



# Progress of Remote Sensing Forest BaseMap Development

March 4th, 2013  
(based on material for progress report in December)

Kokusai Kogyo Co.,Ltd (KKC)  
Consultant for PNGFA/JICA&JICS



## Table of Contents

- Project Scope/What to be done by 2014 & Base Map
- Base Map Progress using Remote Sensing (RS)
  - Vegetation Type Definition Review
  - Classification Target and Work-Flow using RS
  - Local/Regional Knowledge(Veg & Forest Type)
  - Example of Classification Procedure
  - Object-base Classification and Example
- Schedule of Forest Base Map Development
  - OJT Capacity Building with Counterpart
  - Draft Classification Check (Sample Tile)
  - Mass Production based on Work-flow and Input from CP
- Output-based Schedule (Draft Revising)
  - Forest BaseMap
  - Forest BaseMap (cloud corrected)
- Future Work (using Map and improving)

# Project Scope/Situation and Challenges

## As-Is (Current)

1. National level forest basemap is not developed since 1972
2. Forest GIS (FIMS: Forest Inventory & Mapping System) is not updated since 1996
3. Existing forest related data is not sufficient for carbon estimation

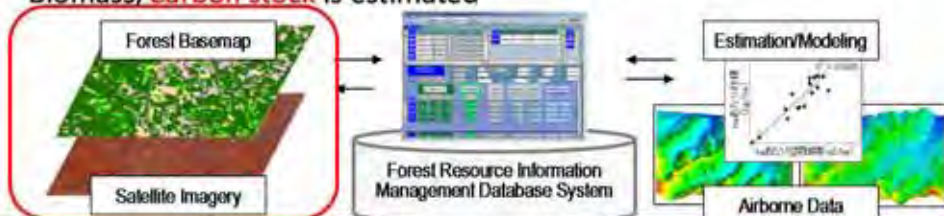


### Problem

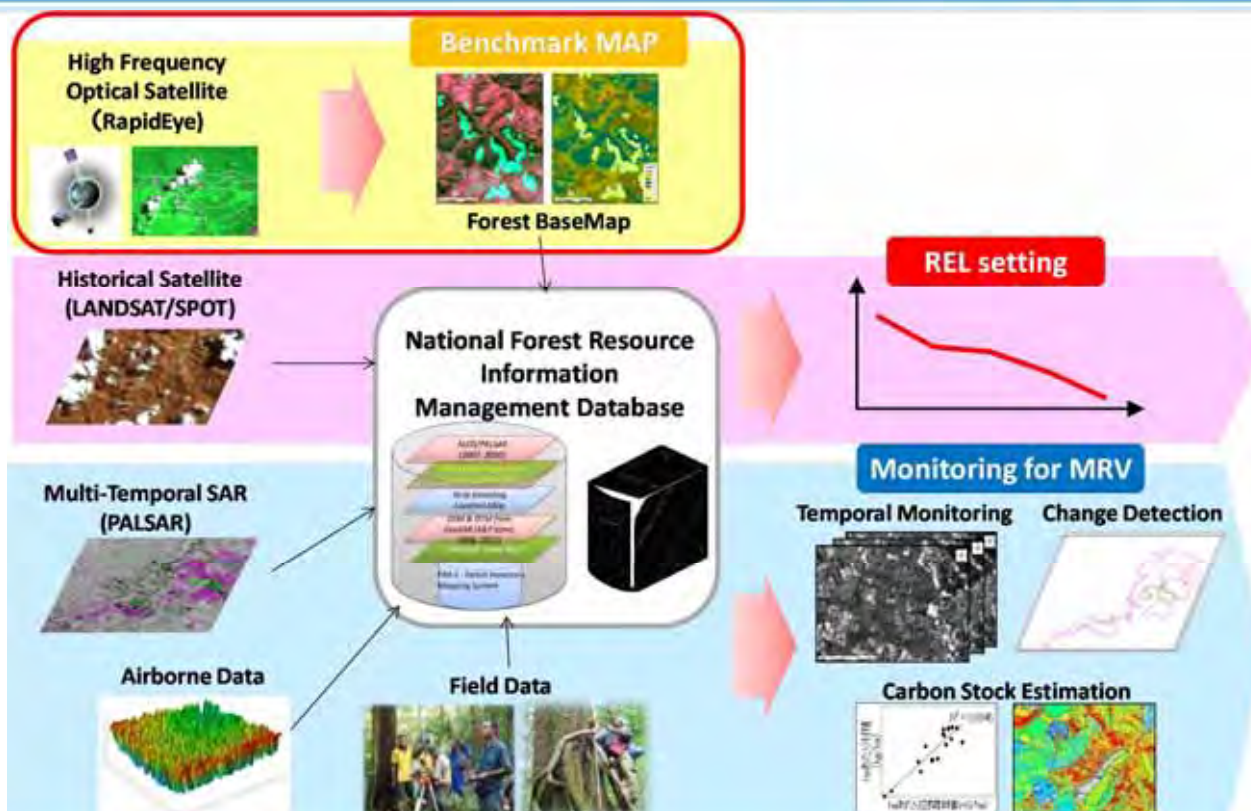
- Vast forest area, but no access road to do forest survey for whole country
- 97% of PNG land is customary land

## To-Be (Goals)

1. National level forest resource **basemap** is developed and utilized
2. National level forest resource **GIS/Database** is developed and utilized
3. Biomass/**Carbon stock** is estimated



# What to be done by 2014/Benchmark Map



# Vegetation Type Definition Table (1/2)

IPCC GL-AFOLU	Forest and Non-forest	No.	Vegetation type	Condition	Code	No.	Remarks	
Forest land		1	Low Altitude Forest on Plains and Fans	below 1,000m	Pl		Large to medium crowned forest	
					Po		Open forest	
					Ps		Small crowned forest	
			2	Low Altitude Forest on Uplands	below 1,000m	Hl		Large crowned forest
						Hm		Medium crowned forest
						HmAr		Medium crowned forest with Araucaria common
						Hmd		Medium crowned depauperate/damaged forest
	Hme						Medium crowned forest with an even canopy	
	Hs						Small crowned forest	
	Hse						Small crowned forest with an even canopy	
	HsAr						Small crowned forest with Araucaria common	
	HsCa						Small crowned forest with Castanopsis	
	HsCp						Small crowned forest with Casuarina papuana	
	HsN						Small crowned forest with Nothofagus	
		3	Lower Montane Forest	above 1,000m	L		Small crowned forest	
					LAr		Small crowned forest with Araucaria common	
					LN		Small crowned forest with Nothofagus	
					Lc		Small crowned forest with conifers	
					Ls		Very small crowned forest	
					LsCp		Very small crowned forest with Casuarina papuana	
					LsN		Very small crowned forest with Nothofagus	
		4	Montane Forest	above 3,000m	Mo		Very small crowned forest	
					D		Dry evergreen forest	
		5	Dry Seasonal Forest	in Western Prov.	B		Mixed forest	
					BCe		Forest with Casuarina equisetifolia	
		6	Littoral Forest		BMI		Forest with Melaleuca leucadendron	
					Fri		Riverine mixed successions	
		7	Seral Forest		FriCg		Riverine successions with Casuarina grandis	
FriK						Riverine successions with Eucalyptus deglupta		
FriTb						Riverine successions with Terminalia brassii		
Fv						Volcanic successions		

# Vegetation Type Definition Table (2/2)

IPCC GL-AFOLU	Forest and Non-forest	No.	Vegetation type	Condition	Code	No.	Remarks				
Forest land		8	Swamp Forest		Fsw		Mixed swamp forest				
					FswC		Swamp forest with Camptosperma				
					FswMI		Swamp forest with Melaleuca leucadendron				
					FswTb		Swamp forest with Terminalia brassii				
		9	Woodland		W		Woodland				
					Wri		Riverine successions dominated by woodland				
					WriCg		Riverine successions with Casuarina grandis woodland				
					Wv		Volcanic successions dominated by woodland				
					Wsw		Swamp woodland				
					WswMI		Swamp woodland with Melaleuca leucadendron				
						10	Savanna		Sa		Savanna
	Saf		Savanna with galley forest								
	SaMI		Savanna with Melaleuca leucadendron								
	Sc		Scrub								
	ScBc		Scrub with Bambusa and Cyathea								
	Scv		Volcanic successions dominated by scrub								
	Grassland		12	Grassland and Hermland		G		Grassland			
						Gf		Grassland with some forest			
						Gr		Grassland reverting to forest			
						Grf		Grassland reverting to forest with some forest			
Gsw							Swamp grassland				
Gri							Riverine successions dominated by grass				
Gv							Volcanic successions dominated by grass				
Hsw							Herbaceous swamp				
						13	Alpine grassland	above 3,200m	Ga		Alpine grassland (above 3,200m)
									Gi		Subalpine grassland (2,500m - 3,200m)
Forest land			Estuarine Communities		M	15	Mangrove				
Cropland			Other Non-vegetation		O	16	PNGRIS agricultural land use intensity classes 0-4				
Wetlands					E	17	Lakes and larger rivers				
Other Land					Z	18	Bare areas				
Settlements					U	19	Larger urban centres				
					-	20	Forest Plantation				
					-	21	Plantation other than forest plantation				



# Classification Target by Satellite RS

2 Low Altitude Forest on Uplands

Remote sensing (Satellite)

HI	Large crowned forest
Hm	Medium crowned forest
HmAr	Medium crowned forest with Araucaria common
Hmd	Medium crowned depauperate/damaged forest
Hme	Medium crowned forest with an even canopy
Hs	Small crowned forest
Hse	Small crowned forest with an even canopy
HsAr	Small crowned forest with Araucaria common
HsCa	Small crowned forest with Castanopsis
HsCp	Small crowned forest with Casuarina papuana
HsN	Small crowned forest with Nothofagus
HsRt	Small crowned forest with Rhus taitensis

Interpretation (Aerial photo)



HI  
(Large crowned forest)



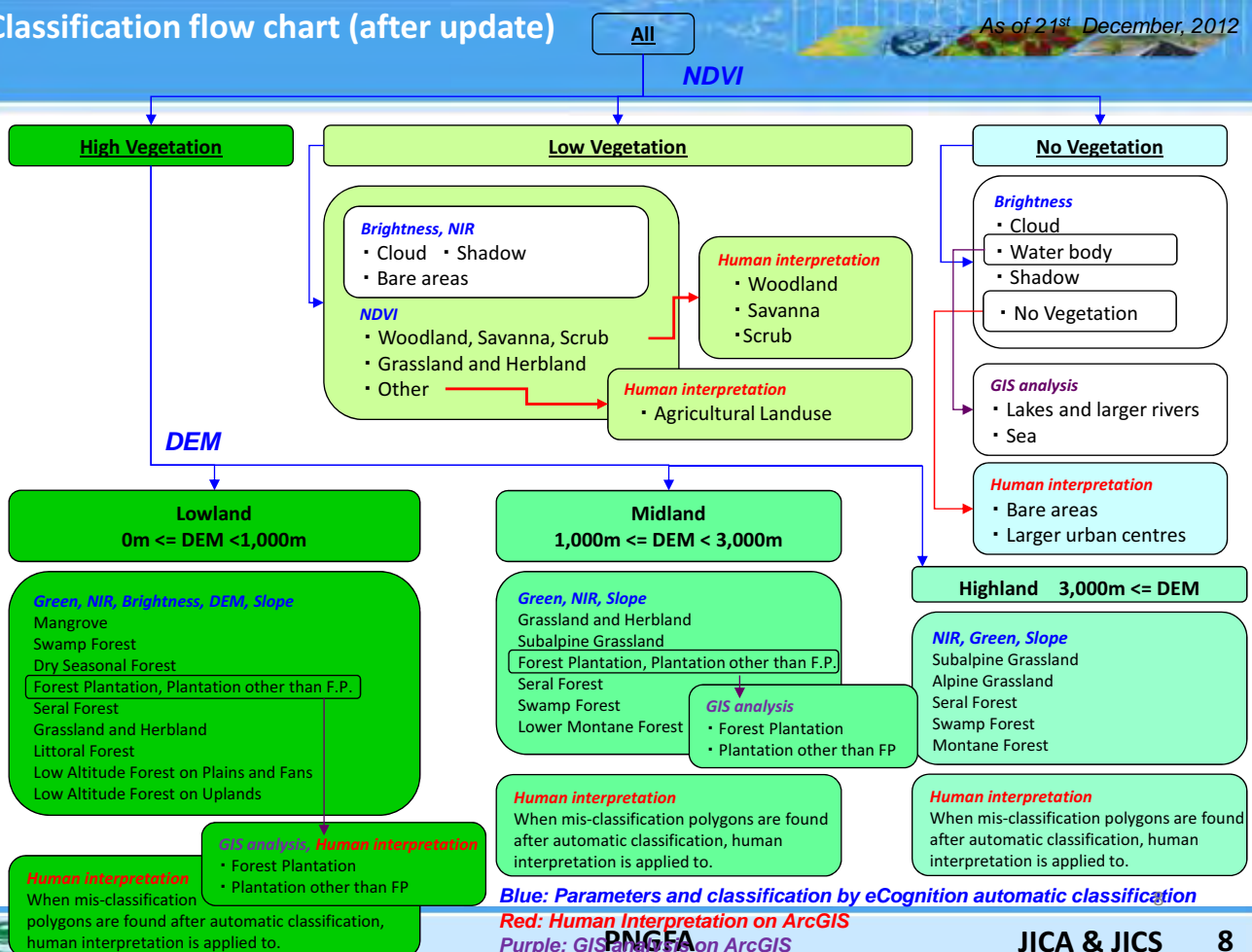
Hm  
(Medium crowned forest)



Hs  
(Small crowned forest)

## Classification flow chart (after update)

As of 21<sup>st</sup> December, 2012



## + Local/Regional Knowledge 1

- **Woodland** is **NOT existing** in Enga, Western Highlands and Simbu Prov. (less than 5km<sup>2</sup> in Eastern Highlands)
- **Savanna** is **existing** in Western, Gulf, Central, Milne Bay and Northern Prov.
- **Scrub** is **existing** (here in less than 10 km<sup>2</sup>) in Eastern Highlands, East Sepik and New Ireland Prov.
- **Mangrove** is **NOT existing** in Eastern/Western/Southern Highlands, Enga and Simbu Prov.

Source : FOREST RESOURCES OF PAPUA NEW GUINEA  
SUMMARY STATISTICS FROM THE FOREST INVENTORY MAPPING  
(FIM) SYSTEM, 1998

## Vegetation Type and Province

Provincial Summary - Vegetation Cover - 1975 (sq km)

Province		Vegetation Type							
Name	Area	Forest	Woodland	Savanna	Scrub	Grassland/ Herbland	Mangrove	Land use <sup>(a)</sup>	Other <sup>(b)</sup>
Western	98,452	61,352	11,528	9,282	4,466	7,716	1,235	1,035	1,837
Gulf	34,801	28,767	1,709	188	78	430	2,636	657	337
Central	29,872	20,276	1,430	1,710	238	1,670	664	3,842	43
Milne Bay	14,264	9,900	79	14	48	2,161	420	1,635	7
Northern	22,772	16,792	1,667	713	149	1,547	171	1,688	45
Southern Highlands	25,748	20,229	113	0	25	573	0	4,748	62
Enga	11,824	7,815	0	0	68	846	0	3,093	< 5
Western Highlands	9,141	5,253	0	0	32	588	0	3,268	0
Simbu	6,134	4,032	0	0	19	83	0	2,000	0
Eastern Highlands	11,205	5,650	< 5	0	6	1,737	0	3,811	< 5
Morobe	33,933	22,565	469	0	73	3,278	32	7,490	26
Madang	29,095	21,595	923	0	143	2,223	21	3,952	238
East Sepik	43,813	25,689	7,259	0	< 5	7,934	320	2,593	17
West Sepik	36,054	32,896	586	0	49	1,034	14	1,474	0
Manus	2,150	1,523	244	0	33	17	78	253	< 5
New Ireland	9,610	7,798	282	0	0	179	198	1,153	0
East New Britain	15,344	13,062	29	0	126	11	22	2,088	5
West New Britain	20,456	18,420	337	0	141	160	158	1,161	79
North Solomons	9,433	7,043	283	0	321	224	45	1,468	48
Totals	464,101	330,656	26,938	11,906	6,014	32,411	6,016	47,408	2,750

(a) areas of significant land use, urban, mining etc.  
(b) bare areas, lakes etc.

Source : FOREST RESOURCES OF PAPUA NEW GUINEA  
SUMMARY STATISTICS FROM THE FOREST INVENTORY MAPPING  
(FIM) SYSTEM, 1998

## + Local/Regional Knowledge 2

- **Lowland Plains** (below 1,000m) is **NOT existing** in Eastern/Western Highlands, Enga and Simbu Prov.
- **Lower Montane** (above 1,000m) is **NOT existing** in Manus Prov.
- **Dry Seasonal** is **only existing** in Western Prov.
- **Littoral** is mainly **existing** in Western, Central, Milne Bay and North Solomons Prov. (around 79%)
- **Seral** is **NOT existing** in Eastern/Western/Southern Highlands, Enga, Simbu and Manus Prov.
- **Swamp** is **NOT existing** in Eastern/Western Highlands, Simbu, Manus and New Ireland Prov. **Mostly existing** in Western, Gulf and East Sepik Prov. (around 85%)

Source : FOREST RESOURCES OF PAPUA NEW GUINEA  
SUMMARY STATISTICS FROM THE FOREST INVENTORY MAPPING  
(FIM) SYSTEM, 1998

## Forest Type and Province

Provincial Summary - Forest Types - 1975 (sq km)

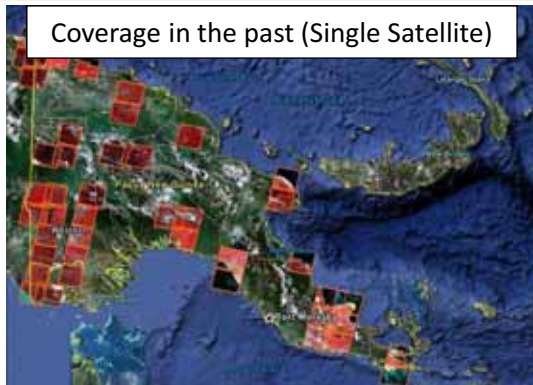
Province		Forest Type							
Name	Area	Lowland Plains (<1,000m)	Lowland Hills (<1,000m)	Lower Montane (>1,000m)	Montane (>3,000m)	Dry Seasonal	Littoral	Seral	Swamp
Western	98,452	2,556	33,810	3,105	< 5	10,629	377	218	10,652
Gulf	34,801	3,517	19,300	1,670	0	0	27	< 5	4,249
Central	29,872	2,439	10,942	6,283	327	0	147	51	87
Milne Bay	14,264	1,259	7,117	1,417	< 5	0	80	20	6
Northern	22,772	2,958	8,410	4,884	221	0	6	209	105
Southern Highlands	25,748	147	7,166	12,693	71	0	0	0	152
Enga	11,824	0	602	6,885	324	0	0	0	< 5
Western Highlands	9,141	0	1,128	3,942	183	0	0	0	0
Simbu	6,134	0	1,627	2,304	102	0	0	0	0
Eastern Highlands	11,205	0	481	5,088	81	0	0	0	0
Morobe	33,933	453	7,986	13,591	207	0	24	56	246
Madang	29,095	2,719	12,695	5,012	155	0	20	53	941
East Sepik	43,813	4,499	14,034	2,474	< 5	0	22	400	4,254
West Sepik	36,054	8,228	17,414	6,148	92	0	29	20	966
Manus	2,150	14	1,492	0	0	0	17	0	0
New Ireland	9,610	134	6,576	1,032	0	0	0	55	0
East New Britain	15,344	417	9,639	2,766	0	0	22	197	22
West New Britain	20,456	1,798	15,318	687	0	0	17	242	359
North Solomons	9,433	1,470	3,732	1,120	0	0	77	186	459
Totals	464,101	32,608	179,468	81,099	1,774	10,629	865	1,710	22,503

Source : FOREST RESOURCES OF PAPUA NEW GUINEA  
SUMMARY STATISTICS FROM THE FOREST INVENTORY MAPPING  
(FIM) SYSTEM, 1998

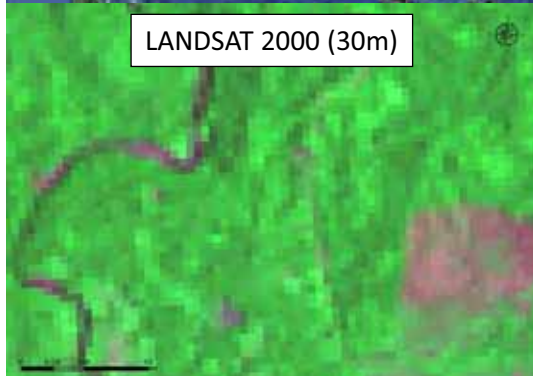


# Satellite Imagery for Classification

## Previous Available Satellite Imagery

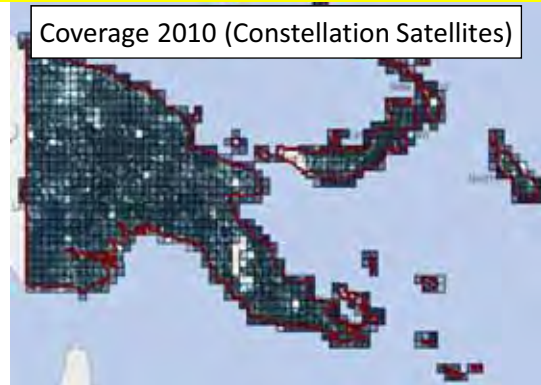


Coverage in the past (Single Satellite)

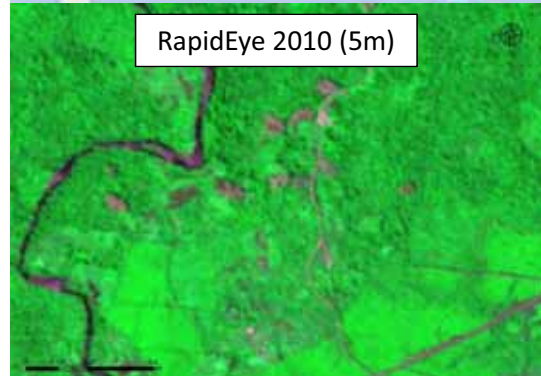


LANDSAT 2000 (30m)

## Newly Aquired Satellite Imagery

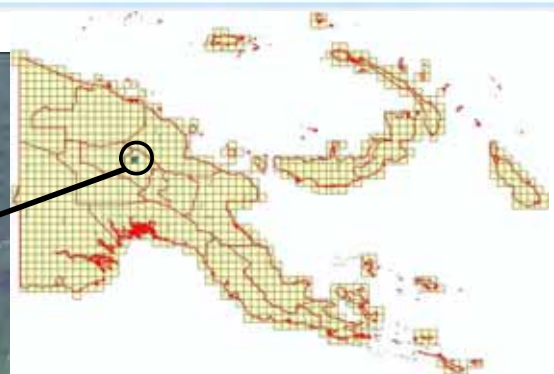
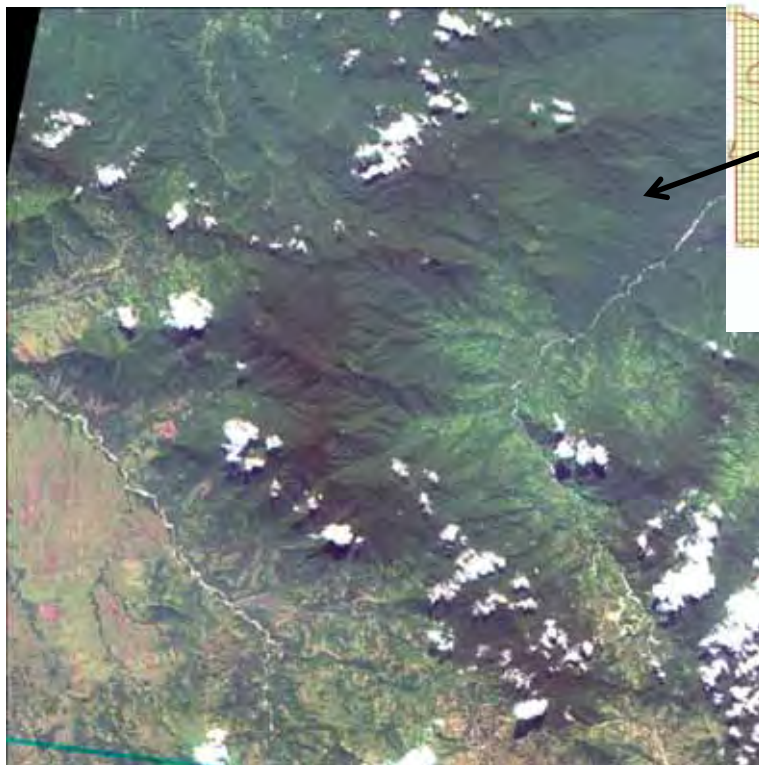


Coverage 2010 (Constellation Satellites)



RapidEye 2010 (5m)

# Example of Classification Procedure

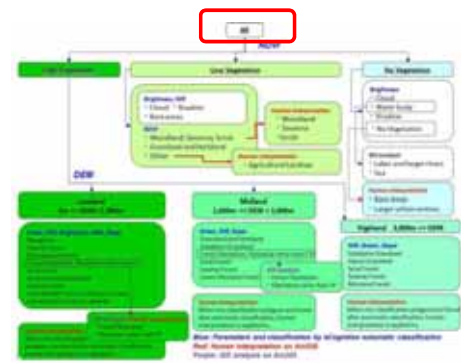


Location : Western Highlands



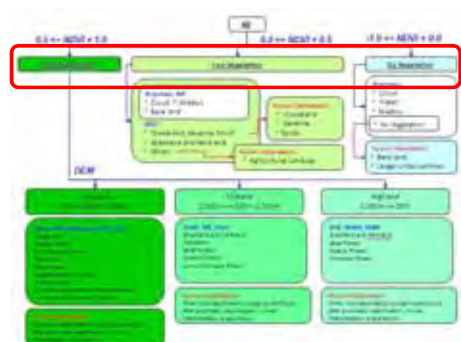
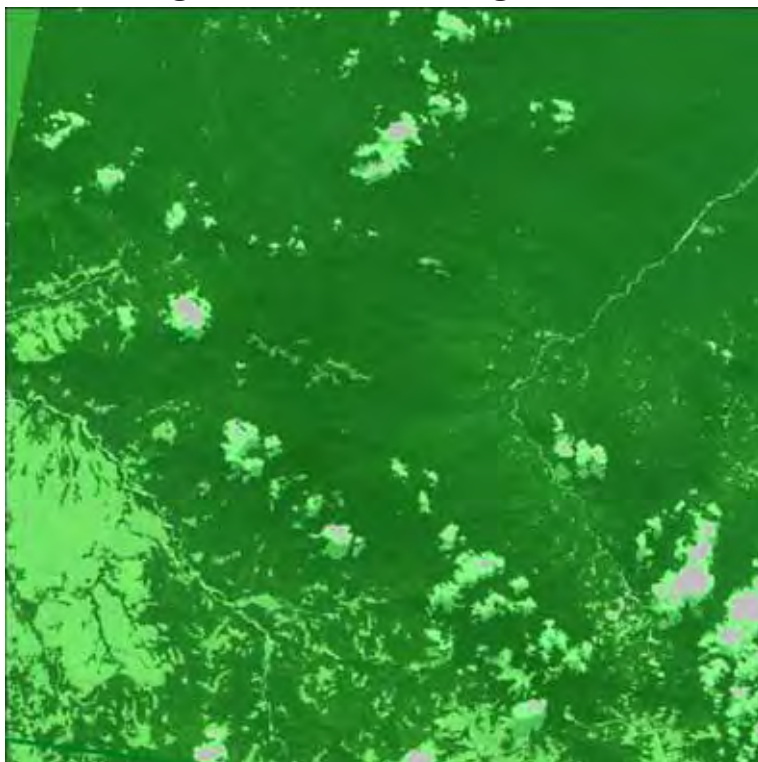
# Example of Classification Procedure

## Segmentation



# Example of Classification Procedure

## 1st : Vegetation area using NDVI

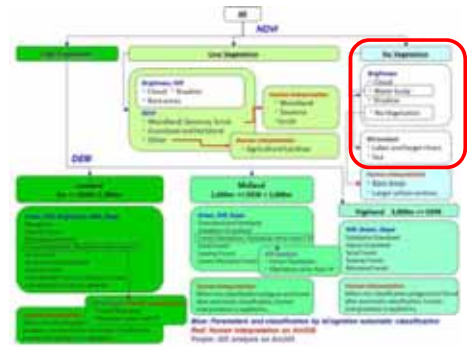
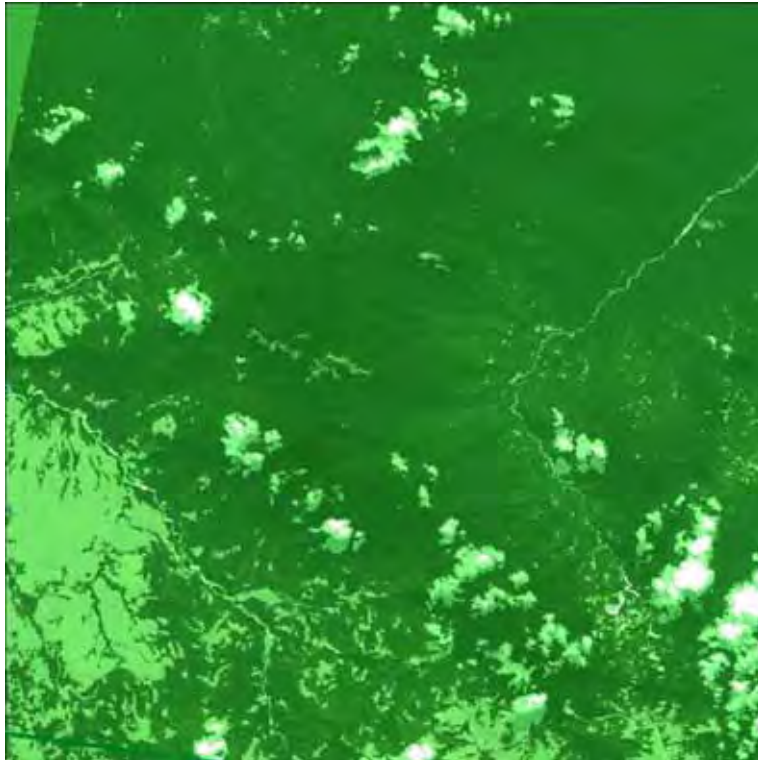


● High Veg.  
● Low Veg.  
● No Veg.



# Example of Classification Procedure

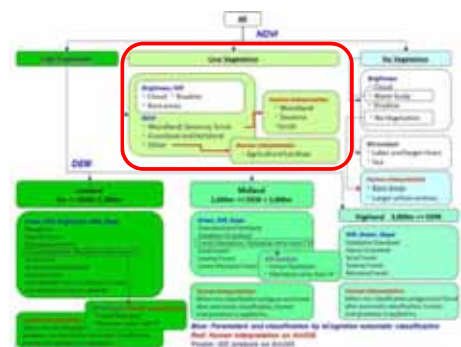
## 2nd : Classification of No Vegetation area



- Cloud
- High Veg.
- Low Veg.
- No Veg.
- Shadow
- Waterbody

# Example of Classification Procedure

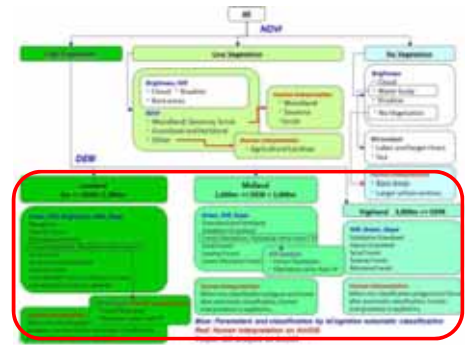
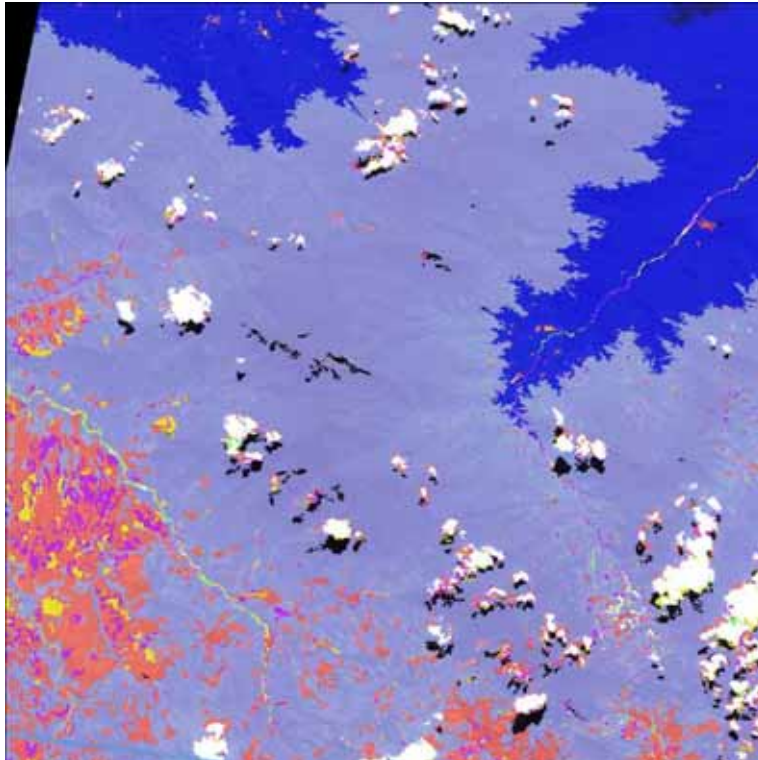
## 3rd : Classification of Low Vegetation area



- Bareland
- Cloud
- Glassland and Harbland
- High Veg.
- Shadow
- Waterbody
- Woodland, Savanna, Scrub

# Example of Classification Procedure

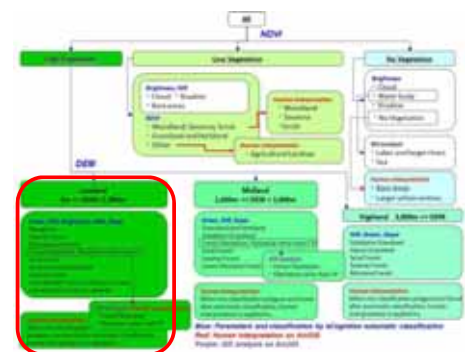
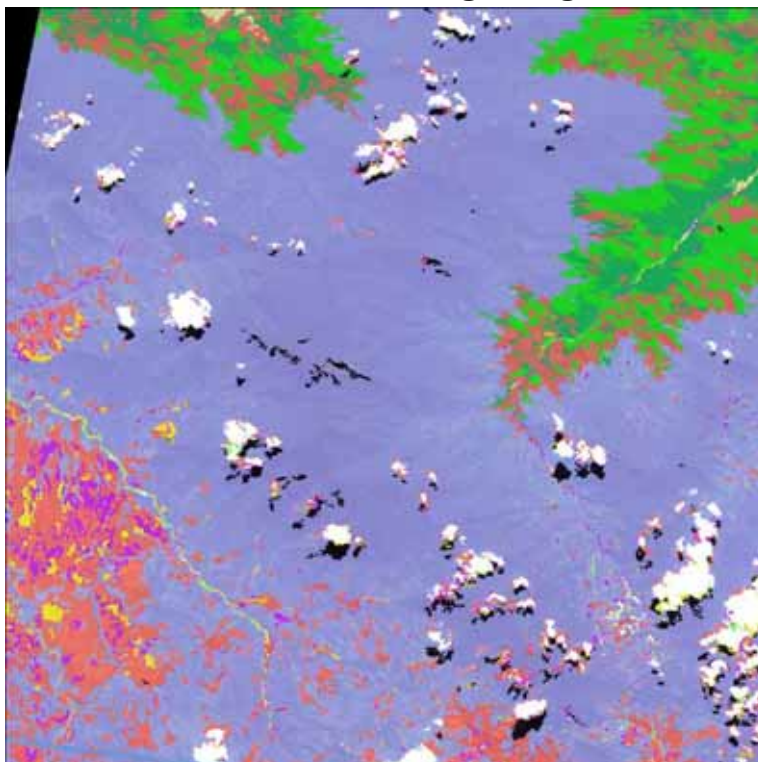
## 4th : Classification of High Vegetation area



- Bareland
- Cloud
- Grassland and Harbland
- High\_DEM0500
- High\_DEM1000
- High\_DEM3000
- High\_DEM5000
- Shadow
- Waterbody
- Woodland, Savanna, Scrub

# Example of Classification Procedure

## 5th : Classification of High Vegetation area

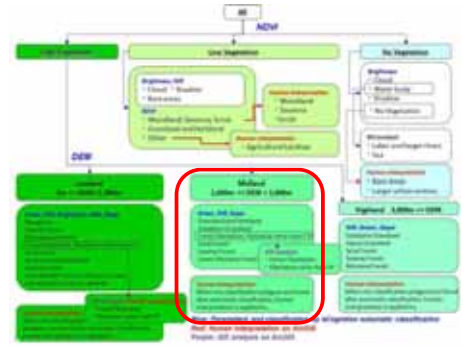
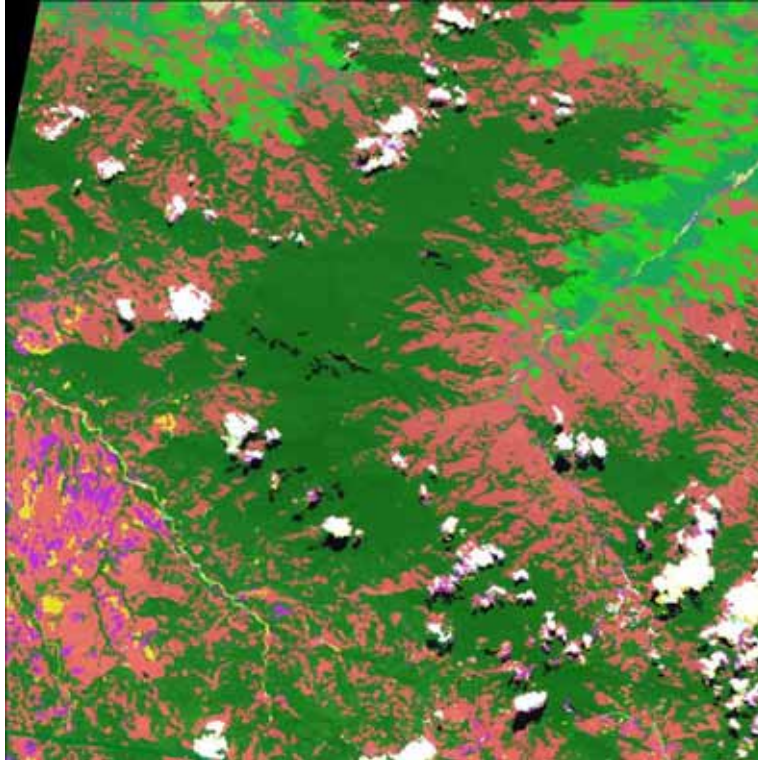


- Bareland
- Cloud
- Dry Seasonal Forest
- Grassland and Harbland
- Littoral
- Low Alt. Forest Plains
- Low Alt. Forest Uplands
- Lower Montane Forest
- Mangrove
- Montane Forest
- Plantation
- Serai(Riverline)
- Shadow
- Swamp
- Waterbody
- Woodland, Savanna, Scrub



# Example of Classification Procedure

## 6th : Classification of High Vegetation area



- Bareland
- Cloud
- Dry Seasonal Forest
- Grassland and Harbland
- Litoral
- Low Alt. Forest Plains
- Low Alt. Forest Uplands
- Lower Montane Forest
- Mangrove
- Montane Forest
- Plantation
- Seral(Riverline)
- Shadow
- Swamp
- Waterbody
- Woodland, Savanna, Scrub.

# Object-based Classification (compare with Pixel based)



RapidEye image

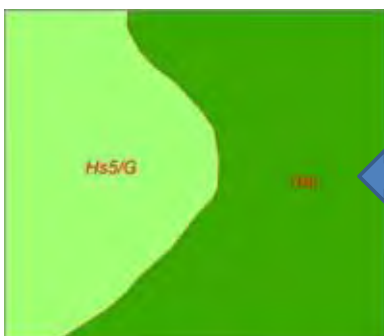


eCognition segmentation



Pixel-based classification

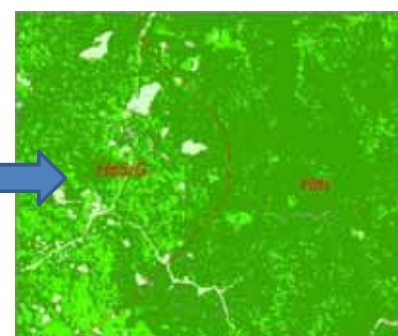
1:25,000 Level



FIMS vegetation



Forest base map (Obj. based)



Forest base map (Pxl. based)





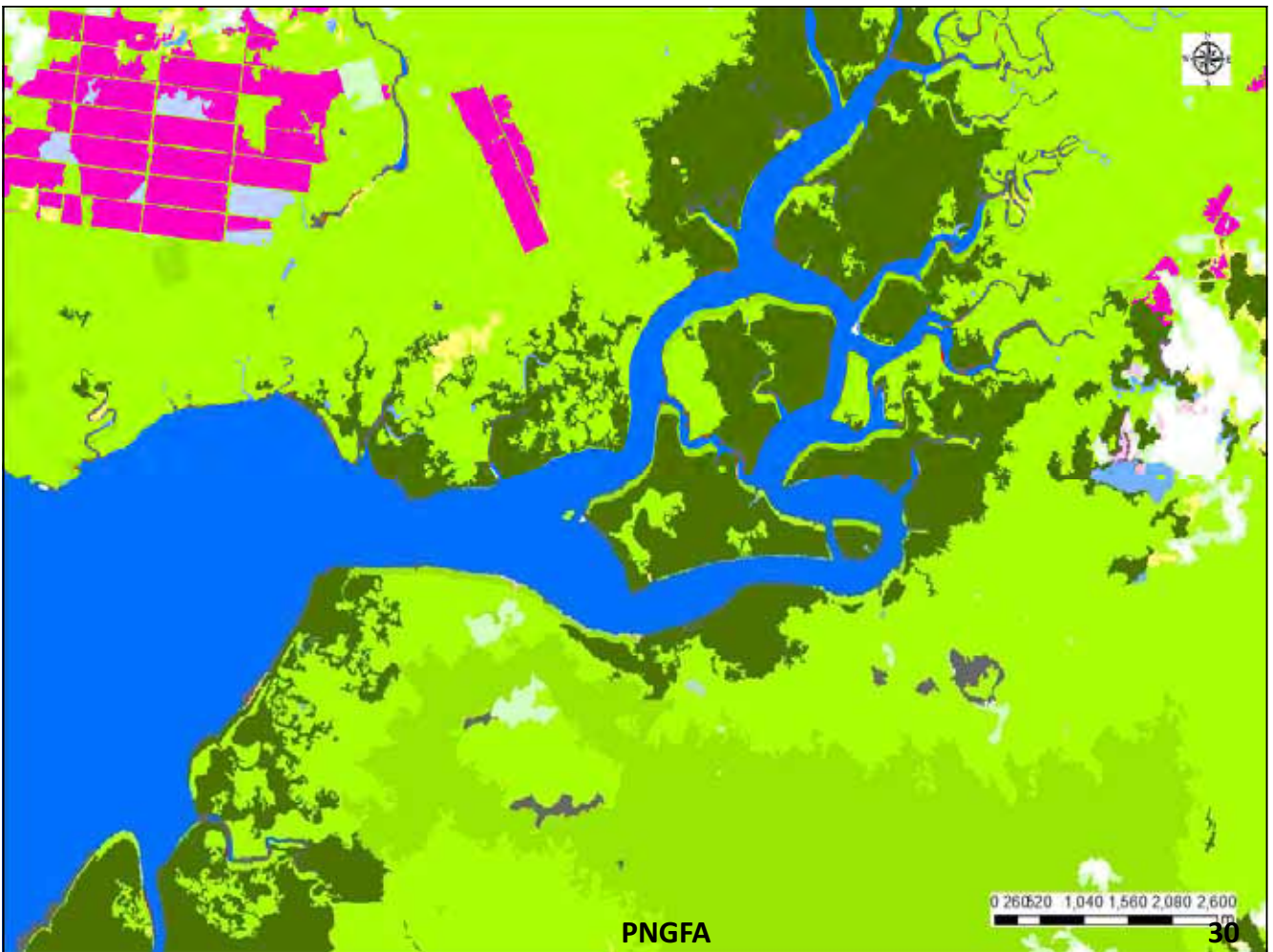
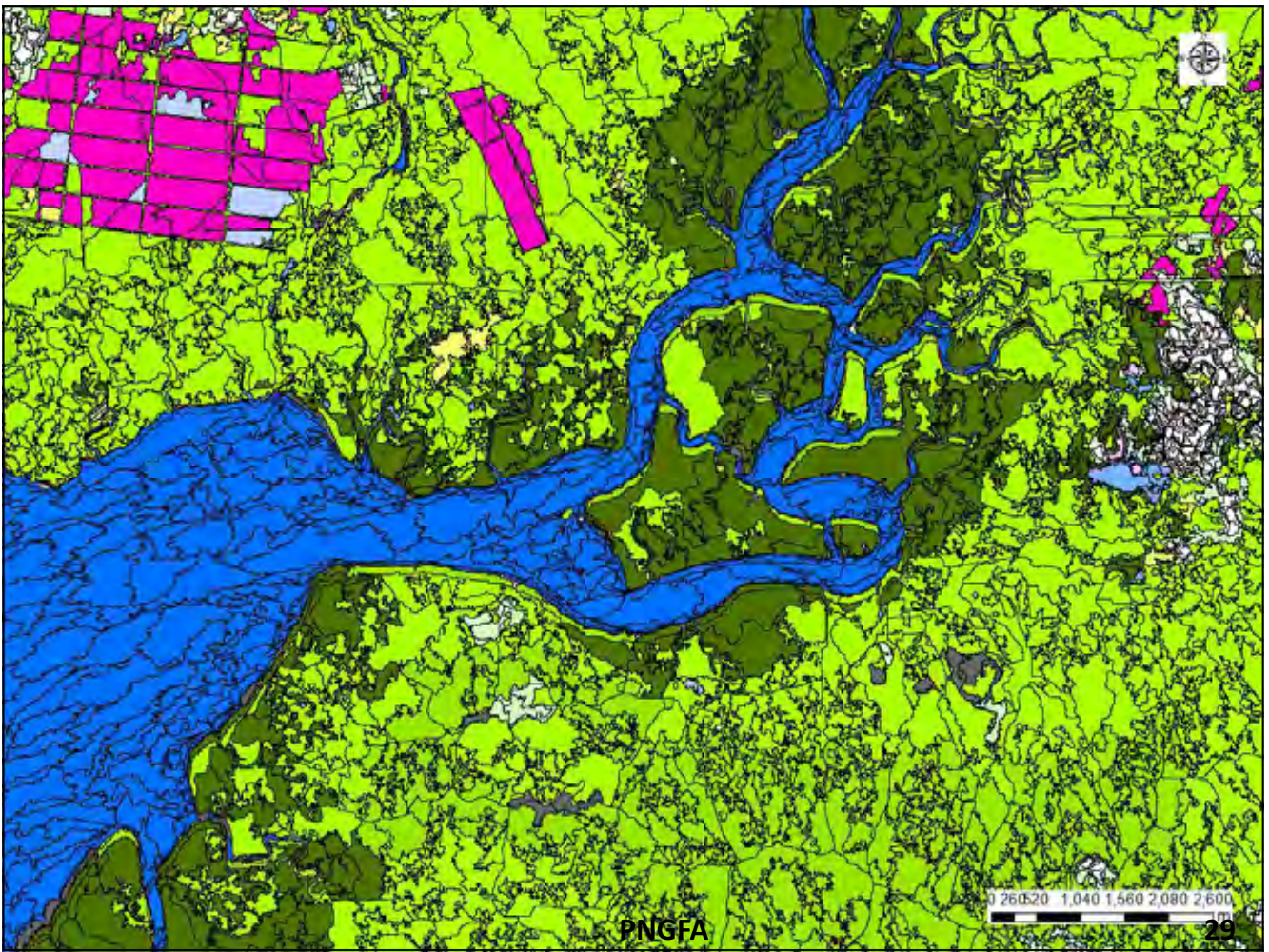




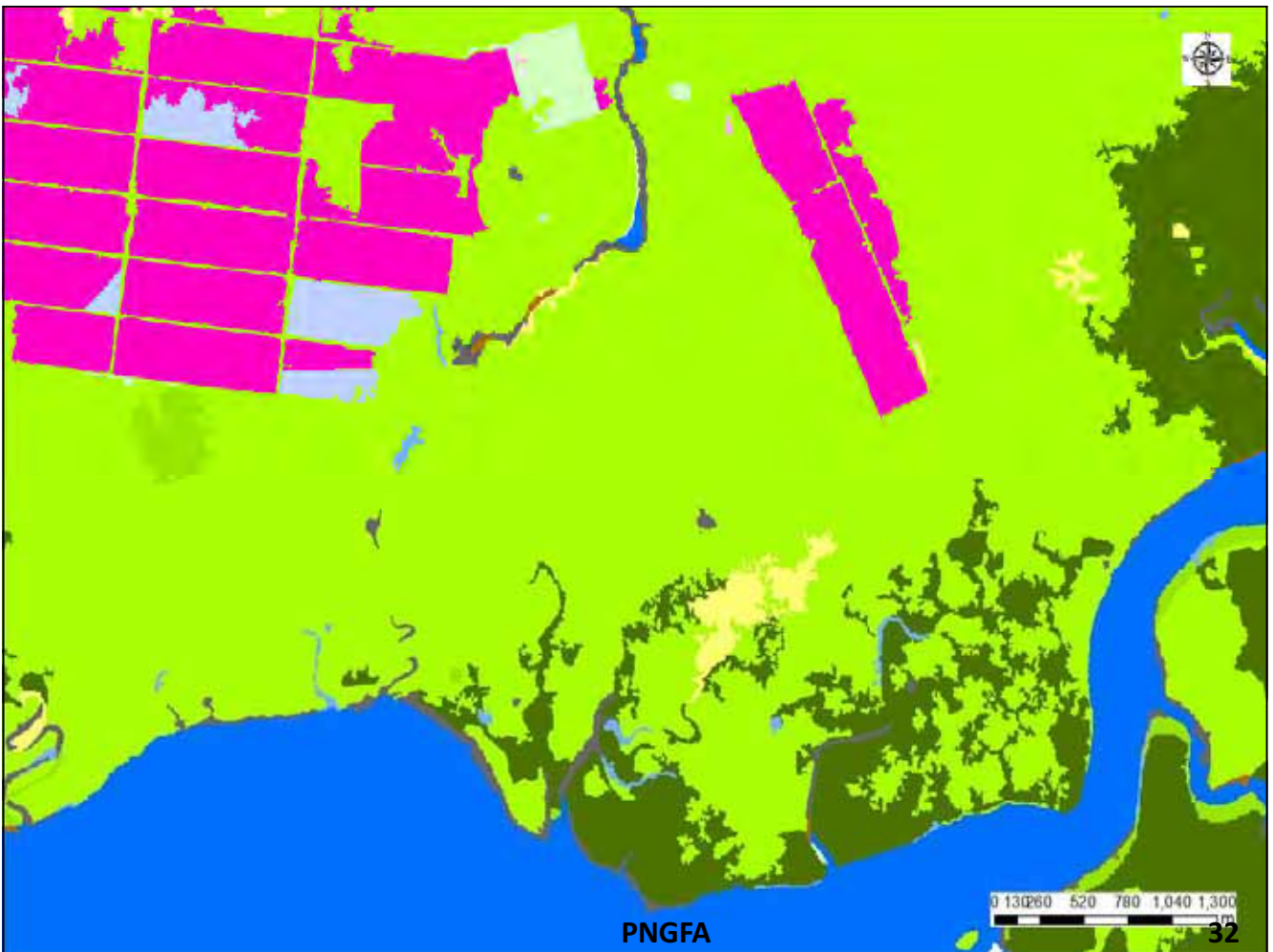
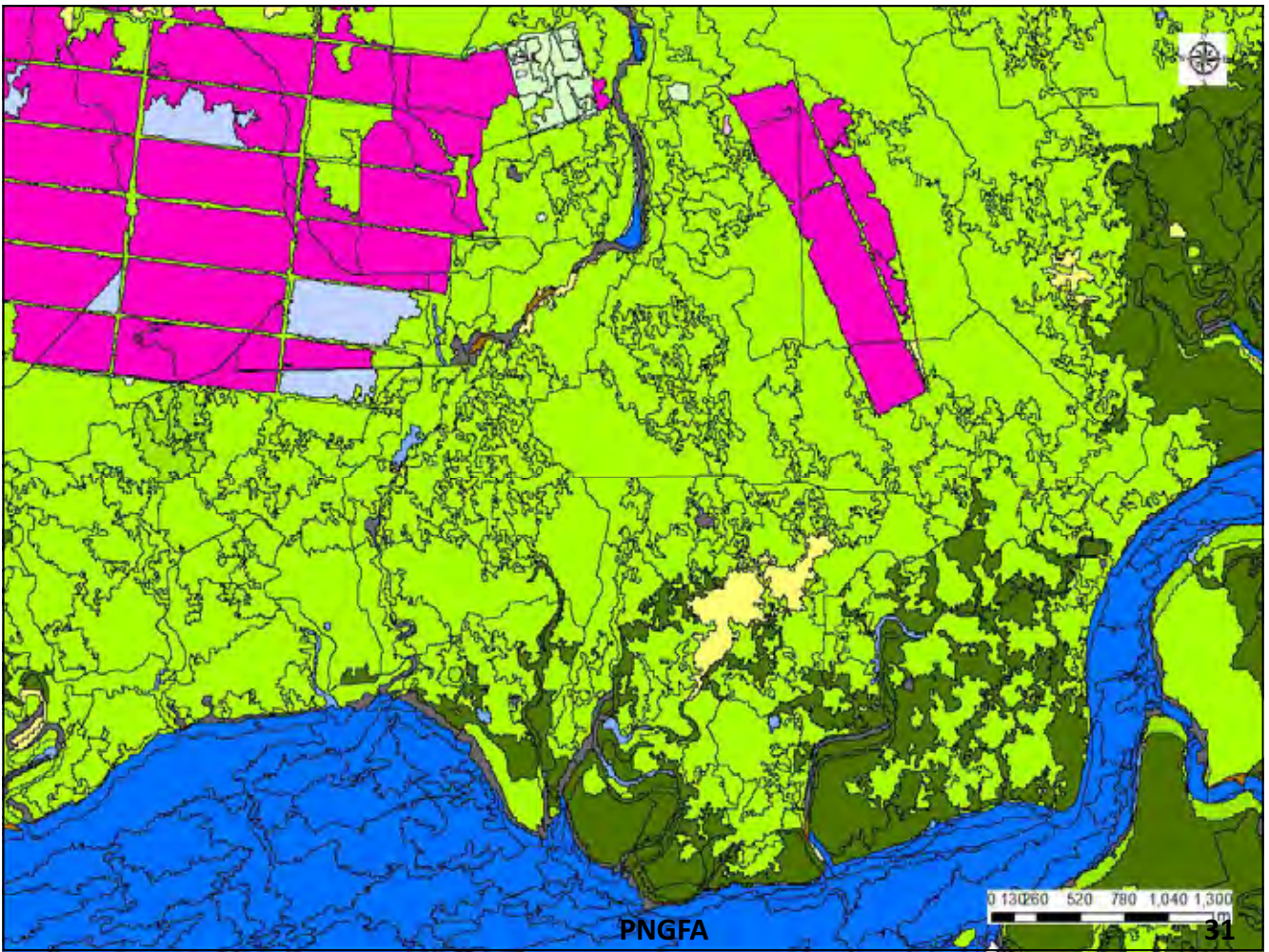






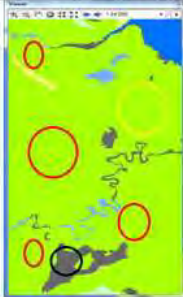









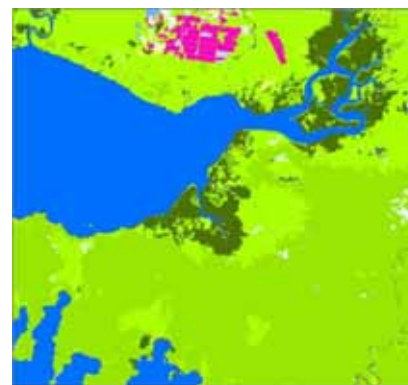


# Evaluation of Automatic Classification Result

Title ID	5534626	Officer(s)	Elizabeth Kaidong
Province	Mline Bay	Region	Southern
Veg. Type			
Acq. Date	02/03/2011	Doc. Date	30/11/2012
Classification Result		Rapid Eye Image	
			
FIMS		Parameters	
			
Comments	This polygon (red) is classified as low alt. forest plains but it is grassland. The second polygon (yellow) is classified as low alt. forest plains but is mangrove forest. The third polygon (black) is classified as shadow but it is bare land.		



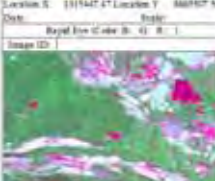



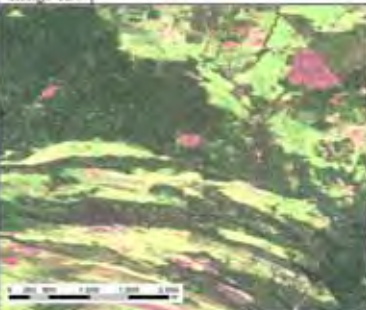

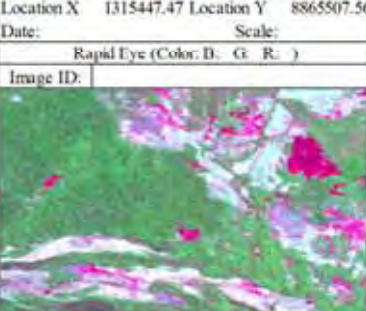
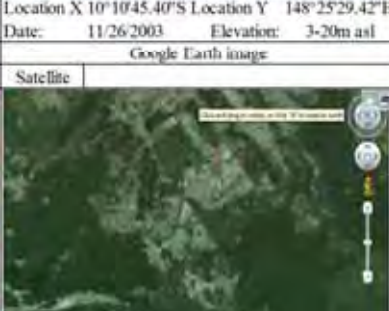
Classification before update parameters



Classification after update parameters

# Interpretation Card for Correcting for Classification

Structural formation	Overhead and Horizontal '12'			
Vegetation type	Overhead			
Definition of FIMS	Overhead, angles, both and very low woody shade. Generally less than 3m tall. Scattered trees may be present.			
Characteristic	Slope (°/cent)	Reddish brown (020452)		
	Color	NA		
Line of RapidEye image	Size	NA		
	Pattern	NA		
Shadow	Texture	Multi		
	Shape	NA		
Caption	Class. name	Sign of settlement and gardening, and areas where contain forest patches		
	1st condition			
	2nd condition			
	3rd condition			
Rapid Eye image	Rapid Eye (Color: B- G- R- )	Google Earth image		
	Image ID:	Satellite		
RapidEye sample image				
	Location X: 1315447.47 Location Y: 8865507.56 Date: 11/28/2011 Scale: 3.20m/px	Location X: 10°10'45.40"S Location Y: 148°25'29.42"E Date: 11/26/2003 Elevation: 3-20m asl		
Overhead	Rapid Eye (Color: B- G- R- )	Google Earth image		
	Image ID:	Satellite		
				
	Location X: 1315447.47 Location Y: 8865507.56 Date: 11/28/2011 Scale: 3.20m/px	Location X: 10°10'45.40"S Location Y: 148°25'29.42"E Date: 11/26/2003 Elevation: 3-20m asl		

Rapid Eye (Color: B- G- R- )		Google Earth image	
Image ID:	Satellite		
			
Location X: 1315447.47 Location Y: 8865507.56 Date: 11/28/2011 Scale: 3.20m/px	Location X: 10°10'45.40"S Location Y: 148°25'29.42"E Date: 11/26/2003 Elevation: 3-20m asl		
Rapid Eye (Color: B- G- R- )		Google Earth image	
Image ID:	Satellite		
			
Location X: 1315447.47 Location Y: 8865507.56 Date: 11/28/2011 Scale: 3.20m/px	Location X: 10°10'45.40"S Location Y: 148°25'29.42"E Date: 11/26/2003 Elevation: 3-20m asl		



# Classification Threshold

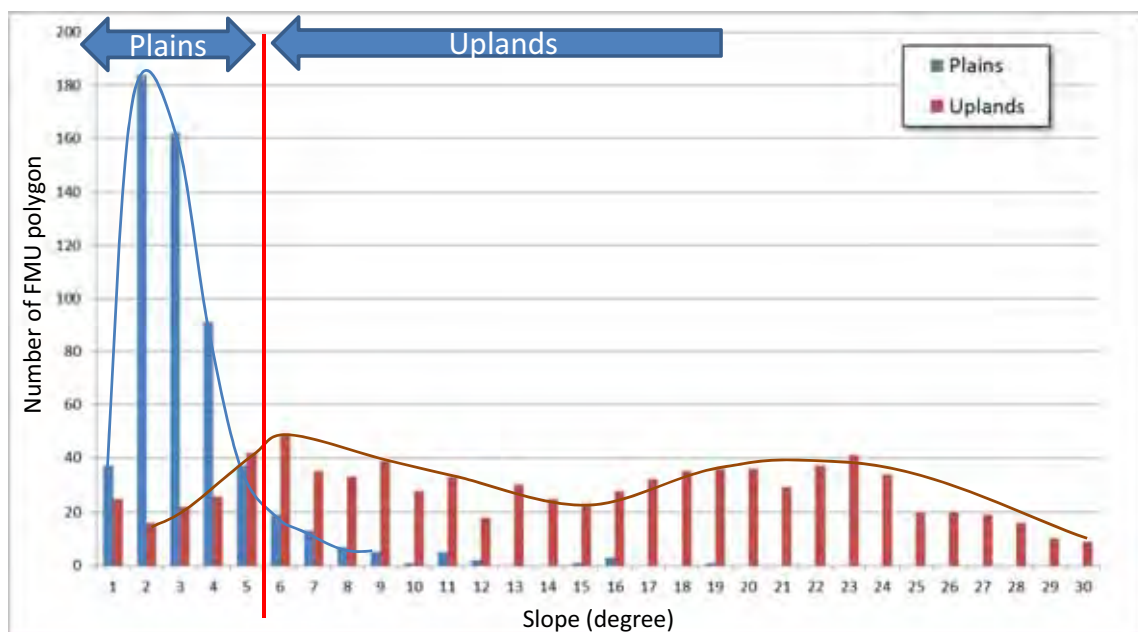
To reduce mis-classification in automatic classification process, we optimized some classification threshold as below.

Vegetation Type	Sep. 2012	Dec. 2012 (Updated)
Low Altitude Forest on Plains and Fans	0 – 15 degree	0 – 6 degree
Low Altitude Forest on Uplands	15 - degree	6 - degree

Vegetation Type	Sep. 2012	Dec. 2012 (Updated)
Grassland and Herbland	All	0 – 2,500m
Subalpine grassland	-	2,500 – 3,200m
Alpine grassland	-	3,200m -

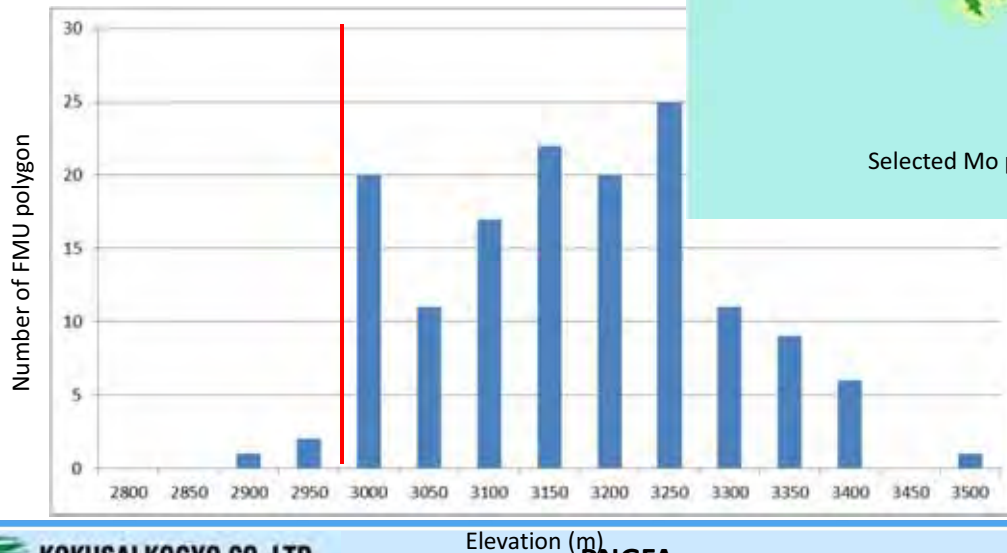
# Classification Threshold

To decide boundary between “P” and “H”, I calculated mean slope value of FIMS “P” and “H” polygons.



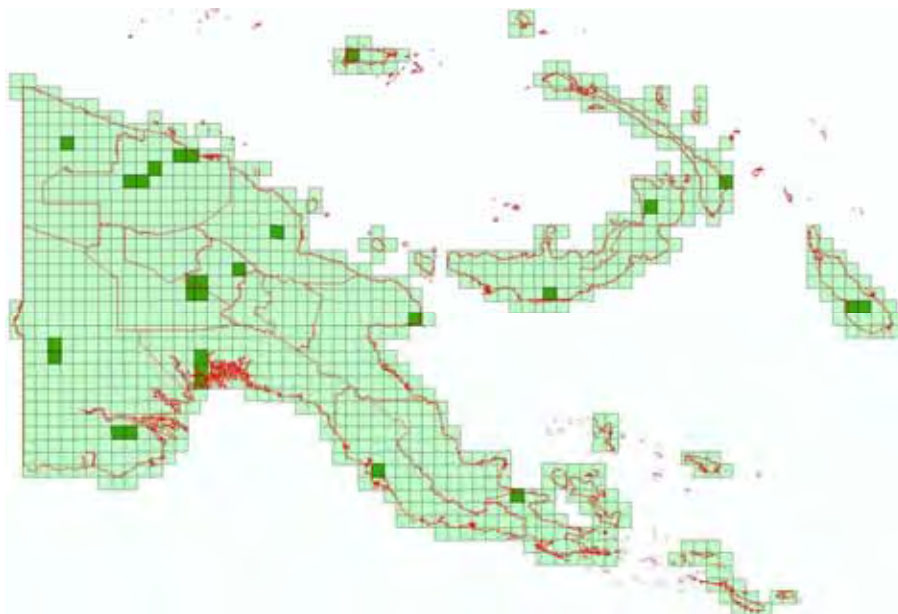
# Classification Threshold

To check boundary of “Mo”, I also calculated mean elevation of FIMS “Mo” polygons.



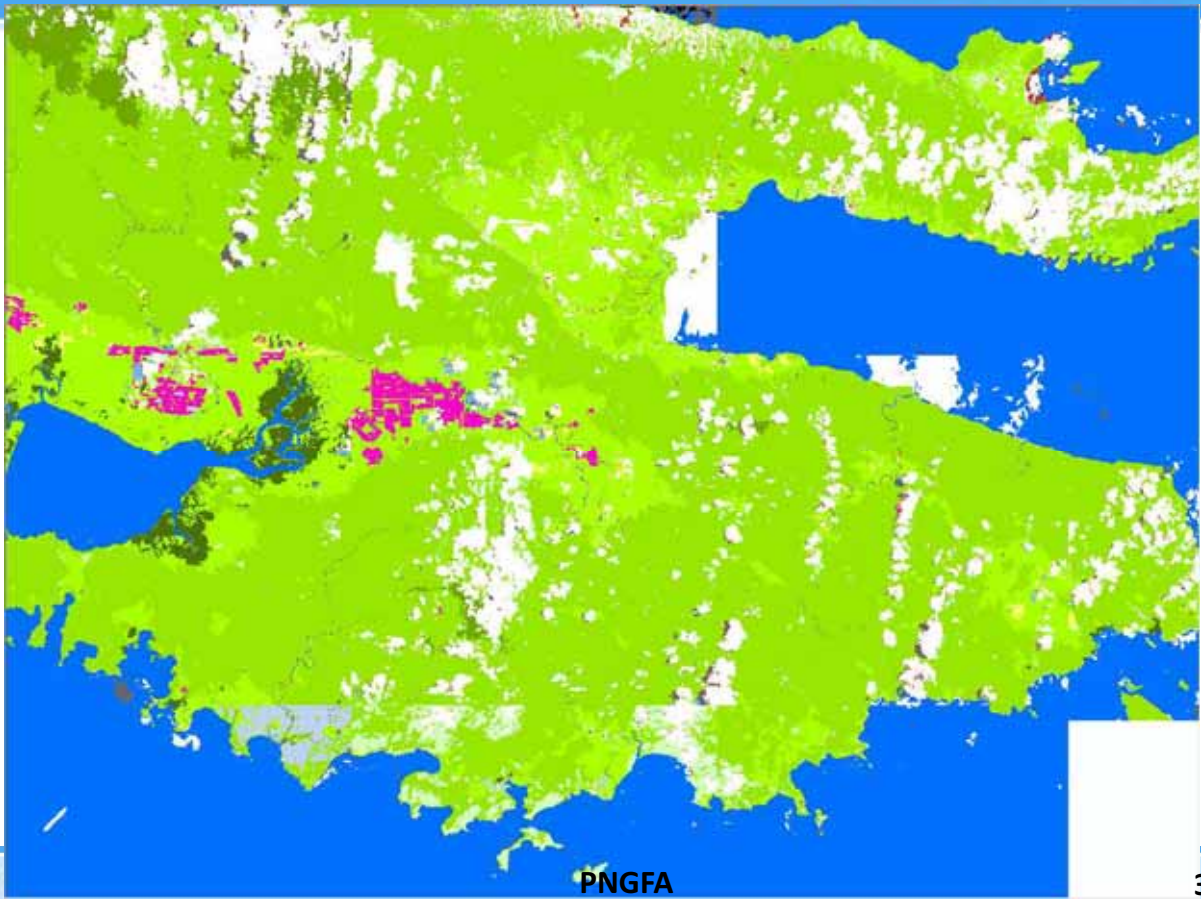
# Draft Classification Check (Sample Tile)

To optimise other threshold values, CP team made “Misclassification processing documentation” for 28 scenes in 17 typical vegetation areas.





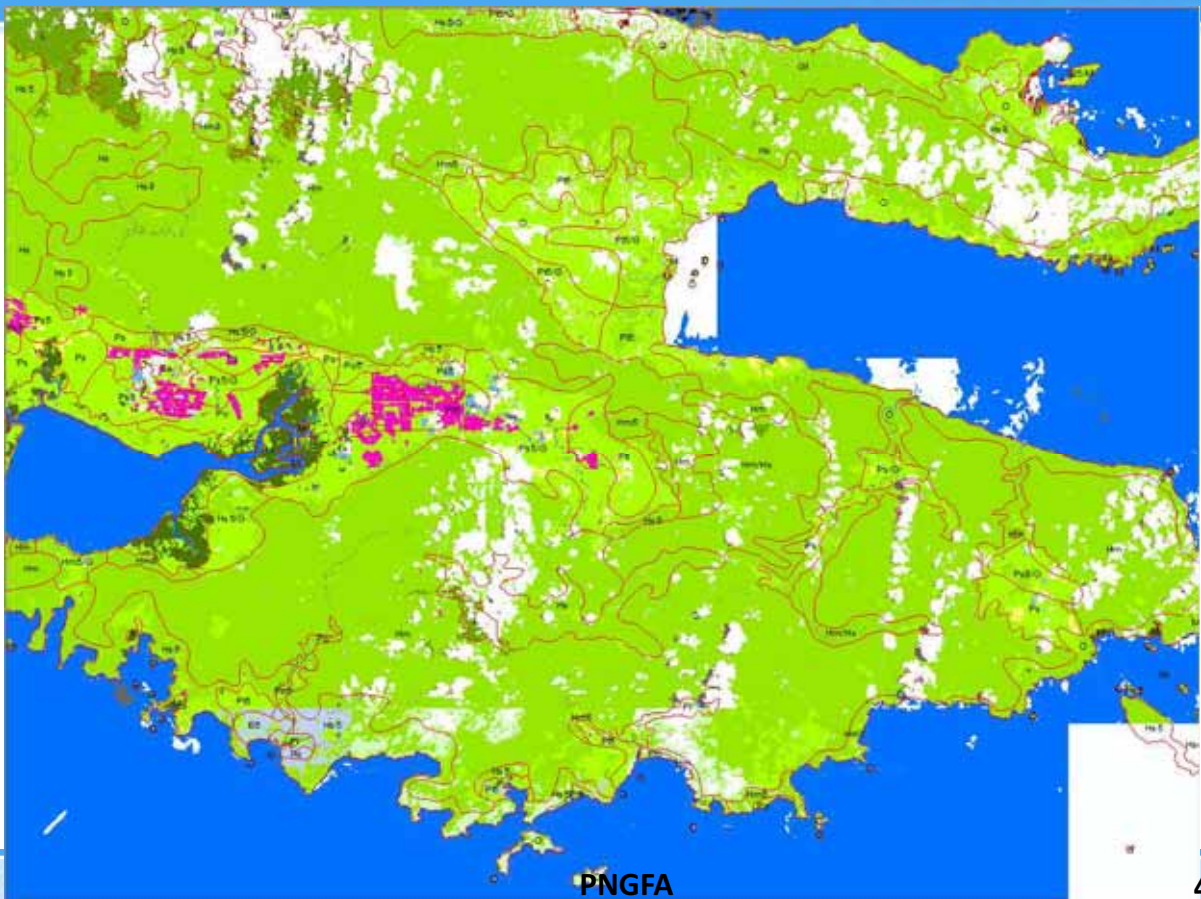
# Sample Image of Forest Base map



PNGFA

39

# Sample Image of Forest Base map

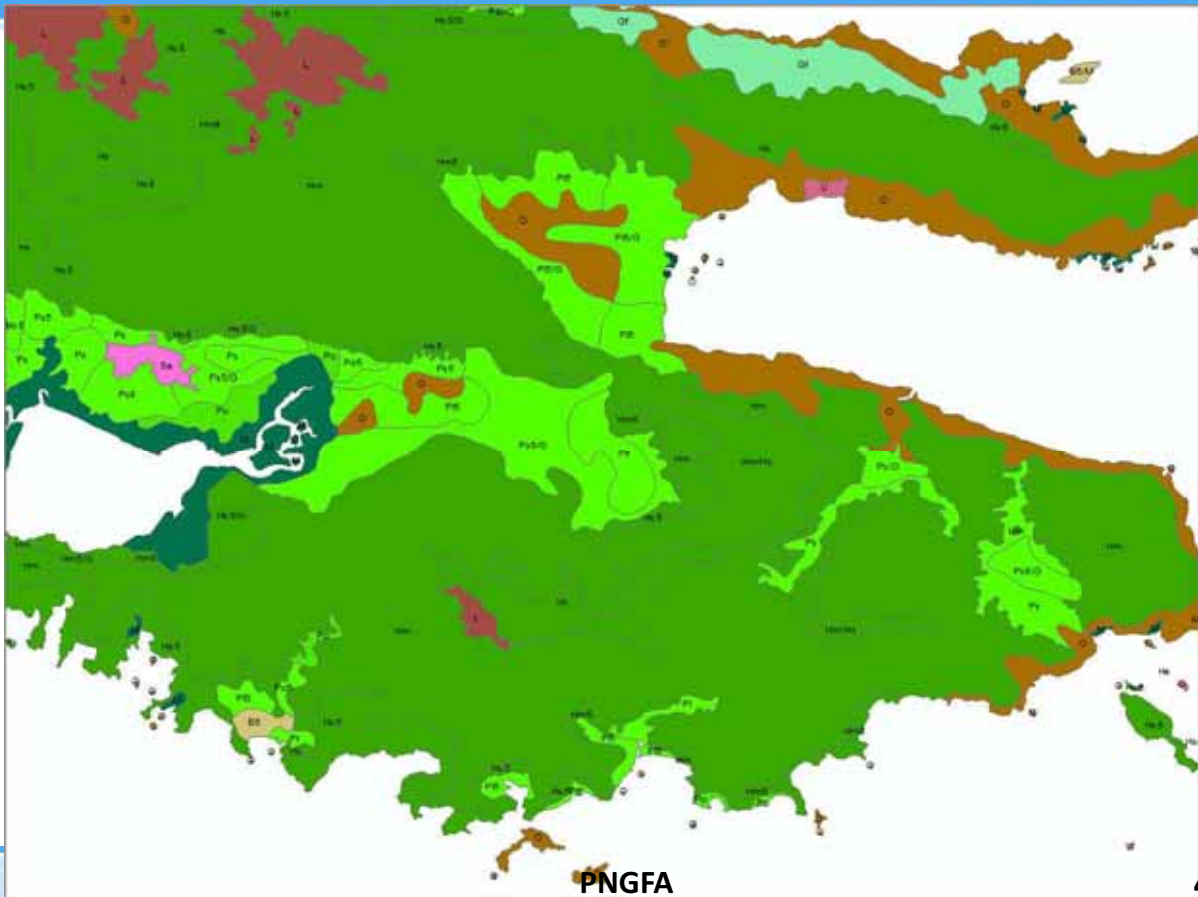


PNGFA

40



# Sample Image of Forest Base map

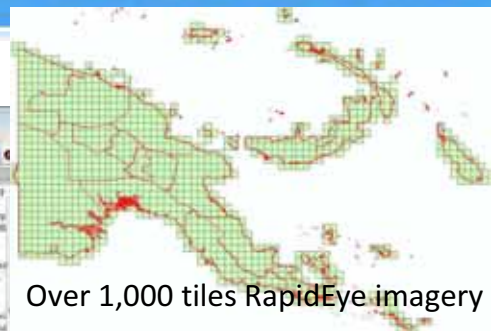
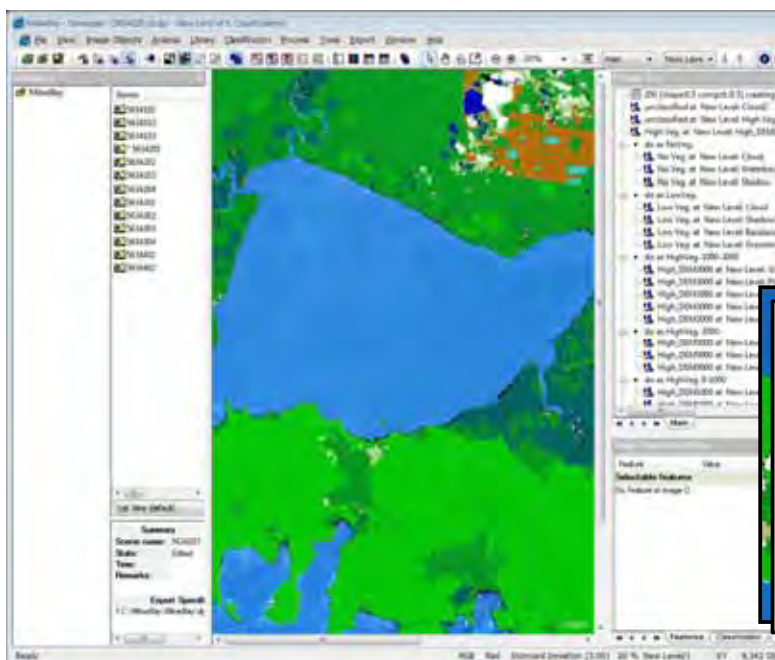


PNGFA

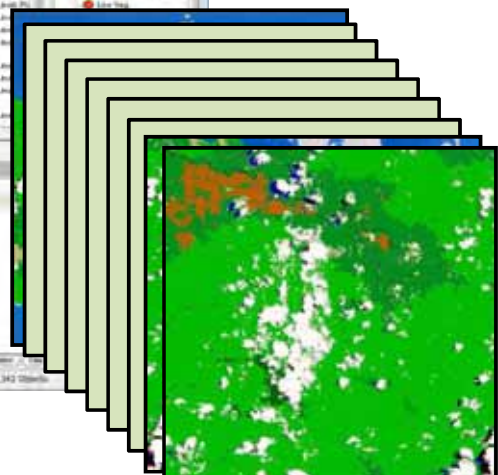
41

# Mass Production based on Classification Flow and Input from CP

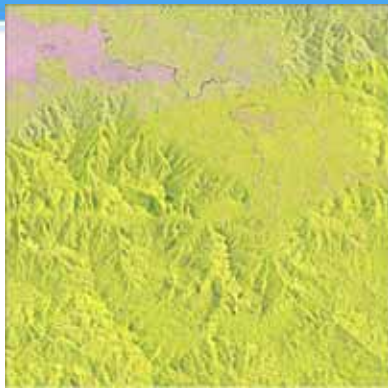
Forest classification by eCognition software



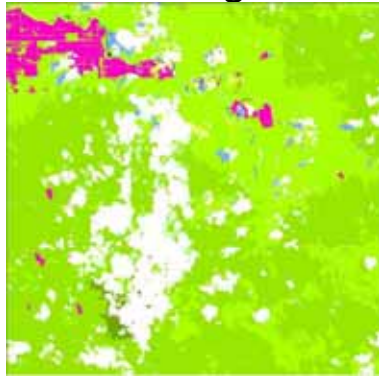
Over 1,000 tiles RapidEye imagery



# Correction for Cloud Area



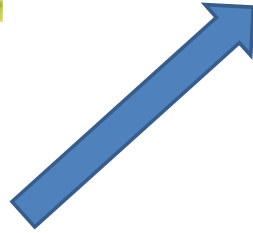
PALSAR image



Classification Result from RapidEye



Dissolved image



Corrected image

# Correction for Cloud Area



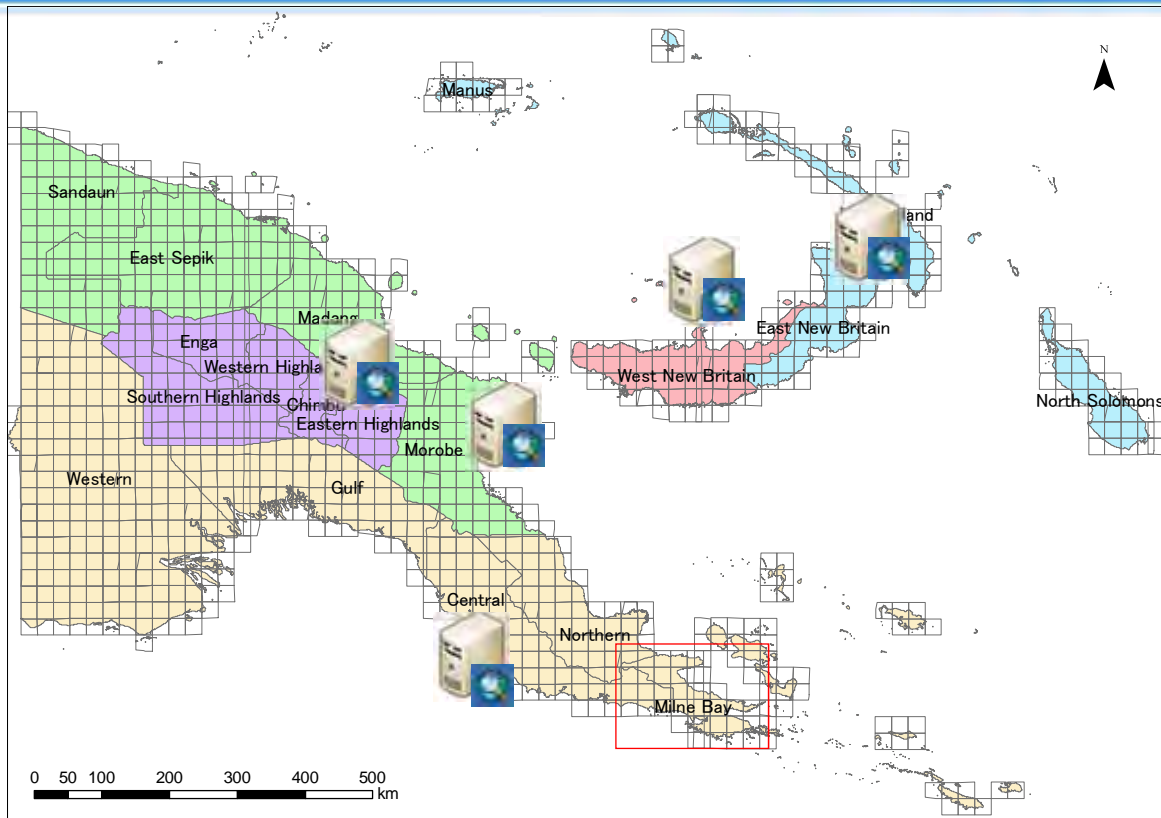
Classification



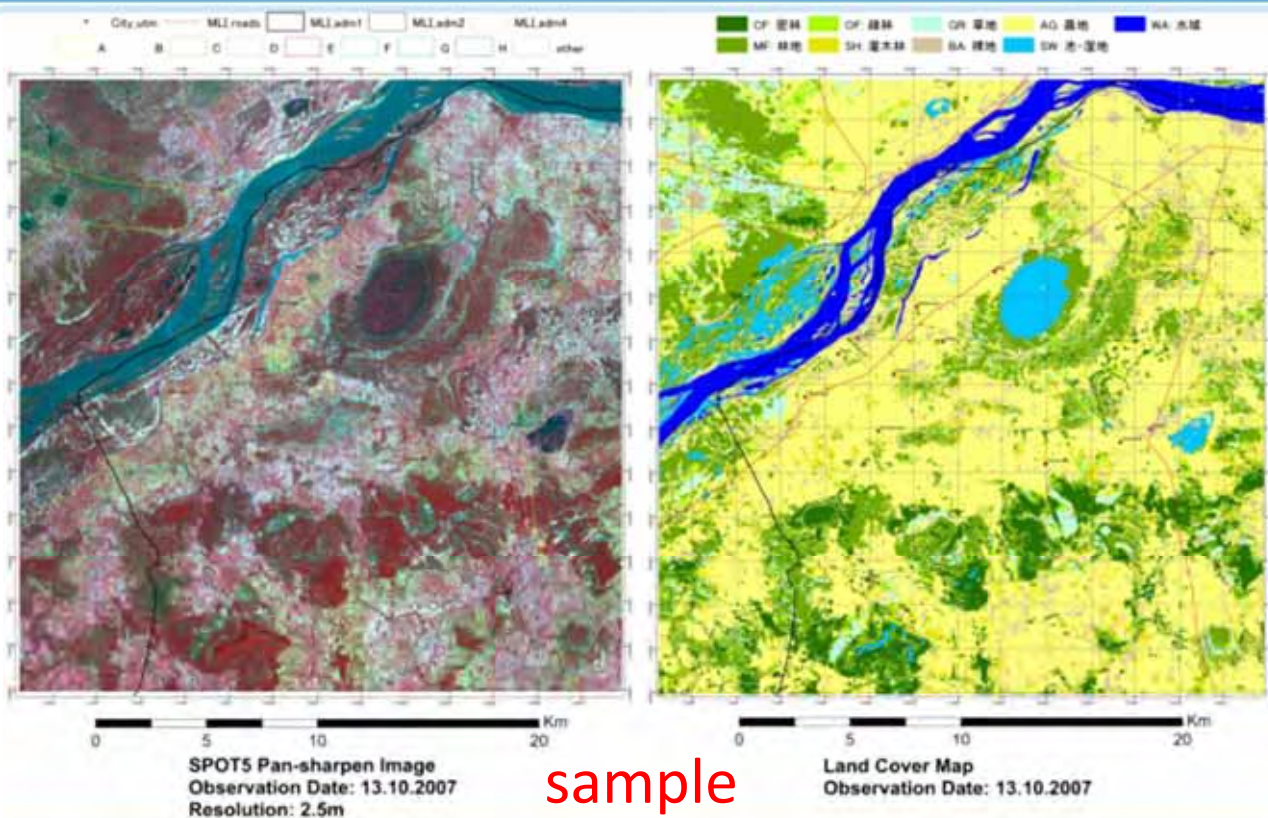
Corrected cloud cover Classification





# Future Work (Local base station)



# Future Work (Satellite Image and BaseMap)



# Future Work (Verification Sheet)

	Photo No. <u>001</u> Waypoint # <u>009</u>	Date	2012/3/14	
Code	Vegetation Type:	Reported by	Rabbie Lalo	Remarks
L	Lower Montane Forest - above 1000 m a.s.l	Area Office	Miomage	
Code	Forest Types:	Province	Morobe	Near the forest edges is quite disturbed occasionally due to subsistence gardening activities practiced by the local landowners.
L	Small crowned forest ✓	District	Stulim	
LAr	Small crowned forest with Araucaria common	Village	Zinzumau	
LN	Small crowned forest with Nothofagus ✓	X-coordinate (longitude)	7° 28' 3"	
Lc	Small crowned forest with conifers ✓	Y-coordinate (latitude)	145° 28' 3"	Also near the forest edge are evident of secondary regrowths.
Ls	Very small crowned forest ✓	Altitude (elevation)	950 metres a.s.l	
LsCp	Very small crowned forest with Casuarina papua	Direction of photo capture	45° III (NSEW)	
LsN	Very small crowned forest with Nothofagus ✓	Distance of photo capture	50 metres	Gastanopsis forest also evident in this vegetation type
		Slope, direction	5 ~ 35% II (°NSEW)	
		Time (24hr)	1300 hr	
		Tree Height (ave.)	14 metres	
		Crown coverage (ave.)	70 (%)	
		Canopy size (ave.)	5 ~ 10 metres	Sketch
				

22

# Summary & Conclusion

- BaseMap Development is intensively worked with Counterpart (need Local Veg. Knowledge)
- Draft Classification is checked with Counterpart using selected Sample Satellite (appreciated)
- Workflow and Class is drafty defined and would like to start processing in Japan (considering schedule)
- Capacity Building is Important for Future Sustainable Monitoring (addressing on parallel)
- BaseMap development in PNG is huge work and will be continuously improved with local Knowledge





# Development of Forest Resource Information Management Data Base

PNGFA-JICA GIS/Ground Truth Workshop  
March 5<sup>th</sup>, 2013

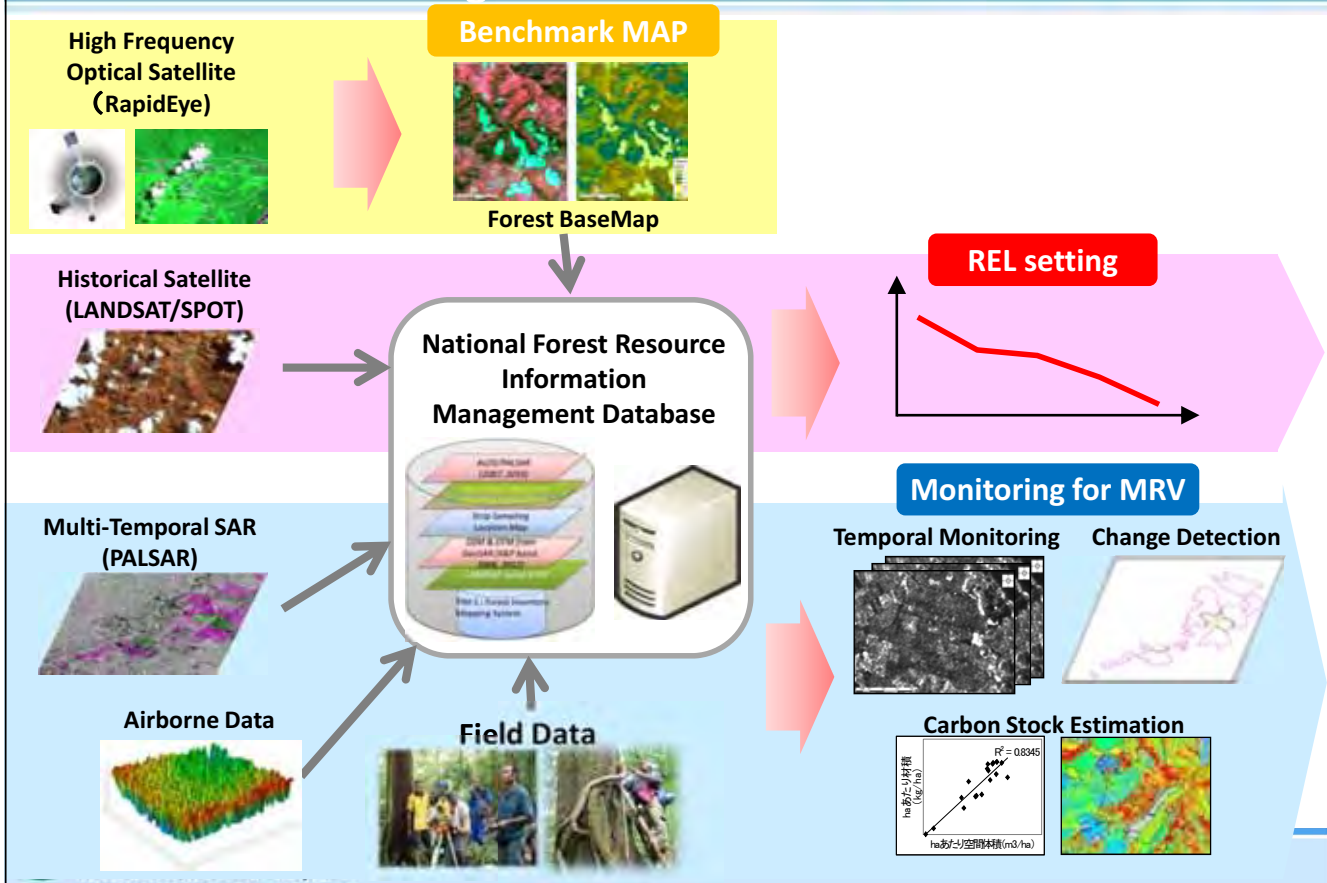
Kokusai Kogyo Co.,Ltd (KKC)  
Consultant for PNGFA/JICA&JICS



## Table of Contents

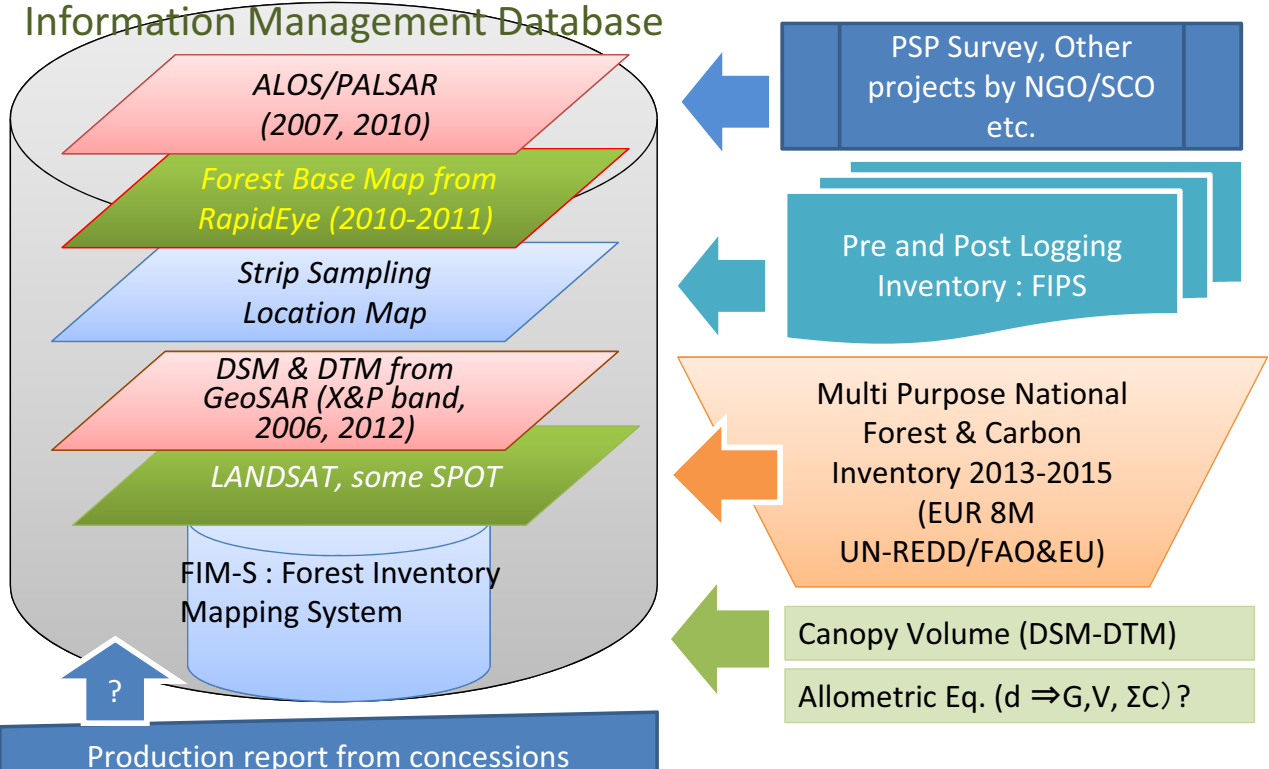
1. Concept of Forest Resource Information Management Data Base
2. Improvement of FIMS and FIPS
3. Integration of Remote Sensing Data and Field Data
4. Use of Forest Resource Information

# Concept of Forest Resource Information Management Data Base



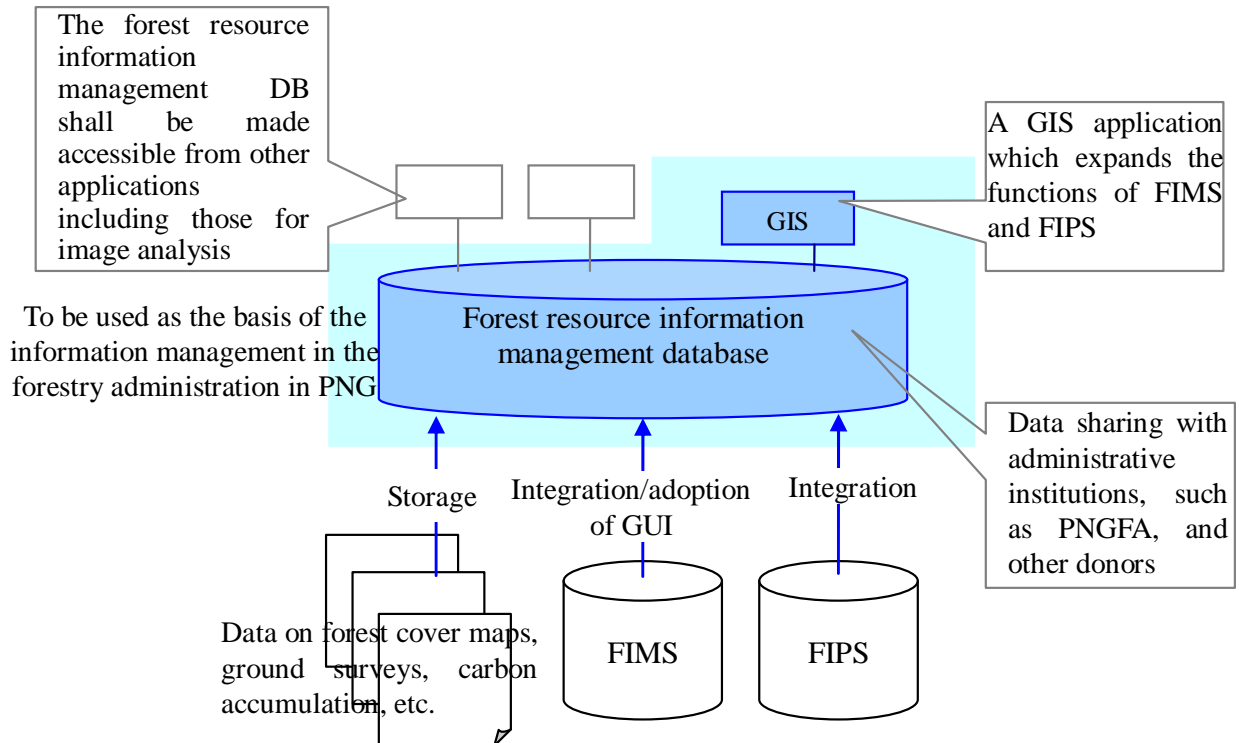
# What to be done by 2014

## National Forest Resource Information Management Database



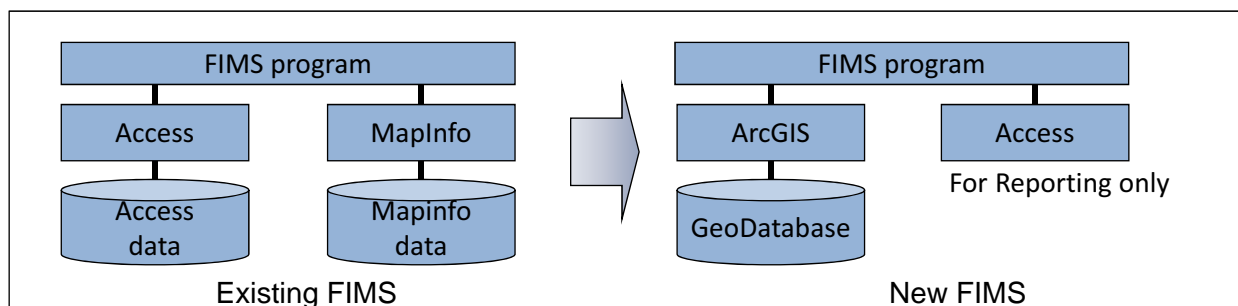


# PNGFA New Database: Scope of Integration of Existing DBs



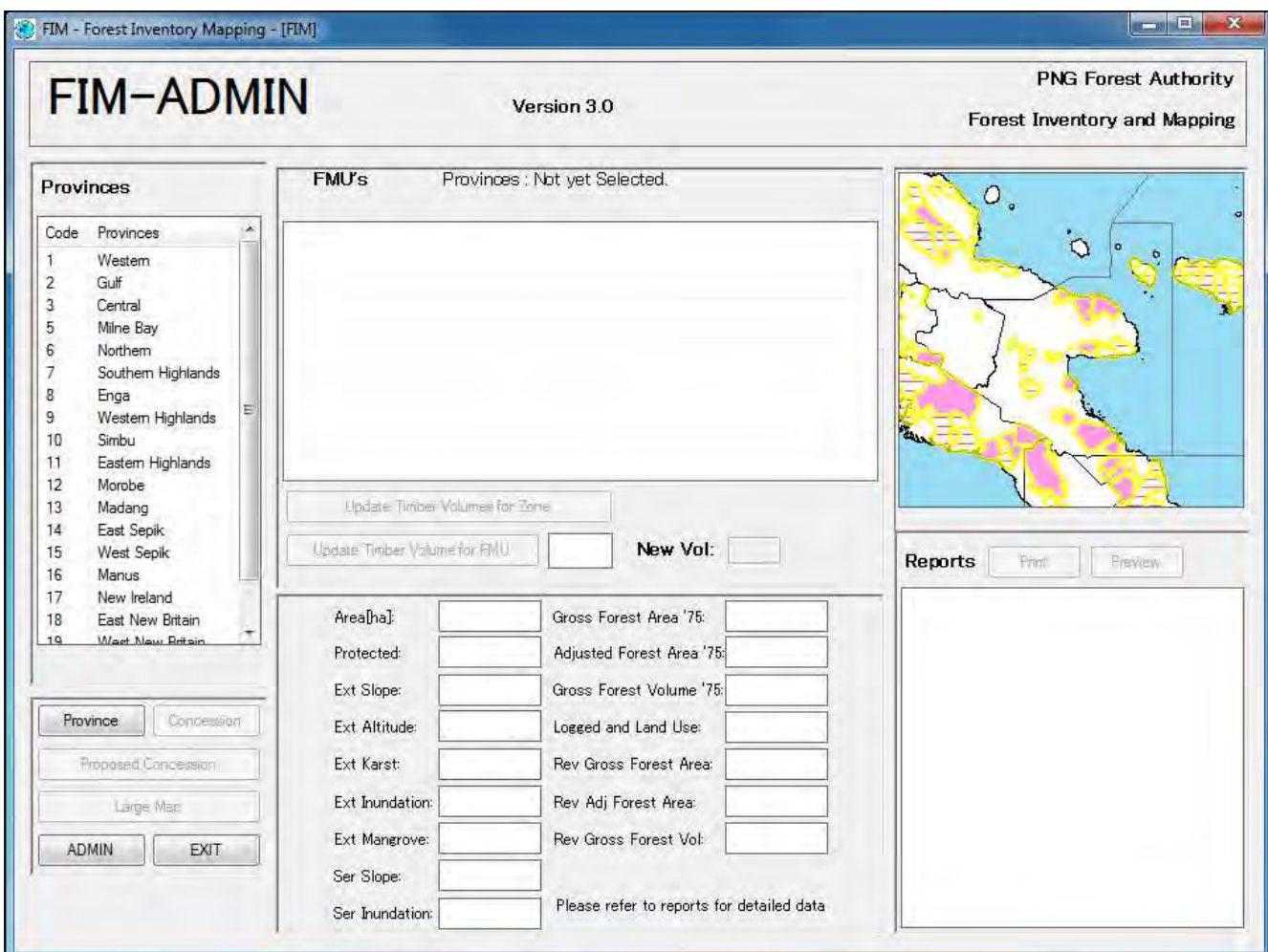
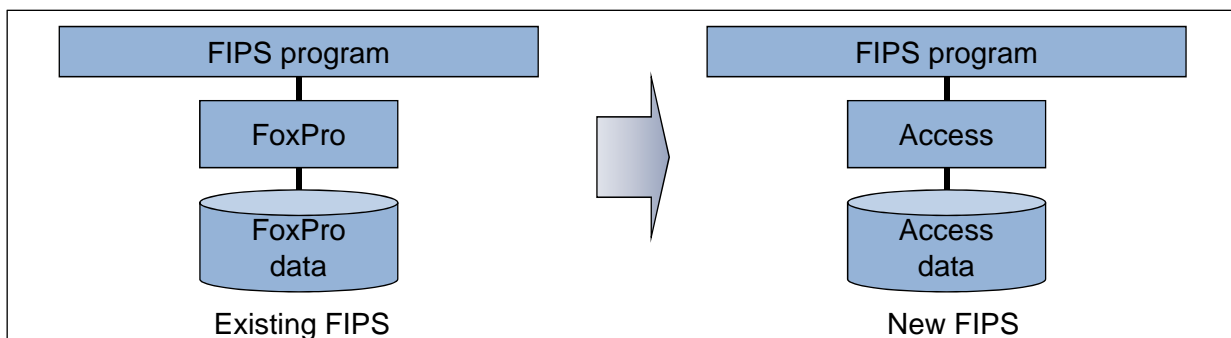
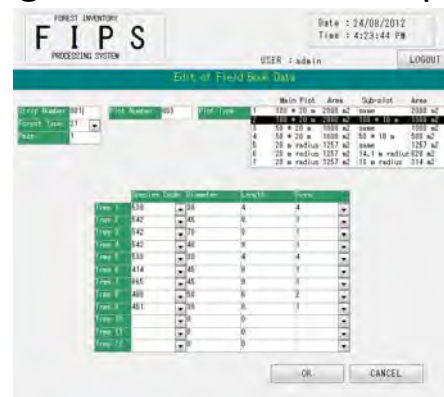
# New FIMS (ArcGIS version): Screen Image

- GUI and the functions of the existing FIMS have been incorporated

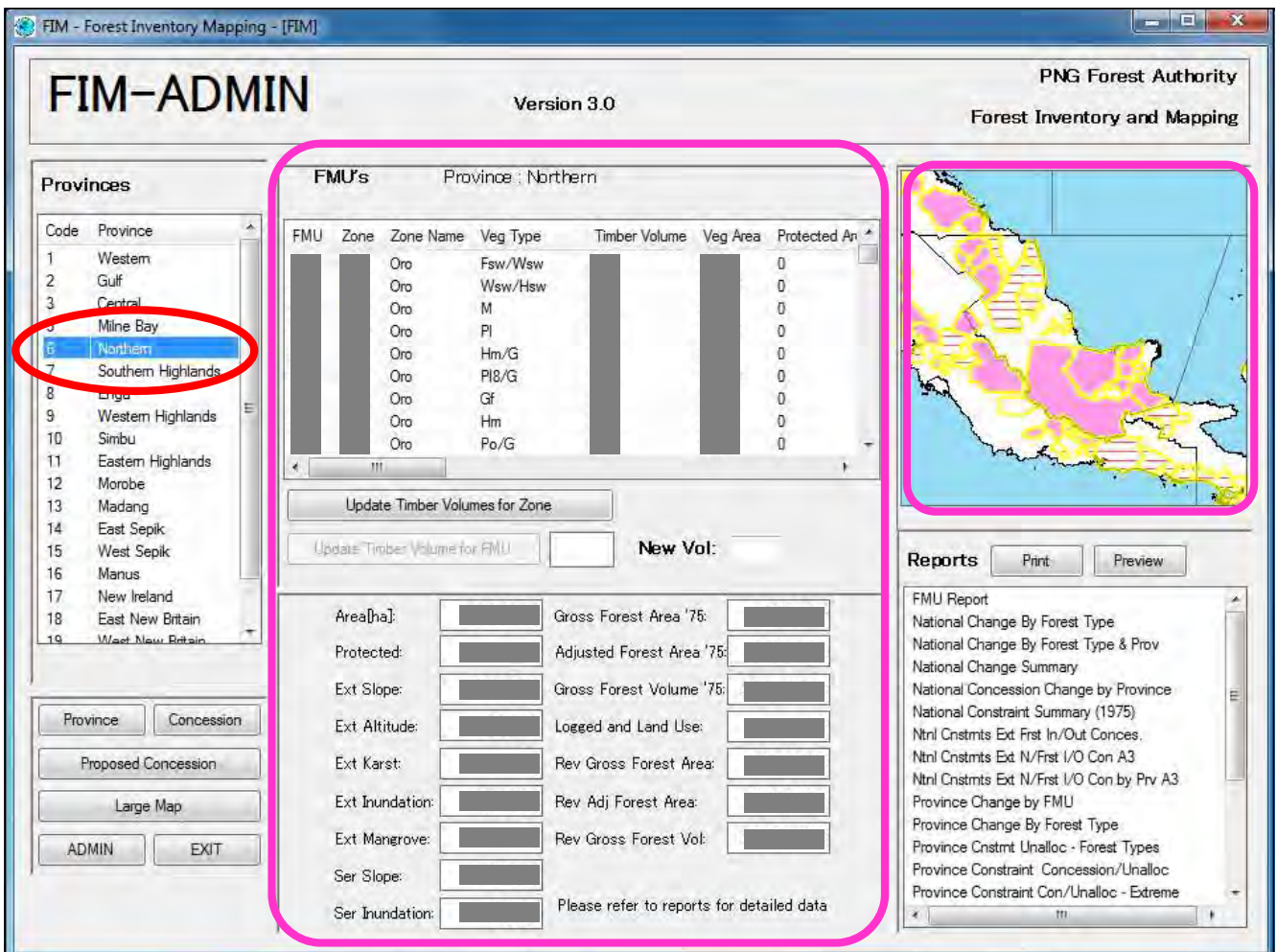
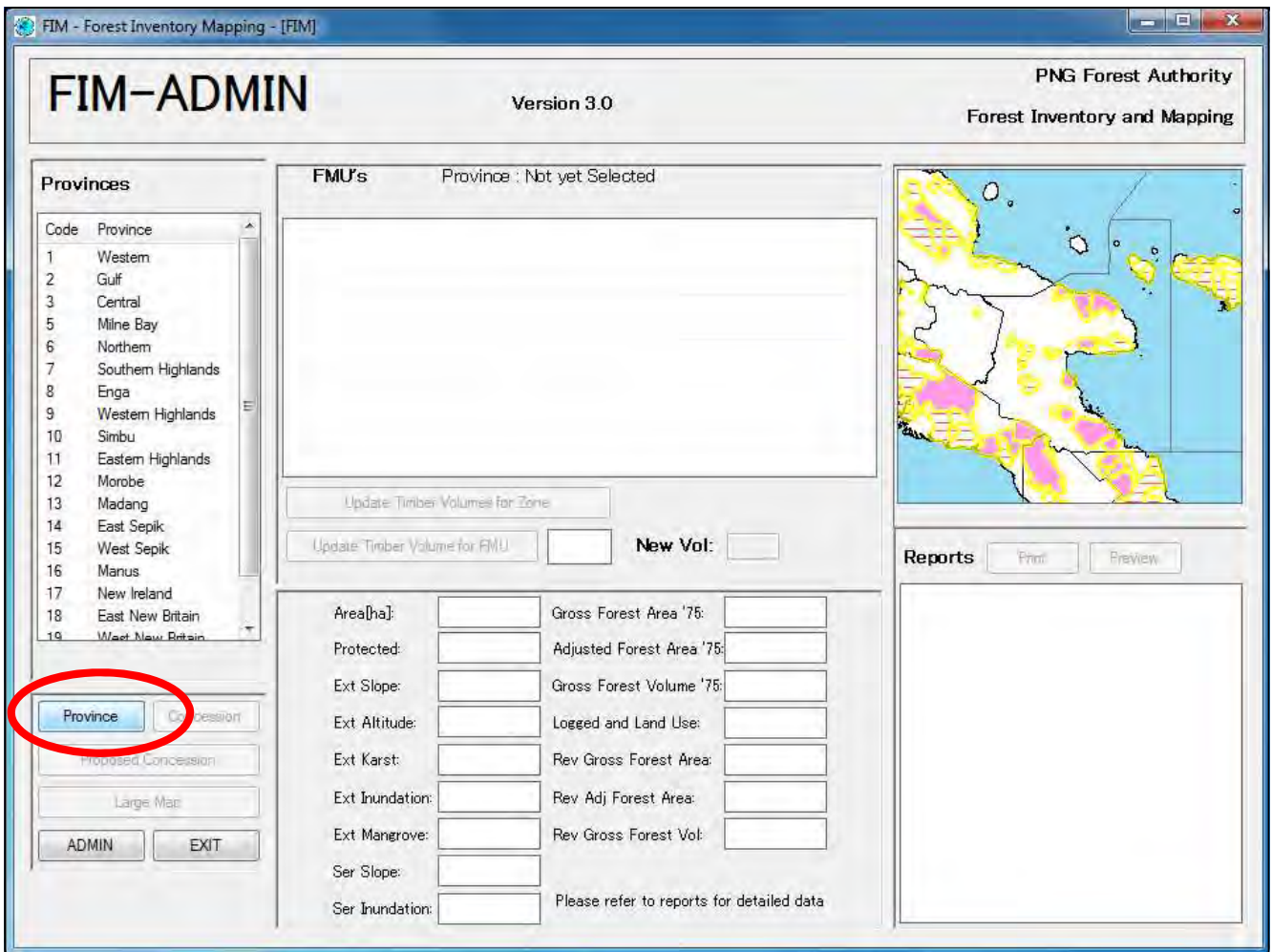


# Replacement of FIPS (Access version)

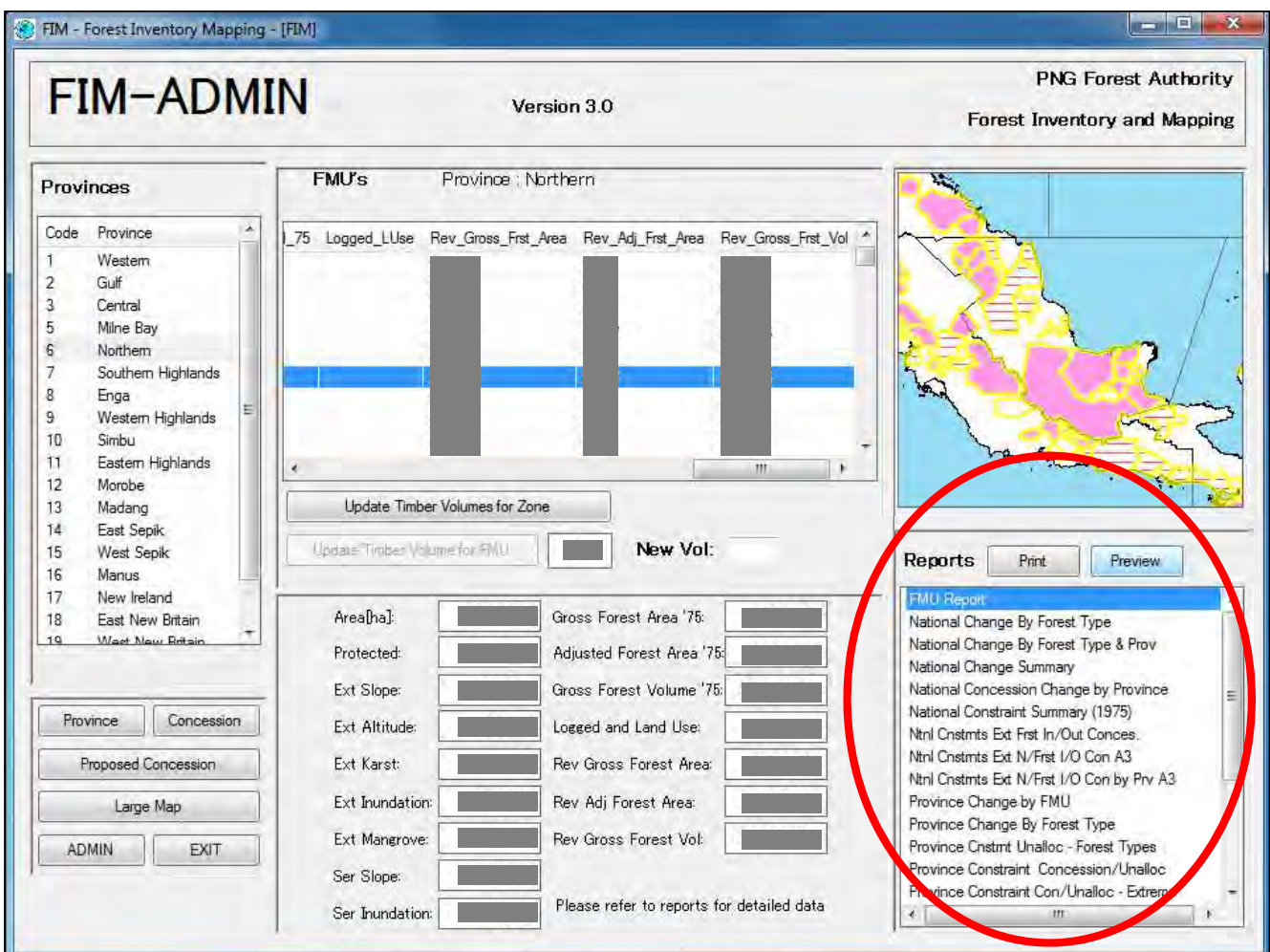
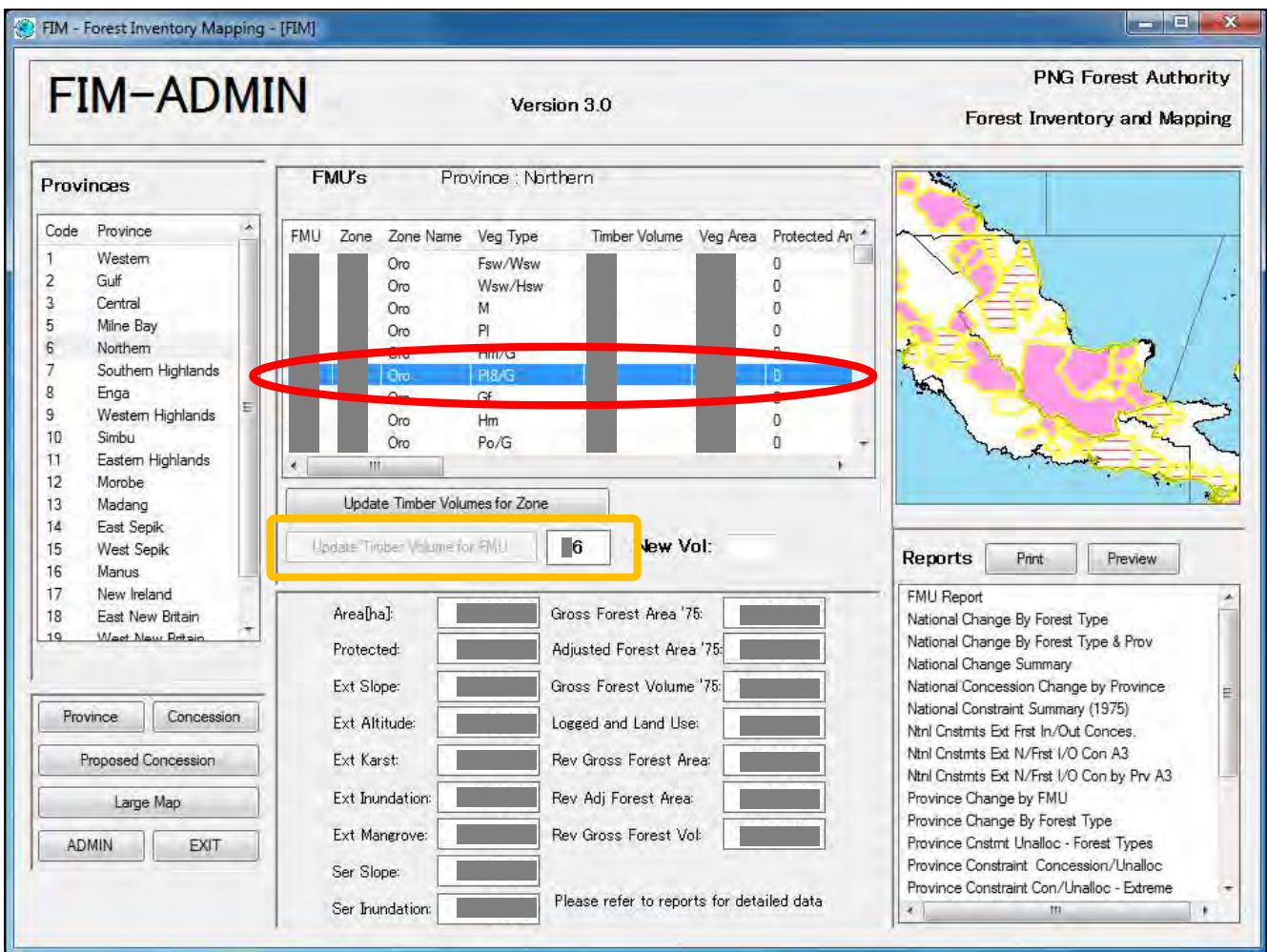
- GUI and the functions of the existing FIPS have been incorporated













rpt\_FMU

FIM - Forest Inventory and Mapping FMU Report 02-Mar-2013

Province: Northern FMU: 6

Vegetation Type: PIB/G Complex - Large to medium crowned forest/Grassland

Zone: 502 Oro

	Total	Protected	Extreme Constraints					Serious Constraints		All Constraints
			>30° Slope	>3400m Altitude	Tower Karst	>50% Inundated	Mangroves	20-30° Slope & h/h High Relief	>50% Inundated	
Gross Area (ha)										
Protected Area Within Constraints (ha)										
Timber Volume (cu m/ha)										
1975	Gross Forest Area (ha)									
	Adjusted Forest Area (ha)									
	Gross Volume (cu m)									
Change 1975 - Current	Logged Over Area (ha)									
	Converted to Land Use:									
	Logged (ha)									
	Cleared (ha)									
Current	Gross Forest Area (ha)									
	Adjusted Forest Area (ha)									
	Gross Volume (cu m)									

1/1 Page

Page: 1 No Filter

FIM - Forest Inventory Mapping - [FIM]

# FIM-ADMIN

Version 3.0 PNG Forest Authority Forest Inventory and Mapping

**Provinces**

Code	Province
1	Western
2	Gulf
3	Central
5	Milne Bay
6	Northern
7	Southern Highlands
8	Enga
9	Western Highlands
10	Simbu
11	Eastern Highlands
12	Morobe
13	Madang
14	East Sepik
15	West Sepik
16	Manus
17	New Ireland
18	East New Britain
19	West New Britain

Province: **Concession**

Proposed Concession

Large Map

ADMIN EXIT

**FMU's** Province: Northern

FMU	Logged_LUse	Rev_Gross_Frst_Area	Rev_Adj_Frst_Area	Rev_Gross_Frst_Vol
_75				

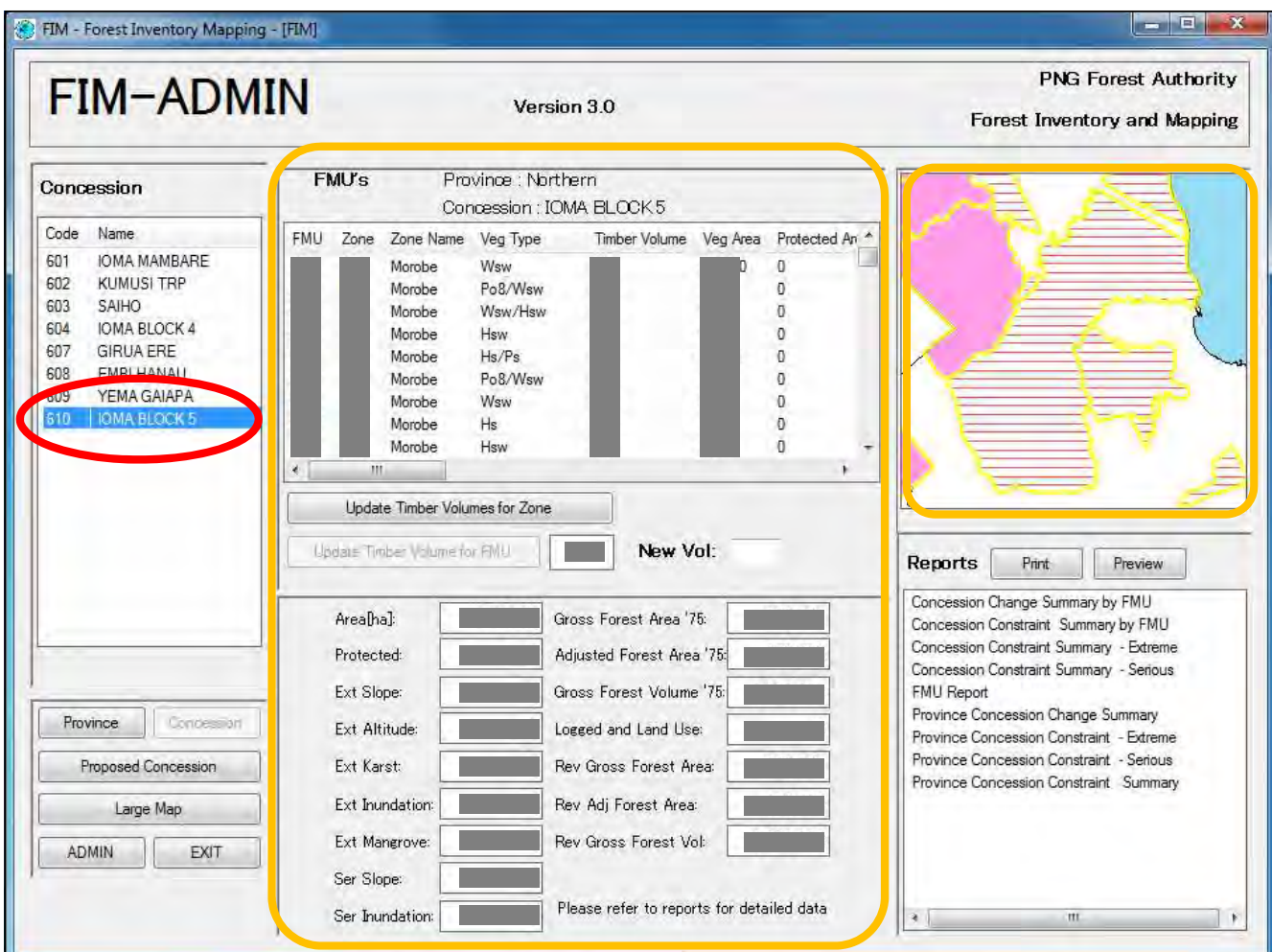
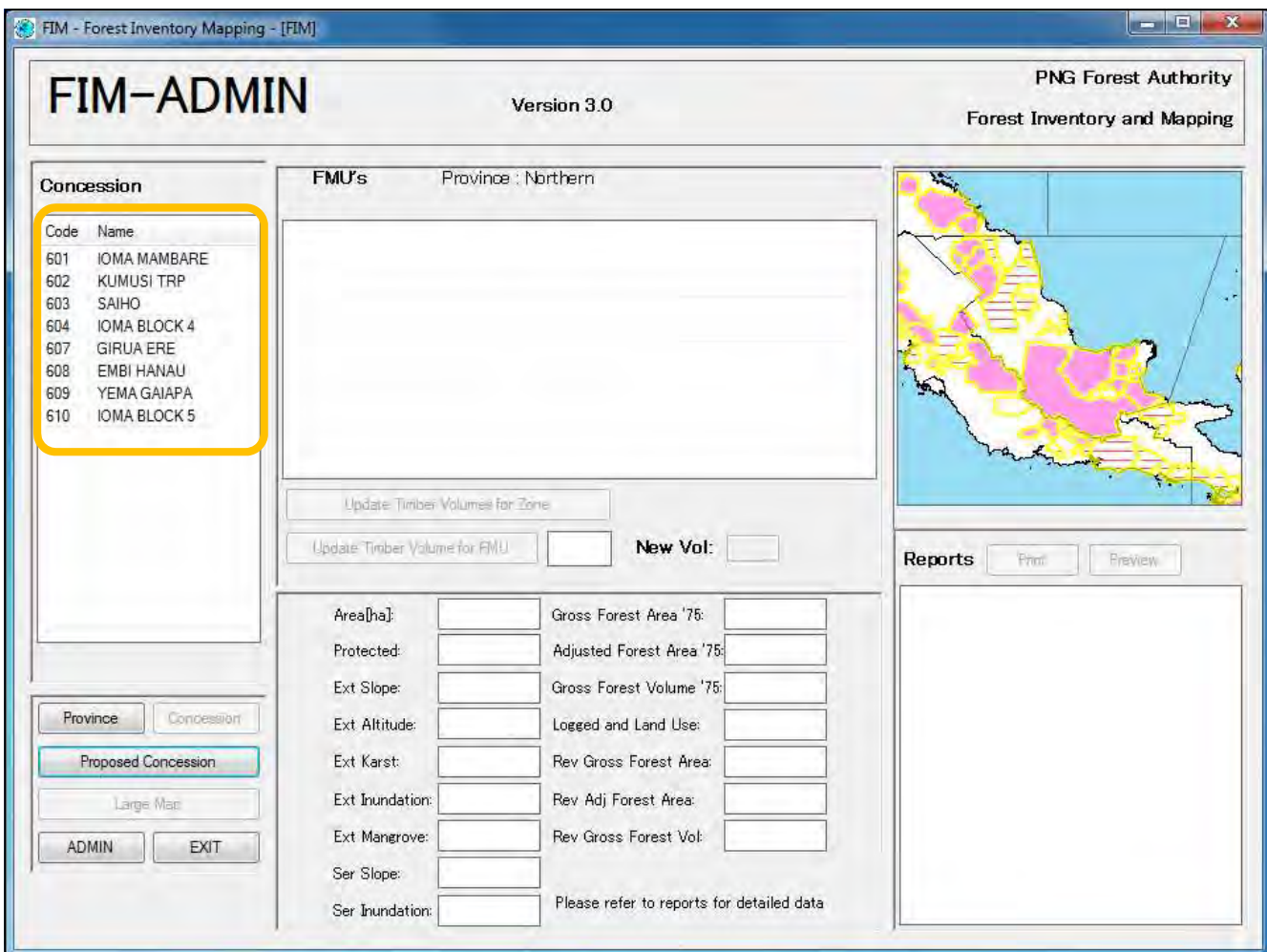
Update Timber Volumes for Zone

Update Timber Volume for FMU **New Vol:**

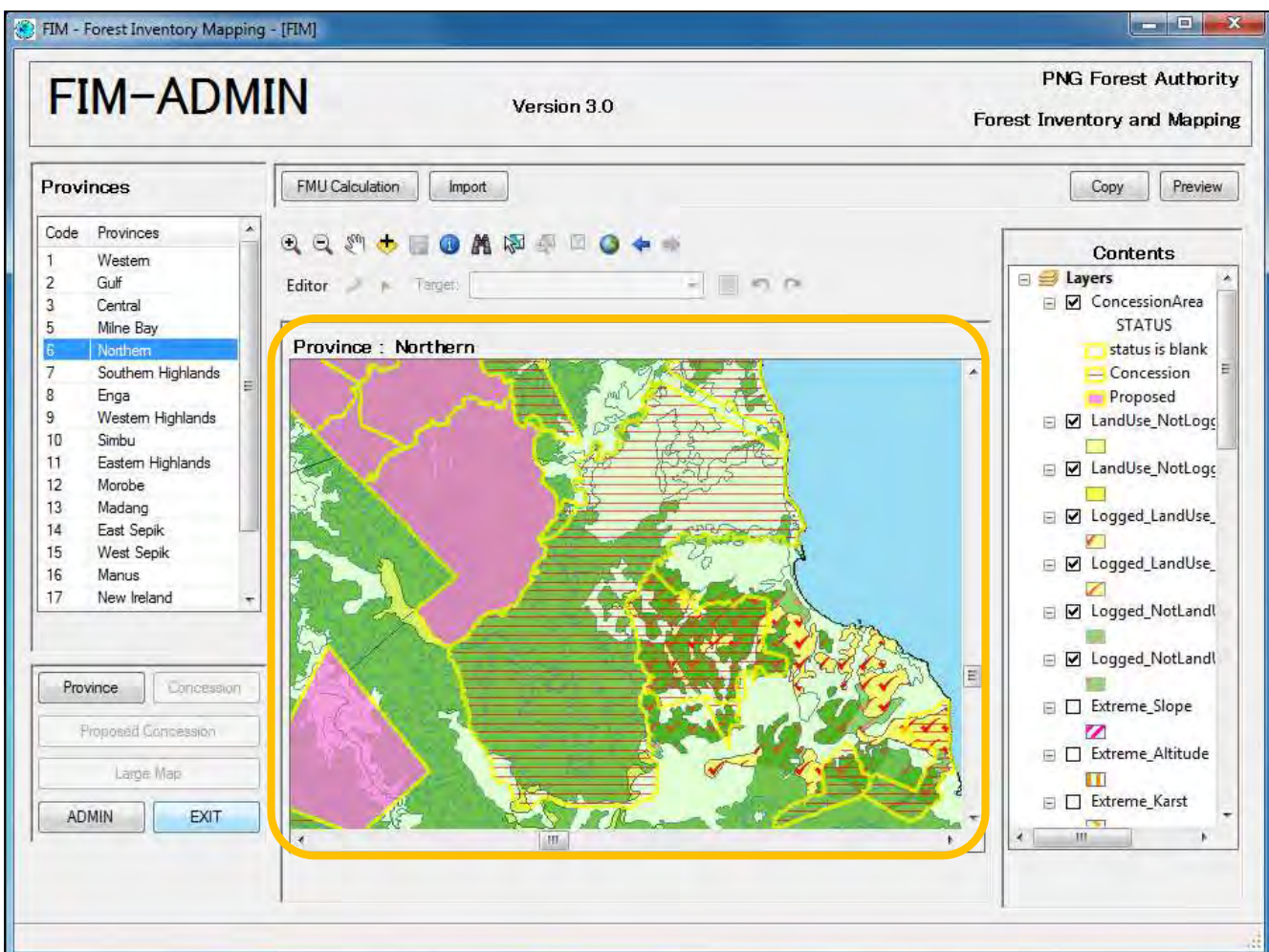
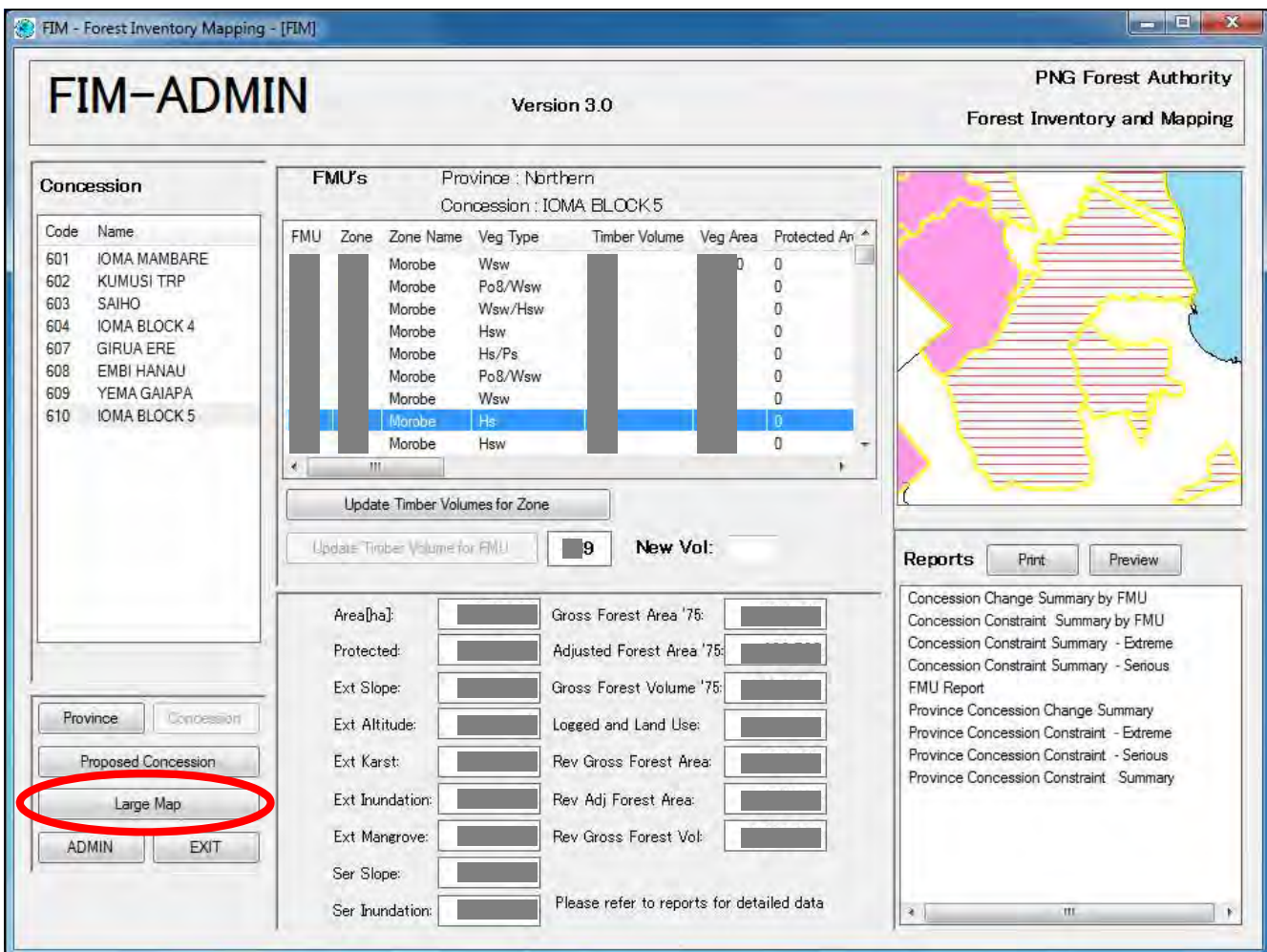
Area[ha]:	<input type="text"/>	Gross Forest Area '75:	<input type="text"/>
Protected:	<input type="text"/>	Adjusted Forest Area '75:	<input type="text"/>
Ext Slope:	<input type="text"/>	Gross Forest Volume '75:	<input type="text"/>
Ext Altitude:	<input type="text"/>	Logged and Land Use:	<input type="text"/>
Ext Karst:	<input type="text"/>	Rev Gross Forest Area:	<input type="text"/>
Ext Inundation:	<input type="text"/>	Rev Adj Forest Area:	<input type="text"/>
Ext Mangrove:	<input type="text"/>	Rev Gross Forest Vol:	<input type="text"/>
Ser Slope:	<input type="text"/>		
Ser Inundation:	<input type="text"/>	Please refer to reports for detailed data	

**Reports** Print Preview

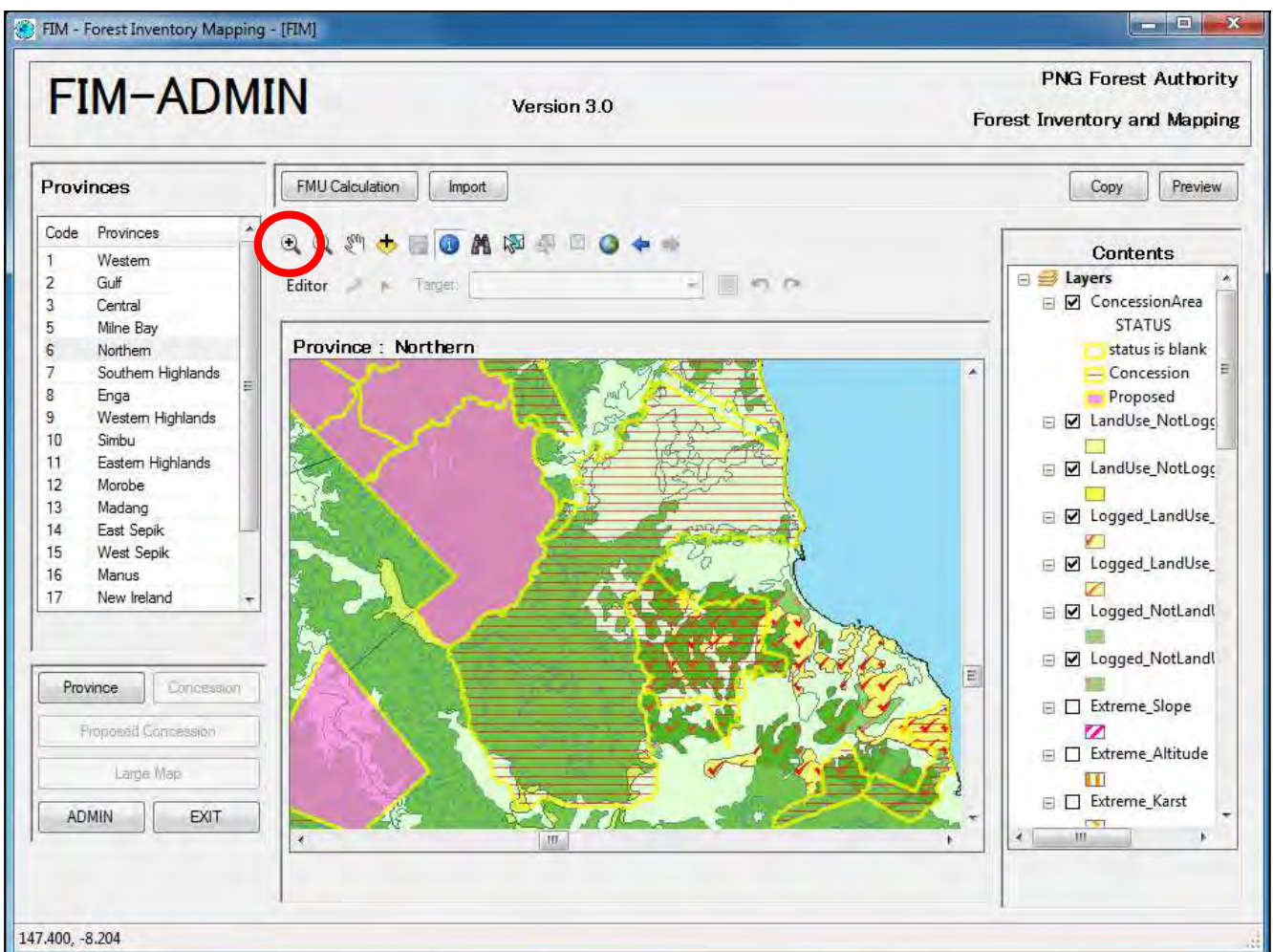
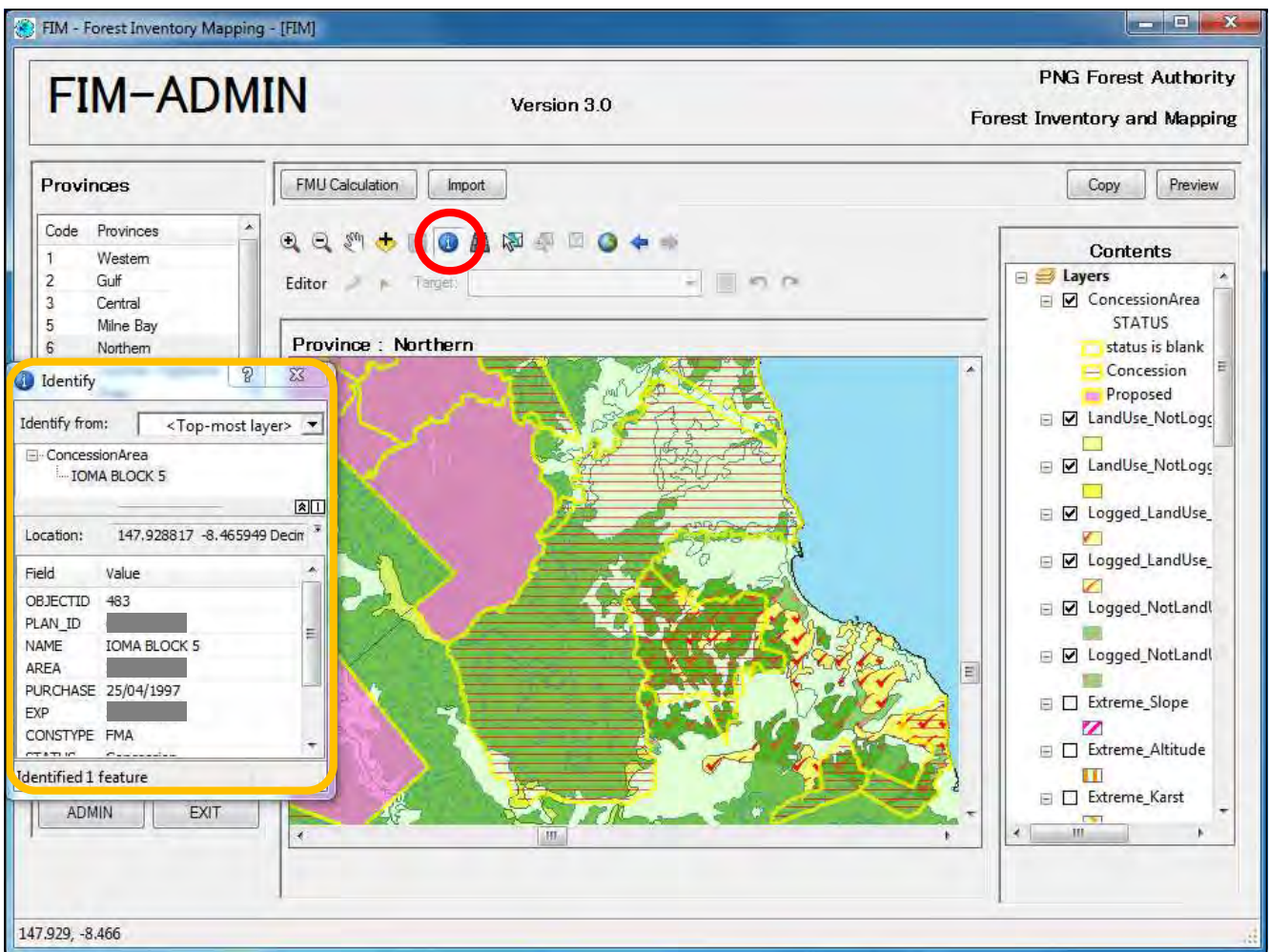
- FMU Report
- National Change By Forest Type
- National Change By Forest Type & Prov
- National Change Summary
- National Concession Change by Province
- National Constraint Summary (1975)
- Ntrl Cnstrmts Ext Frst In/Out Conces.
- Ntrl Cnstrmts Ext N/Frst I/O Con A3
- Ntrl Cnstrmts Ext N/Frst I/O Con by Prv A3
- Province Change by FMU
- Province Change By Forest Type
- Province Cnstrnt Unalloc - Forest Types
- Province Constraint Concession/Unalloc
- Province Constraint Con/Unalloc - Extreme



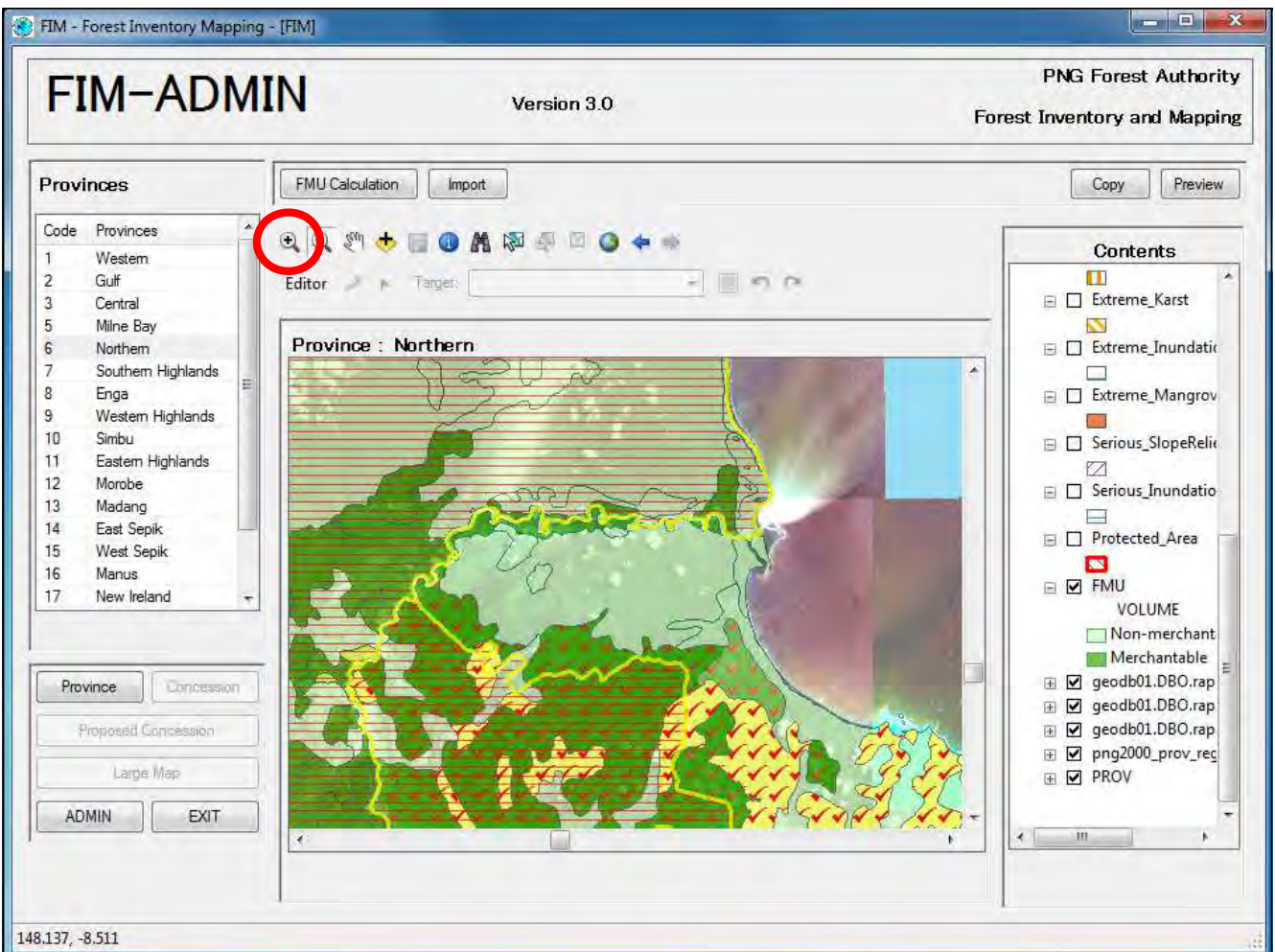
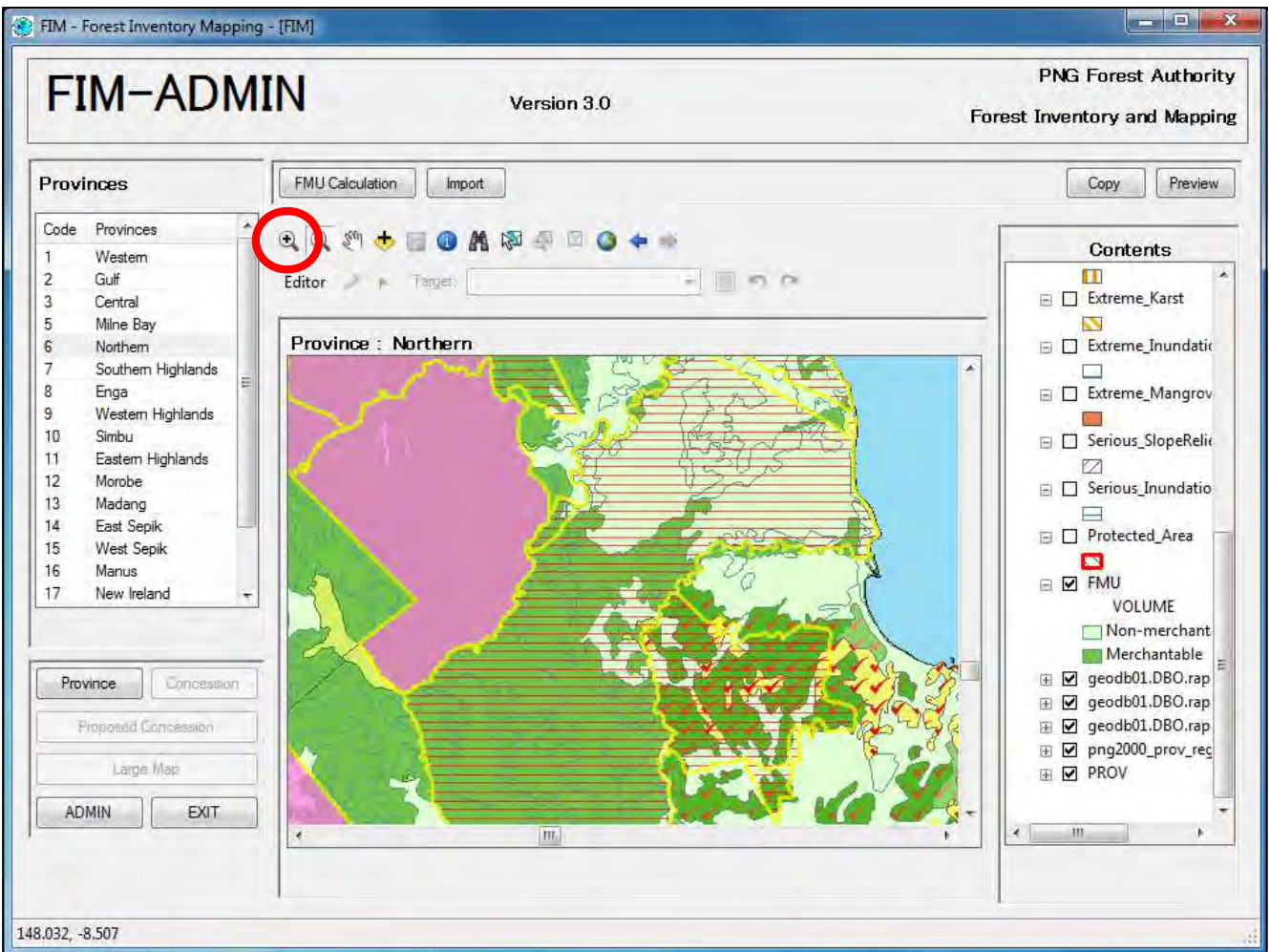




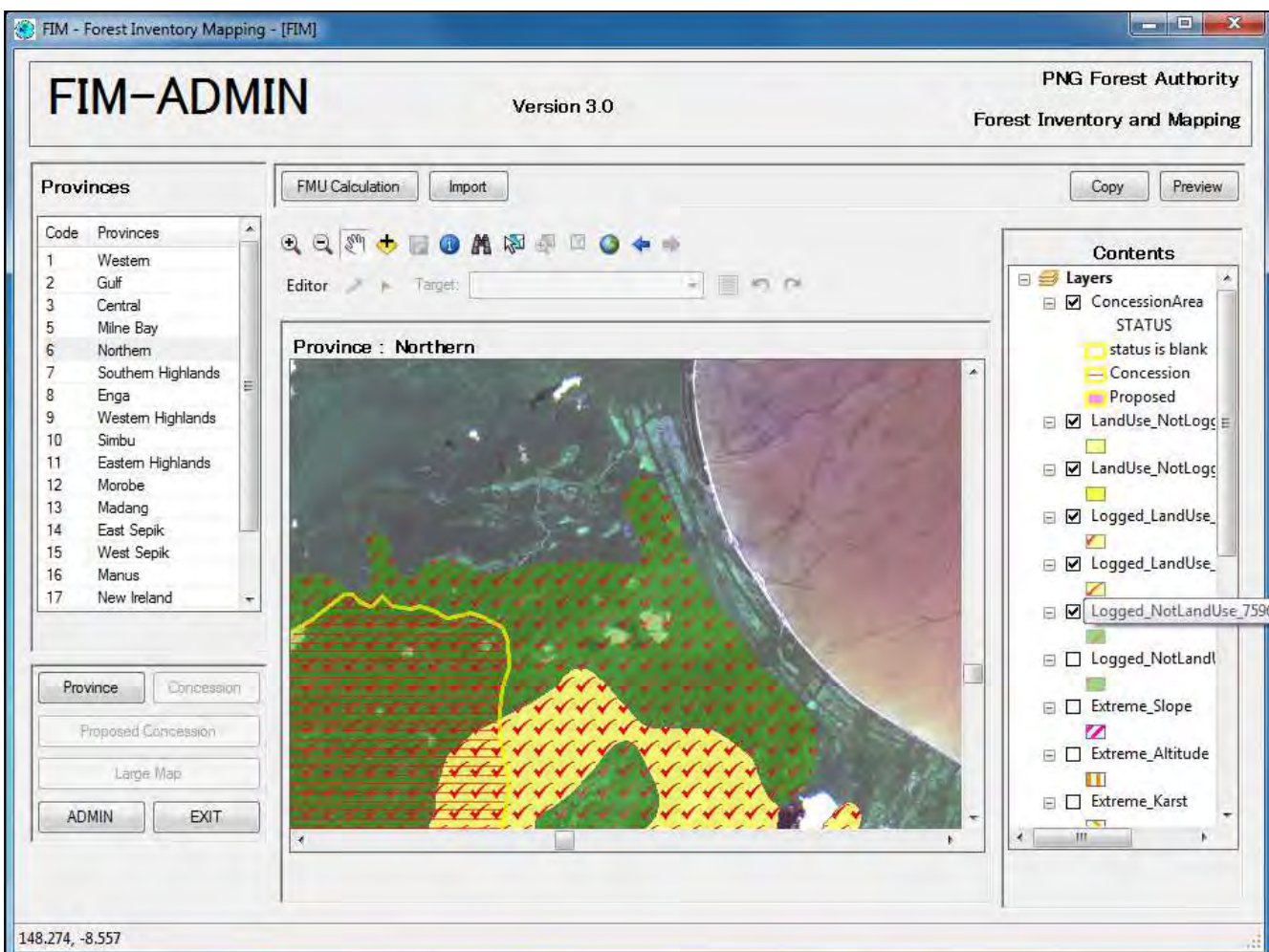
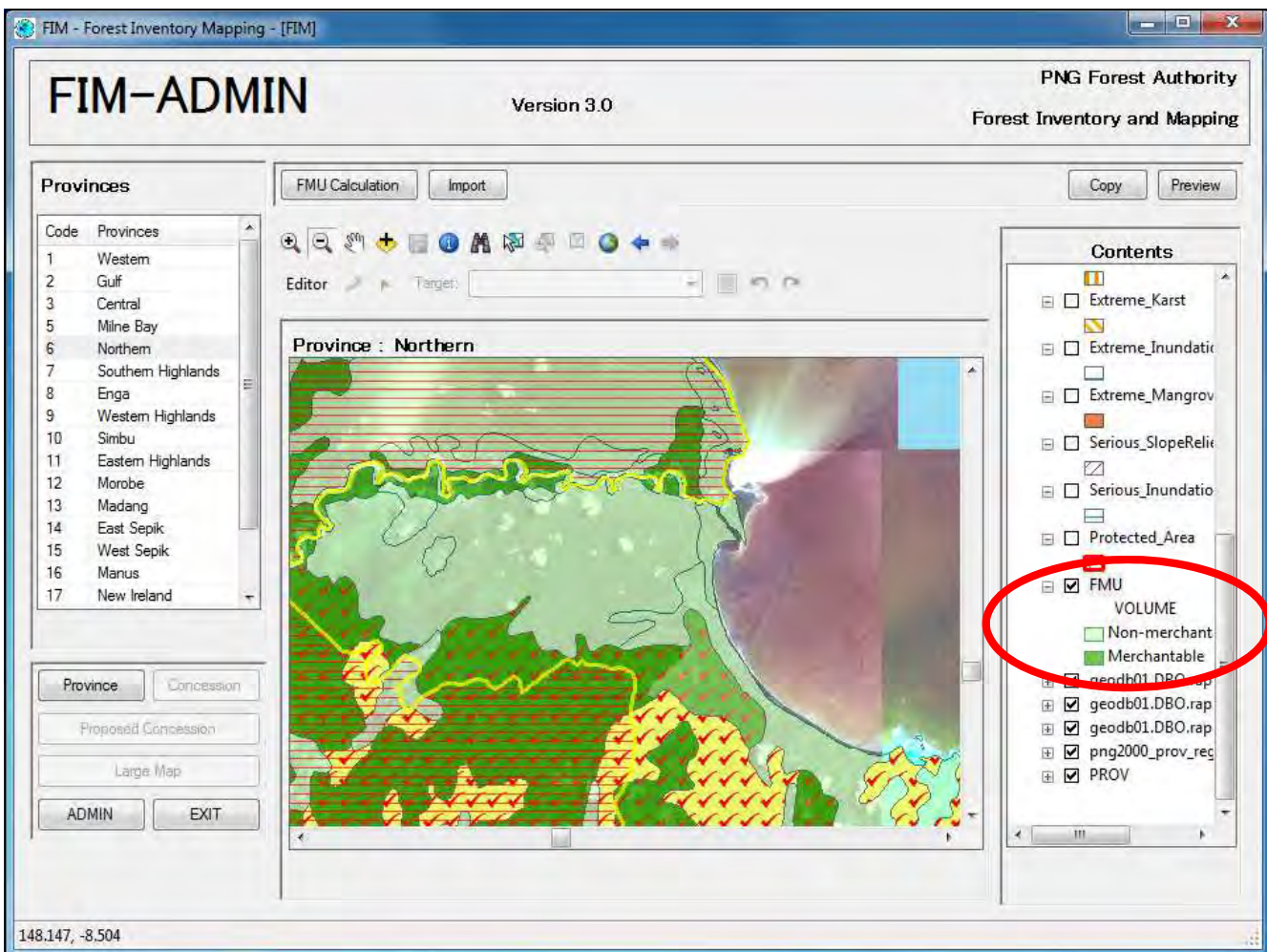




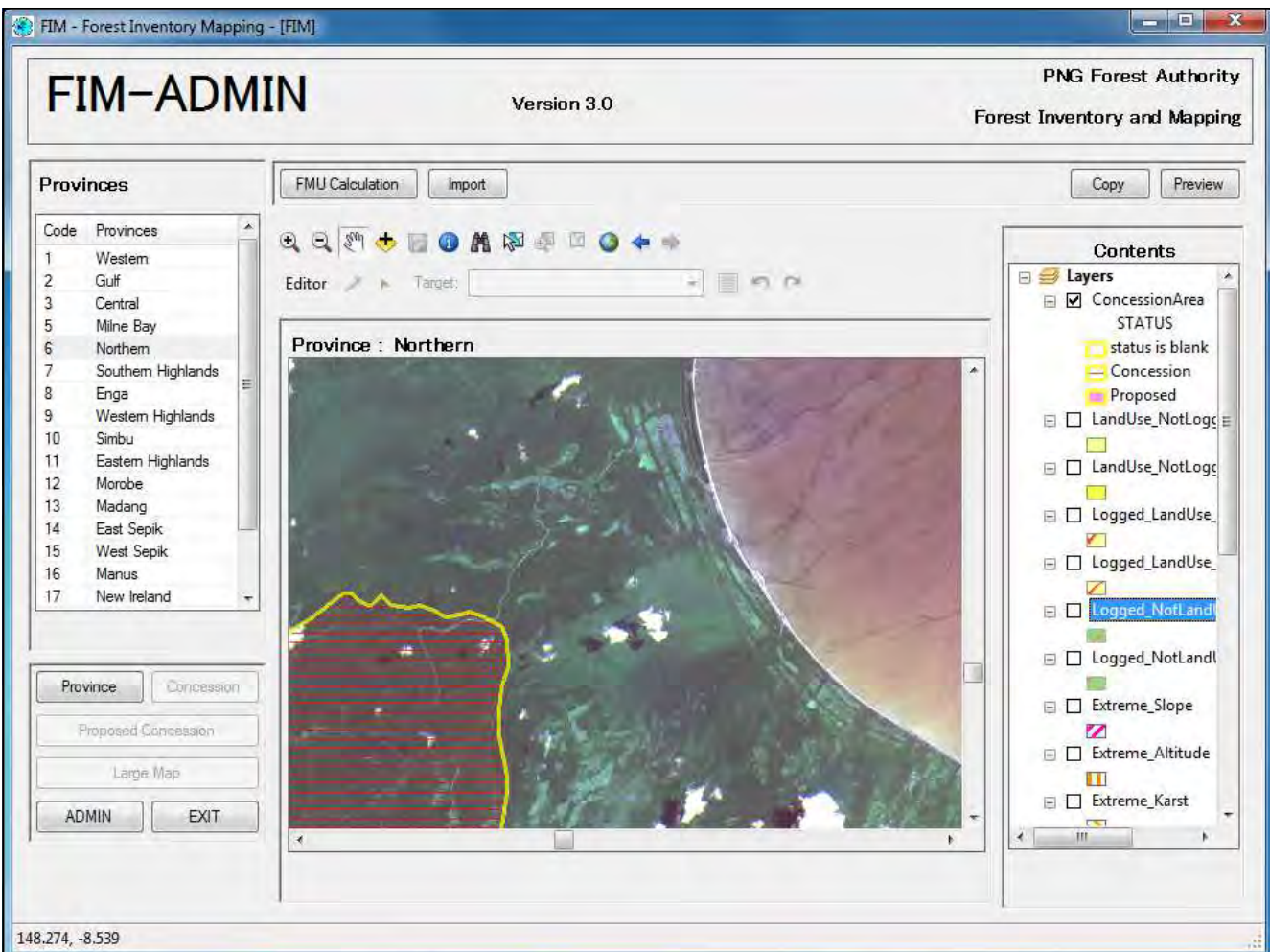
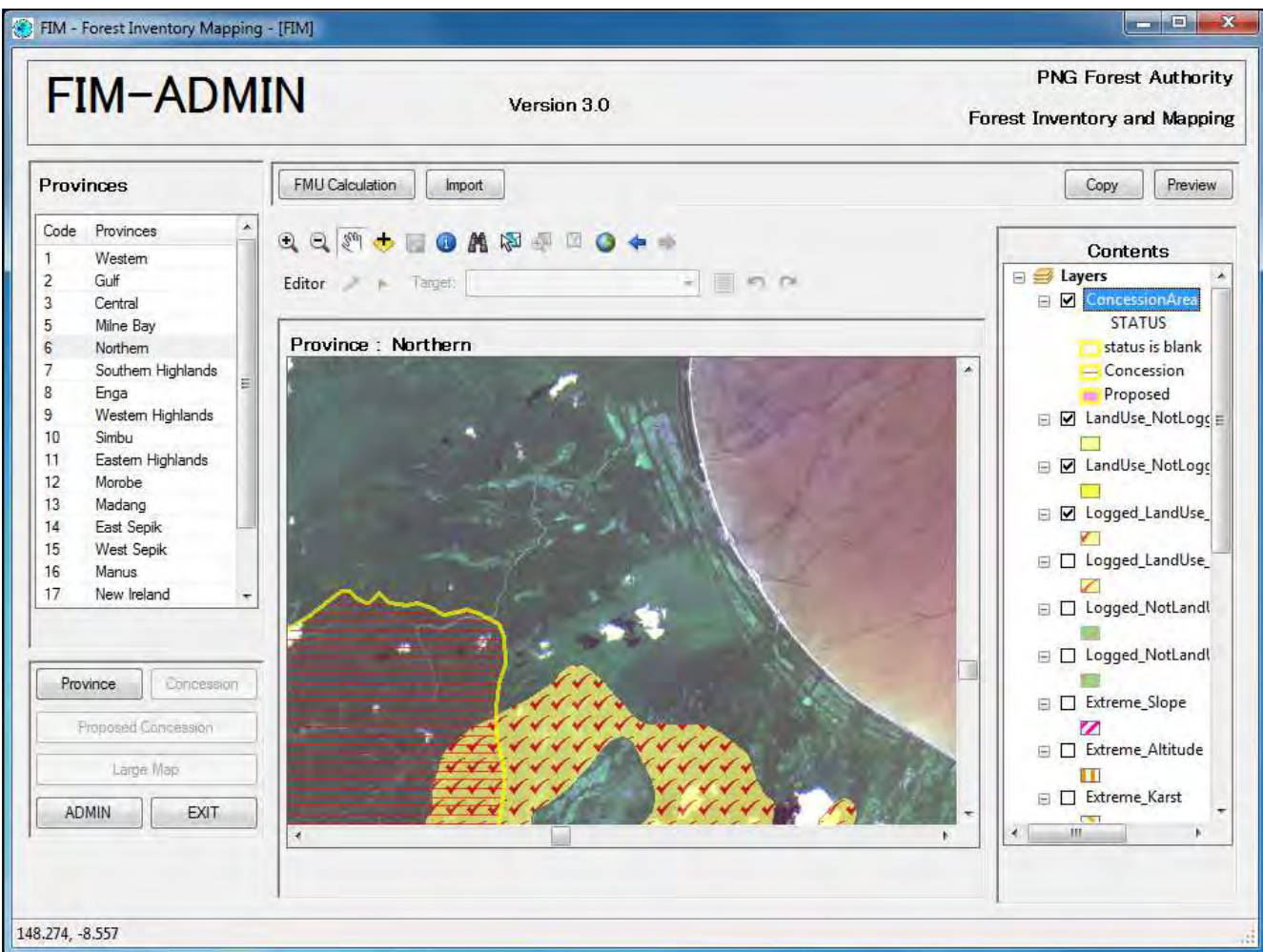




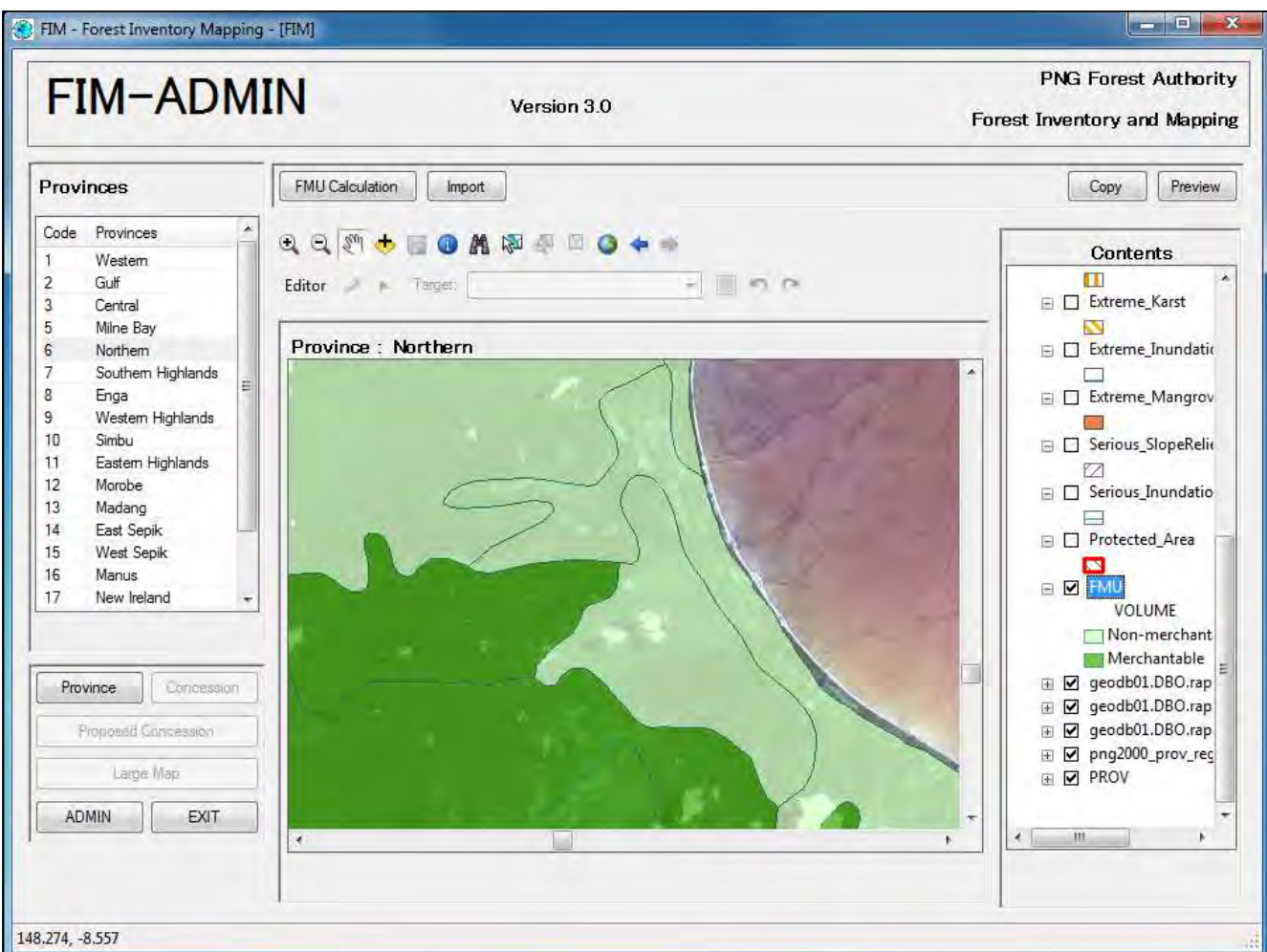
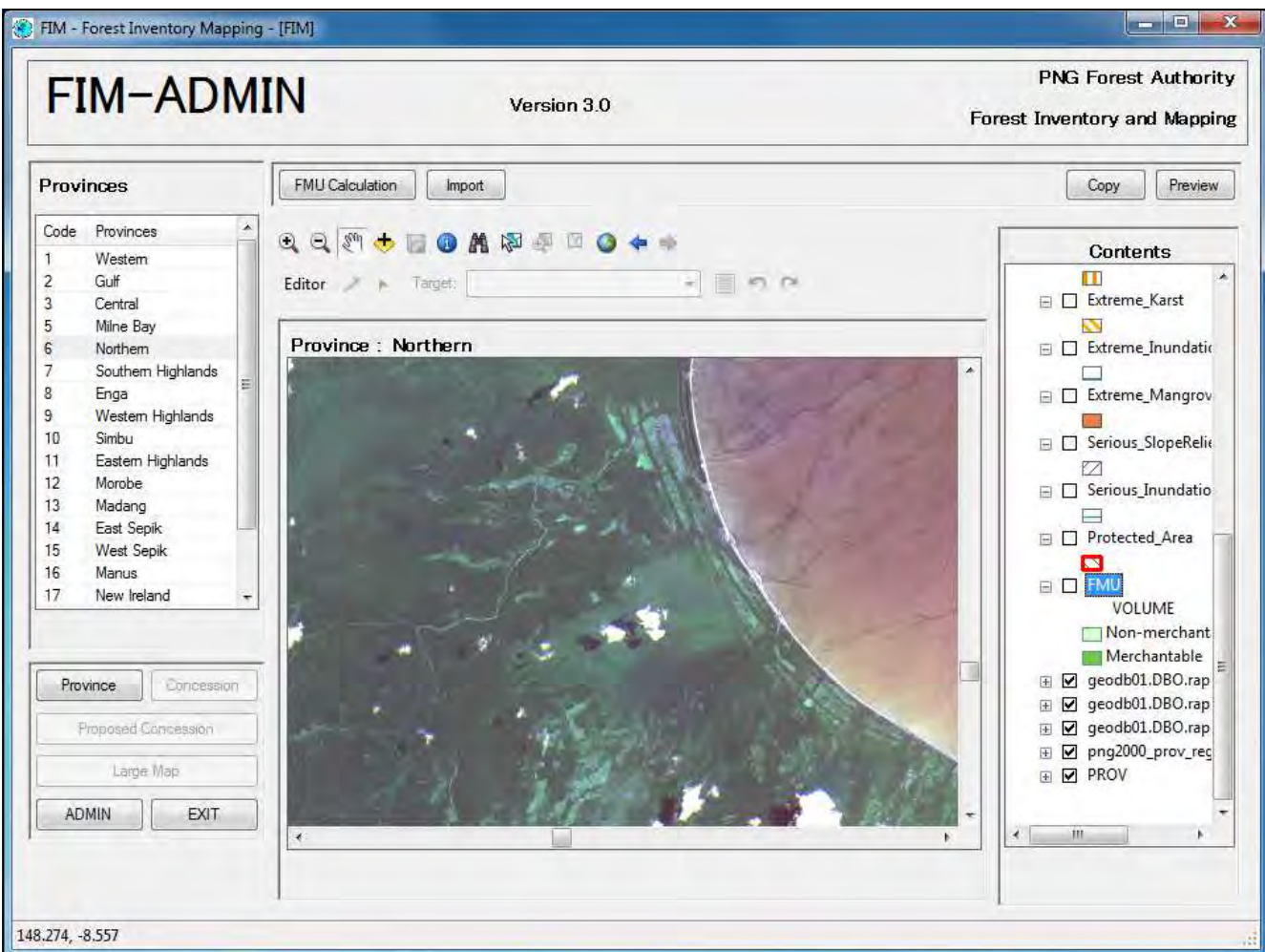




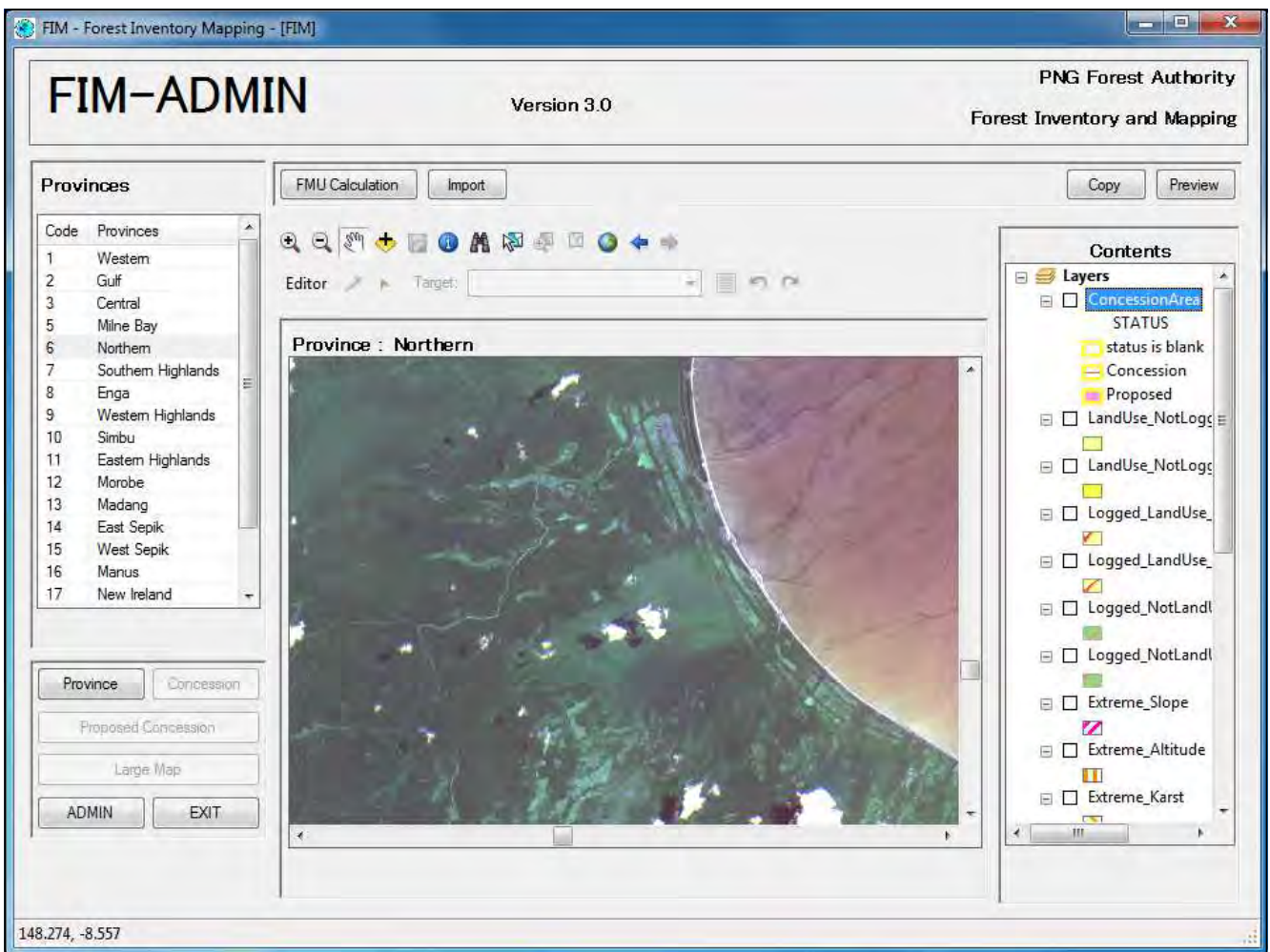




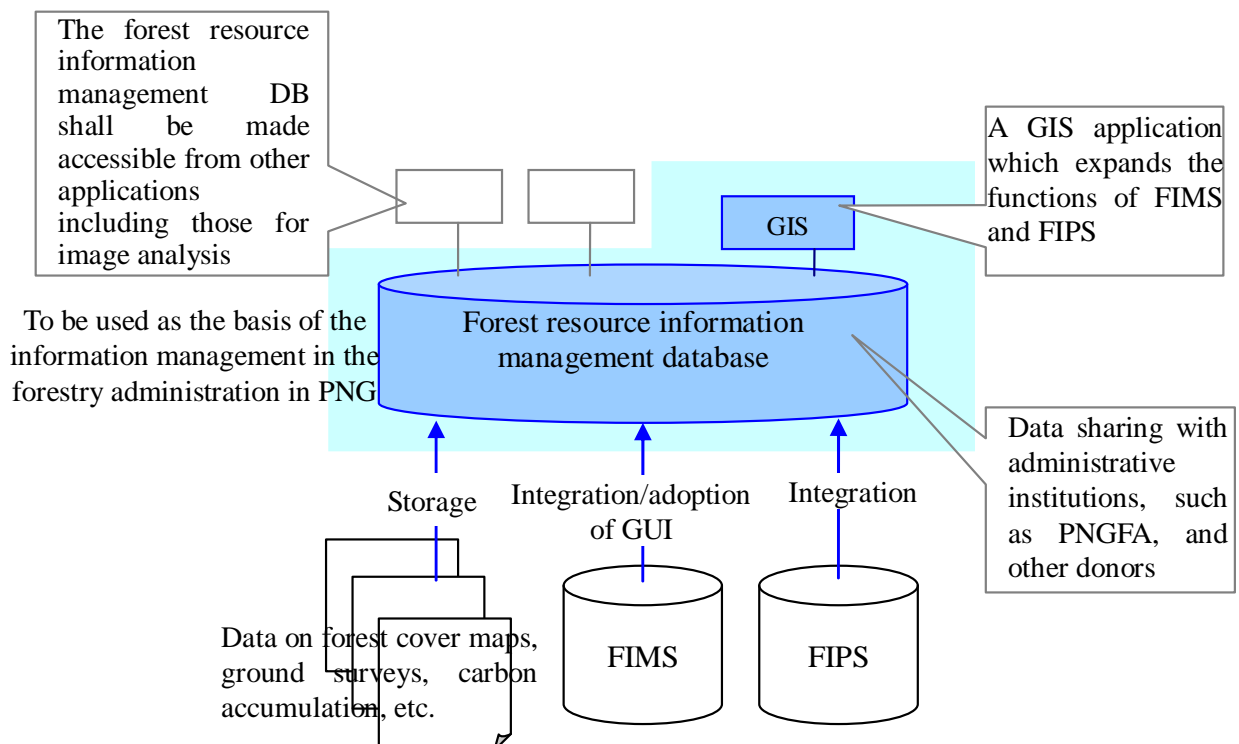




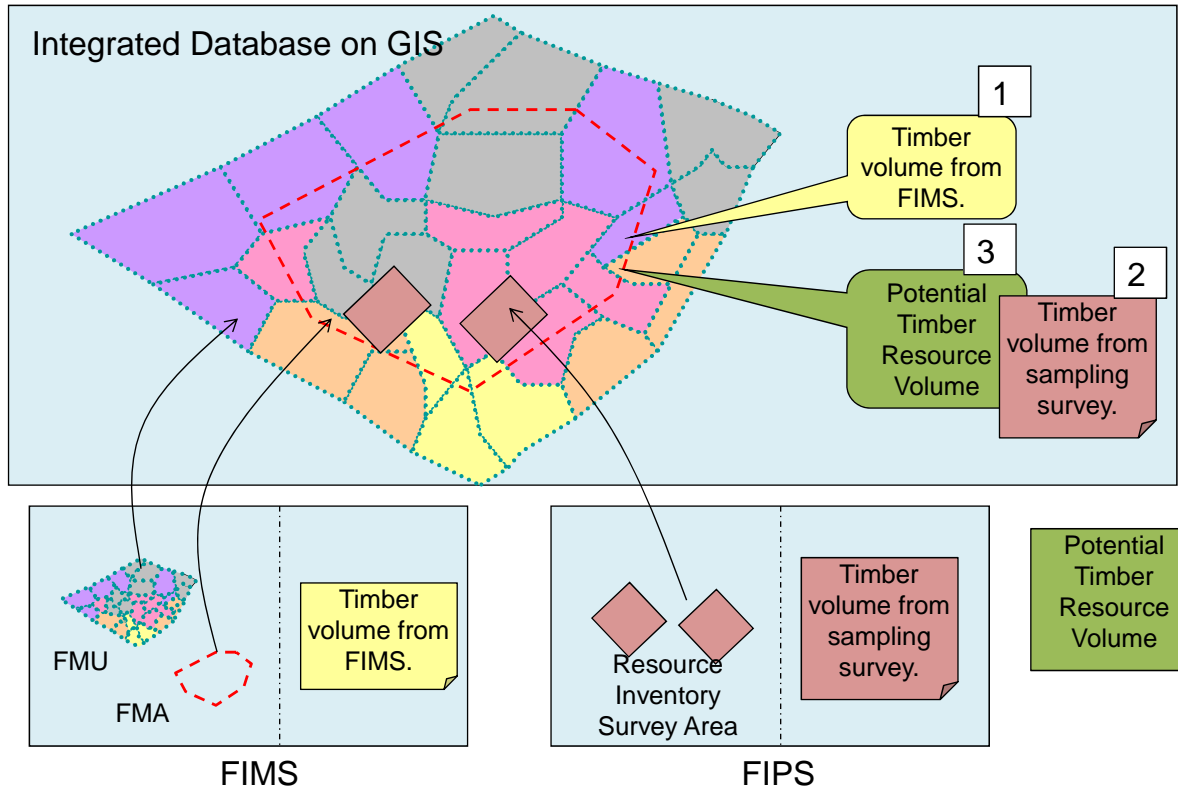




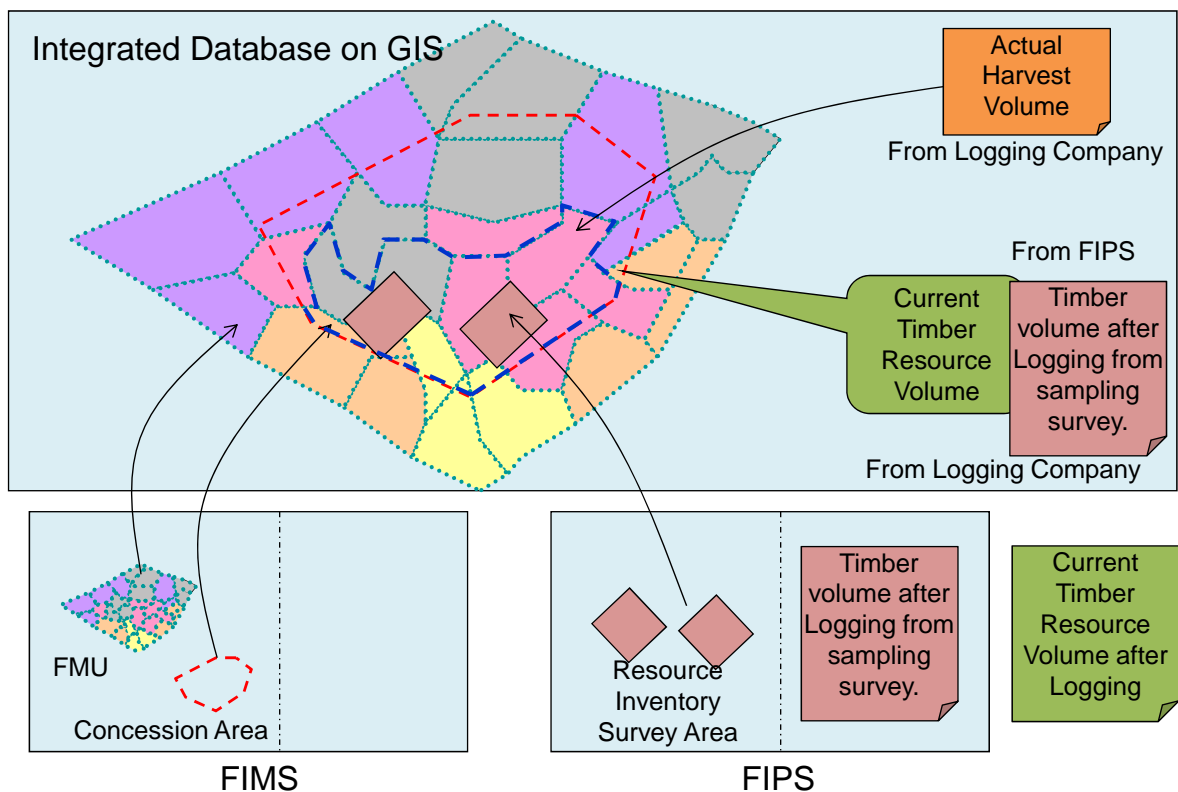
## PNGFA New Database: Scope of Integration of Existing DBs



# Idea for Integration: After Resource Inventory

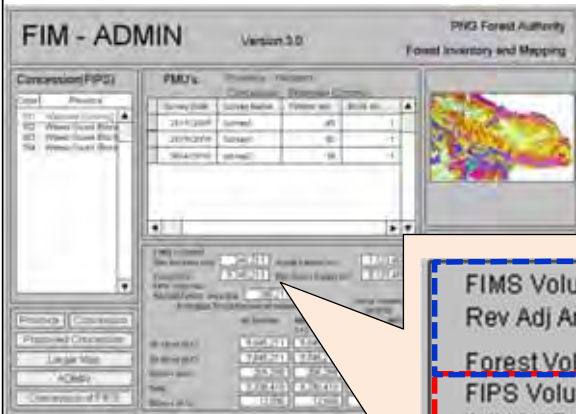


# Idea for Integration: Post Logging Inventory





# Screen Image of Integrated Information



From FIMS

From Logging Company

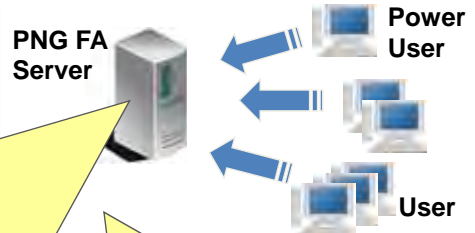
From FIPS

FIMS Volumes		Rev Adj Area [ha]: 245,211	Actual harvest Vol: 1,123,456
Forest Vol:		9,245,211	Rev Gross Forest Vol: 8,123,456
FIPS Volumes		Adj Net Forest area [ha]: 205,211	
Estimated Timber Resource (million m3)			Gross Volume (m3/ha)
	All species	MEP group 1+2	All spe MEP grp 1+2
10-19cm (A-F)	9,845,211	9,845,211	45 45
20-49cm (A-F)	9,845,211	9,845,211	30 30
50cm + (A-F)	205,298	205,298	30 30
Total	9,238,410	9,238,410	60 60
50cm + (A-C)	12,596	12,596	20 20

# Spatial Data Management: Design & Organize Data

## Folder construction rule

File type	Folder name	Description
Satellite & airborne imagery (original /pre-analysis data)	01_Satellite	Satellite imagery
	02_Airbone	Airborne data
	03_DEM	Satellite imagery (DEM)
	04_TopoMAP	Topographic Survey map
Field survey data	11_FieldSurvey	Field survey data
Analysis data	21_TopoAnalyst	Topological analysis data
	22_SatelliteAnalyst	Satellite imagery analysis data
Thematic data	31_ForestMap	National forest basemaps
	32_CarbonStock	Carbon stock data
Other thematic and its parts data	41_Thematic	Other thematic data
	42_Boundary	Boundary data
	43_Planning	Planning data
Other spatial data	51_Others	Other spatial data
Map layout & output data	71_MapLayout	Map layout (Map document file)
	72_Output	Report file/Exported map
Existing system & data sets	81_FIMS	FIMS
	82_FIPS	FIPS
	83_PNGRIS	PNGRIS
	84_Geobooks	Geobook data produced by UPNG
	85_MRA	Spatial data produced by MRA
Other documents	86_NWS	Spatial data produced by NWS
	87_FreeData	Other free data
Other documents	91_Documents	Other documents



## File naming rule



# Concept of Forest Resource Information Management Data Base

