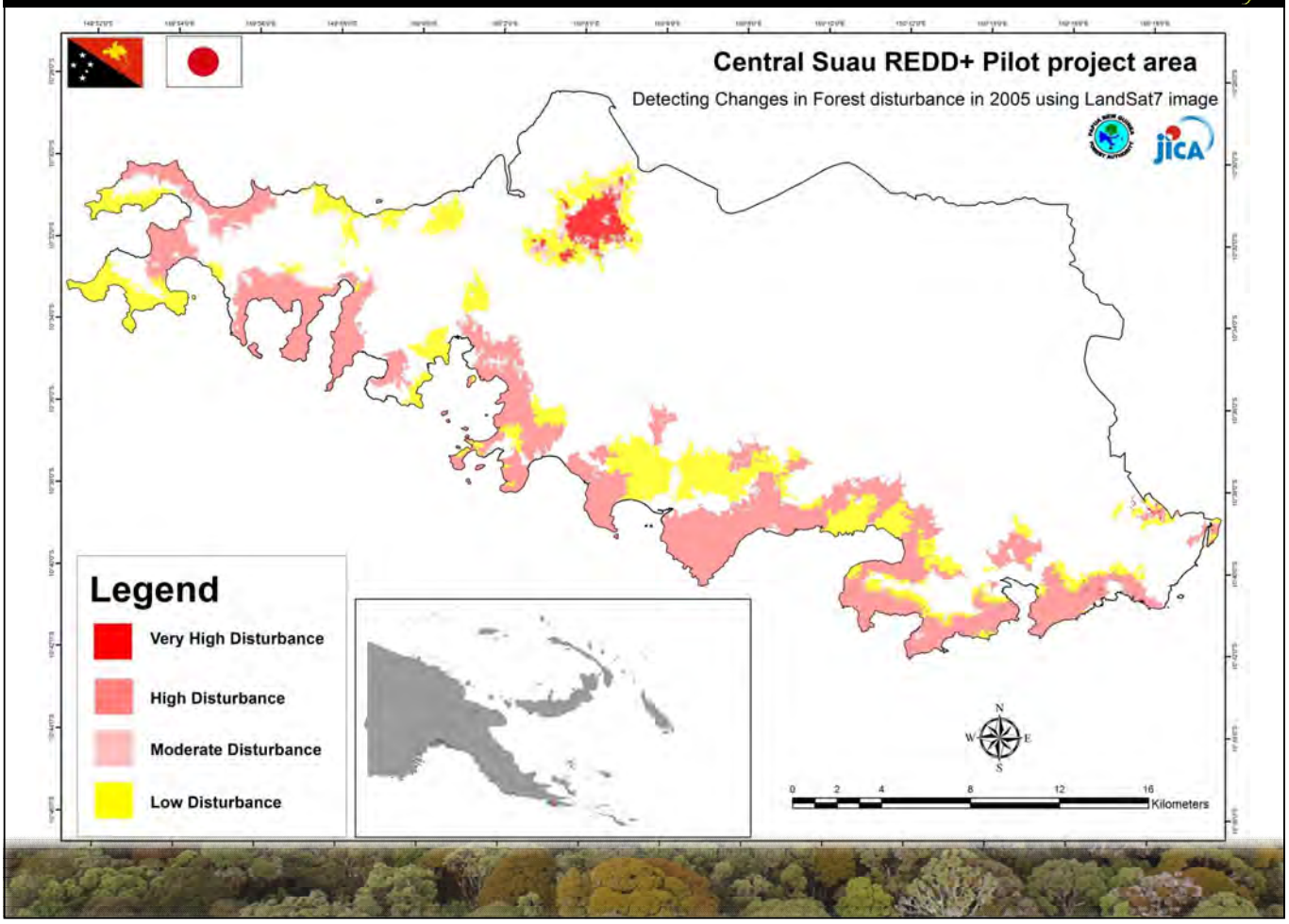

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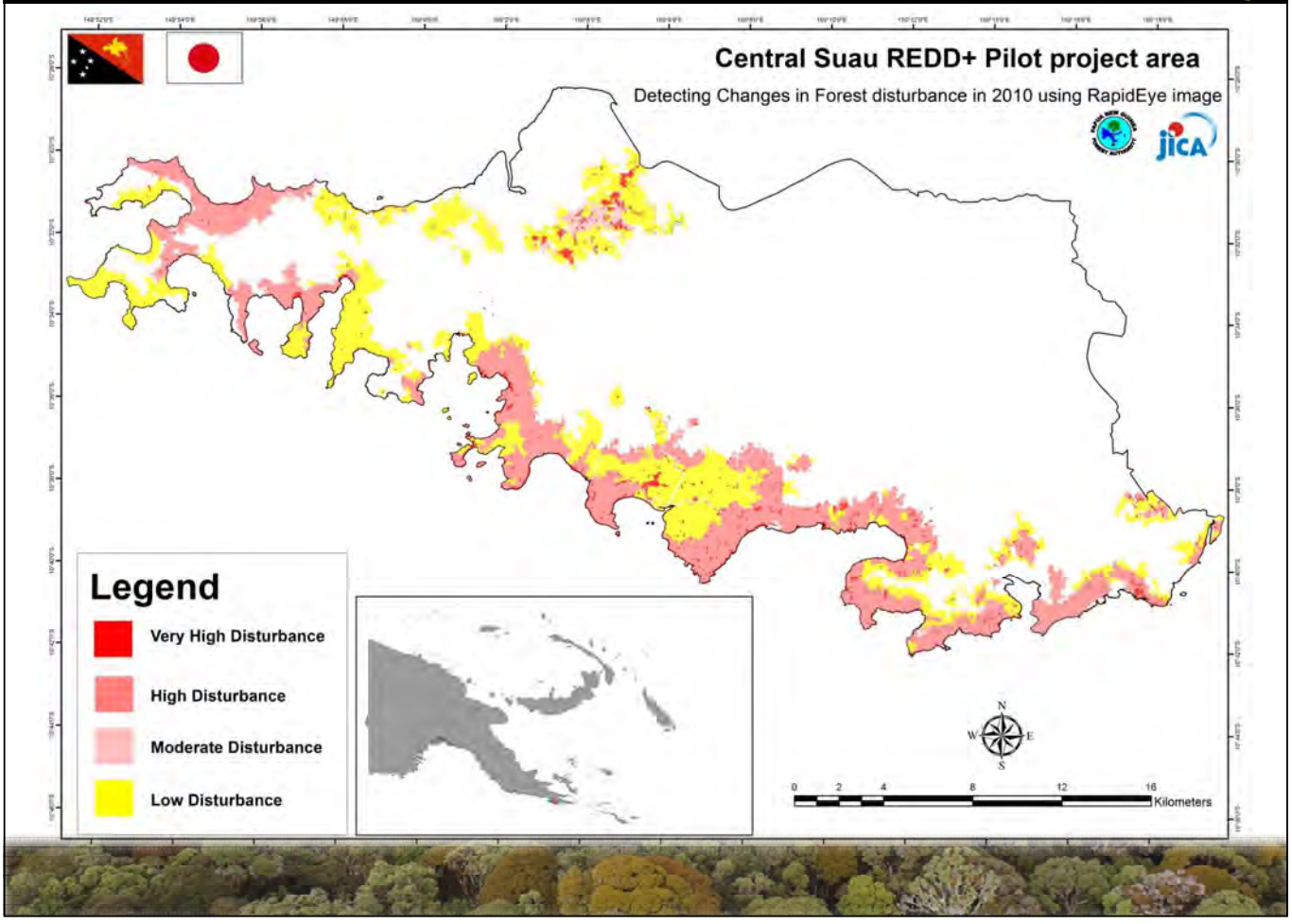
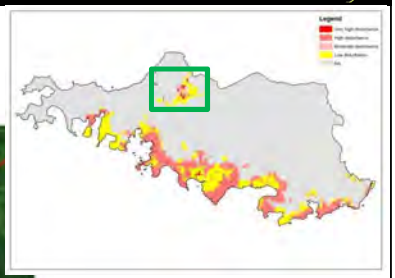
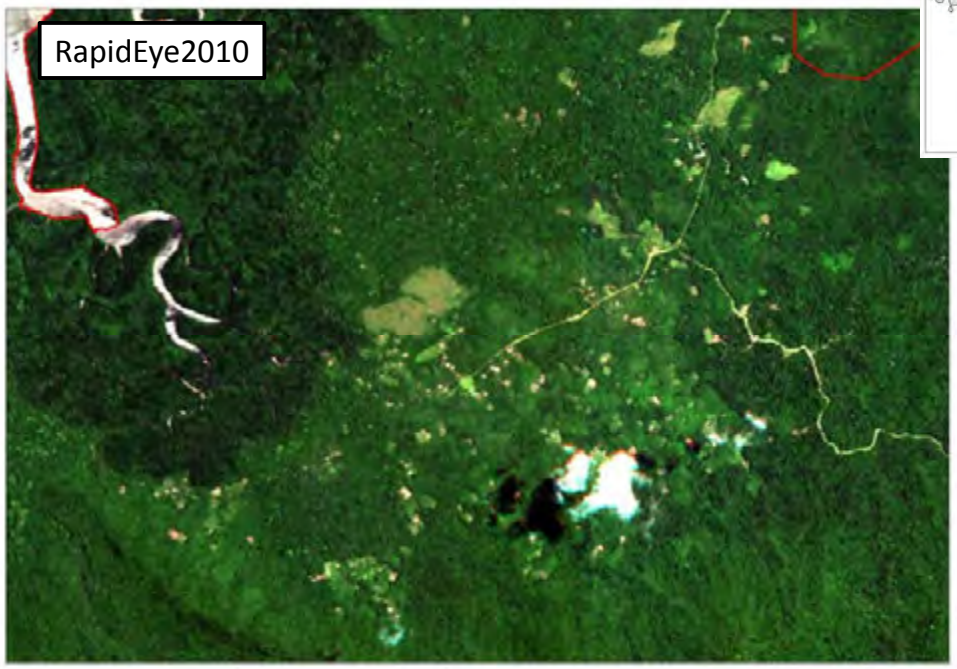


Central Suau, Milne Bay: Active Change Area:





1990

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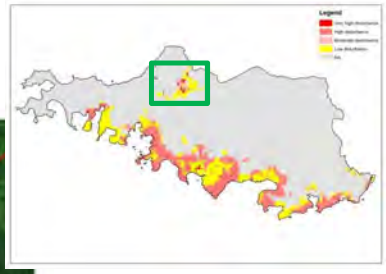
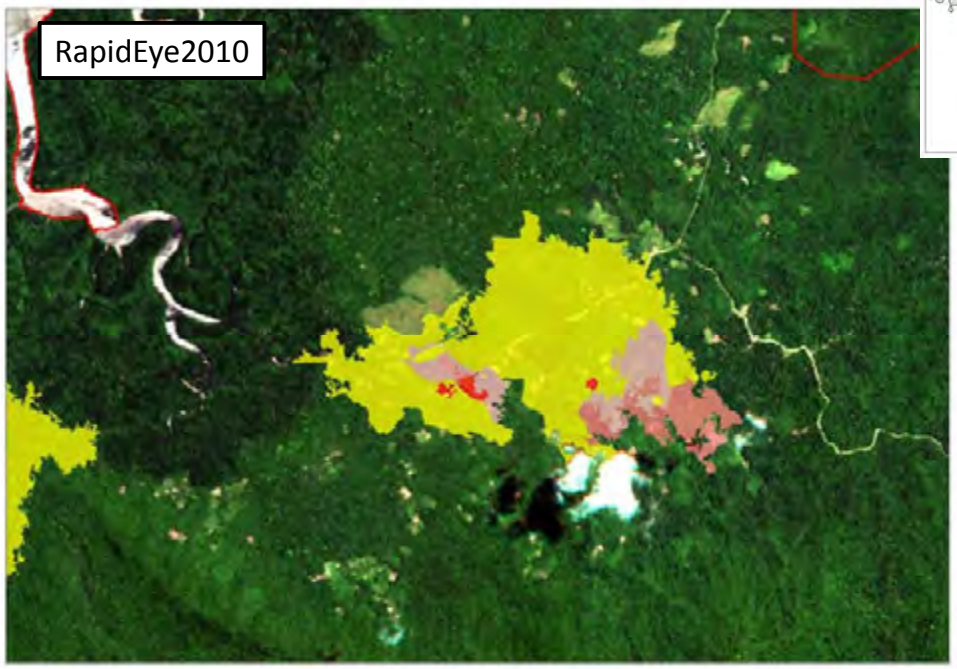
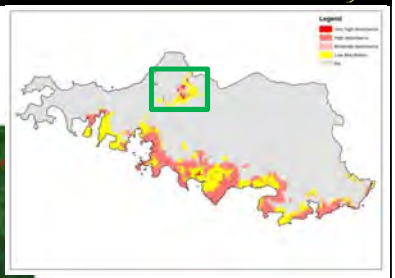
Central Suau, Milne Bay: Active Change Area:

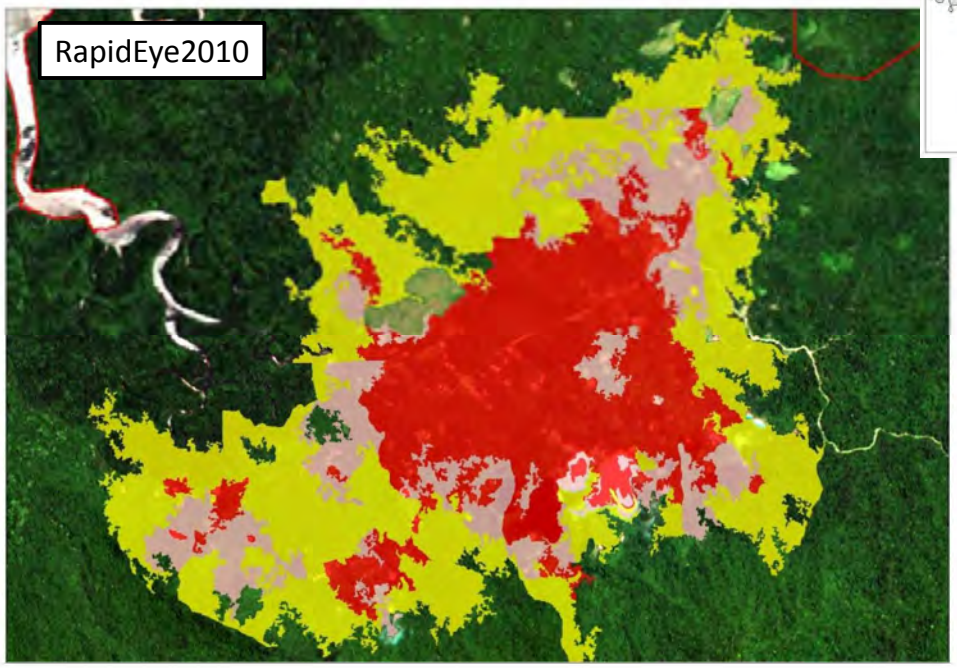




2000

Central Suau, Milne Bay: Active Change Area:





2005

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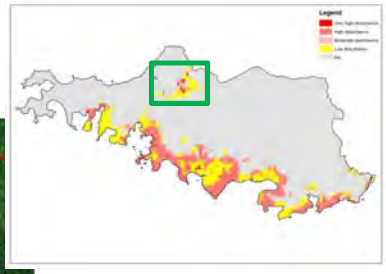
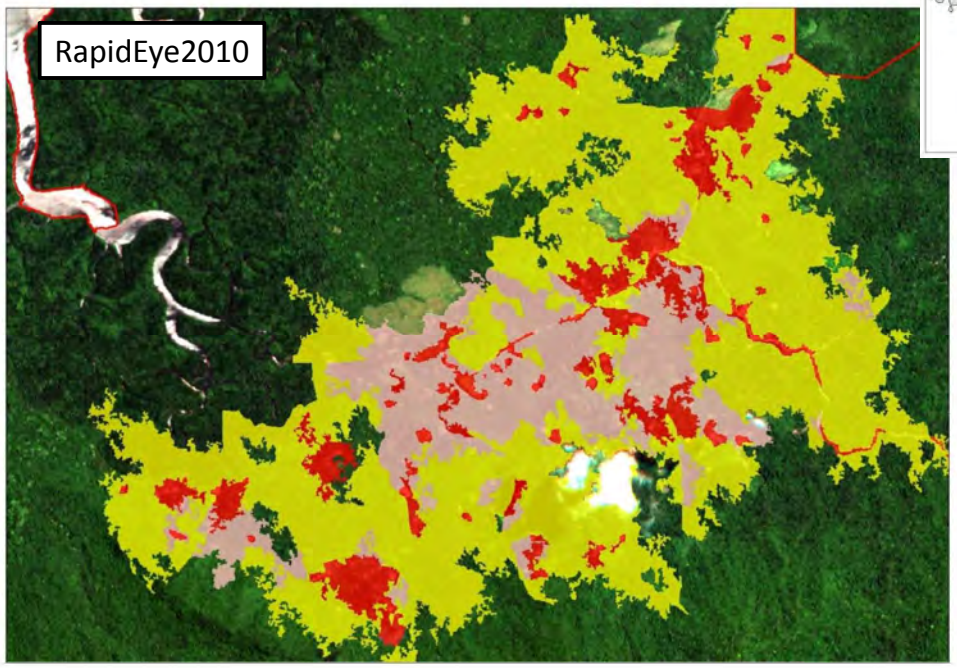
Central Suau, Milne Bay: Active Change Area:





2010

Result: Stock Change Equation

- *Stock-Difference Method* can be used where carbon stocks in relevant pools are measured at two points in time to assess carbon stock changes

$$\Delta C = (C2 - C1)/(t2-t1)$$

Where:
ΔC = annual carbon stock change in the pool, tonnes C yr-1
C1 = carbon stock in the pool at time t1, tonnes C
C2 = carbon stock in the pool at time t2, tonnes C

Source: Chapter 4 (pg-4.19) 2006 IPCC Guidelines for National Greenhouse Gas Inventories

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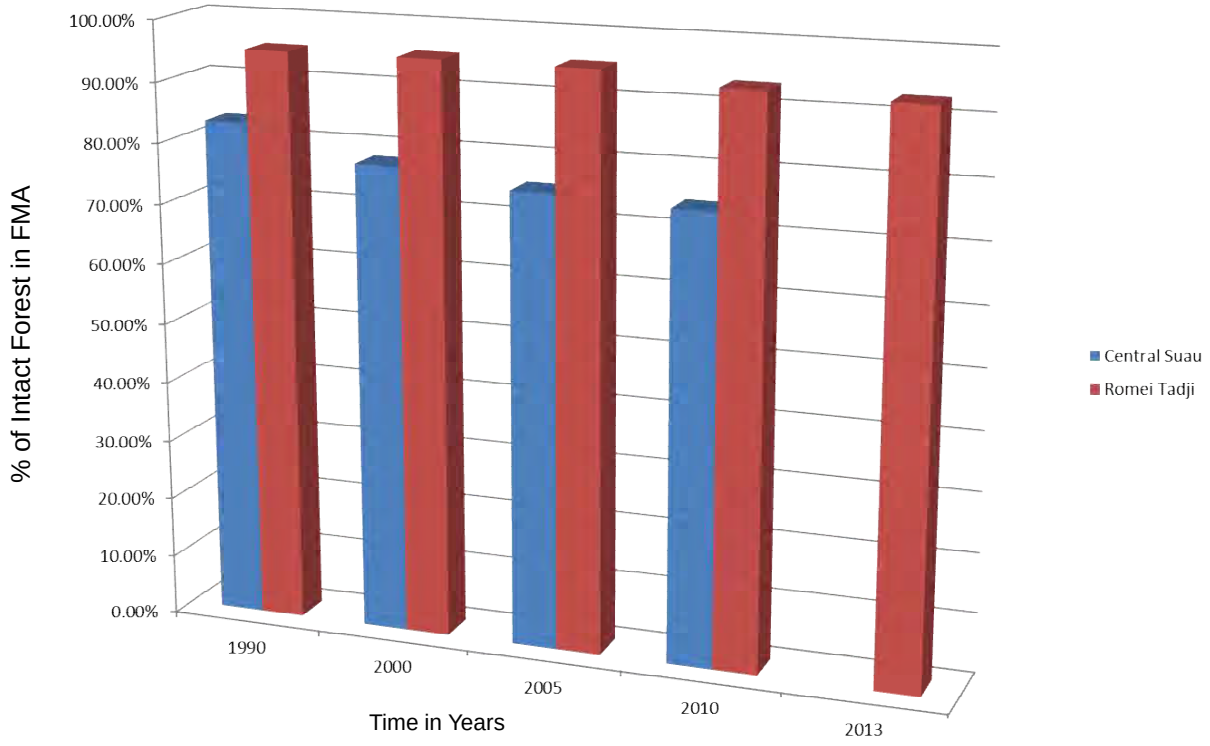
Result: Stock Change Matrix for Romei Tadji with 29 classes

IPCC-KC	FIMS Code	Land Cover Type	1990	2000	2005	2010	2013
Forest Land	P	Intact Low Altitude Forest on Plains and Fans	67,655.41	65,483.88	62,869.29	58,408.18	57,028.44
	P8	Low Disturbed Low Altitude Forest on Plains and Fans			31.78	527.76	2,686.76
	P5	Medium Disturbed Low Altitude Forest on Plains and Fans		52.57	4,734.02	4,798.97	4,510.98
	P2	High Disturbed Low Altitude Forest on Plains and Fans	79.06	2,561.05	349.94	2,155.65	677.92
	H	Intact Low Altitude Forest on Uplands	96,433.95	95,756.03	95,657.04	95,321.11	94,971.16
	H8	Low Disturbed Low Altitude Forest on Uplands			571.14		2.03
	H5	Medium Disturbed Low Altitude Forest on Uplands			166.37	248.43	397.67
	H2	High Disturbed Low Altitude Forest on Uplands	26.64	652.53	17.49	380.18	448.23
	L	Intact Lower Montane Forest	61.61	61.61	61.61	61.61	61.61
	B	Intact Littoral Forest	1,534.97	1,448.33	1,391.39	1,391.56	1,393.16
	B8	Low Disturbed Littoral Forest			56.94		
	B5	Medium Disturbed Littoral Forest		86.55	86.55		
	B2	High Disturbed Littoral Forest					
	Fsw	Intact Swamp Forest	2,372.17	2,369.92	2,369.92	2,372.13	2,372.17
	Fsw8	Low Disturbed Swamp Forest					
	Fsw5	Medium Disturbed Swamp Forest		2.26	2.26		
	Fsw2	High Disturbed Swamp Forest					
	W	Intact Woodland	17,086.65	16,537.02	16,060.45	16,411.44	16,188.61
	W8	Low Disturbed Woodland			1,126.79	41.03	41.03
	W5	Medium Disturbed Woodland	74.22	657.96		24.08	
	W2	High Disturbed Woodland	40.81		7.74		32.94
	M	Intact Mangrove	660.58	660.58	660.58	660.58	660.58
Grassland	G	Grassland	5,826.76	5,652.41	5,812.88	6,145.93	6,234.65
Cropland	O	Agriculture	219.22	304.19	349.19	1,344.63	2,641.53
Wetland	E	Large rivers and lakes	1,885.89	1,890.12	1,890.12	1,888.27	1,889.05
Settlement	U	Settlements and large urban centres	1,123.51	759.06	652.73	1,988.86	2,450.96
	NA	Road (Separated from 'U')	272.18	396.61	404.25	348.91	348.88
	NA	Logging Road (Separated from 'U')				631.16	100.10
Other land	Z	Bare areas	4.27	25.24	27.44	207.44	219.44
		Total	195,357.87	195,357.87	195,357.87	195,357.87	195,357.87

Result: Intact Forest Comparison



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Result: Stock Change Forest Classess with default AGB values

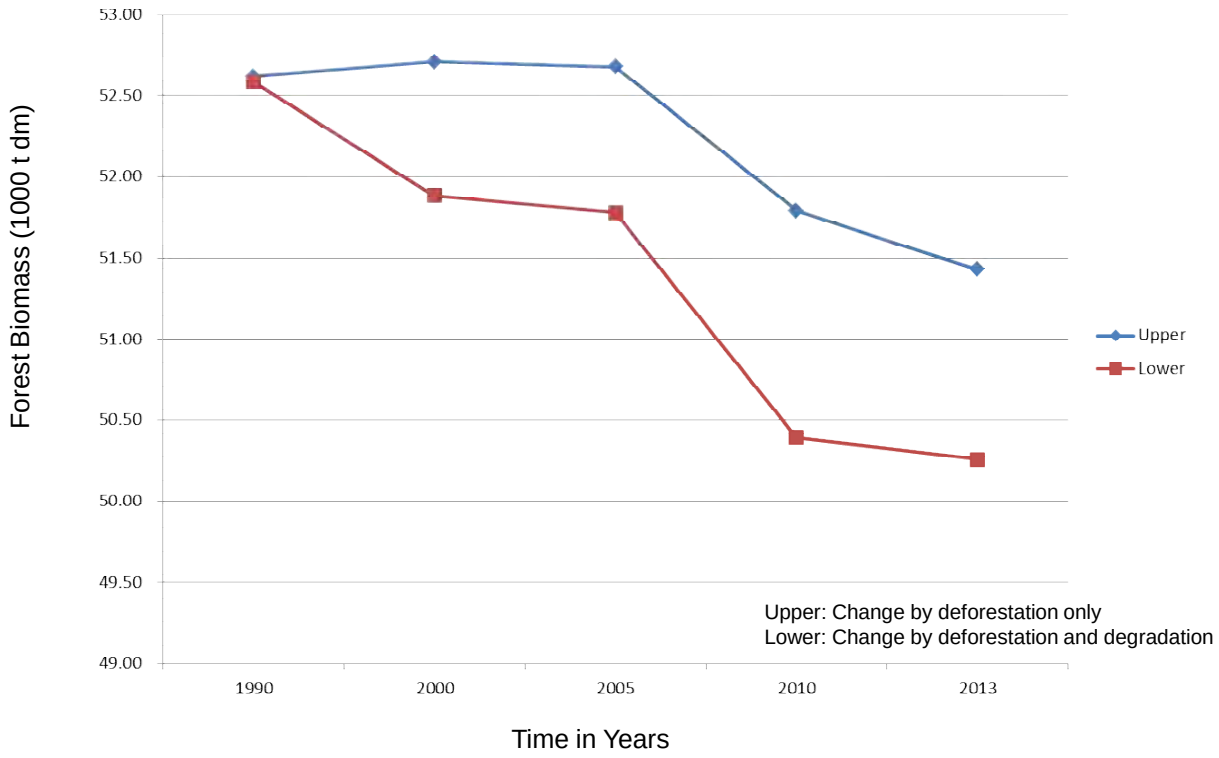
Code	VEGNAME	AGLB(t/ha)
P	Low Altitude Forest on Plains & Fans	300
H	Low Altitude Forest on Uplands	300
L	Lower Montane Forest	140
Mo	Montane Forest	140
D	Dry Seasonal Forest	180
B	Littoral Forest	180
Fri	Seral Forest	300
Fsw	Swamp Forest	300
M	Mangrove Forest	192
W	Woodland	130
Sa	Savanna	70
Sc	Scrub	70

Result: Carbon Calculations per strata – Romei Tadji

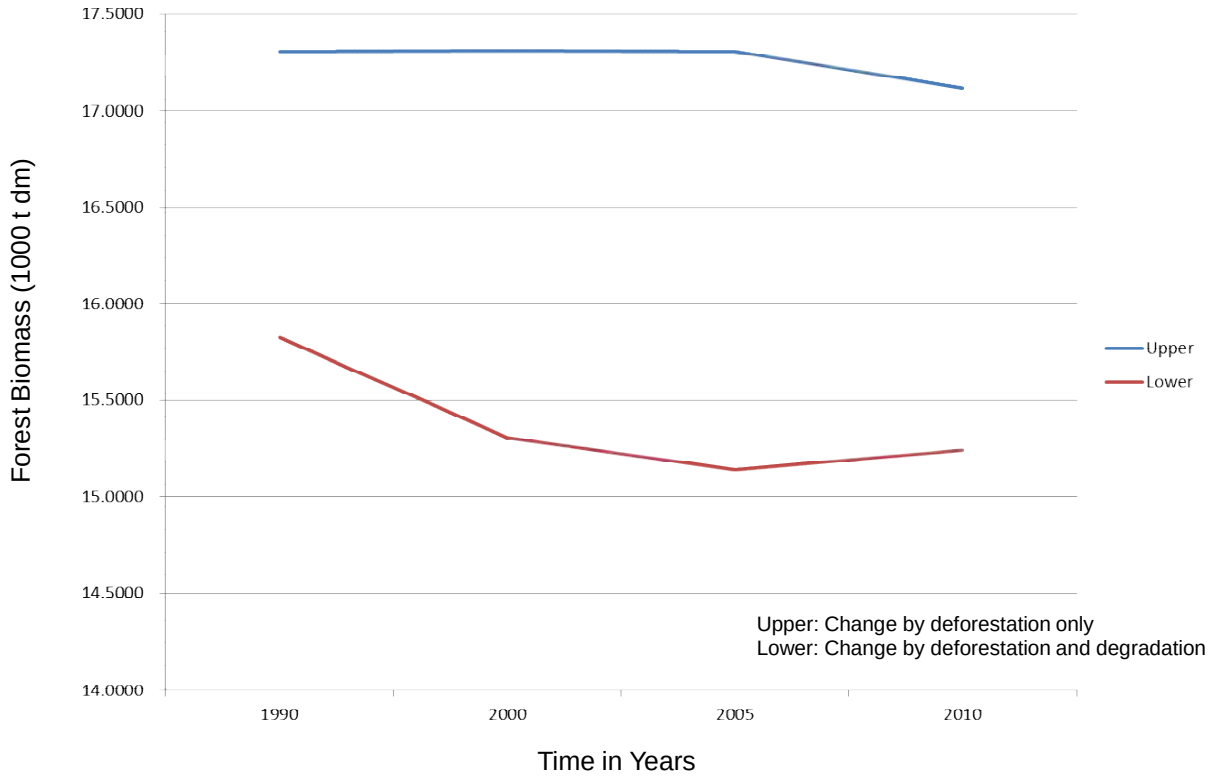
Land Cover Type (National level)	1990	2000	2005	2010
Intact Low Altitude Forest on Plains and Fans	20.30	19.65	18.86	17.52
Low Disturbed Low Altitude Forest on Plains and Fans	-	-	0.01	0.16
Medium Disturbed Low Altitude Forest on Plains and Fans	-	0.02	1.42	1.44
High Disturbed Low Altitude Forest on Plains and Fans	0.02	0.77	0.10	0.65
Intact Low Altitude Forest on Uplands	28.93	28.73	28.70	28.60
Low Disturbed Low Altitude Forest on Uplands	-	-	0.17	-
Medium Disturbed Low Altitude Forest on Uplands	-	-	0.05	0.07
High Disturbed Low Altitude Forest on Uplands	0.01	0.20	0.01	0.11
Intact Lower Montane Forest	0.01	0.01	0.01	0.01
Intact Littoral Forest	0.28	0.26	0.25	0.25
Low Disturbed Littoral Forest	-	-	0.01	-
Medium Disturbed Littoral Forest	-	0.02	0.02	-
High Disturbed Littoral Forest	-	-	-	-
Intact Swamp Forest	0.71	0.71	0.71	0.71
Low Disturbed Swamp Forest	-	-	-	-
Medium Disturbed Swamp Forest	-	0.00	0.00	-
High Disturbed Swamp Forest	-	-	-	-
Intact Woodland	2.22	2.15	2.09	2.13
Low Disturbed Woodland	-	-	0.15	0.01
Medium Disturbed Woodland	0.01	0.09	-	0.00
High Disturbed Woodland	0.01	-	0.00	-
Intact Mangrove	0.13	0.13	0.13	0.13
Total:	**52.62**	**52.71**	**52.68**	**51.79**

JICA-PNGFA PROJECT for Capacity Development on Forest Resource Monitoring for Addressing Climate Change

Result: Graph of Forest Change Biomass in Romei Tadji FMA, West Sepik



Result: Graph of Forest Change Biomass in Central Suau



JICA-PNGFA PROJECT for Capacity Development on Forest Resource Monitoring for Addressing Climate Change

Limitation

- Landsat 30m resolution difficulties of interpreting (1990, 2000, 2005 and 2013)
- Cloud cover in Landsat and RapidEye hinder detection process
- Lack of knowledge on land use types
- Mangrove forest changes not captured very well
- Segmentation (2010) not fully defining situation in previous years (1990, 2000, 2005)

Recommendation

- Develop “Area of Interest” to train or teach imagery for classification
- Filtering clouded areas using GeoSAR before interpreting imagery
- Application of Accuracy Assessment on GIS classification
- Use of Gain-Loss Method LULUCF
- Uncertainty Assessment on Area calculation (preparation to reach Tier 2)
- Better classification workflow and Step-by-step GIS rules application

JICA-PNGFA PROJECT for Capacity Development on Forest Resource Monitoring for Addressing Climate Change

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Thank you and/or
(Tenkyu tru) and/or
(Arigatou gozaimasu)

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Achievements of the Current Project -Output Three-

Tatsuya Watanabe

Chief Advisor

JICA PNGFA Project

Contents

1. Expected Output 3 and activities

➢Expected Output 3: To address climate change, the monitoring system of forest resource including carbon stock is improved.

➢Activities under Output 3:

a. Participation to REDD+ Working Group
b. Liaison with OCCD
   - ✓ COP participation (1)
c. Preparation of basic design of forest resource monitoring system
d. Estimation of past forest carbon change
   - ✓ Biomass Survey (2), Current Carbon Stock Estimation (3), Change Detection(4),(5)
e. Development of preliminary Forest Reference Emission Levels

2. Achievement of Output 3 measured by Indicators

✓ Achievement of Output 3

- To address climate change, the monitoring system of forest resource including carbon stock is improved.

✓Indicators

1. The basic design of appropriate forest resource monitoring system is prepared in written format
   Partly completed (not yet summarized in written format)
2. The past change of national forest carbon stock is estimated
   Partly completed (for a specific area, not nation-wide)
3. Preliminary reference emission levels for REDD+ are developed
   Partly completed (for a specific area, not nation-wide)

Modified from 'Summary of Terminal Evaluation' by PNG-Japan Joint Evaluation Team

3. Issues to be addressed

Schedule of the Plan of Operation of the Project might not be realistic. More inputs were needed for an estimation of national level carbon stock change and reference emission level.
→ Elements for project activities under new output three.

Design of the forest monitoring system remains as “basic design” only.
→ New activities under new output two.

JICA-PNGFA PROJECT for Capacity Development on Forest Resource Monitoring for Addressing Climate Change

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Thank you
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Arigatou gozaimashita

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Activities related to JICA T/C Project conducted by PNGFA

Goodwill Tony Amos

Manager- REDD and Climate Change

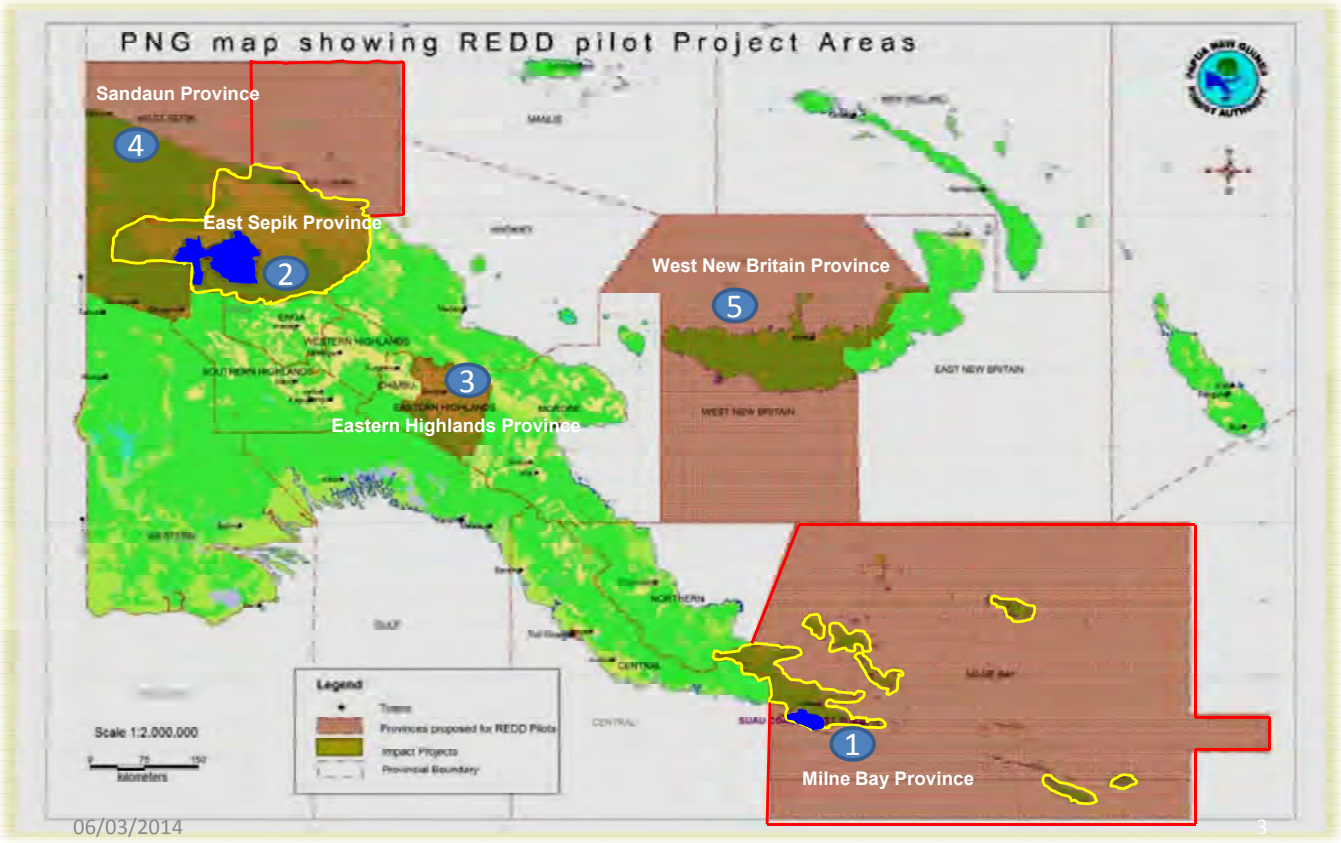
Forest Policy and Planning Directorate/ PNGFA

JICA-PNGFA PROJECT for Capacity Development on Forest Resource Monitoring for Addressing Climate Change

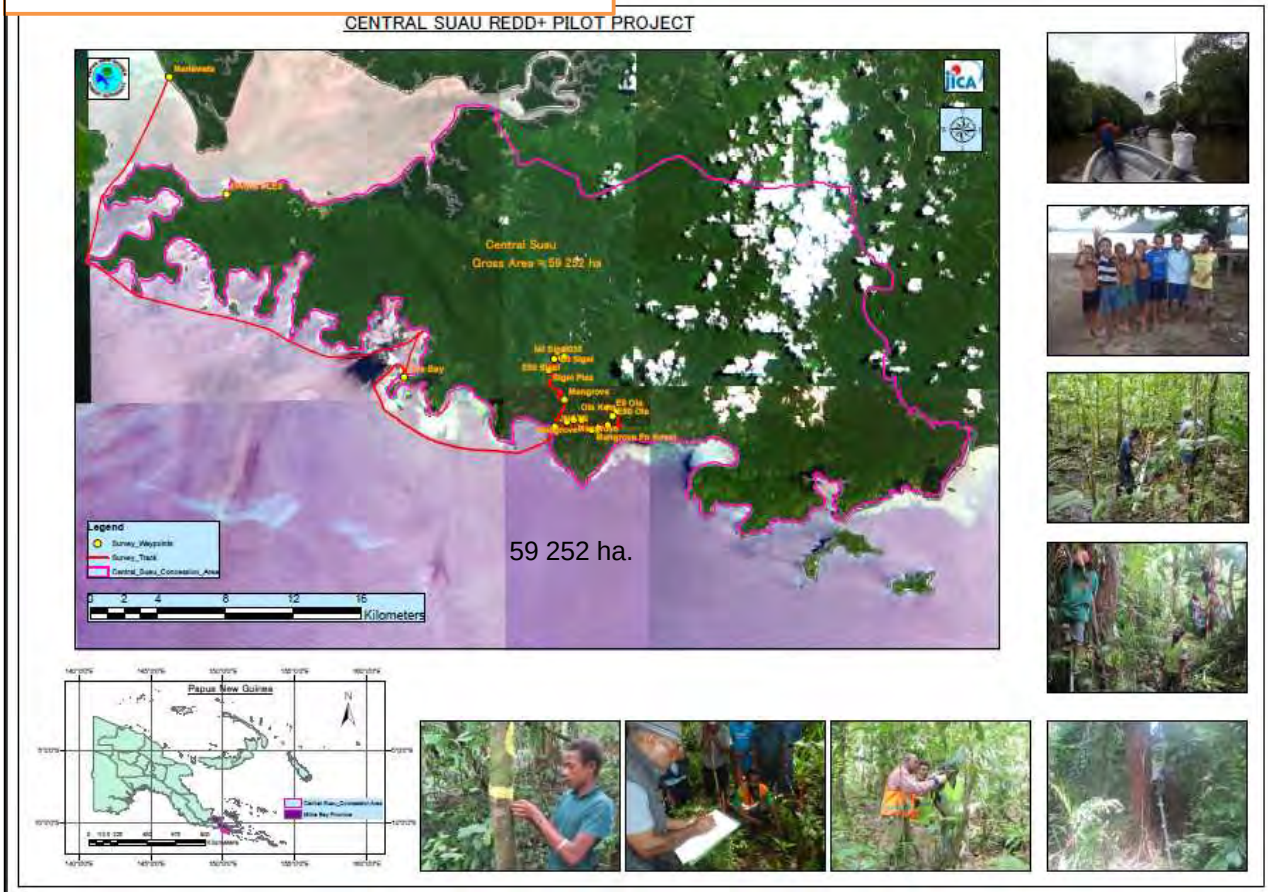
Outline

1. Five REDD+ Pilot Provinces
2. Milne Bay Province – Central Suau REDD+ Pilot
3. Activities conducted with collaboration with JICA
4. On-going activities for the REDD Pilot sites
5. Other Activities/Projects

1. FIVE REDD+ Pilot Provinces



2. Milne Bay Province

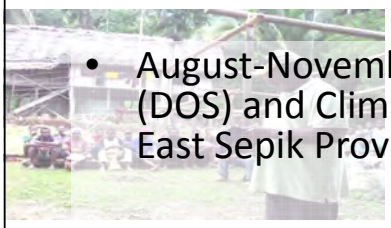


3. Activities conducted with collaboration from JICA

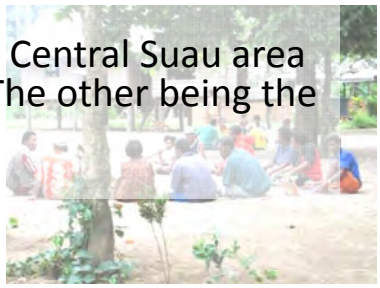
Duration	Activities	Purpose	Participants
March 2012	Climate Change Workshop (Port Moresby)	Discuss the methodology in data collection and assessment of the 5 Carbon Pools. Also with the demonstration of GPS instrument, tree measurement and soil/litter sample collection.	Area Officers, Provincial Officers, FRI, HQ, DEC, OCCD
May 2012	Preliminary Forest Biomass Survey for Central Suau, Milne Bay Province	To test out the "L" shaped plot to collect forest biomass data and align the flight path of the satellite (Rapid Eye) at the same time prepare for the major biomass survey (October-November)	Provincial Officers, FRI, FPPD (HQ), Landowners (Ipulai)
September 2012	Below Ground Biomass Training Workshop (Lae)	To conduct a destructive sampling of some trees with the aid of excavator in particular with the measurement of fresh and dry weight of the tree. The training was conducted in 3 parts: theory, field and laboratory.	Area Officers, HQ, Provincial Officers, FRI, OCCD, NGOs and Landowners (Oomsis)
October- November 2012	Main Forest Biomass Survey for Central Suau, Milne Bay Province	To collect data and determination of carbon content for the forest types in four selected locations within the Central Suau area.	HQ, Provincial Officers, Area Officers, FRI, UNITECH (Lecturers & students), landowners (Mila, Leileiafa, Ipulai and Modewa).

Activities conducted with collaboration from JICA

4. On-going Activities for the REDD Pilot Sites



- August-November 2012: Conducted the Development Option Study (DOS) and Climate Change Awareness for the April Salumei FMA, East Sepik Province.
- October-November 2012: Awareness on REDD, Climate Change and the New ILG Legislation (Act 2009) for Central Suau, Milne Bay Province. Also informing the people that the major biomass survey was going to be conducted in selected sites.



- April-May 2013: Conducted two activities for the Central Suau area (MBP), i.e. ILG Verification and Documentation. The other being the Vulnerability and Adaptation Assessment.

5. Other Activities/Projects

- Multi-Purpose National Forest Inventory (UNREDD-FAO): Conducted three workshops (October 2012, February 2013 and September 2013) and one dendrology refresher course training (August 2013) conducted in Lae (FRI).
- Community Forest Management (ITTO): Conducted a workshop in September 2013 (key partners identified for the Pre-project phase) and after consultation meetings carried out for each respective partners' project or pilot sites.
- JICA Project has funded 3 international meetings including 2 UNFCCC COPs in Doha (COP 18) in 2012 and in Warsaw (COP 19) in 2013 and also the APFNet Meeting in Beijing in 2012.

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Collaboration with UN-REDD/FAO & JICA in PNG

Gewa Gamoga

REDD & Climate Change Branch
Forest Policy & Planning Directorate
PNG Forest Authority

JICA-PNGFA PROJECT for Capacity Development on Forest Resource Monitoring for Addressing Climate Change

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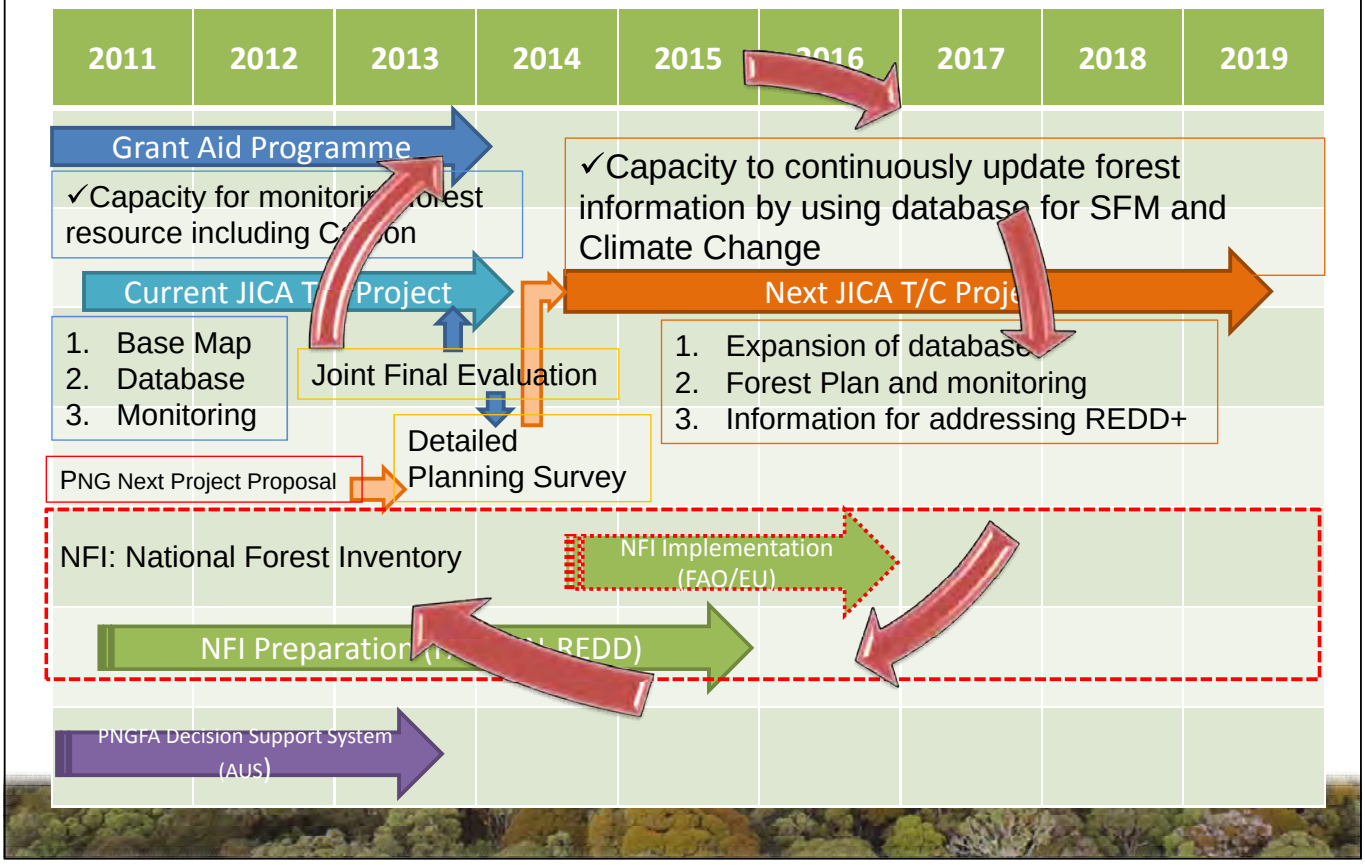
Outline

1. National Forest Inventory (NFI) Brief
2. JICA-PNGFA Project's Contribution to NFI
3. Summary -

Sequence for terminal evaluation and new project formulation in the timeframe of JICA and relevant projects in 2011-2019



Background

- Funding
  - EU and UNREDD Program
- Project title
  - Technical support to the PNG Forest Authority to implement a multi-purpose National Forest Inventory
- Period
  - October 2013 - September 2016

Background

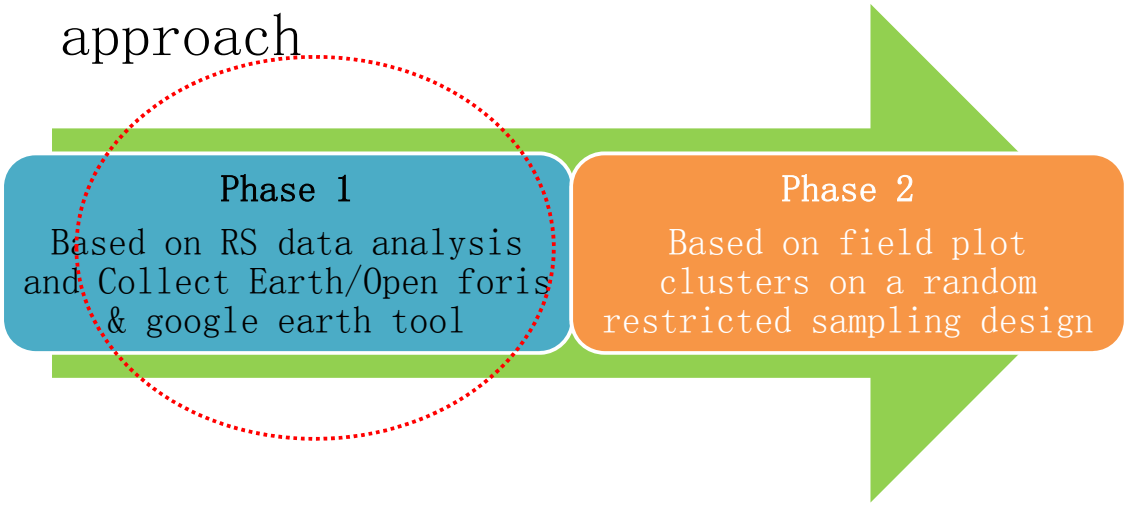
- The project overall objective
  - is to contribute to the implementation of PNG's policies and measures for climate change mitigation.
- The purpose
  - is to support the PNG Forest Authority to implement a continuous and multi-purpose National Forest Inventory (NFI) as part of a National Forest Monitoring System that will fulfil the UNFCCC Cancun and Copenhagen decision requests

Background

- **Key features of this project**
  - Capacity building to improve the capabilities of the PNG Forest Authority and the University of Technology-Department of Forestry on continuous and multi-purpose forest monitoring systems.
  - Capacity development to establish the first multi-purpose National Forest Inventory of PNG
  - NFI Information and Data Sharing System Development
  - Support to research and education activities on PNG forests.
  - Promote policy dialogue on forestry.

NFI Progress

- Inventory Approach
- PNG has taken a double sampling approach



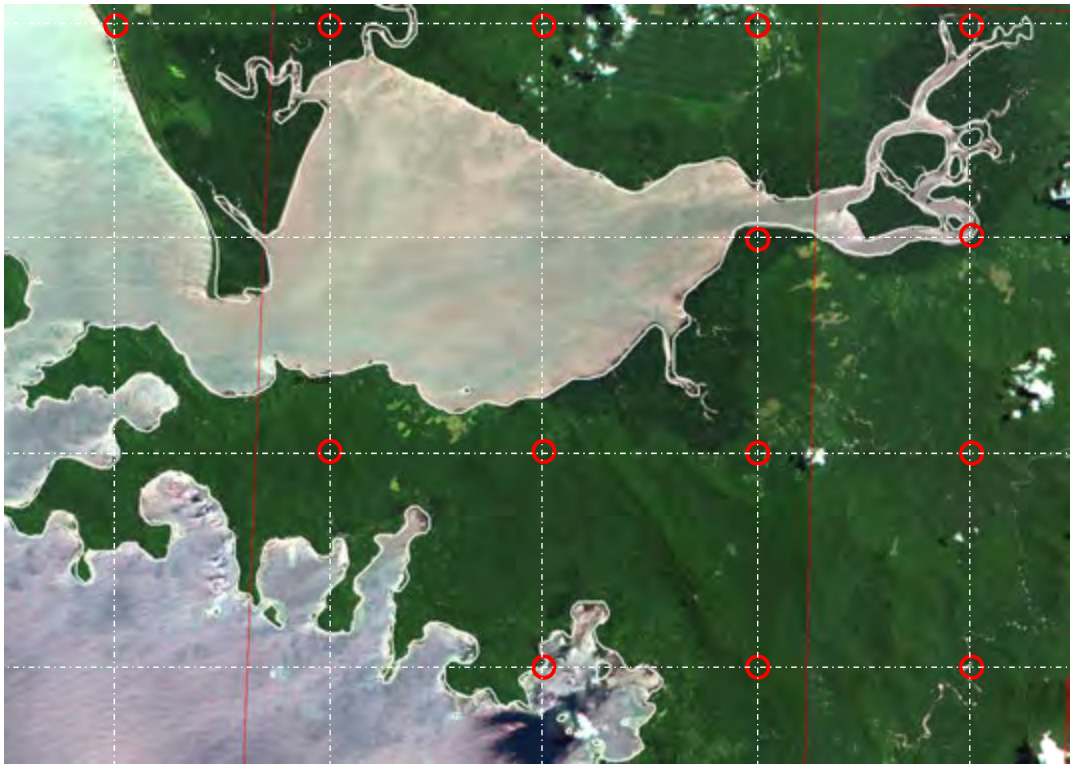
Phase 1 - Pre-Inventory Assessment

1. Sampling Design
   - Systematic grid 4x4 km
   - 25,279 tracts covering PNG
2. Sampling Unit
   - 1 hectare (100m x 100m) & 25 check points
3. Classification:
   - IPCC land use categories and sub-categories + PNG Forest type and Vegetation classifications as sub-divisions

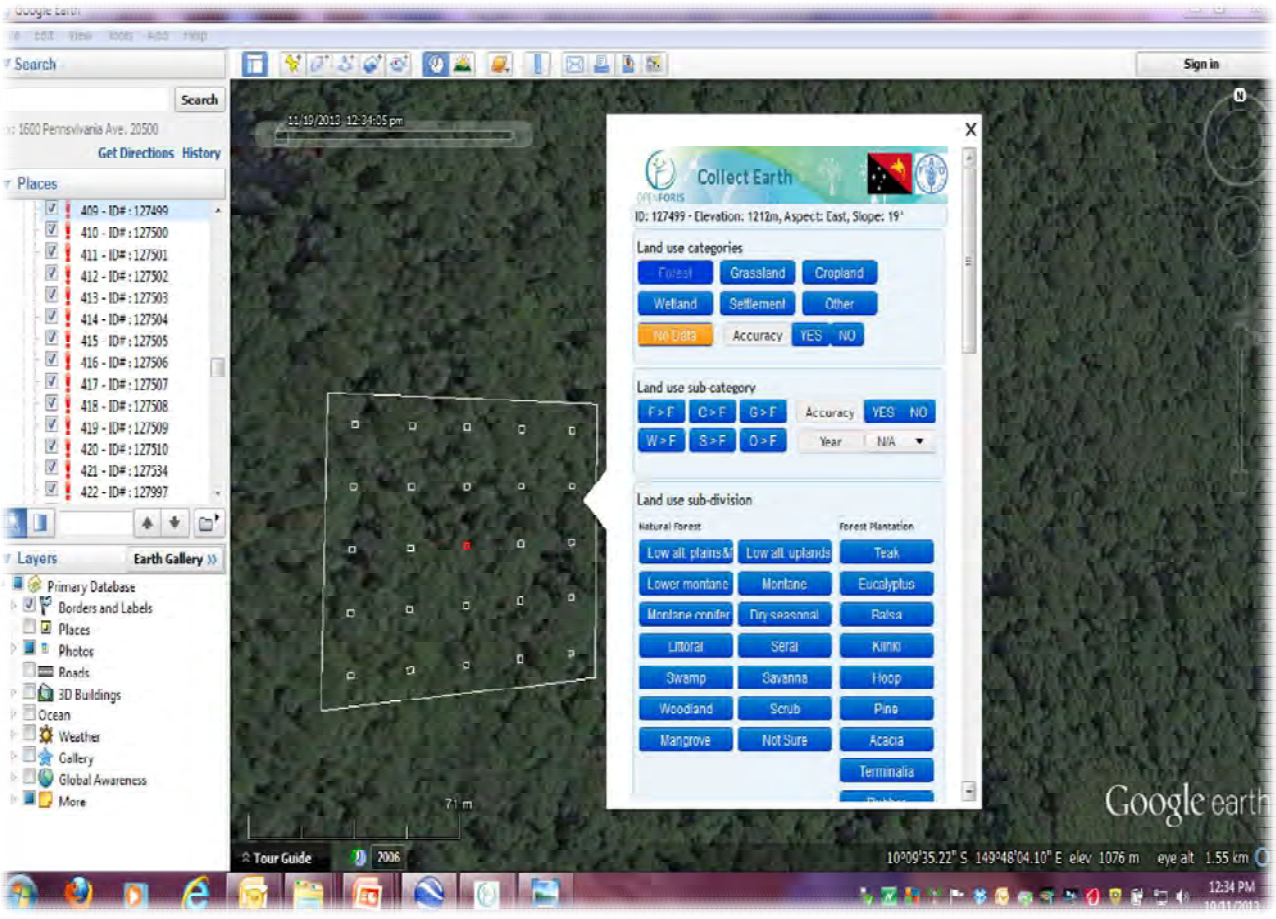
Collect Earth PNG

- We are using "Collect Earth" to assess forest and land use
- A basic and user friendly tool to assess land use and land cover changes
  - through point sampling and visual interpretation of RS data using Google Earth

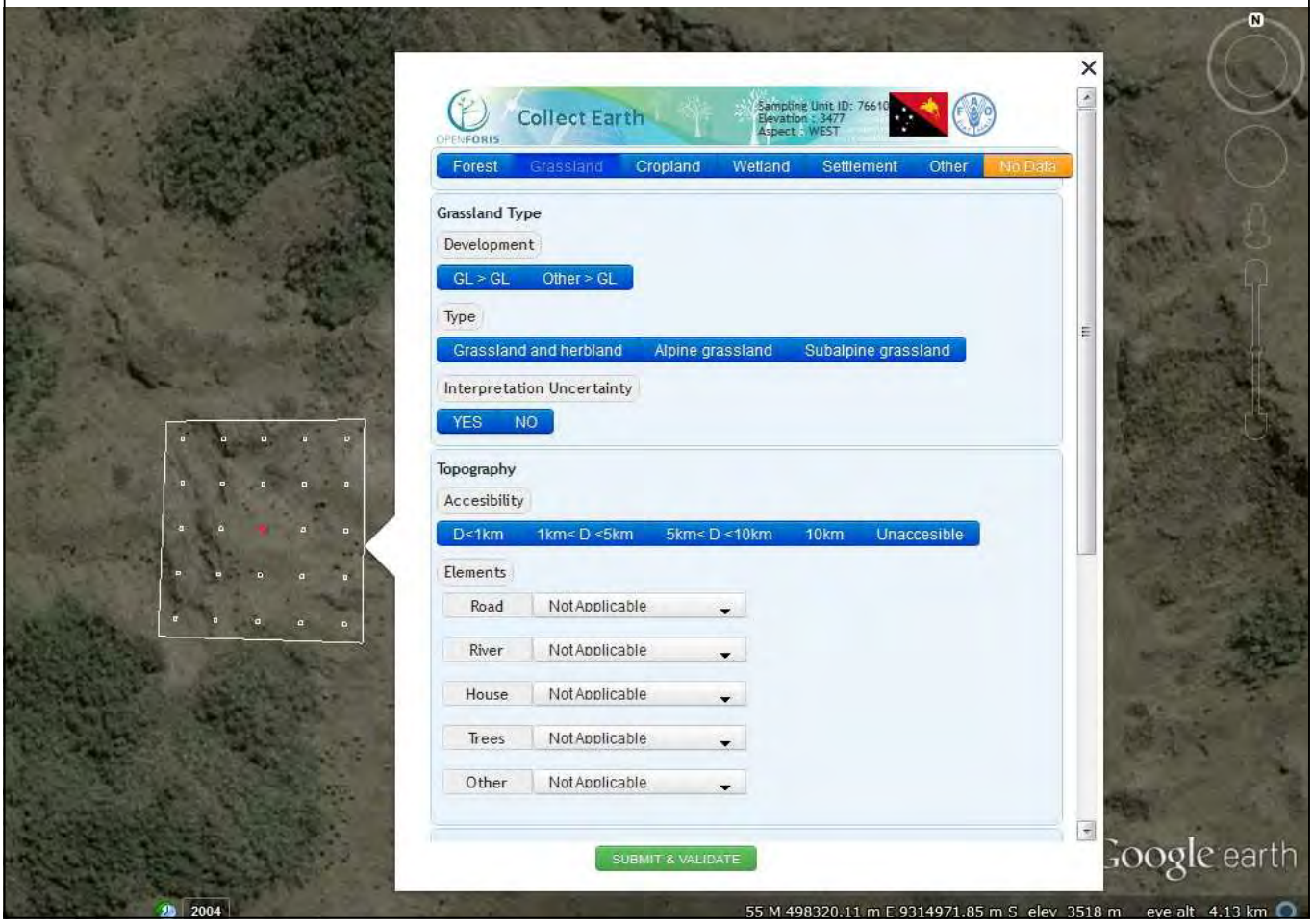
Landscape detail of Rapid Eye image coverage with sample plots distribution



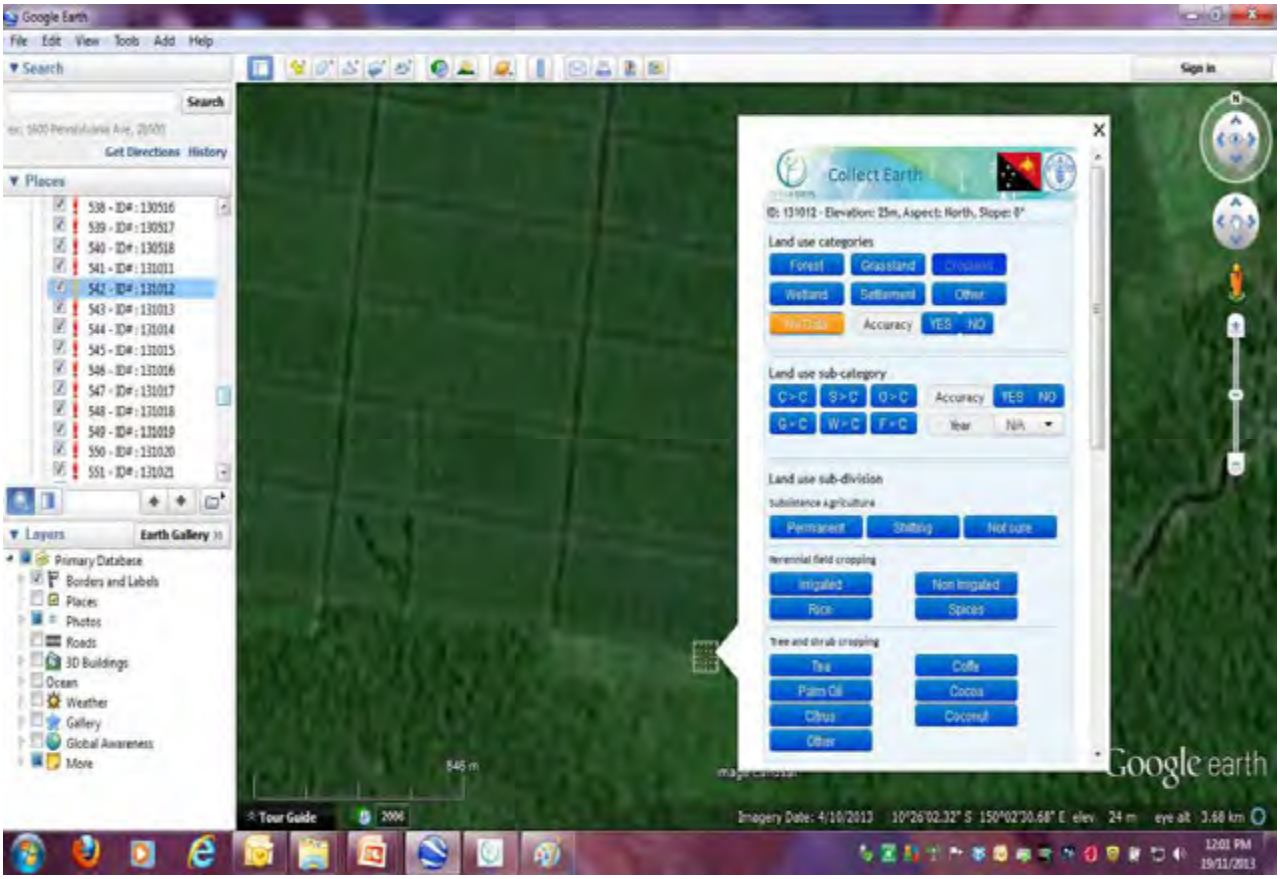
Collect Earth layout for forest land:



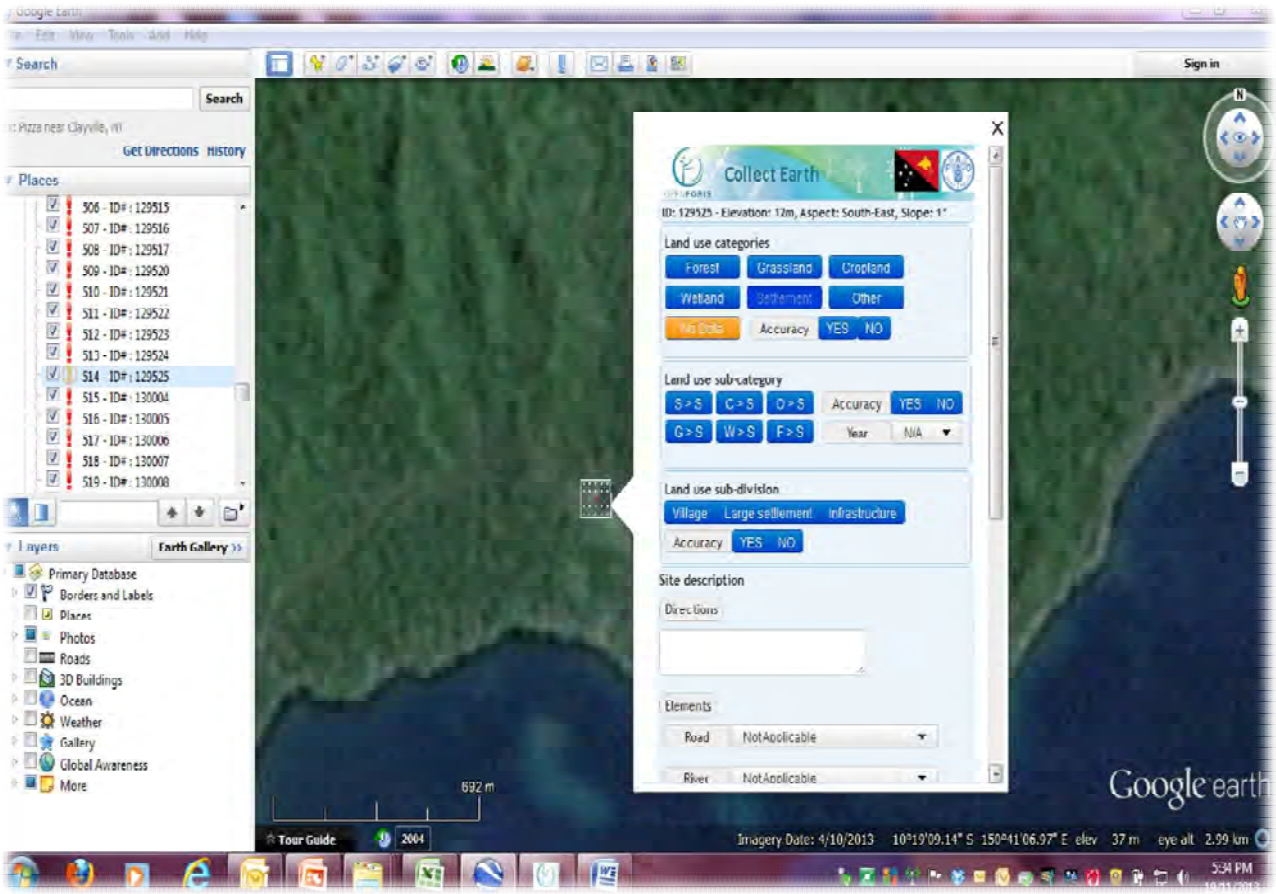
Collect Earth PNG layout for grassland:



Collect Earth PNG layout for Cropland:



Collect Earth PNG layout for Settlement:

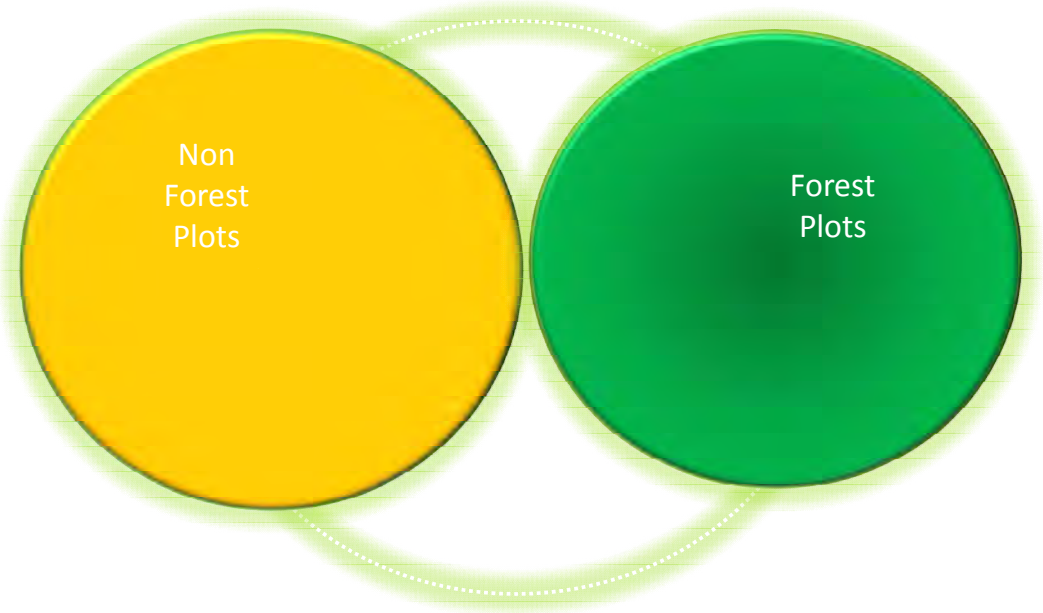


Phase 1 outputs

- After assessing all the 25,279 plots

Phase 1 outputs

- Separate Forest plots from non forest plots



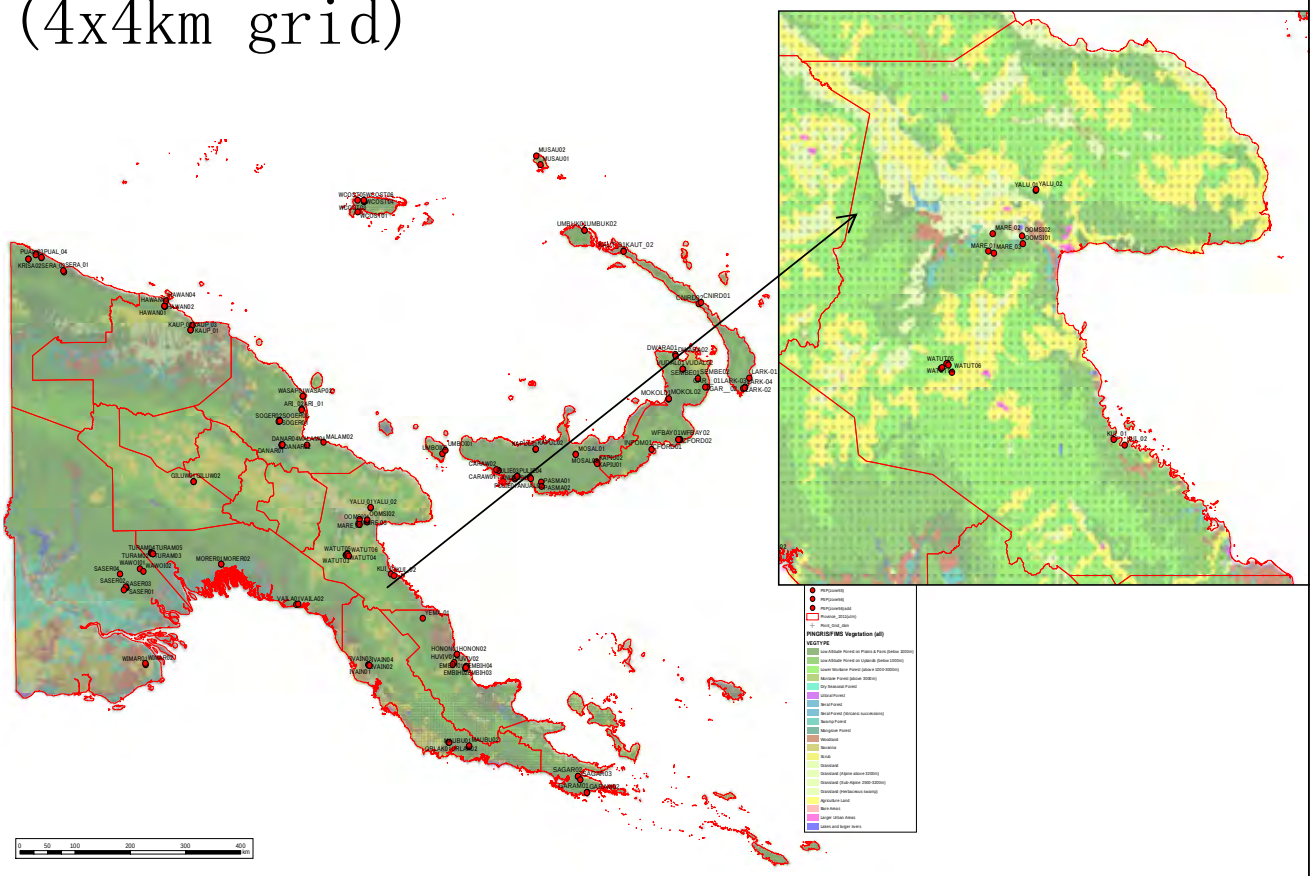
Phase 1 outputs

- Do further analysis of the forest plots for the 2nd phase

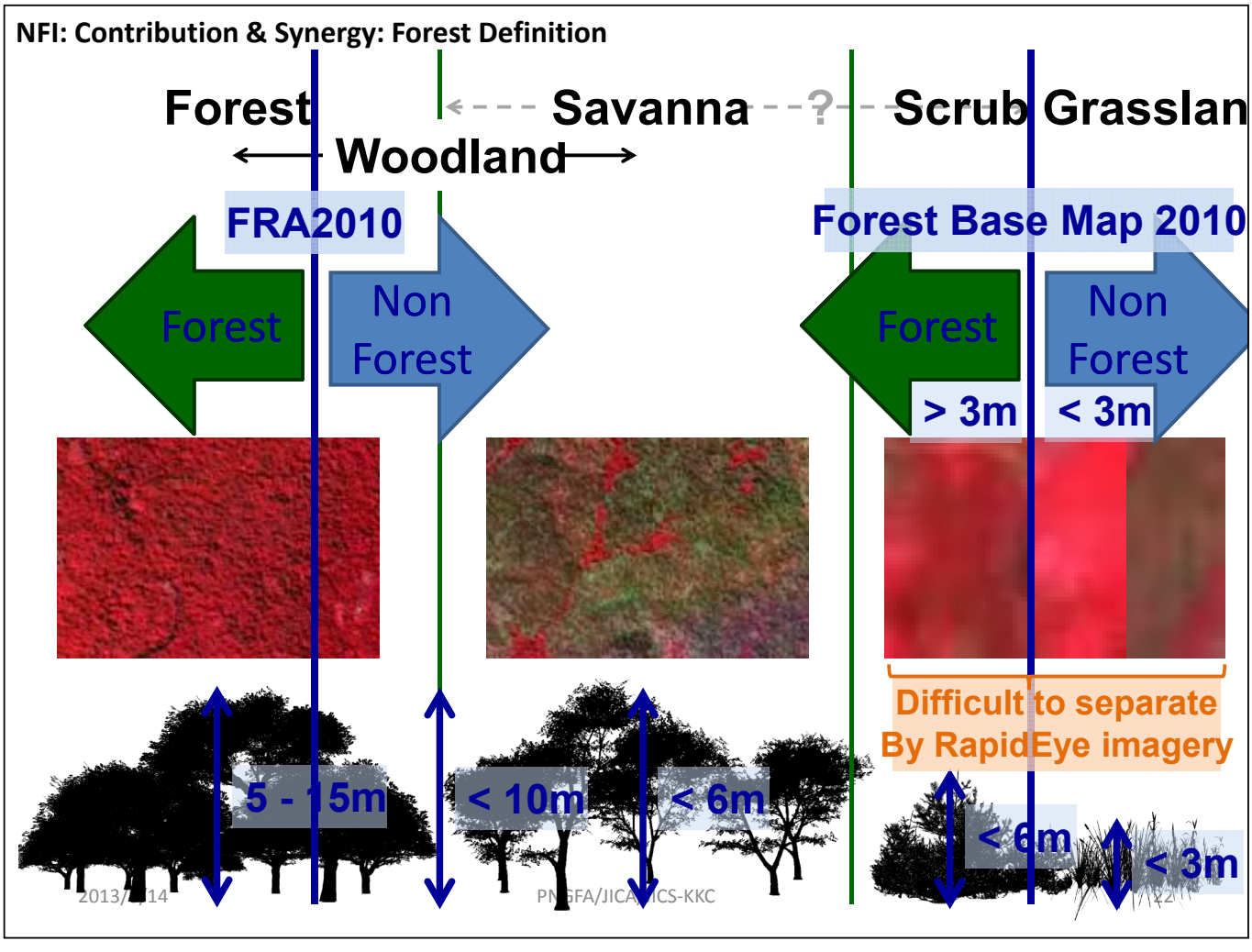
JICA-PNGFA Project Contributions to NFI

- Initial NFI Design & Planning
  - assist with 4km x4km grid
- Provide expert advice on defining the national ‘Forest Definition’.
- Provision of kmz files for
  - FIMs vegetation classes
  - rapid Eye images
  - timber concessions

Initial NFI Design & Planning (4x4km grid)



Forest Definition



NFI: Contribution & Synergy: Forest Definition

	Area	Canopy	Height	
	hectare	%	meter	
UNFCCC KP Range	0.05 - 1	10 – 30	2 – 5	
FAO FRA2010	0.5	10	5	
PNG WS, Feb. 2009	0.5	10	3	
PNG Tentative 2013	1	30	3	Small huddling 19 Feb. 2013
PNG FIMs	1 (smallest FMU)	>50 (LU4 Min.)		
Montane Forest			5 – 15	
Woodlands			Up to 10	
Savannah			Less than 6	
Scrub			Up to 6	
Grassland			Less than 3	
Agreement in Combined NFI WG (3)	1	10	3	16th Aug 2013, Lae

Provision of Kmz files for plot analysis

Landsat April 2013

Rapid Eye 2010

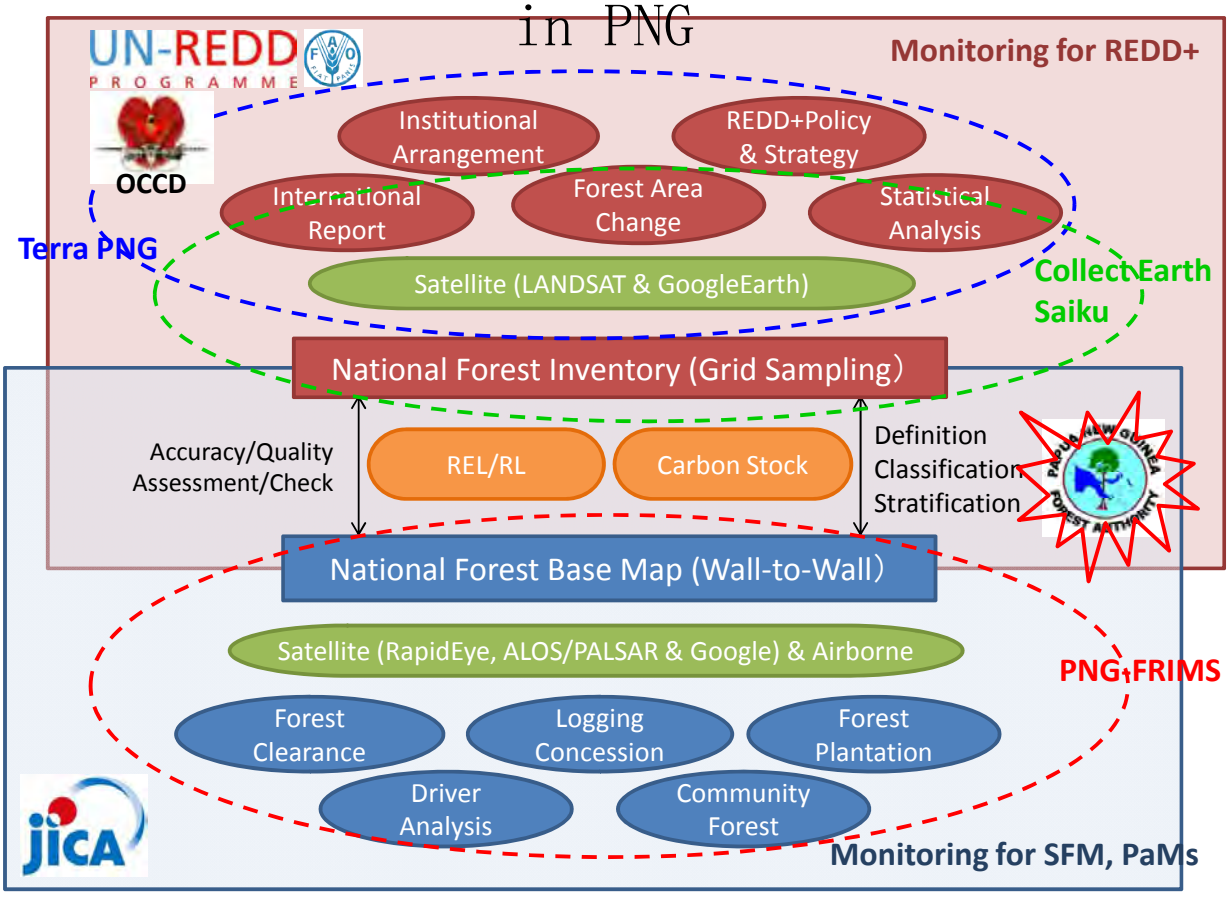
Landsat April 2013

RapidEye 2010

Collaboration with UN-REDD/FAO & JICA in PNG

Summary

Collaboration with UN-REDD/FAO & JICA in PNG



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Arigatou gozaimasu

Closing Ceremony and final Workshop for Project Completion
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Holiday Inn Hotel, Port Moresby, PNG

Detailed Design of the Next JICA Technical Cooperation Project

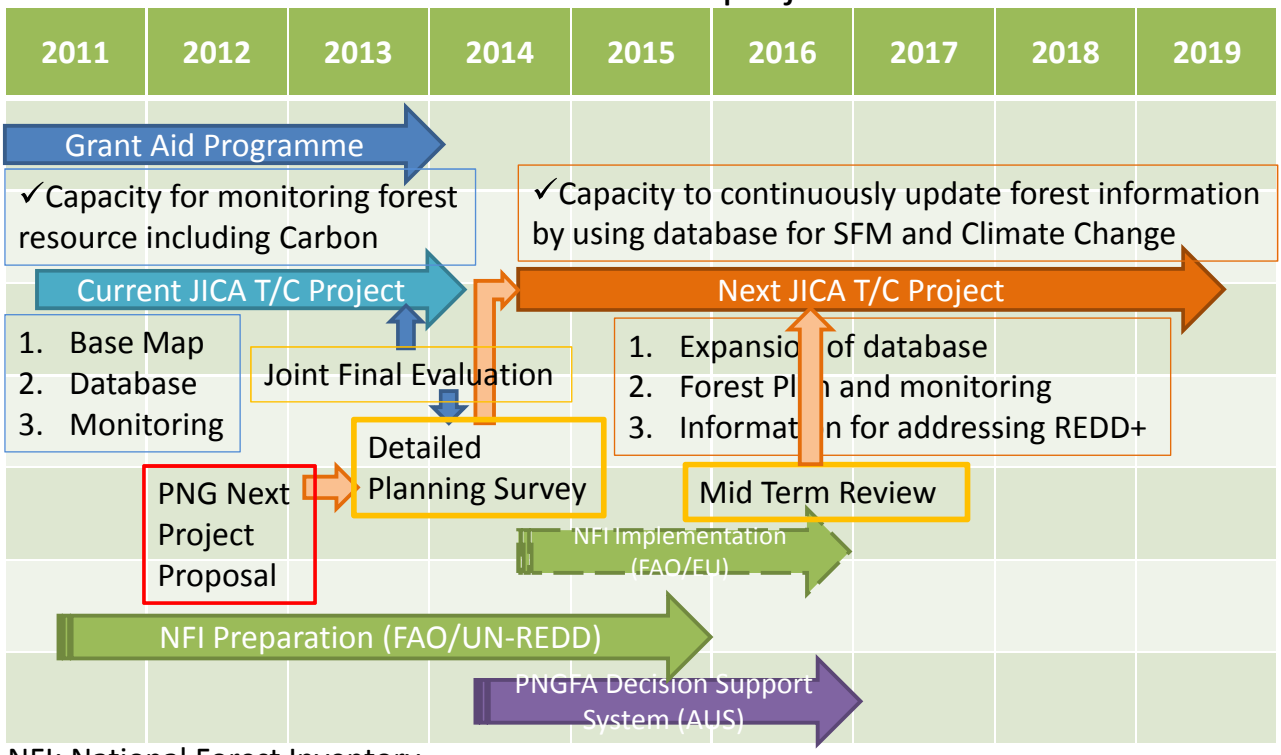
Tatsuya Watanabe

Chief Advisor

JICA PNGFA Project

Contents

1. Sequence for new project formulation in the timeframe of JICA and relevant projects in 2011-2019



NFI: National Forest Inventory

2. Outline of detailed planning survey

1. Survey Team

Mr. Hiroki MIYAZONO	Team leader, JICA HQ
Mr. Masahiko HORI	Forest Planning/Climate Change, Forestry Agency
Mr. Akira TAKAGI	Project Evaluation & Analysis, ICONS Inc.
Mr. Hiroyuki MIYAZAKI	Cooperation Planning, JICA HQ

2. Survey schedule

20th – 30th January 2014

3. Overall Concept of the new Project

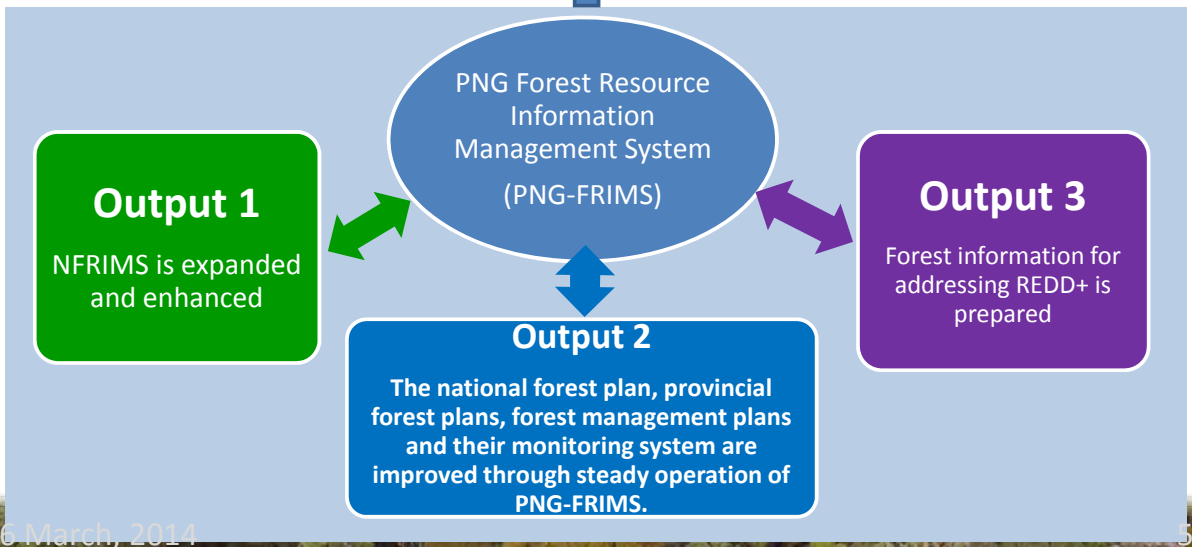
Project Period: 5 years (from 2014 to 2019)

Overall Goal

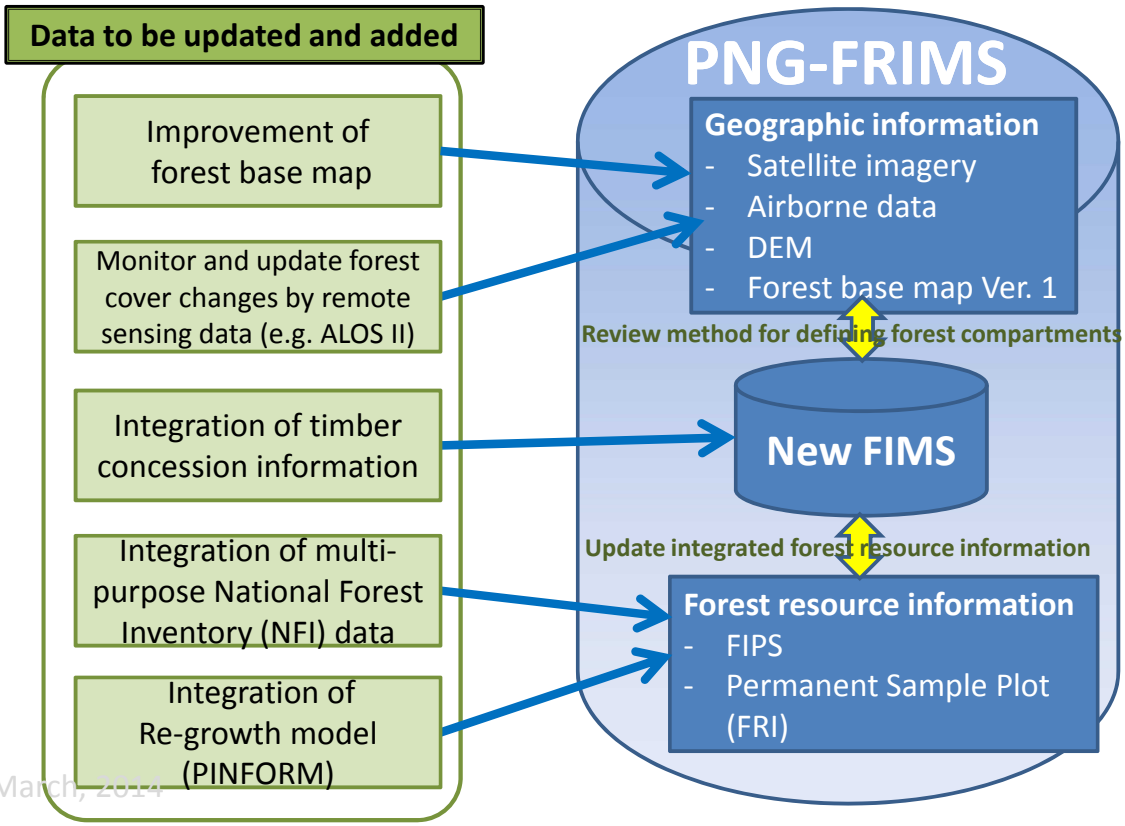
Forests in PNG are conserved and managed in a sustainable manner, while at the same time, mitigation and adaptation measures against climate change are promoted.

Project Purpose

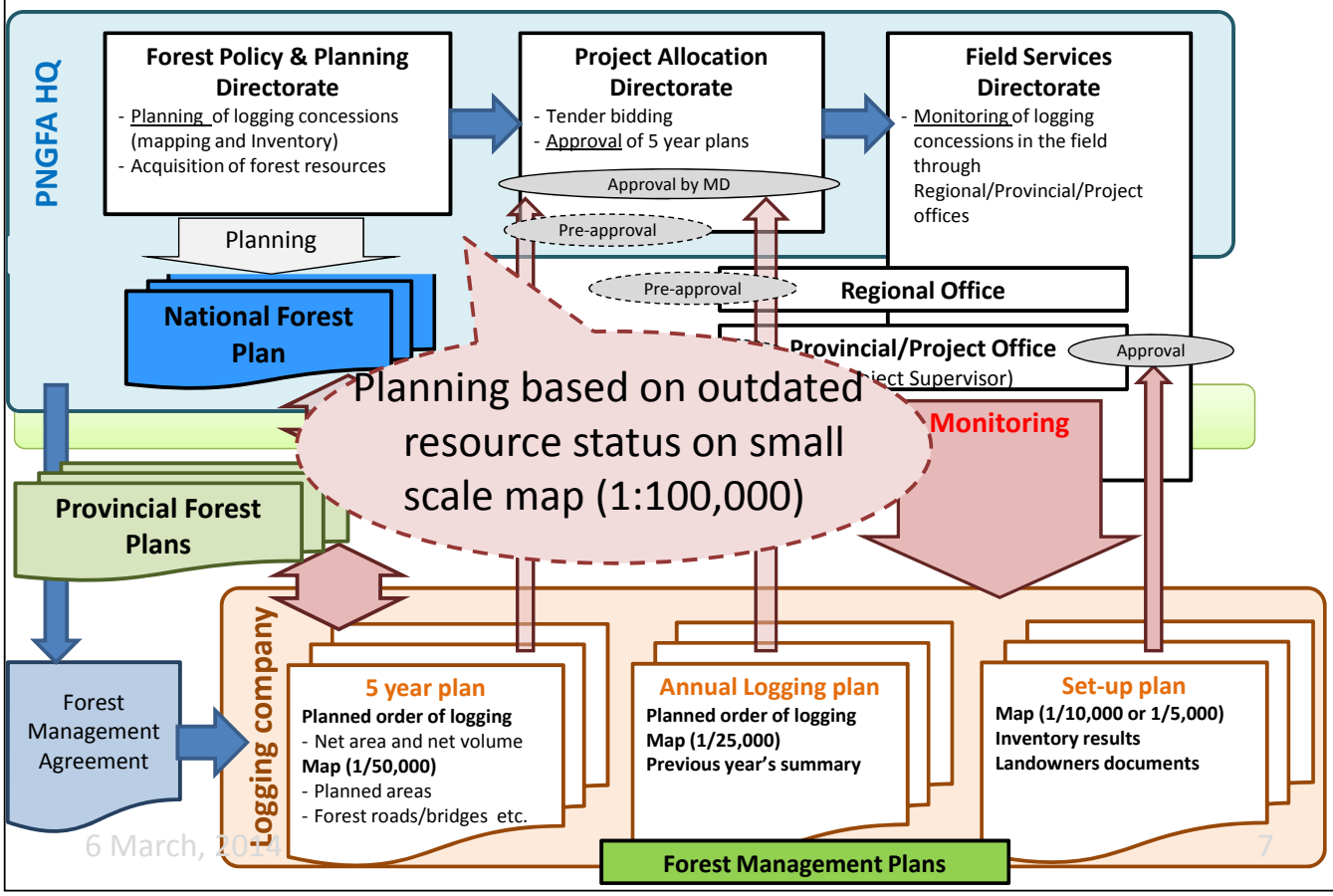
Capacity of the PNGFA to continuously update forest information and to fully operationalize and utilize PNG-FRIMS for promoting sustainable forest management and for addressing climate change is enhanced.



4. Output 1: The PNG Forest Resource Information Management System (PNG-FRIMS) is expanded and enhanced



4. Output 2: The national forest plan, provincial forest plans, forest management plans and their monitoring system are improved through steady operation of PNG-FRIMS.



4. Output 1 and 2: Issues to be tackled

- ◆Planning based on outdated resource status on small scale map (1:100,000)

  ➔ Limited capacity for evaluating logging operation plan

- ✓ Updating resource status on larger scale map

  ➔ Limited capacity for monitoring field logging operation

  ➔ Limited capacity for verifying compliance with the Logging Code of Practice

- ✓ Extended use of forest base-map, hand-held GPS, GIS and so on...

4. Output 1: The PNG Forest Resource Information Management System (PNG-FRIMS) is expanded and enhanced

Activities

1.1 Examine and identify information to be added and integrated to PNG-FRIMS.

1.2 Lay out a basic design for expansion and enhancement of PNG-FRIMS.

1.3 Examine the approach of updating the forest base map.

1.4 Examine the method of developing and updating information on growing stock.

1.5 Examine the method of reflecting the ground sample plot information on forest resources in the activities 1.3 and 1.4.

1.6 Examine the method of preparing information other* than the methods of the activity 1.3 and 1.4 if necessary.

1.7 Develop a prototype of upgraded PNG-FRIMS on the basis of the activities 1.1 - 1.6.

1.8 Operate the prototype on a trial basis and finalize PNG-FRIMS.

1.9 Develop a work manual of the PNG-FRIMS operation including field data collection.

1.10 Conduct training for keeping and improving the technical levels of PNGFA and other collaborators particularly on remote sensing, GIS and database which are necessary for the PNG-FRIMS operation.

*: Note for presentation. gardening, agriculture plantation, mining, wildlife, etc.

Output 2: The national forest plan, provincial forest plans, forest management plans and their monitoring system are improved through steady operation of PNG-FRIMS.

Activities

2.1 Review the current status of the forest planning system.

2.2 Experiment a series of the operations of forest management plans; evaluation, advice, approval (or preparation) and monitoring by utilizing PNG-FRIMS, in the pilot area(s).

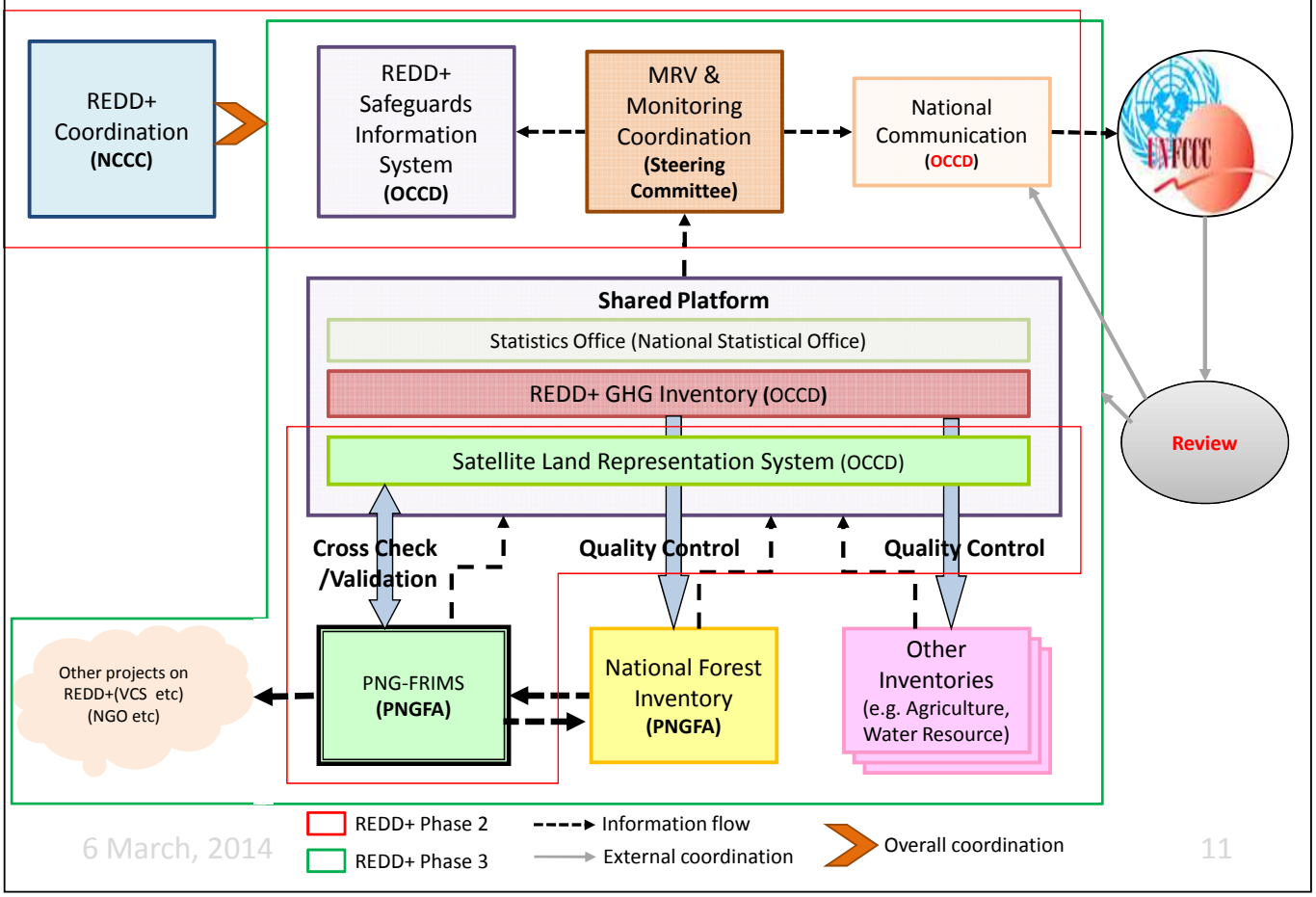
2.3 Hold training workshops for the PNGFA officers and other collaborators to disseminate the achievement in the pilot area(s).

2.4 Examine the content of inputs to the process of developing the next national and provincial forest plans on the basis of the output 1 and the activities 2.1 to 2.3.

2.5 Prepare guidelines of the overall forest planning using PNG-FRIMS on the basis of the activities 2.2 to 2.4.

2.6 Prepare and disseminate information on the Project outputs, taking the opportunities such as the training workshops.

4. Output 3: Forest information for addressing REDD+ is prepared



4. Output 3: Forest information for addressing REDD+ is prepared

Activities

3.1 Examine possible estimation methods for the measurement and reporting of forest carbon emissions and removals utilizing PNG-FRIMS.

3.2 Propose a draft of the technical procedures for estimation.

3.3 Consider how to utilize PNG-FRIMS in the calculation of the forest reference emission level and forest reference level (FREL/FRL).

3.4 Identify the information which PNGFA is able to provide by using PNG-FRIMS, regarding necessary forest resource information for project-based REDD+ activities.

3.5 Establish guidelines on the method of access to and provision of the information in the activity 3.4 and inform concerned parties about the guidelines.

3.6 Provide technical input to committees established by PNG Government relating to climate change as needed.

3.7 Conduct training for keeping and improving the technical levels of PNGFA and other collaborators on measurement and reporting of forest carbon emissions and removals, and development of FREL/FRL.

3.8 Prepare and disseminate information on the Project outputs, taking opportunities such as climate change related meetings and conferences.

Plan of Operation

Tentative Plan of Operation (PO) **Annex 2**

The Project Title: Capacity Development Project for Operationalization of PNG Forest Resource Information Management System (PNG-FRIMS) for Addressing Climate Change — Ver No. : 1

Implementation Organization: PNG Forest Authority (PNGFA) — Duration: July 2014 to June 2019 — As of 28 January 2014

Project Purpose: Capacity of the PNGFA to continuously update forest information and to fully operationalize and utilize PNG-FRIMS for promoting sustainable forest management and for addressing climate change is enhanced.

(FMCC:Forest Management/Climate Change, FP:Forest Planning, RS/GIS:Remote Sensing/GIS, DM:Database Management)

(FPPD: Forest Policy & Planning Directorate, PAD: Project Allocation Directorate, FSD: Field Services Directorate, CSD: Corporate Service Directorate, FRI: Forest Research Institute)

Year	2014		2015				2016				2017				2018				2019		Directorate/Branch in Charge	JICA Expert in Charge
Quarter	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q		
OUTPUT 1. PNG-FRIMS is expanded and enhanced.																						
1.1 Examine and identify information to be added and integrated to PNG-FRIMS.																					All Directorates	FMCC, FP, RS/GIS, DM
1.2 Lay out a basic design for expansion and enhancement of PNG-FRIMS.																					FPPD, CSD	FMCC, FP, RS/GIS, DM
1.3 Examine the approach of updating the forest base map.																						
1.3.1 Lay out a basic design for the method of detecting forest area changes with remote sensing technology.																					FPPD, CSD, FRI	FMCC, FP, RS/GIS
1.3.2 Process and analyze the remote sensing data combining with ground truth on a trial basis.																					FPPD, FRI, FSD	RS/GIS
1.3.3 Identify necessary additional information from other sources.																					All Directorates	FMCC, FP, RS/GIS
1.3.4 Develop the manual on updating forest base map.																					FPPD	RS/GIS
1.3.5 Update forest base map for the forest area change detected in the pilot area(s) identified in activity 2.2.1.																					FPPD, FRI, FSD	RS/GIS
1.4 Examine the method of developing and updating information on growing stock.																						
1.4.1 Examine the method for defining a new set of the forest management units in PNG-FRIMS based on the historical record of logging operation and vegetation type.																					All Directorates	FMCC, FP, DM
1.4.2 Examine the possibilities of integrating PINFORM into PNG-FRIMS.																					FPPD, CSD, FRI	FMCC, DM
1.4.3 Design and develop the database for calculating and recording harvested timber and timber growth on the basis of the activity 1.4.1 and 1.4.2.																					FPPD, CSD, FRI, FSD	DM
1.5 Examine the method of reflecting the ground sample plot information on forest resources in the activities 1.3 and 1.4.																					FPPD, FRI, FSD	FMCC, RS/GIS, DM
1.6 Examine the method of preparing information other than the methods of the activity 1.3 and 1.4 if necessary.																					All Directorates	FMCC, FP, RS/GIS, DM
1.7 Develop a prototype of upgraded PNG-FRIMS on the basis of the activities 1.1 ~ 1.6.																					FPPD, FRI, CSD	RS/GIS, DM
1.8 Operate the prototype on a trial basis and finalize PNG-FRIMS.																					FPPD, FRI, CSD	RS/GIS, DM
1.9 Develop a work manual of the PNG-FRIMS operation including field data collection.																					FPPD, FRI, CSD	RS/GIS, DM
1.10 Conduct training for keeping and improving the technical levels of PNGFA and other collaborators particularly on remote sensing, GIS and database which are necessary for the PNG-FRIMS operation.																					All Directorates	RS/GIS, DM
OUTPUT 2. The national forest plan, provincial forest plans, forest management plans and their monitoring system are improved through steady operation of PNG-FRIMS.																						
2.1 Review the current status of the forest planning system.																						
2.1.1 Examine the current forest planning system and document issues on the implementation of the national forest plan, provincial forest plan, forest management plans.																					All Directorates	FMCC, FP
2.1.2 Develop appropriate methods/procedures where necessary for solving the issues.																					All Directorates	FMCC, FP
2.2 Experiment a series of the operations of forest management plans; evaluation, advice, approval (or preparation) and monitoring by utilizing PNG-FRIMS, in the pilot area(s).																						
2.2.1 Identify the pilot area(s).																					All Directorates	FMCC, FP
2.2.2 Examine the usage of PNG-FRIMS in the evaluation, advice, approval (or preparation) and monitoring of forest management plans.																					All Directorates	FMCC, FP, RS/GIS, DM
2.2.3 Conduct a series of the operations of forest management plans through hands-on-training for PNGFA officers in the evaluation, advice, approval (or preparation) and monitoring of forest management plans.																					FPPD, FSD, PAD, CSD	FMCC, FP, RS/GIS, DM
2.2.4 Determine how to utilize PNG-FRIMS in a series of the operations of forest management plans on the basis of the result of the activity 2.2.3.																					FPPD, FSD, PAD	FMCC, FP, RS/GIS, DM
2.2.5 Summarize the results of the activities 2.2.1 - 2.2.4.																					FPPD, FSD, PAD	FMCC, FP
2.3 Hold training workshops for the PNGFA officers and other collaborators to demonstrate the achievement in the pilot area(s).																					All Directorates	FMCC, FP, RS/GIS, DB
2.4 Examine the content of inputs to the process of developing the next national and provincial forest plans on the basis of the output 1 and the activities 2.1 to 2.3.																					FPPD	FP
2.5 Prepare guidelines of the overall forest planning using PNG-FRIMS on the basis of the activities 2.2 to 2.4.																					All Directorates	FP
2.6 Prepare and disseminate information on the Project outputs, taking the opportunities such as the training workshops.																					FPPD	FMCC, FP
OUTPUT3. Forest information for addressing REDD+ is prepared.																						
3.1 Examine possible estimation methods for the measurement and reporting of forest carbon emissions and removals utilizing PNG-FRIMS.																					FPPD, FRI	FMCC
3.2 Propose a draft of the technical procedures for estimation.																					FPPD, FRI	FMCC, FP
3.3 Consider how to utilize PNG-FRIMS in the calculation of the forest reference emission level and forest reference level (FREL/FRL).																					FPPD, FRI	FMCC, FP, RS/GIS, DM
3.4 Identify the information which PNGFA is able to provide by using PNG-FRIMS, regarding necessary forest resource information for project-based REDD+ activities.																					FPPD, FRI	FMCC, RS/GIS, DM
3.5 Establish guidelines on the method of access to and provision of the information in the activity 3.4 and inform concerned parties about the guidelines.																					FPPD, FRI	FMCC
3.6 Provide technical input to committees established by PNG Government relating to climate change as needed.																					FPPD, FRI	FMCC, FP, RS/GIS, DM
3.7 Conduct training for keeping and improving the technical levels of PNGFA and other collaborators on measurement and reporting of forest carbon emissions and removals, and development of FREL/FRL.																					FPPD, FRI, FSD	FMCC, RS/GIS, DM
3.8 Prepare and disseminate information on the Project outputs, taking opportunities such as climate change related meetings and conferences.																					FPPD, FRI	FMCC

Closing Ceremony and final Workshop for Project Completion
5th - 6th March 2014
Holiday Inn Hotel, Port Moresby, PNG

From the People of Japan

Thank you
Tenkyu tru
Arigatou gozaimashita