# LAND COVER DATA IN THE PHILIPPINES

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# OUTLINE

- LAND COVER MAPPING
  BRIEF HISTORICAL BACKGROUND
  NATIONAL FOREST RESOURCES INVENTORY
- 2003 LAND COVER
- 2010 LAND COVER
- ON-GOING LAND COVER
- OBSTACLES AND ACTIONS

# LAND COVER MAPPING

The Land Cover Mapping Project is a nationwide assessment of land cover using a satellite-based remote sensing images and integrating tool of GIS technology. The objective is to produce more detailed and updated nationwide land cover information to serve as input in the proper utilization and management of the country's land resources consistent with the of sustainable principles development.

- Updated land cover provides opportunity to assess the extent of the country's remaining natural forest, agricultural, builtup, open areas and other types
- It is a potential data source to estimate biomass degradation and deforestation in various geographic locations
- A valuable theme of information required by various climate change mitigation and adaptation initiatives
- Serves as a vital input in physical and development planning at various levels

Iand cover serves as activity data in esimating volume of carbon sink from forest type and aerial extent; and GHG emissions based on specific land cover type and prevailing practices in various localities

- \* land cover enable analysis of change in national/local GHG levels over time
- studies related to Forest Resources
  Accounting and Valuation provide
  values on tree carbon content

# **HISTORICAL BACKGROUND**

- 1<sup>st</sup> National Forest Resources 1969 Inventory Project
- 2<sup>nd</sup> National Forest Resources 1988 Inventory Project
- Forest/Land Cover Mapping 2003
- Forest/Land Cover Mapping 2010

# 1<sup>st</sup> National Forest Resources Inventory (NFRI) Project

- ✓ aerial photographs (1962-1968)
- supported with forest inventory/ ground measurement
- ✓ Bureau of Forestry and CERTEZA Surveying Inc.

# 2<sup>nd</sup> National Forest Resources Inventory (NFRI) Project

- Aerial photographs taken in 1979 for NE Mindanao
- ✓ Aerial photographs 1985 for Luzon
- ✓ satellite imageries (Landsat 1982-85)
- ✓ supported with ground measurement
- Bureau of Forest Development with assistance from FAO and GTZ Survey

# **2003 LAND COVER DATA**

- Nationwide land cover mapping
- Last quarter of CY 2002
- Satellite imagery (Landsat ETM 5 & 7)
- 21 land cover classification
- No ground validation
- NAMRIA and FMB collaboration



# INDEX OF LANDSAT ETM

### 40 scenes (taken mostly in 2002)



# 2003 Land Cover Map



#### FOREST/LAND COVER STATISTICS (AS OF 2003)

REGION	Forest	Other wooded land	Other land & inland water	TOTAL		
CAR	67 2,3 23. 29	840,720.40	29 4, 643 .24	1,8 07 ,68 6.9 3		
REGION I	187,8 10.25	480,435.56	58 8, 18 1.80	1,2 56 ,427.6 1		
REGION II	1, 149,8 45.26	383,234.59	1, 112, 986.41	2,646,066.26		
REGION III	589,496.75	336,935.58	1, 16 2, 154.48	2,088,586.81		
NCR	2, 8 19 .63	479.41	69,278.60	7 2,577.63		
REGION IV - A	28 9,6 7 1. 13	327,022.64	1,067,067.16	1,683,760.92		
REGION IV - B	1, 193,843.89	527,243.02	96 5, 703 .93	2,686,790.84		
REGION V	156,476.31	268,422.14	1,308, 124.31	1,7 33,02 2.7 6		
REGION VI	24 1, 1 13. 47	724,364.22	1,03 9, 356 .42	2,004,834.12		
REGION VII	7 4,868.55	419,600.75	92 2, 38 1.54	1,4 16,850.84		
REGION VIII	519,849.61	686,099.70	87 8, 33 1.53	2,084,280.84		
REGION IX	18 2, 1 94, 22	284,047.93	98 9, 200 .25	1,455,442.40		
REGION X	337,493.49	323,028.54	1,066,533.73	1,7 27 ,05 5.7 6		
REGION XI	42 1,0 34, 7 9	642,24 1.82	765,088.47	1,8 28 ,36 5.0 8		
REGION XII	349,233.87	564,745.26	1,014,433.06	1,9 28 ,412. 19		
REGION XIII	52 3,2 9 1. 13	524,626.71	819,583.39	1,8 67 ,50 1.2 3		
ARRM	250,344.69	259,458.39	735, 118.91	1,2 44,92 1.98		
			-			
TOTAL	7, 14 1,7 10.32	7,592,706.66	14,798,167.22	2 9,5 32,58 4.19		

# **2010 LAND COVER MAPPING**

Nationwide land cover mapping

- Published Last quarter of CY 2013
- Satellite imagery (Landsat TM7, ALOS AVNIR AND SPOT)
- 21 land cover classification and aggregated 14
- With ground validation

#### LAND COVER CLASSIFICATION

ID	Original 21 Land Cover Classification	AGGREGATED TO 14				
1	Closed forest, broadleaved	Closed Forest				
2	Closed forest, mixed					
3	Closed forest, coniferous					
4	Open forest, broadleaved					
5	Open forest, mixed	Open Forest				
6	Open forest, coniferous					
8	Forest plantation, broadleaved	Closed or Open Forest				
9	Forest plantation, coniferous	closed of Open Polest				
7	Mangrove forest	Mangrove Forest				
10	Other wooded land, shrubs	Shrubs				
11	Other wooded land, fallow	Fallow				
12	Other wooded land, wooded grassland	Wooded grassland				
14	Other land, natural, grassland	Graceland				
18	Other land, cultivated, pastures	Grassialiu				
16	Other land, cultivated, annual crop	Annual Crop				
17	Other land, cultivated, perennial crop	Perennial Crop				
13	Other land, natural, barren land	Open/Barren				
20	Other land, built-up area	Built-up				
15	Other land, natural, marshland	Marshland/Swamp				
19	Other land, fishpond	Fishpond				
21	Inland water	Inland Water				

6 Categories (IPCC)	14 Aggregated Categorie					
Forest	Closed forest					
	Open forest					
	Mangrove forest					
	Shrubs					
	Fallow					
	Wooded grassland					
Grassland	Grassland					
Cropland	Annual crop					
	Perennial crop					
Other Land	Barren land					
Settlements	Built-up area					
Wetlands	Marshland/Swamp					
	Fishpond					
	Fishpond Inland water					

# **INDEX OF SATELLITE IMAGERIES**



## **METHODOLOGY OF 2010 LAND COVER**

#### **1. PRE-PROCESSING ACTIVITIES**

 Data Acquisition/Gathering Satellite Image (Landsat, AVNIR & SPOT5) Topographic Maps
 Image Pre-processing Rectification, Enhancement, Pansharpening & Mosaicing

•Preliminary Classification

#### 2. FIELD VALIDATION ACTIVITIES

3. POST-PROCESSING ACTIVITIES

Accuracy Assessment & Editing

# **PRE-PROCESSING** – correcting data for sensor irregularities and distortions due to sensor-earth geometry variation

**IMAGE RECTIFICATION -** transformation process used to project two-or-more images onto a common image plane. It corrects image distortion by transforming the image into a standard coordinate system.





- 1. TOPOGRAPHIC MAP
- 2. DEM (Digital Elevation Model)

**SPOT 5 SATELLITE IMAGE** 

#### Image Enhancement – digitally process data to highlight specific information



#### Cloud Masking



#### **Mosaicing** – process for constructing large seamless image from various images





**TOPOGRAPHIC MAP** 

SATELLITE IMAGE

## **PRELIMINARY CLASSIFICATION**

**Visual interpretation** is a process of utilizing biology geosciences rules and the check analysis method to carry on generalized analysis and logical deduction according to the operating person's experience and knowledge



RECOGNITION ELEMENTS Tones, Size, Patterns, Textures, Shadow and Association

# Digital interpretation - methods that consider the brightness

value of pixels and the generation of groups of pixels with similar spectral response, using specific algorithms.



### **FIELD VALIDATION ACTIVITIES**







# ACCURACY ASSESSMENT

CONFUSION MATRIX														
PROVINCE OF IFUGAO														
GROUND THRUTH	Annual crop	Wooded, Grassland	Built-up area	Woodedland,shr ubs	Natural Grassland	Closed Forest, Boadleaved	Open forest, Boradleaved	Open forest, mixed	Open forest, coniferous	Perennial crop	Inland Water	Classified pixel	User's Accuracy	
Annual crop	39											39	100	
Wooded Grassland		10										10	100	
Built-up area			18									18	100	
Woodedland,s hrubs				12			2					14	86	
Nat Grassland	2	1			3							6	50	
Closed forest, broadleaved						2						2	100	
Open forest, broadleaved							27					27	100	
Open forest, mixed							1	6				7	86	
Open forest, coniferous									1			1	100	
Perennial crop	1									0		1	0	
Inland Water											1	1	100	
NUMBER OF GROUND PIXEL	42	11	18	12	3	2	30	6	1	0	1	126		
Producer's Accuracy	93	90.91	100	100	100	100	90	100	100	0	100		94	

89.43% - 2010 Land Cover Average Accuracy

# **2010 FOREST/LAND COVER MAP**



## PRESENT

# DIGITAL (USING ECOGNITION) AND VISUAL INTERPRETATION

**Satellite Imageries:** 

- > Landsat 8 (30m. resolution, 15m panchromatic)
- IFSAR (Interferometric Synthetic Aperture Radar 0.6 m resolution)

# **FUTURE PLAN**

VHR (Very High Resolution) Images

## OVERLAYING LANDSAT TM TO IFSAR/ IFSAR-LANDSAT DATA FUSION









## DIFFERENT METHODOLOGY

- > VARIOUS TYPES OF SATELLITE IMAGES
- > VARIOUS ADMINISTRATIVE BOUNDARIES
- > INSUFFICIENT TRAINING IN RADAR IMAGE PROCESSING

> HIGH COST OF VERY HIGH RESOLUTION (VHR) SATELLITE IMAGES

## **ACTIONS :**

## REFINED METHODOLOGY

### > FUNDING FOR VERY HIGH RESOLUTION (VHR) SATELLITE IMAGES

### > TRAINING ON ADVANCE REMOTE SENSING TECHNIQUES

### > RESOLVED ADMINISTRATIVE BOUNDARIES

### > 2010 FOREST/LAND COVER DATA WILL BE THE BASELINE YEAR

# **THANK YOU**