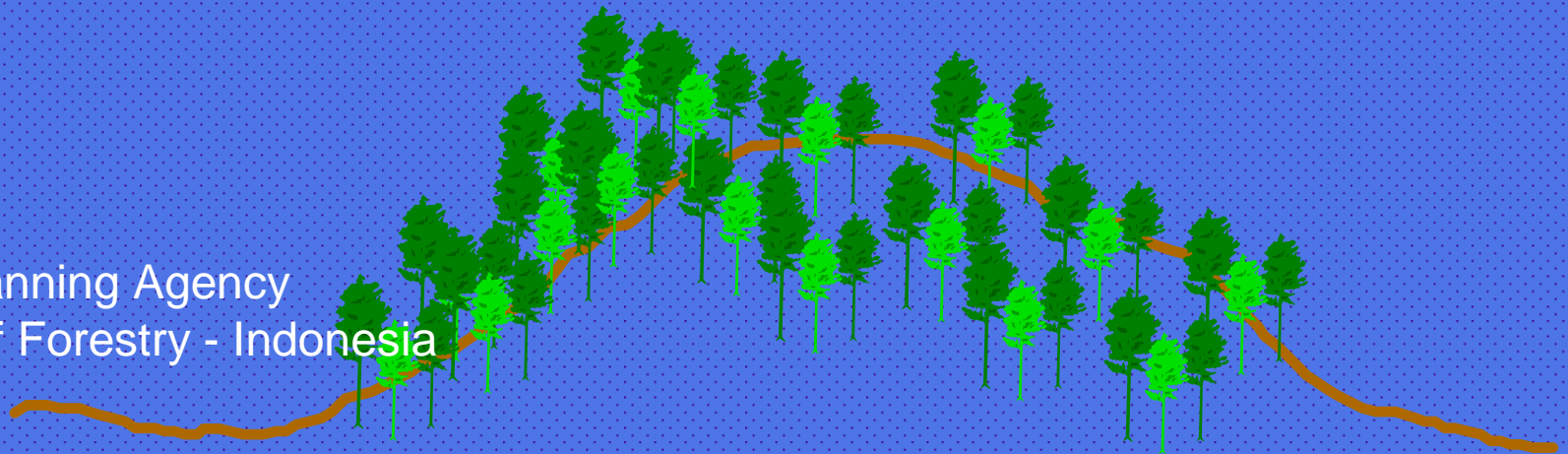


# NATIONAL FOREST INVENTORY

## INDONESIA

Wardoyo  
Forest Planning Agency  
Ministry of Forestry - Indonesia



# NATIONAL FOREST INVENTORY (NFI) INDONESIA

## **NFI PROJECT:**

- 1989 – 1996
- GOI, FAO, WB

## **OBJECTIVES:**

- TO PROVIDE INFORMATION ON THE LOCATION AND EXTENT OF THE MAIN FOREST AND LANDUSE TYPES
- TO ESTIMATE VOLUME AND GROWTH BY FOREST TYPE, SPECIES AND SPECIES GROUPS
- TO ASSESS THE STATE OF FOREST AREAS AND DIVERSITY

# NFI COMPONENTS:

## 1. FOREST RESOURCES ASSESSMENT (FRA)

→ to collect data about forest condition and standing stock, and to predict forest growth. The main activities were field inventory using systematic sampling (TSP/PSP)

## 2. FOREST RESOURCES MONITORING (FRM)

→ to collect data on the current forest status such as forest area, forest distribution, and to monitor forest changes. Remote sensing was the main technique to collect the data.

## 3. DIAS/GIS

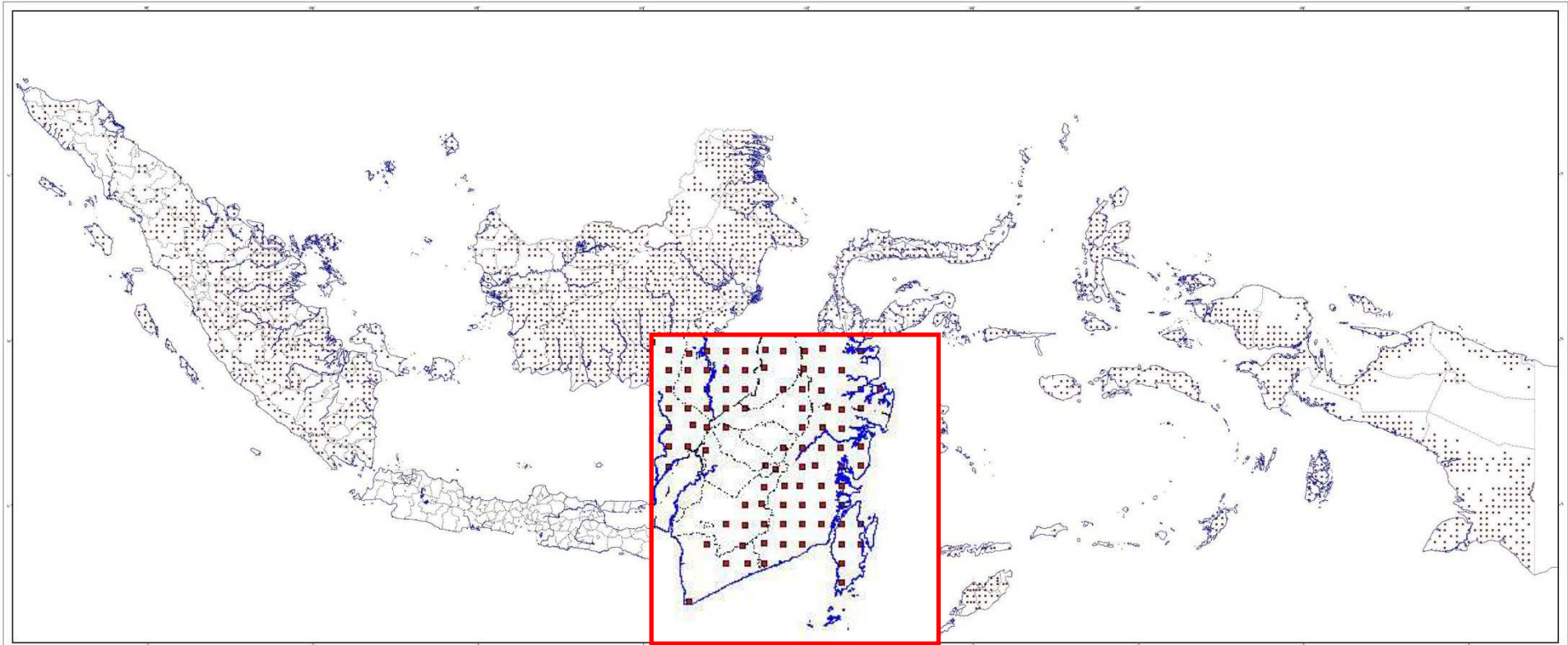
→ data resulted from forest resource monitoring and from forest resource assessment are integrated using geographic information system (GIS).

→ digital image analysis system (DIAS) provides land cover data from satellite images processing and analysis.

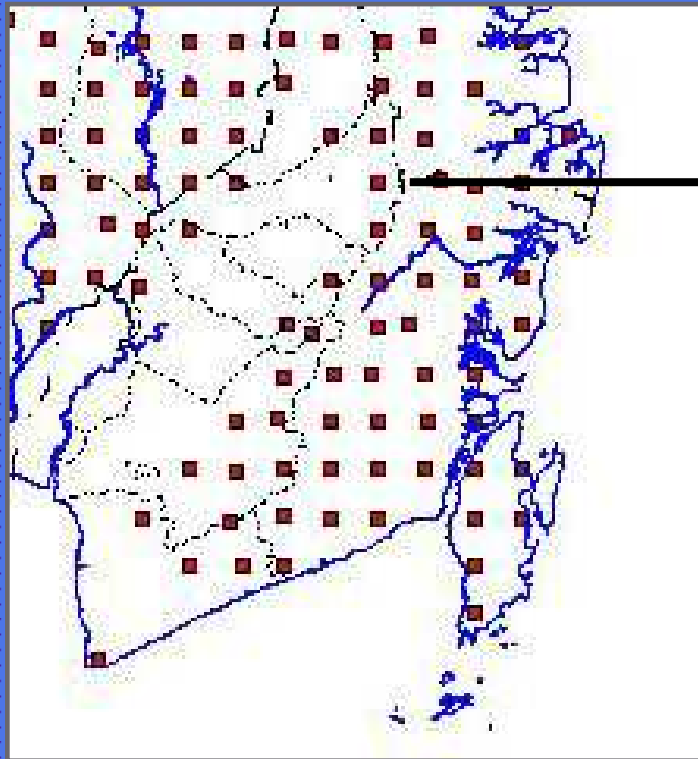
# 1. FOREST RESOURCES ASSESSMENT (FRA)

- ❖ Establishment of TSP/PSP  
All state forest < 1000 m asl,  
distributed systematically in grid of 20km x 20km
- ❖ 1 Cluster : ± 9 Ha of TSP (9 Tract or 72 Sub Plot) and 1 ha of PSP (16 Record Unit)

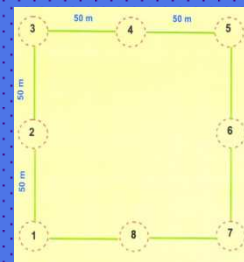
## 2.735 CLUSTER PLOTS AROUND OF INDONESIA



# SAMPLE CLUSTER IN SOUTH KALIMANTAN

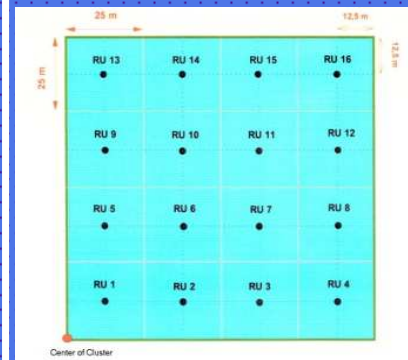


1 Cluster: 9 Tract or 72 Sub Plot  
 TSP : Temporary Sample Plots  
 PSP : Permanent Sample Plots



1 Tract Temporary Sample Plot (TSP):  
 8 Sub Plot ( $\pm 1$  Ha)

Included PSP (tract 5<sup>th</sup>)  
 Measurement with point sampling  
 technique (BAF 4)



1 Tract PSP = 1 Ha  
 Only at 5<sup>th</sup> tract,  
 Square plot (100 m x 100 m) with  
 16 Record Unit

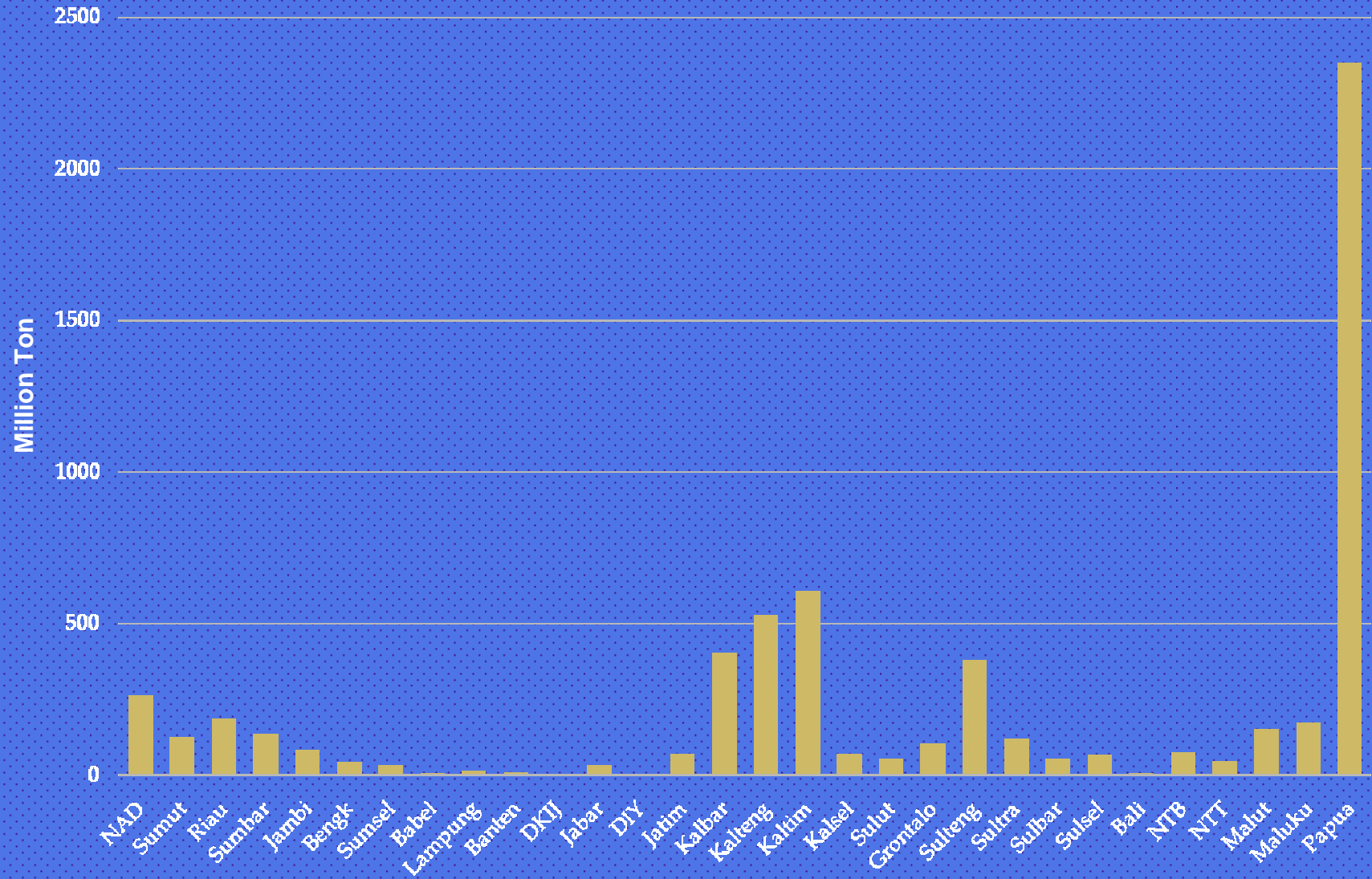
**Re-enumerations of PSP are carried out within interval of 3 - 5 years, started in 1995.**

**Up to now the number of re-enumerated PSPs are ± 1200 plots.**

## Average of Timber Potency for All Species based on TSP/PSP Data 2006 (excluding Java Island)

Province	Sum of Cluster	1990 - 1996				1996 - 2006					
		Number of Tree (N/ha)		Volume of Tree (m3/ha)		Number of Tree (N/ha)			Volume of Tree (m3/ha)		
		20 cm up	50 cm up	20 cm up	50 cm up	20 cm up	50 cm up	60 cm up	20 cm up	50 cm up	60 cm up
NAD	30	104,80	26,70	144,10	95,10	85,50	17,13	10,50	120,87	70,19	55,06
Sumatera Utara	33	97,20	17,40	138,40	75,90	92,06	16,03	7,22	119,75	57,98	35,71
Riau	90	125,50	16,70	124,30	53,50	98,06	12,29	5,56	100,92	41,62	26,81
Kepulauan Riau	-	-	-	-	-	-	-	-	-	-	-
Sumatera Barat	45	95,10	16,40	126,40	68,40	68,26	11,62	6,00	90,91	49,09	36,39
Sumatera Selatan	44	111,80	13,10	111,80	54,20	30,56	3,47	1,87	29,23	13,14	9,90
Jambi	47	152,60	19,30	164,90	82,60	121,50	17,06	8,64	118,97	48,60	32,75
Bengkulu	18	123,10	17,70	143,40	85,40	60,67	11,00	6,33	68,24	35,95	26,82
Bangka Belitung	-	-	-	-	-	-	-	-	-	-	-
Lampung	10	86,80	12,10	99,60	54,90	71,67	11,00	6,33	74,12	40,23	31,74
<b>SUMATERA (average)</b>	<b>317</b>	<b>117,04</b>	<b>17,47</b>	<b>132,53</b>	<b>68,15</b>	<b>83,17</b>	<b>12,41</b>	<b>6,28</b>	<b>93,37</b>	<b>43,80</b>	<b>30,46</b>
Kalimantan Timur	222	60,30	15,80	88,80	60,60	73,25	16,18	9,86	103,31	64,83	51,41
Kalimantan Selatan	37	108,90	21,50	142,00	87,20	76,85	15,36	8,28	111,59	68,34	52,19
Kalimantan Tengah	96	110,00	15,40	146,80	74,20	84,42	10,70	5,85	96,75	45,89	34,21
Kalimantan Barat	122	133,60	24,30	208,00	123,60	91,29	16,39	9,66	139,17	79,58	63,71
<b>KALIMANTAN (average)</b>	<b>477</b>	<b>92,82</b>	<b>18,34</b>	<b>135,09</b>	<b>81,51</b>	<b>80,39</b>	<b>15,07</b>	<b>8,88</b>	<b>111,80</b>	<b>65,06</b>	<b>51,15</b>
Sulawesi Selatan	42	91,80	17,30	105,60	54,40	64,89	8,77	3,94	61,53	30,20	21,87
Sulawesi Barat	-	-	-	-	-	-	-	-	-	-	-
Sulawesi Tengah	54	116,50	21,50	159,70	88,30	101,15	21,10	11,48	143,28	82,59	61,05
Sulawesi Tenggara	42	136,40	15,50	132,20	52,90	76,96	15,79	8,70	111,95	65,76	49,85
Gorontalo	-	-	-	-	-	-	-	-	-	-	-
Sulawesi Utara	21	108,30	26,70	178,30	114,30	129,60	26,52	15,14	183,68	110,88	85,85
<b>SULAWESI (average)</b>	<b>159</b>	<b>114,15</b>	<b>19,49</b>	<b>140,60</b>	<b>73,43</b>	<b>88,94</b>	<b>17,16</b>	<b>9,24</b>	<b>118,75</b>	<b>68,04</b>	<b>51,02</b>
Bali	17	75,20	4,00	29,40	7,70	86,10	9,60	7,08	67,75	36,69	33,04
NTB	33	112,40	18,20	89,90	49,40	81,37	15,38	9,31	80,08	55,03	46,38
NTT	52	81,70	10,70	63,30	29,50	47,27	6,80	3,31	34,08	17,75	13,28
<b>NUSA TENGGARA (average)</b>	<b>102</b>	<b>90,55</b>	<b>12,01</b>	<b>66,26</b>	<b>32,30</b>	<b>64,77</b>	<b>10,04</b>	<b>5,88</b>	<b>54,57</b>	<b>32,97</b>	<b>27,28</b>
Maluku	-	-	-	-	-	-	-	-	-	-	-
Maluku Utara	-	-	-	-	-	-	-	-	-	-	-
<b>MALUKU (average)</b>	<b>49</b>	<b>100,00</b>	<b>23,60</b>	<b>180,30</b>	<b>108,70</b>	<b>91,50</b>	<b>26,31</b>	<b>9,64</b>	<b>179,53</b>	<b>127,61</b>	<b>59,29</b>
Papua	-	-	-	-	-	-	-	-	-	-	-
Irian jaya Barat	-	-	-	-	-	-	-	-	-	-	-
<b>PAPUA (average)</b>	<b>70</b>	<b>87,90</b>	<b>16,80</b>	<b>108,90</b>	<b>58,60</b>	<b>101,33</b>	<b>19,78</b>	<b>11,22</b>	<b>121,78</b>	<b>71,01</b>	<b>53,60</b>
<b>INDONESIA</b>	<b>1174</b>	<b>102,06</b>	<b>17,84</b>	<b>129,49</b>	<b>72,30</b>	<b>82,65</b>	<b>14,95</b>	<b>8,14</b>	<b>106,22</b>	<b>59,90</b>	<b>43,96</b>

## Carbon Stock in each Province of Indonesia

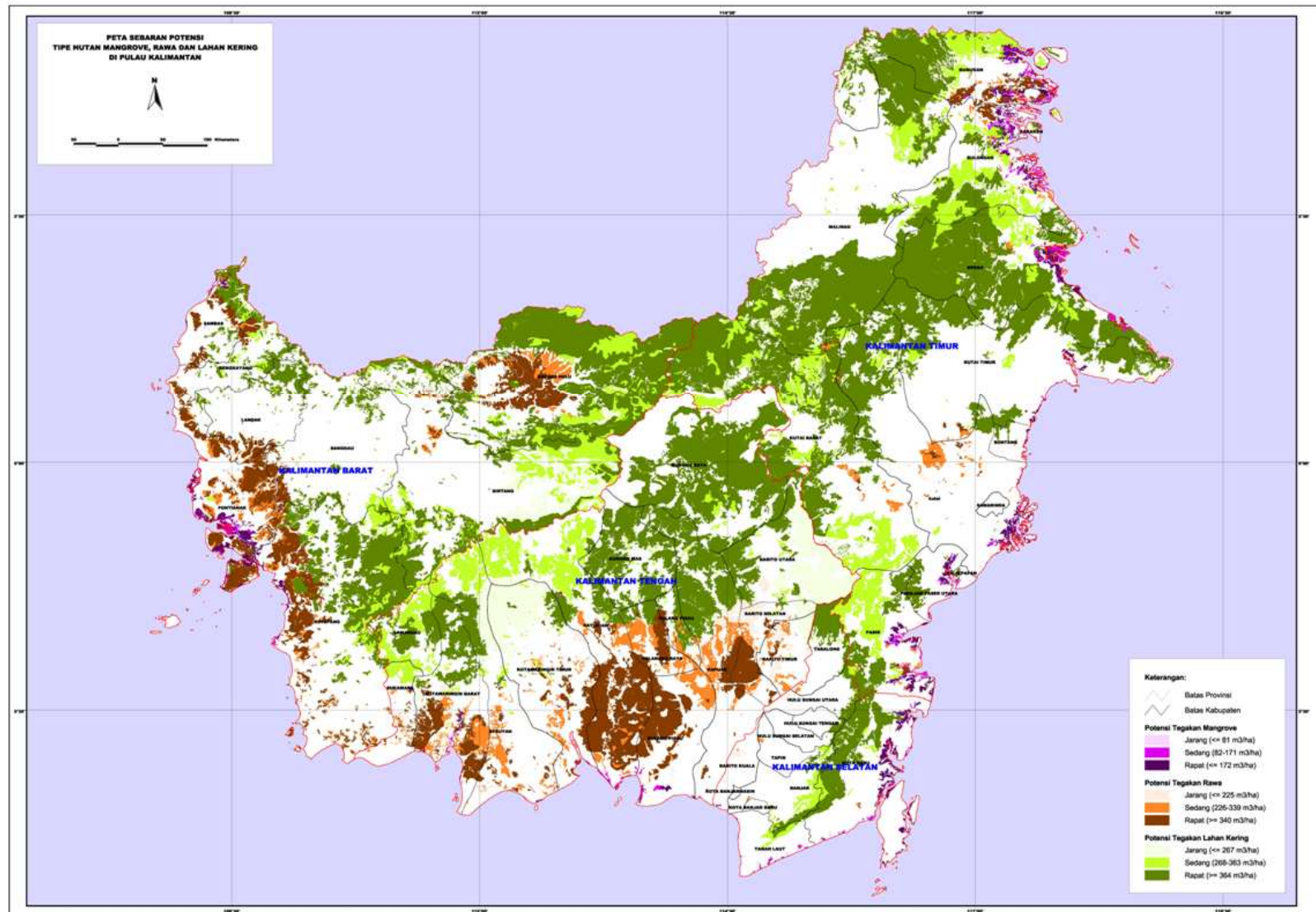


**FRA AFTER NFI 1996 .....**

## **STAND VOLUME ESTIMATION**

- ▣ **To estimate stand volume using multi spatial resolution satellite imageries**
  
- ▣ **Multi-stage sampling:**
  - **Medium resolution (Landsat TM)**
  - **High resolution (SPOT 5)**
  - **Field surveys**
  
- ▣ **Production Forest**
  - **2006 – Kalimantan**
  - **2007 – Sumatera, Sulawesi**
  - **2008 – Papua, Maluku, Nusteng**

# POTENSI KALIMANTAN



## **2. FOREST RESOURCES MONITORING (FRM)**

**→ Remotely sensed data**

**Landsat MSS, Landsat 5**

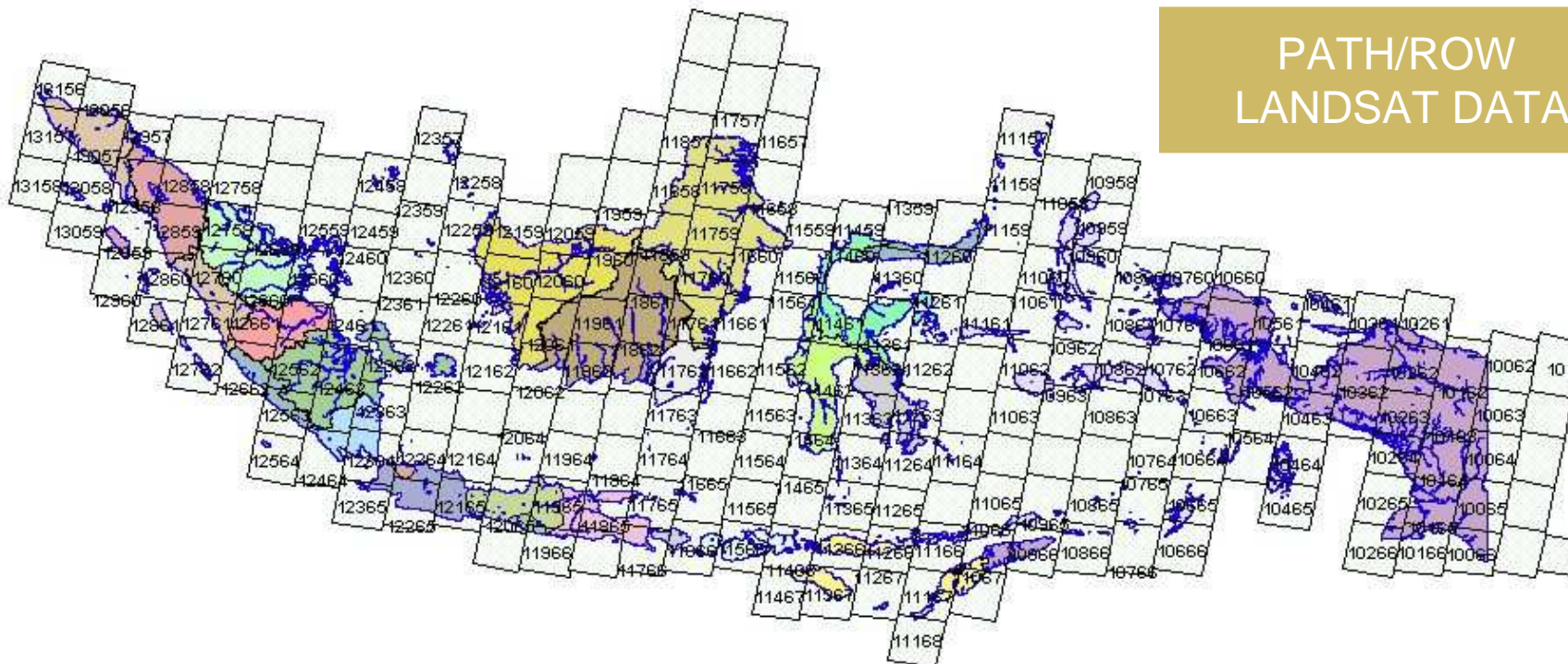
**→ Output: Landcover maps - forest, non forest**

## **FRM AFTER NFI 1996.....**

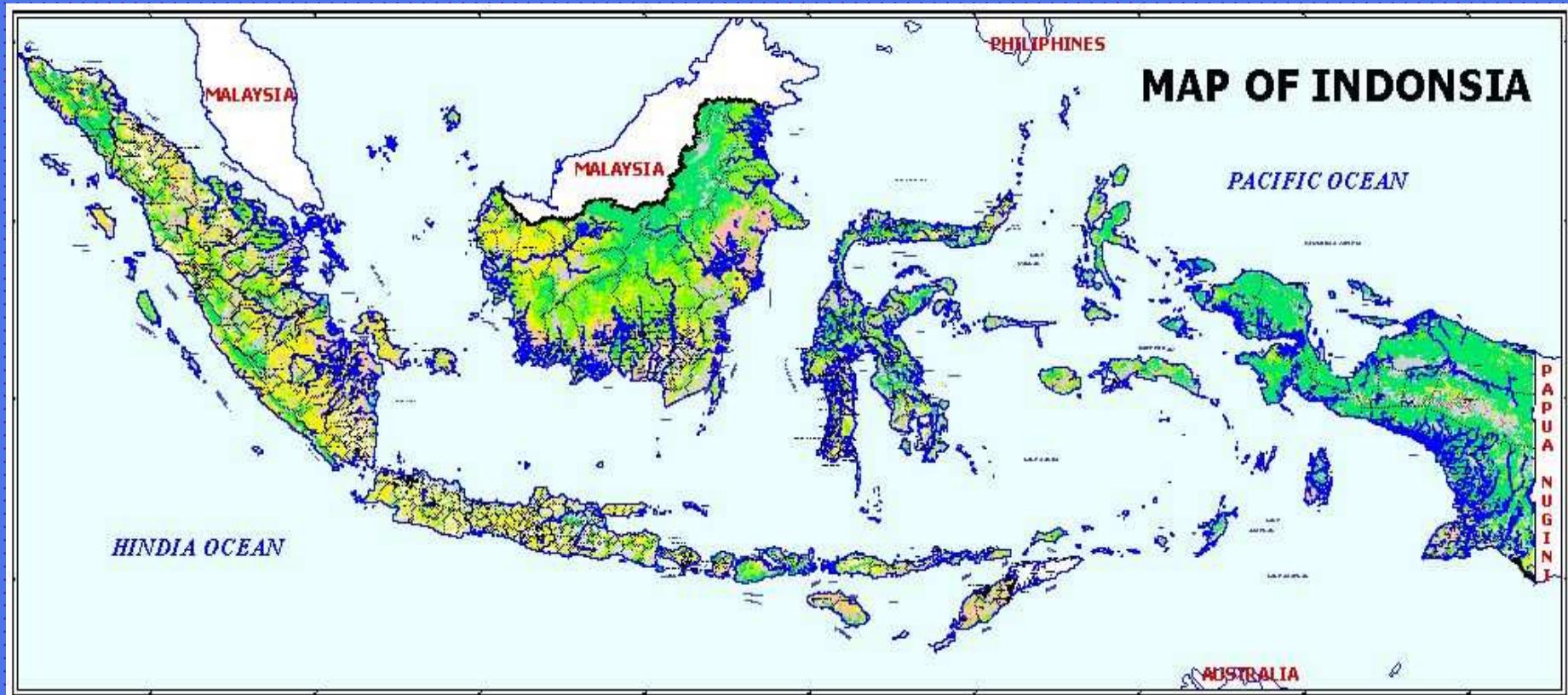
### **A. MEDIUM SPATIAL RESOLUTION IMAGES**

- ▣ Re-monitor every 3 years**
  
- ▣ Satellite data:**
  - . 2000 - Landsat 5 TM**
  - . 2003 - Landsat 7 ETM**
  - . 2006 - Landsat 7 ETM, SPOT 4**
  
- ▣ Outputs: Landcover maps – 23 classes**

# PATH/ROW LANDSAT DATA

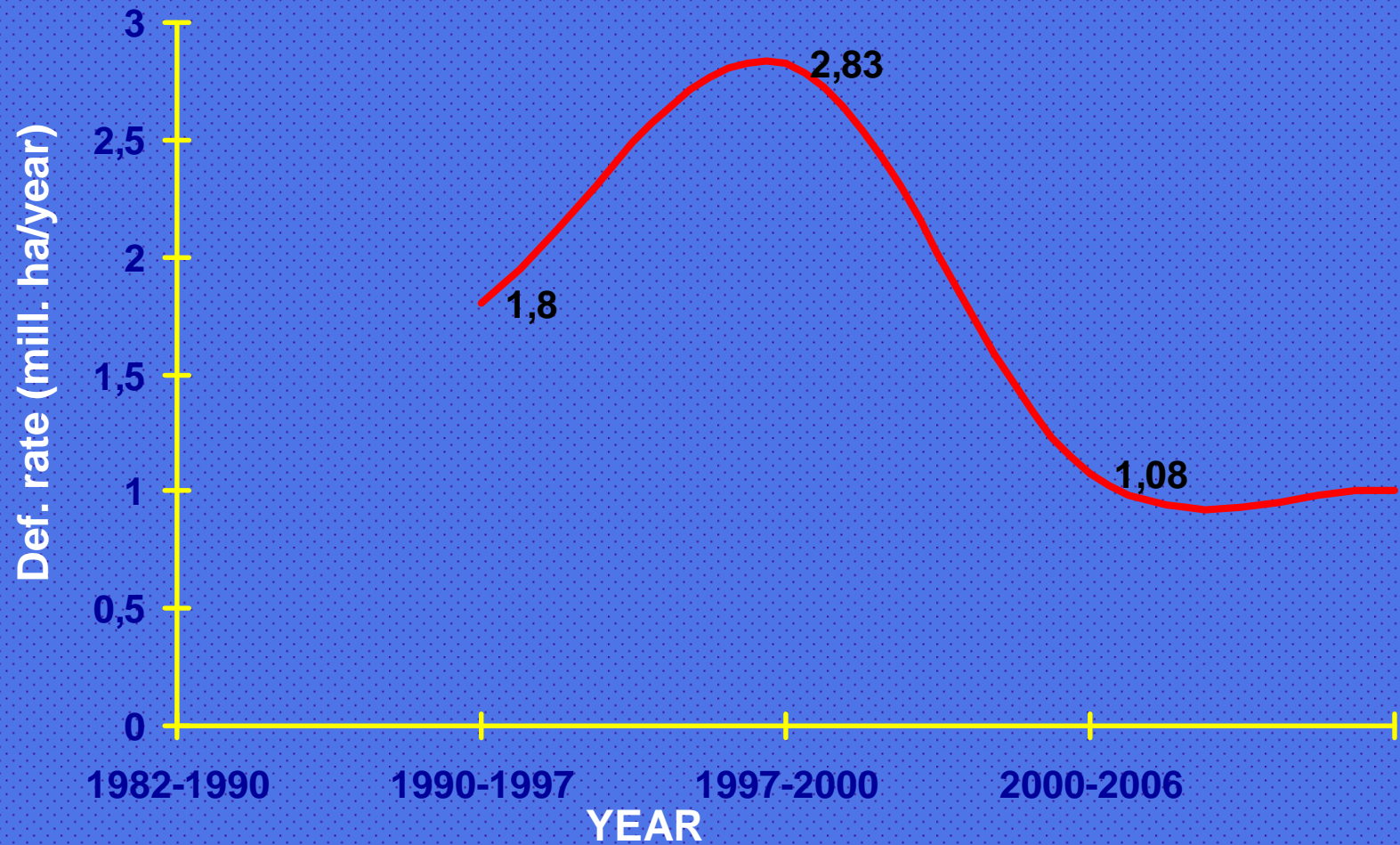


# FOREST COVER MAP OF YEAR 2003 (204 SCENES)





# Rate of deforestation/forest degradation



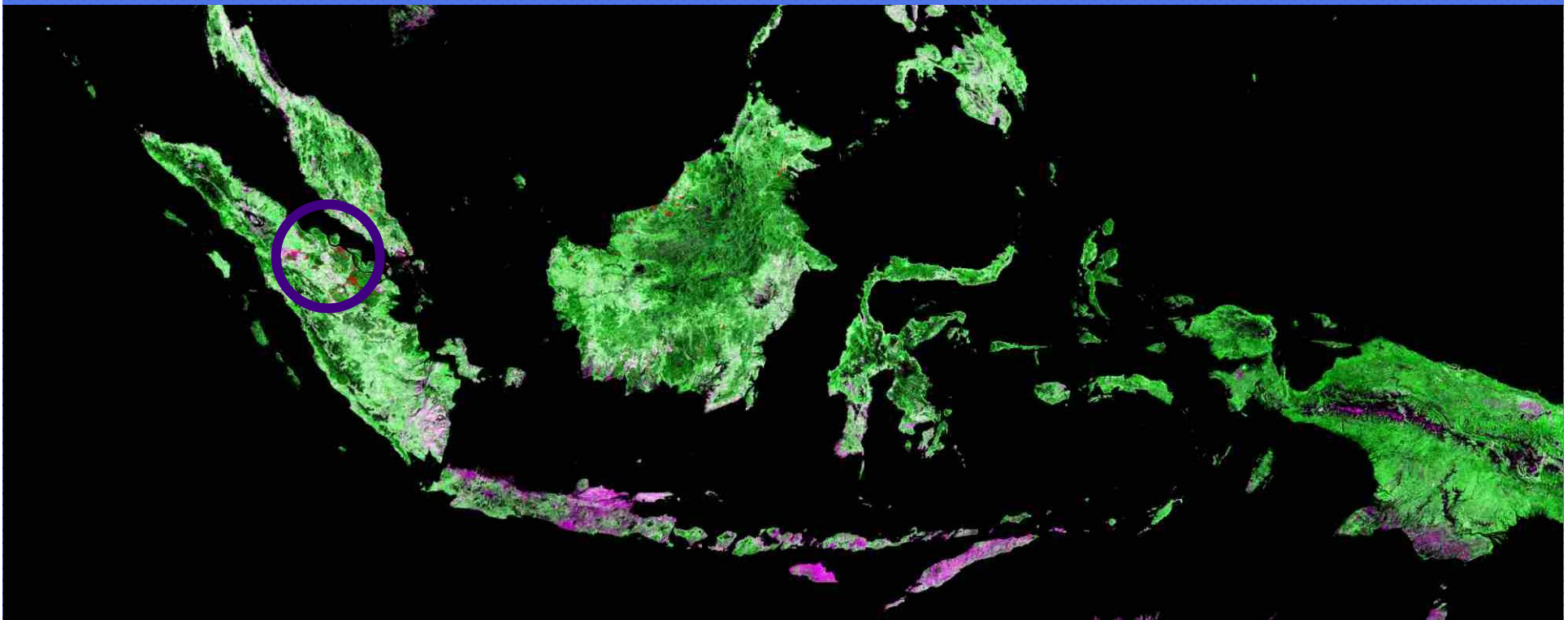
**FRM AFTER NFI 1996 .....**

## **B. LOW SPATIAL RESOLUTION IMAGES (>250 M) (MODIS, SPOT VEG)**

- ▣ **Re-monitor every year**
- ▣ **Fill gaps of Landsat 3-year monitoring**
- ▣ **Cover class: forest, non forest**
- ▣ **Map scale 1:500.000**

**>> Start 2006, cooperation with SDSU, WB, WRI**

# CHANGES OF FOREST COVERS BASED ON MODIS 2000 - 2004



## **PROBLEMS/CONSTRAINTS:**

- **NFI 1989-1996 was not designed to include biomass & carbon stock measurement**
- **In some forest areas, TSP/PSPs disappeared due to forest exploitation, fire, and conversion**
- **Cloud covers in some parts of the country prevent the capability to provide complete data of forest monitoring using satellite imageries for the whole country**
- **Limitation: Budget, trained personnel, and hard/soft-ware**

# **FUTURE DEVELOPMENT**

**→ Re-design NFI:**

**.. More plots: 5km x 5 km, 10km x 10km**

**.. Accommodate biomass/carbon stock measurement**

**→ Enhance the capacity & capability of the MoF in forest inventory, GIS/RS**

**→ Development of FRIS/NCASI**

TERIMA KASIH  
OBRIGADO  
THANK YOU

