

REL/RL DEVELOPMENT FOR REDD+ IN INDONESIA

Anna Tosiani

**Directorate of Forest Resources Inventory and Monitoring
Ministry of Forestry
Republic of Indonesia**

Technical Workshop on National Reference Levels for REDD+
Washington, DC, November 9-10, 2011

Outline

- **Background**
- **Concept of REL/RL**
- **REL Development in Indonesia**
- **Availability of Data**
- **Carbon Estimation (some current efforts)**
- **Near future development (INCAS)**

Background

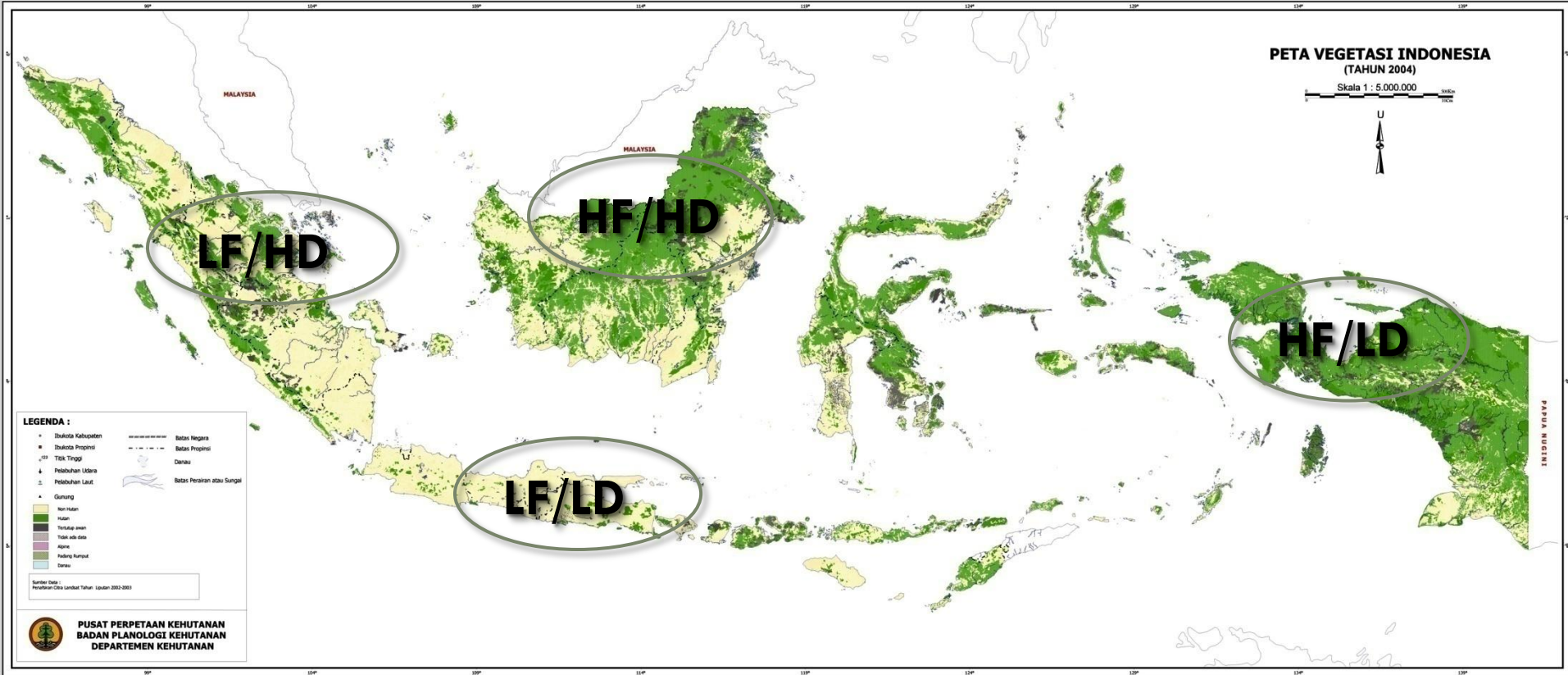
❑ Indonesia has tropical forest (potential for REDD+)

- 187 million ha area & 225 million population
- 70% forest land/forest area → 30% degraded
- Storing and sequestering (and also emitting) significant amount of carbon
- High deforestation rate
 - 1995-2000 : 2.8 jt ha/th
 - 2000-2005 : 1.18 jt ha/th
 - 2006-2009/10 : 0.83 jt ha/th

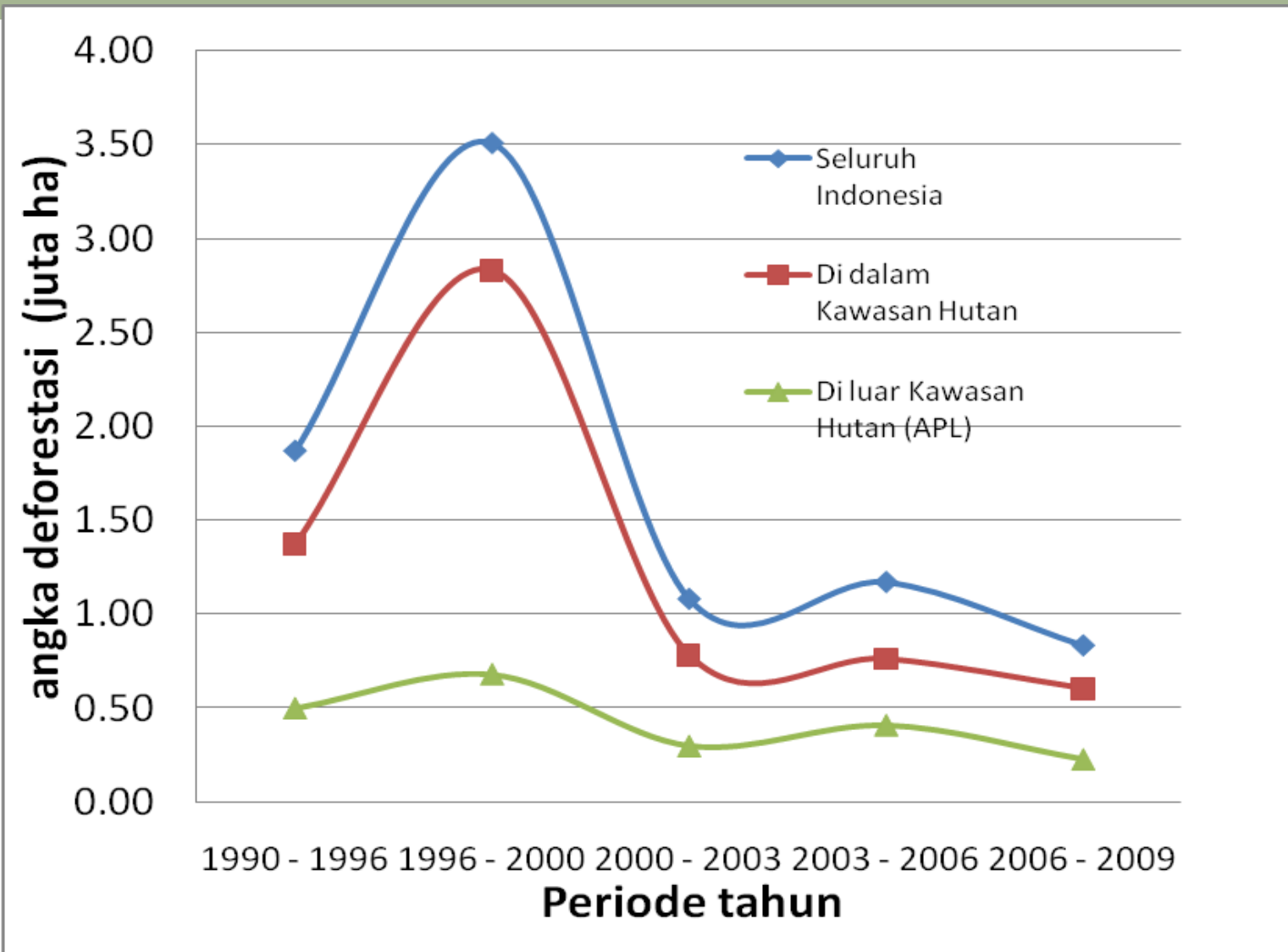
❑ REDD requires a reference to measure emission reduction

- Accurate, verifiable estimation of GHG is required
- Demand and price of GHG credits depends on the quality of MRV

Grouping based on land cover and Deforestation Rate



Graphic of Deforestation Rate



Degradation Rate

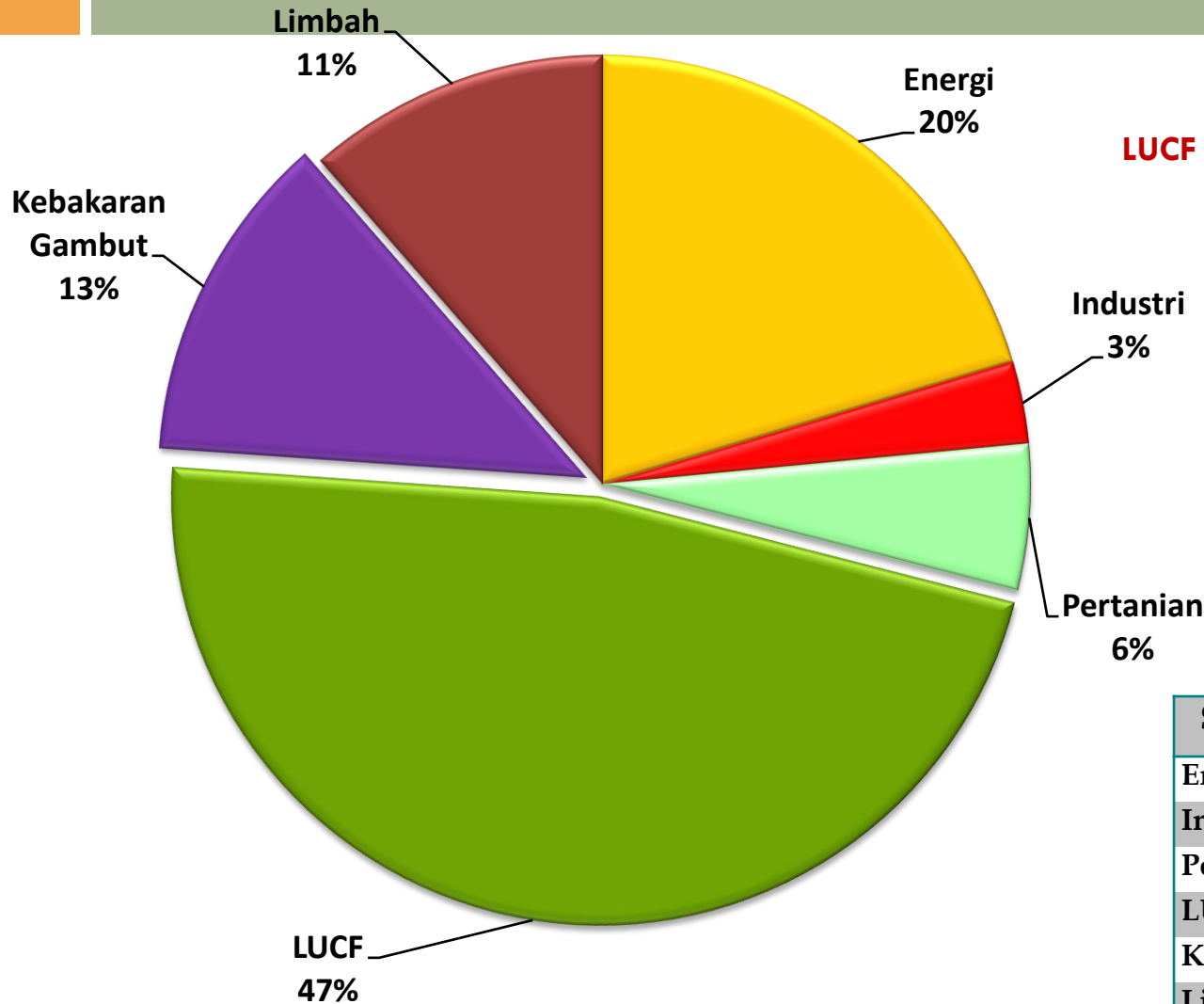
| Years | Natural Forest | Primary Forest | Secondary Forest |
|--------------|-----------------------|-----------------------|-------------------------|
| 1 | 2 | 3 | 4 |
| 1990 | 130,649 | 70,187 | 60,462 |
| 1996 | 118,694 | 63,765 | 54,929 |
| 2000 | 104,027 | 55,885 | 48,142 |
| 2003 | 100,185 | 48,492 | 51,693 |
| 2006 | 95,923 | 44,876 | 51,047 |
| 2009 | 94.141 | 42.081 | 52.060 |

Concept of REL/RL

- **Reference emissions level (REL)** is the amount of gross emissions from a geographical area estimated within a reference time period (REDD)
- **Reference level (RL)** is the amount of net/gross emissions and removals from a geographical area estimated within a reference time period (REDD+)

REL/RL Development

National Emission



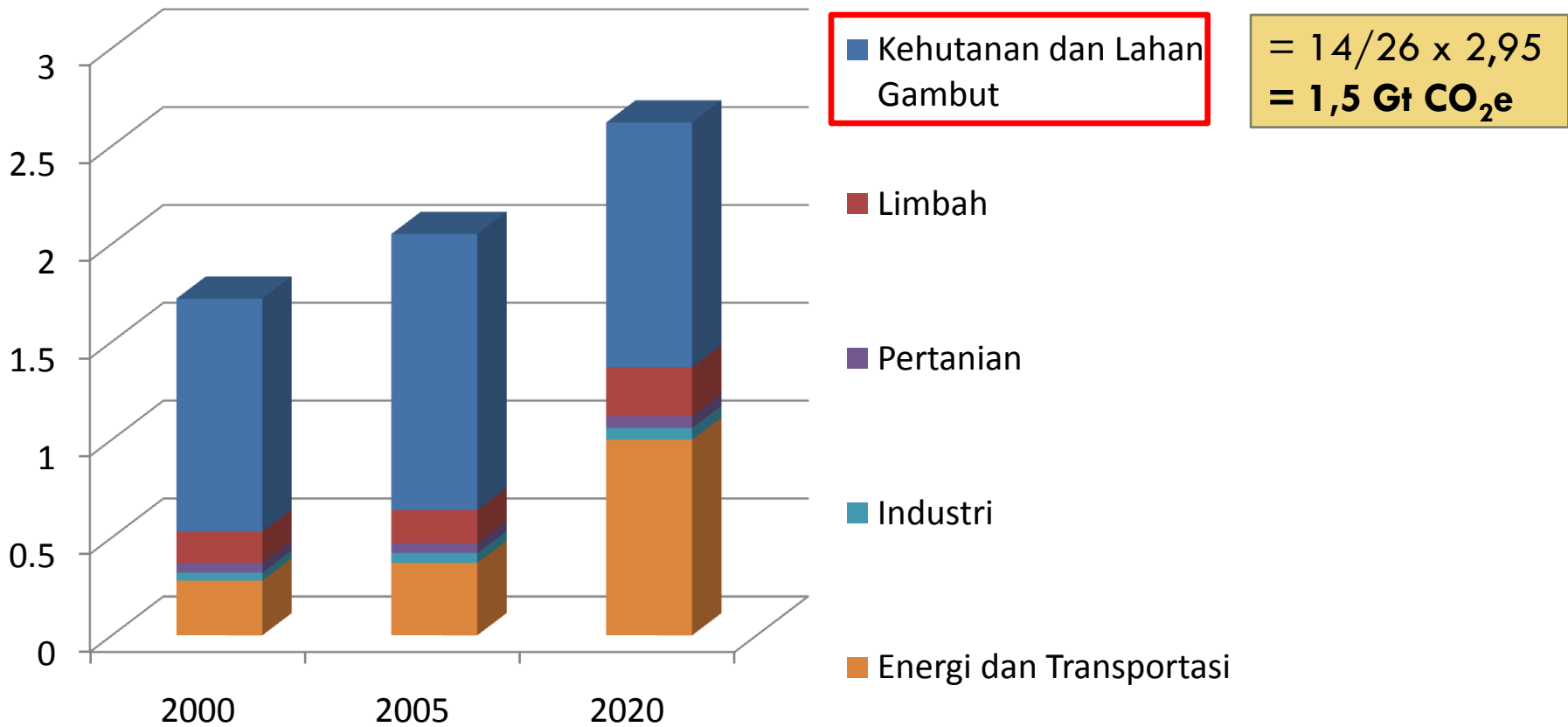
LUCF + Peat Fire = 50 - 55%

| Sektor | Giga CO2e |
|------------------|-----------|
| Energi | 280.938 |
| Industri | 42.814 |
| Pertanian | 75.420 |
| LUCF | 649.254 |
| Kebakaran Gambut | 172.000 |
| Limbah | 157.328 |
| TOTAL | 1.377.754 |

National Emission Scenario

Reduction Emission Target =
26%

Forest Land Conversion +
Peat Fire =
50 - 55% (~14%)

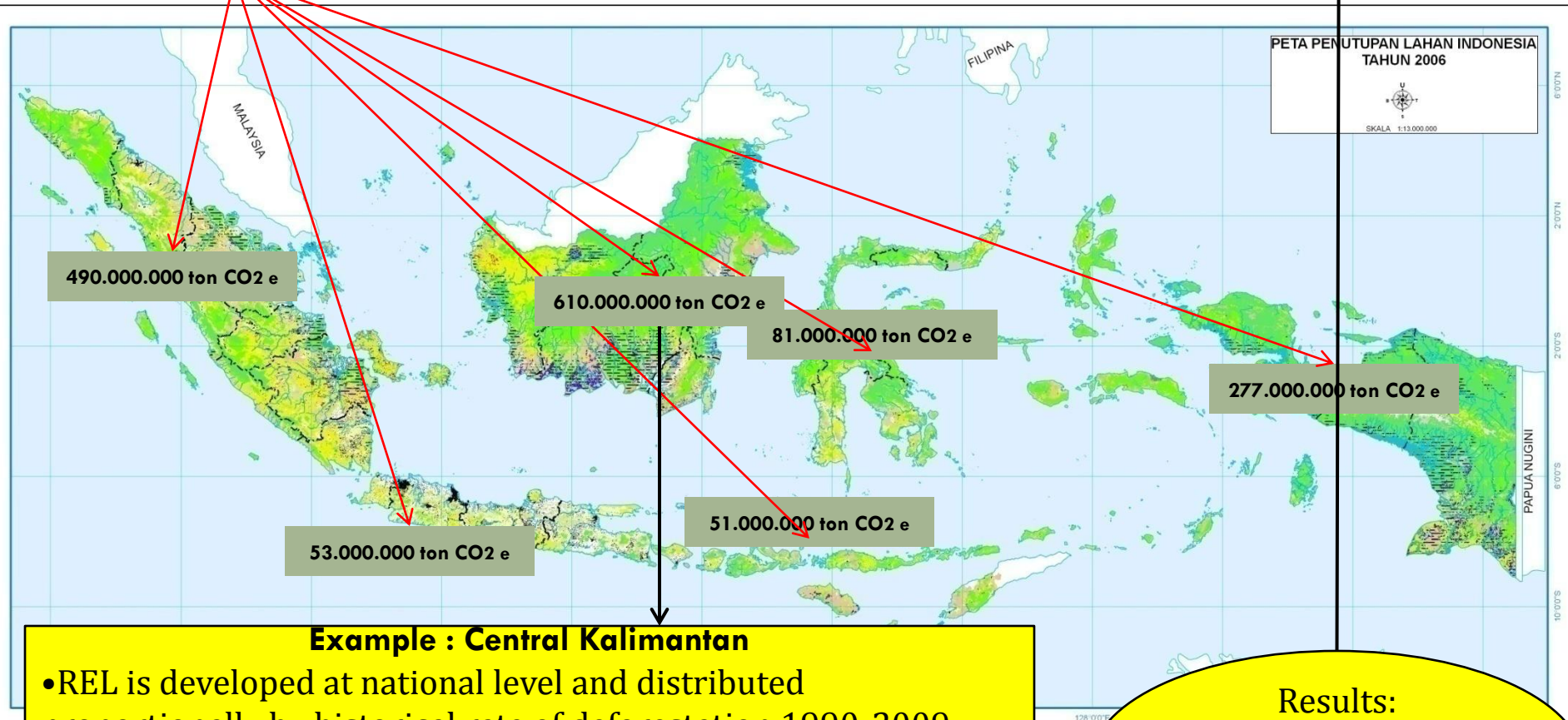


REL National Consultation

1.560.000.000 ton CO₂
e

**NASIONAL REDD+
STRATEGY**

**Total of provincial emission based
on carbon source and sink
NATIONAL**



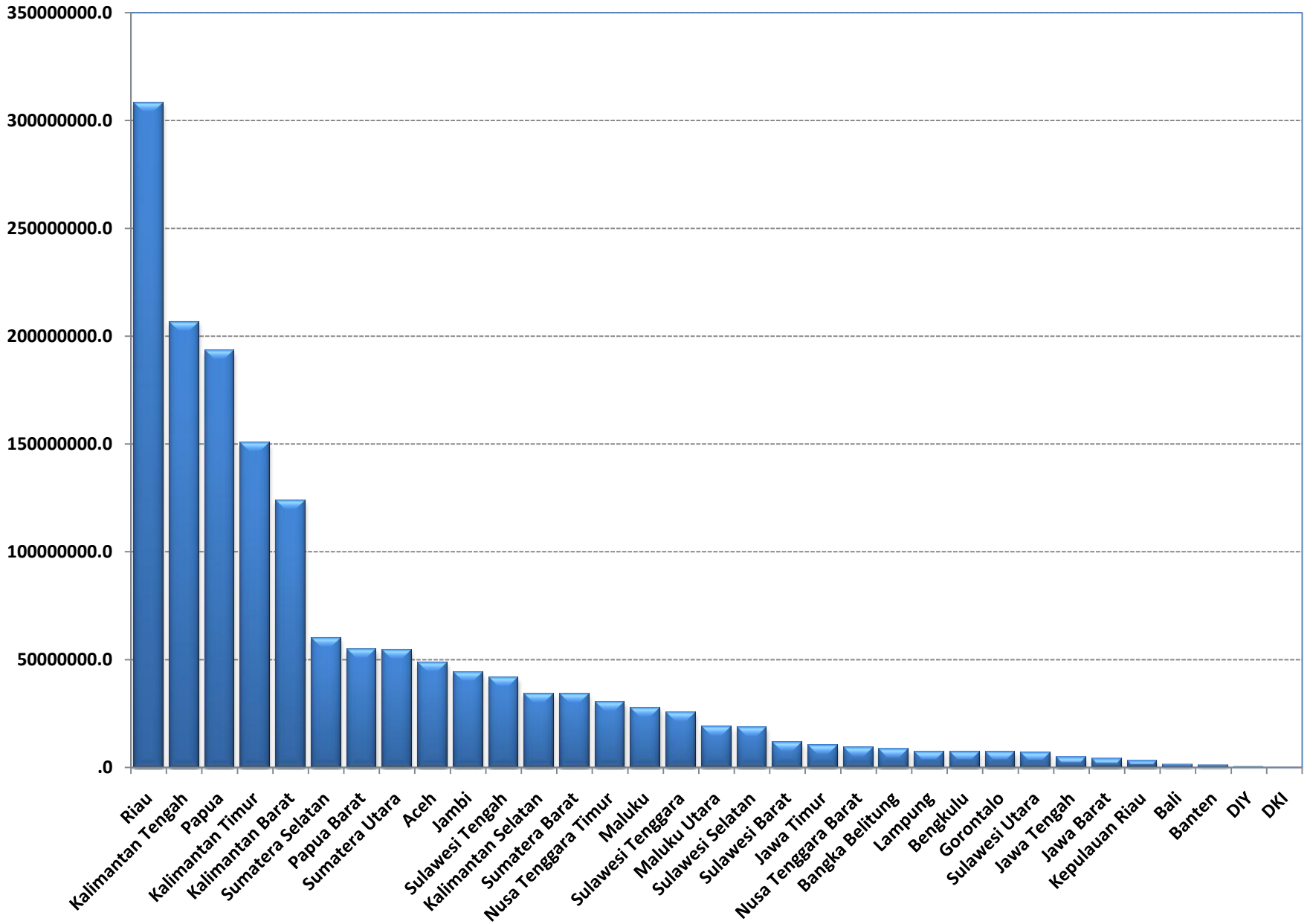
Example : Central Kalimantan

- REL is developed at national level and distributed proportionally by historical rate of deforestation 1990-2009
- Provincial Quota is reconciled with Provincial Development Planning and Provincial Spatial Planning

Results:

**Results:
1. Carbon Source
2. Carbon Sink**

Emission Quota Per Province (2020)



Availability of National REL Data

➤ Activity data :

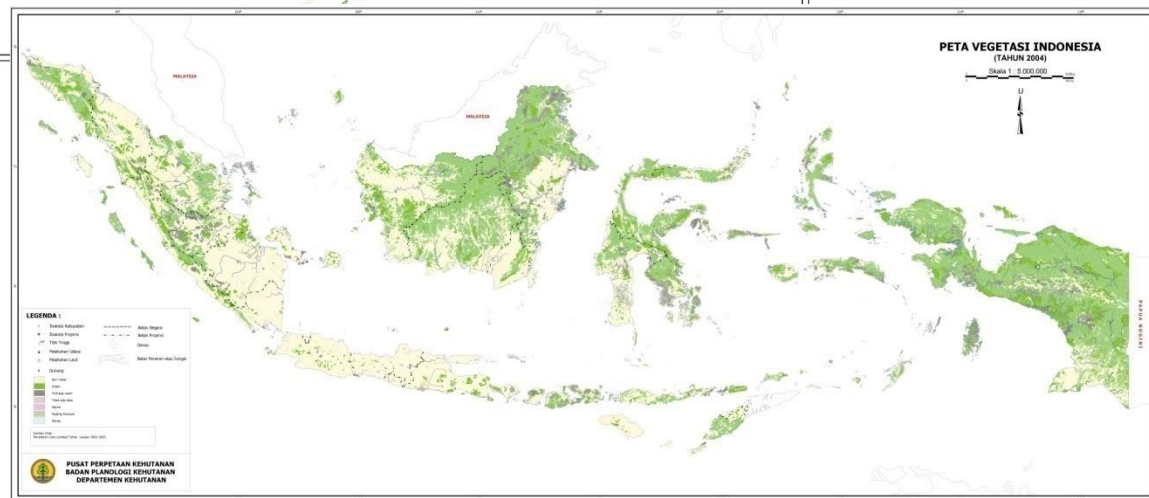
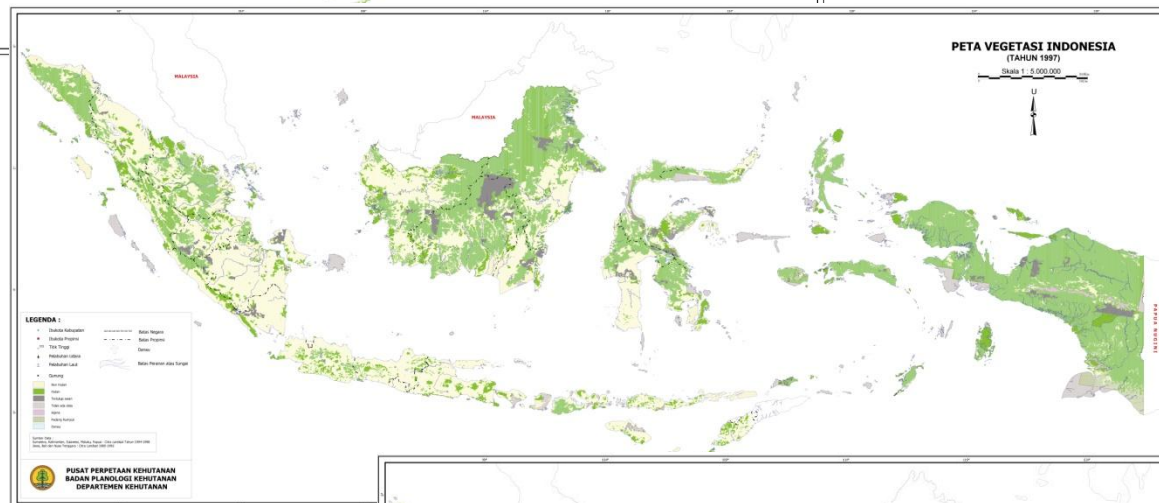
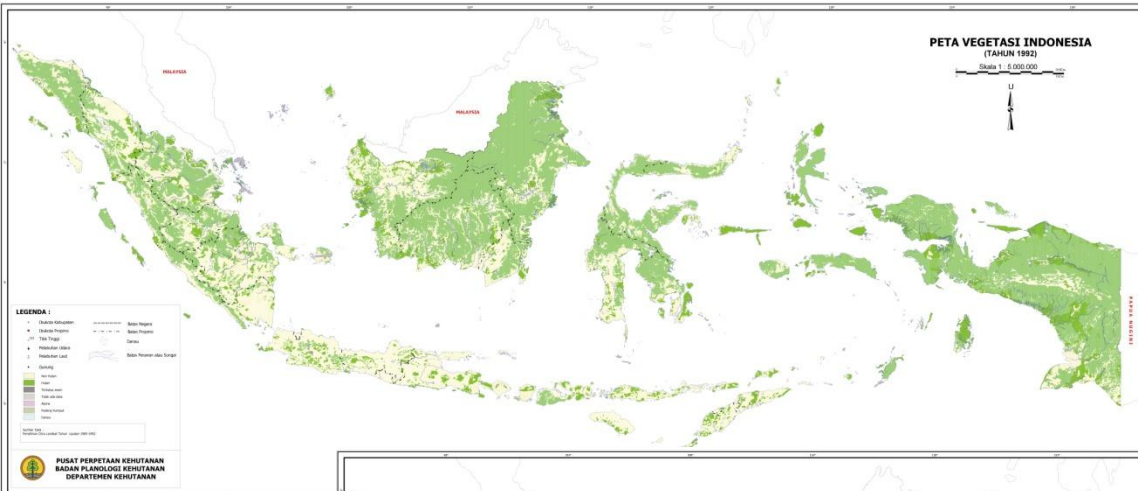
Land cover change: Landsat 5 TM, Landsat 7 ETM+ (1990, 1996, 2000, 2003, 2006, 2009/2010 and 2011 (process))

➤ Emission/Removal Factor :

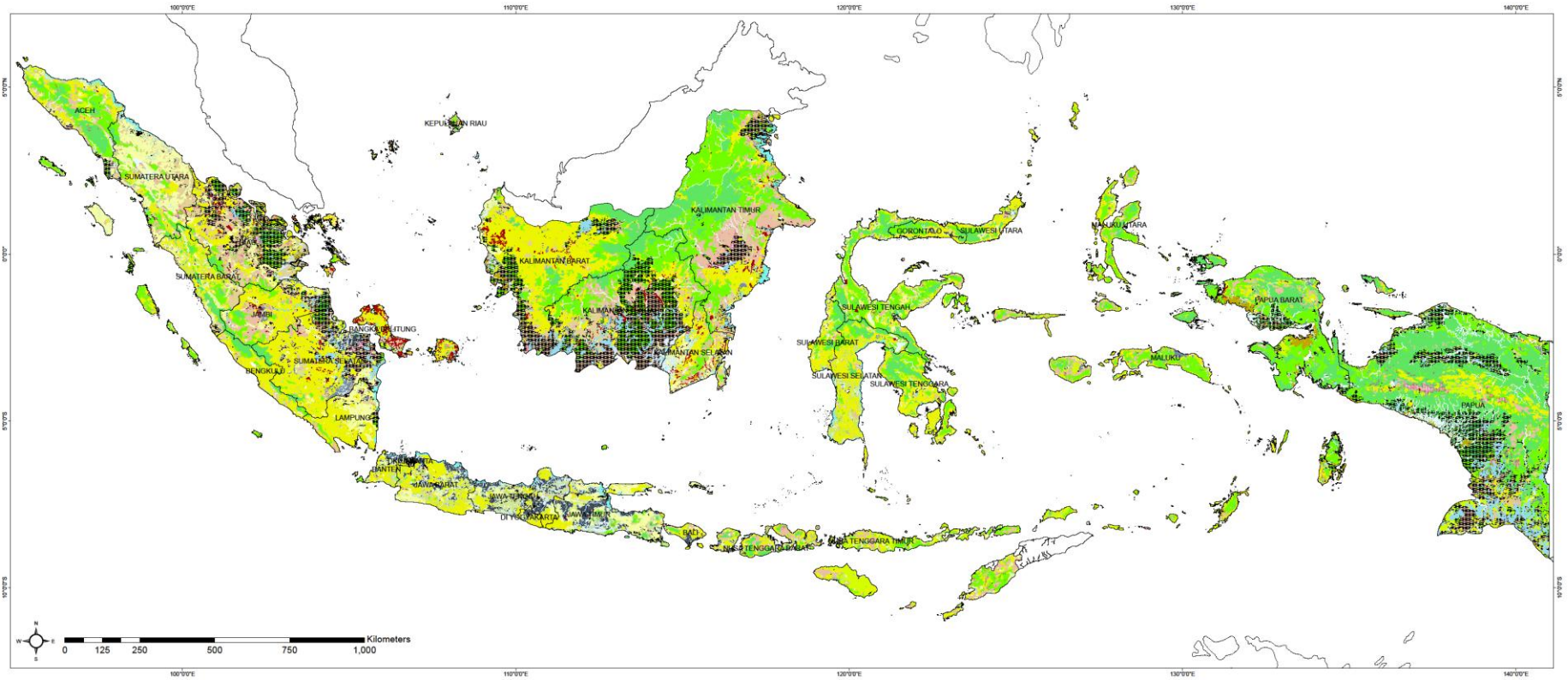
National Forest Inventory (NFI) Sample Plots

- 1990-1996 (2.735 cluster plots)
- 1996-2000 (1.145 cluster plots)
- 2000-2006 (485 cluster plots)
- 2006-2010 (2.997 cluster plots) → **Redesign NFI**
- **2012-2014 → 599 cluster plots/year**

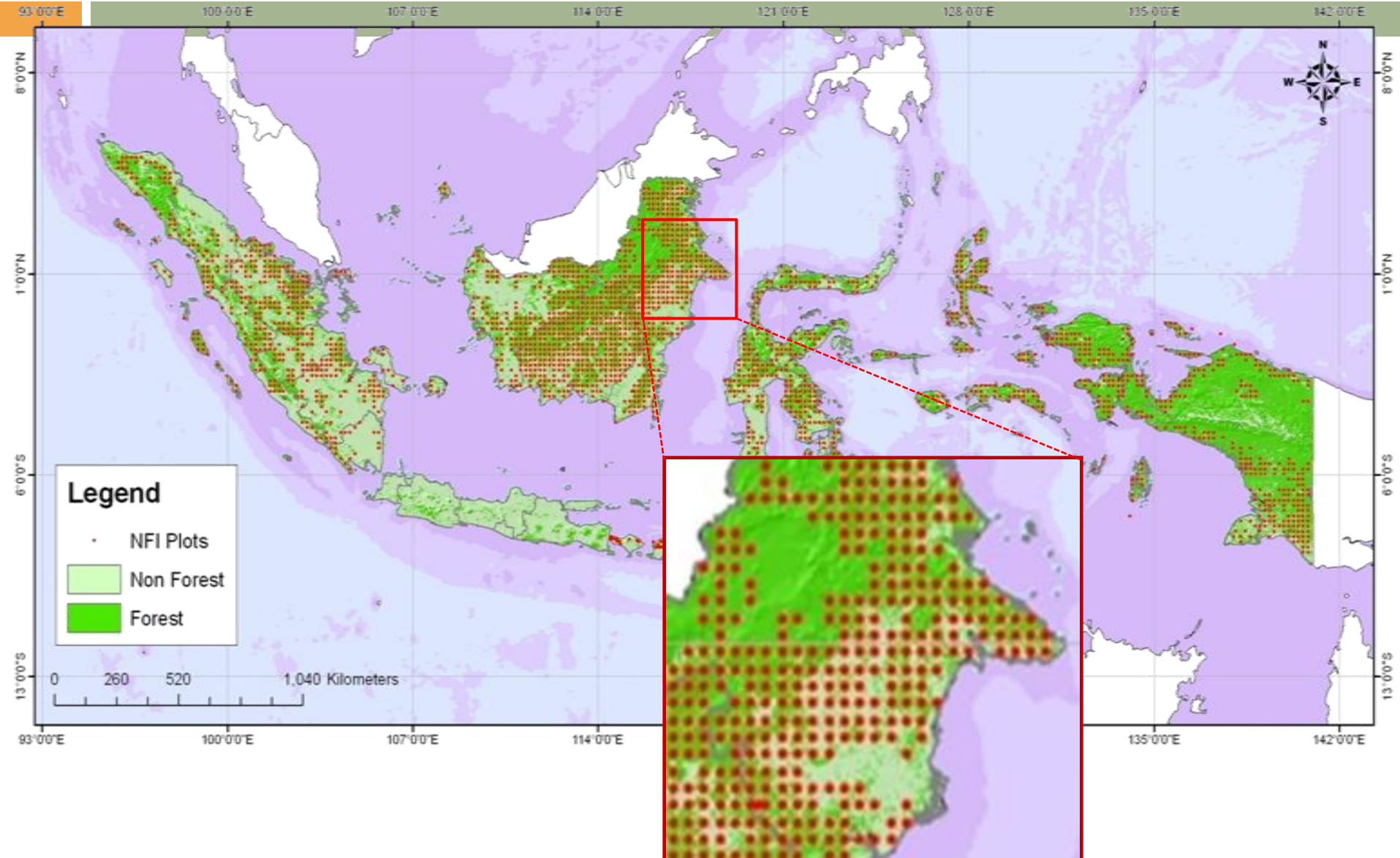
➤ Provincial Development Planning and Provincial Spatial Planning Data



Land Cover, 2009/2010



TSP/PSP of Ministry of Forestry's NFI



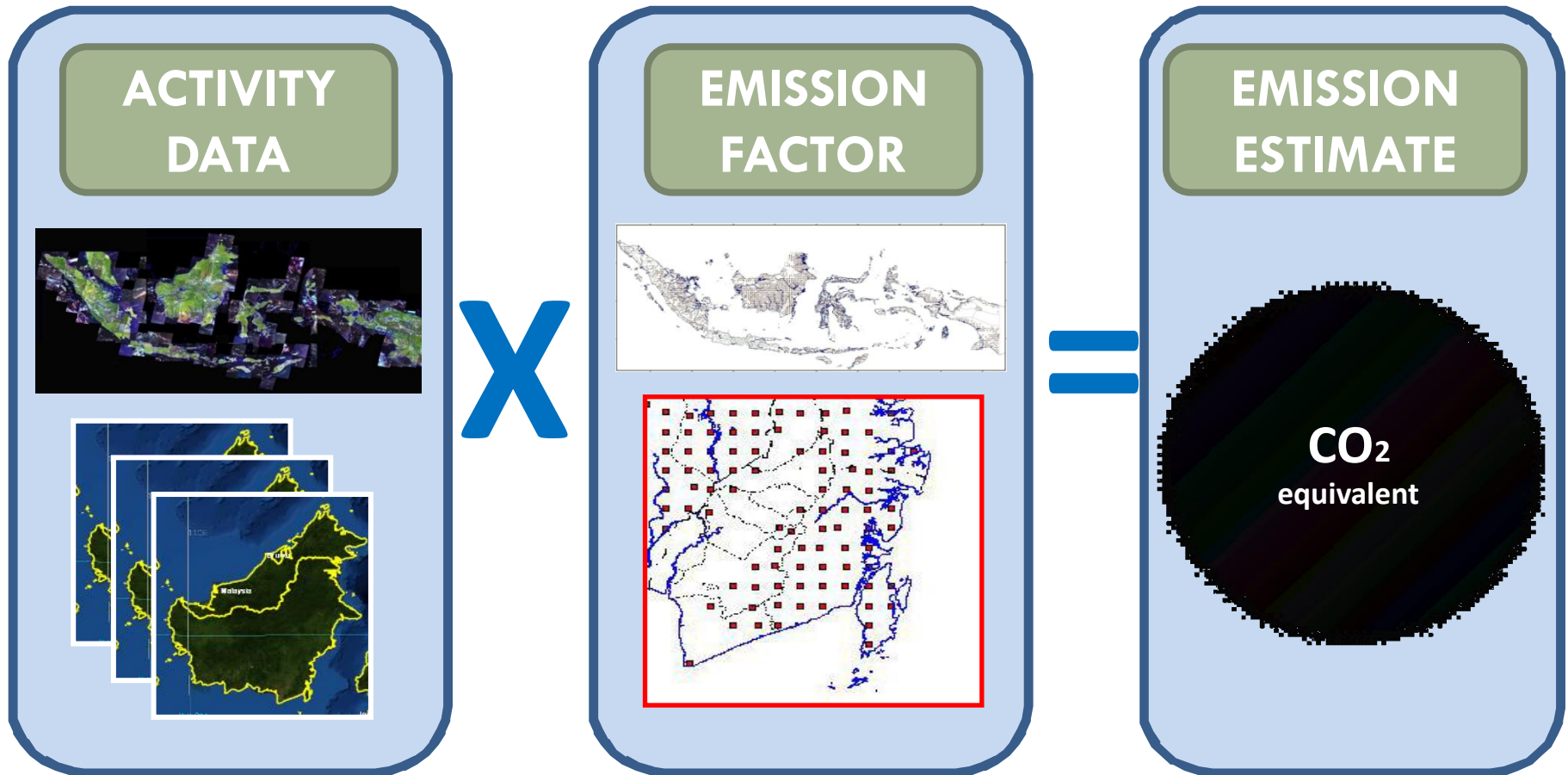
Carbon Estimation

Current efforts :

- Existing Data and Information (Internal Data of Ministry of Forestry)
- *Accountability and Local Level Initiative for Reducing Emission from Deforestation and Degradation (ALLREDDI Project) - (DG of Planning-ICRAF)*

Carbon Estimation

GHG Inventory from LULUCF



Activity Data

| 2006 | | | | | | | | | | | | | | | | |
|-------------------------------|--------------|----------------|-----------------------|---------|------------|------------|---------------|--------|-----|-------------------------|---------------------|--------------|------------------------|-------------------------------|-------|-------------|
| 2009 | | | | | | | | | | | | | | | | Grand Total |
| | Hutan Primer | Hutan Sekunder | Hutan Mangrove Primer | Belukar | Perkebunan | Permukiman | Lahan terbuka | Rumput | Air | Hutan Mangrove Sekunder | Hutan Rawa Sekunder | Belukar Rawa | Pertanian Lahan Kering | Pertanian Lahan Kering campur | Sawah | |
| Hutan Primer | 1.999 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1.999 |
| Hutan Sekunder | 18 | 2.260 | - | - | - | - | - | - | - | - | - | - | 0 | - | - | 2.278 |
| Hutan Mangrove Primer | - | - | 19 | - | - | - | - | - | - | - | - | - | - | - | - | 19 |
| Belukar | 2 | 17 | - | 382 | 1 | - | 0 | - | - | - | - | - | - | - | - | 403 |
| Perkebunan | 0 | 2 | - | 0 | 88 | - | - | - | - | - | - | - | 1 | 0 | - | 91 |
| Permukiman | - | 0 | - | - | - | 28 | - | - | - | - | - | - | - | - | - | 28 |
| Lahan terbuka | 0 | 4 | - | 4 | 1 | - | 50 | - | - | 0 | - | - | 0 | 1 | - | 60 |
| Rumput | - | - | - | - | - | - | - | 12 | - | - | - | - | - | - | - | 12 |
| Air | - | - | - | - | - | - | - | - | 60 | - | - | - | - | - | - | 60 |
| Hutan Mangrove Sekunder | - | - | 0 | - | - | - | - | - | - | 29 | - | - | - | - | - | 30 |
| Hutan Rawa Sekunder | - | - | - | - | - | - | - | - | - | - | 7 | - | - | - | - | 7 |
| Belukar Rawa | - | - | 0 | - | - | - | - | - | - | 2 | - | 1 | - | - | - | 3 |
| Pertanian Lahan Kering | 0 | 4 | - | 1 | - | - | - | - | - | - | - | - | 440 | 2 | - | 447 |
| Pertanian Lahan Kering campur | 1 | 17 | 0 | 5 | - | - | - | - | - | - | - | - | - | 515 | - | 538 |
| Sawah | - | 1 | - | - | - | - | - | - | - | - | - | - | 1 | - | 105 | 107 |
| Grand Total (1000 ha) | 2.020 | 2.304 | 19 | 392 | 90 | 28 | 50 | 12 | 60 | 31 | 7 | 1 | 443 | 518 | 105 | 6.080 |

Example : Matrik of Land cover change of Central Sulawesi, 2006-2009 (dalam .000)

Reclassified 23 Classes into IPCC's

No. MoF Land Cover Class

| | |
|-------------|---------------------------|
| 2001 | PRIMARY DRYLAND FOREST |
| 2002 | SECONDARY DRYLAND FOREST |
| 2005 | PRIMARY SWAMP FOREST |
| 20051 | SECONDARY SWAMP FOREST |
| 2004 | PRIMARY MANGROVE FOREST |
| 20041 | SECONDARY MANGROVE FOREST |
| 2006 | PLANTATION FOREST |
| 20091 | DRYLAND AGRICULTURE |
| 20092 | SHRUB-MIXED DRYLAND FARM |
| 20122 | TRANSMIGRATION AREA |
| 20093 | RICE FIELD |
| 2010 | ESTATE CROPLANTATION |
| 3000 | GRASSLAND |
| 2007 | BUSH/SHRUB |
| 50011 | SWAMP |
| 20071 | SWAMP SHRUB |
| 2012 | SETTLEMENT AREA |
| 2014 | BARREN LAND |
| 20094 | FISH POND |
| 20121 | AIRPORT |
| 20141 | MINING AREA |
| 5001 | WATER |
| 2500 | CLOUD COVERED |

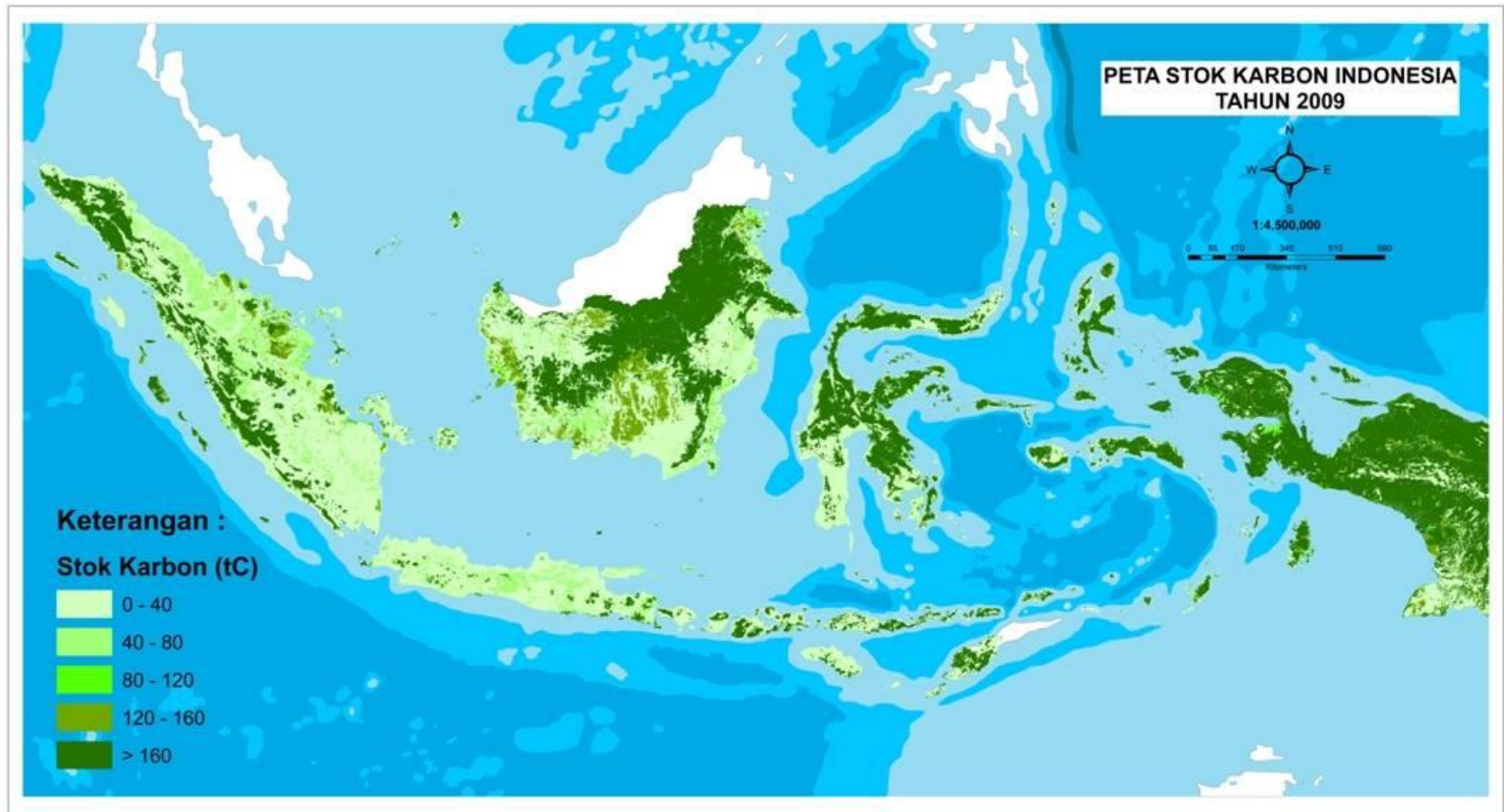
No. IPCC Class

- 1 Forestland
- 2 Cropland
- 3 Grassland
- 4 Wetland
- 5 Settlement
- 6 Other Land

Above Ground Biomass

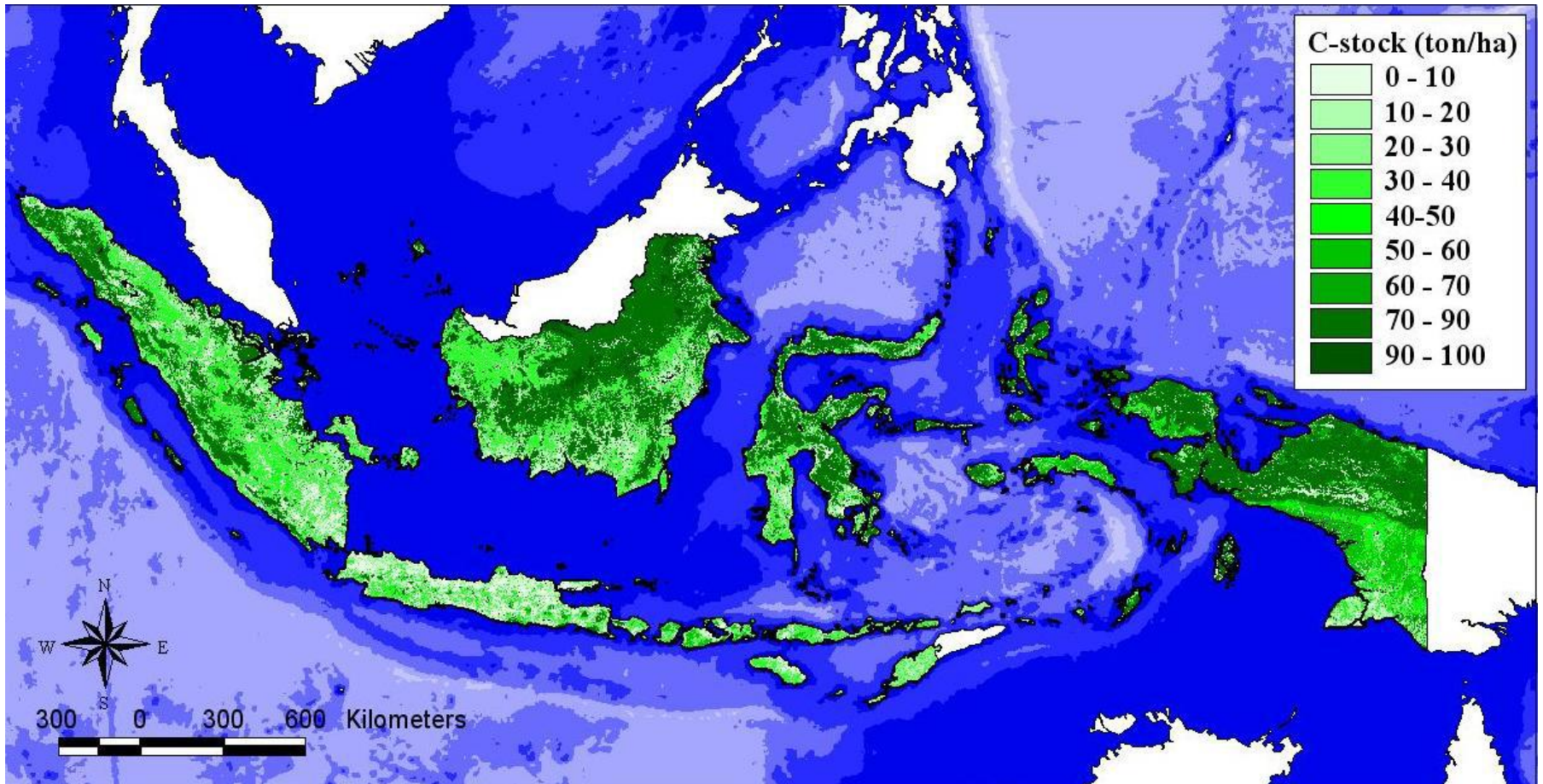
| Forest | Mean of AGB (ton/Ha) | Mean of Carbon AGB (ton/Ha) | Mean of CO ₂ e (ton/Ha) |
|---|-------------------------|-----------------------------------|---------------------------------------|
| Primer (p) | 390,7 | 195,4 | 716,9 |
| Sekunder (s) | 339,2 | 169,6 | 622,4 |
| KSA/ Conservation Forest | 434,2 | 217,1 | 796,7 |
| KSAp | 456,9 | 228,5 | 838,5 |
| KSAs | 388,7 | 194,3 | 713,2 |
| HL/ Protection Forest | 378,1 | 189,0 | 693,7 |
| HLp | 407,5 | 203,8 | 747,8 |
| HLs | 355,3 | 177,7 | 652,0 |
| HPK/ Converted Production Forest | 331,7 | 165,8 | 608,6 |
| HPKp | 332,7 | 166,4 | 610,6 |
| HPKs | 316,4 | 158,2 | 580,6 |
| HP/ Production Forest | 312,1 | 156,1 | 572,7 |
| HPp | 367,7 | 183,9 | 674,8 |
| HPs | 323,1 | 161,5 | 592,8 |
| HPT/ Limited Production Forest | 371,2 | 185,6 | 681,1 |
| HPTp | 394,7 | 197,4 | 724,3 |
| HPTs | 366,5 | 183,3 | 672,6 |
| APL/ Non Forest Area | 271,9 | 136,0 | 499,0 |
| APLp | 293,1 | 146,6 | 537,9 |
| APLs | 271,8 | 135,9 | 498,8 |

Carbon Stock of 2009 (MoFor internal data)



Based on existing data: 23 landcoverclasses and PSP of NFI

Carbon Stock of 2005 (ALREDDI Project)



Based on 28 carbon stock classes and various sources of EF



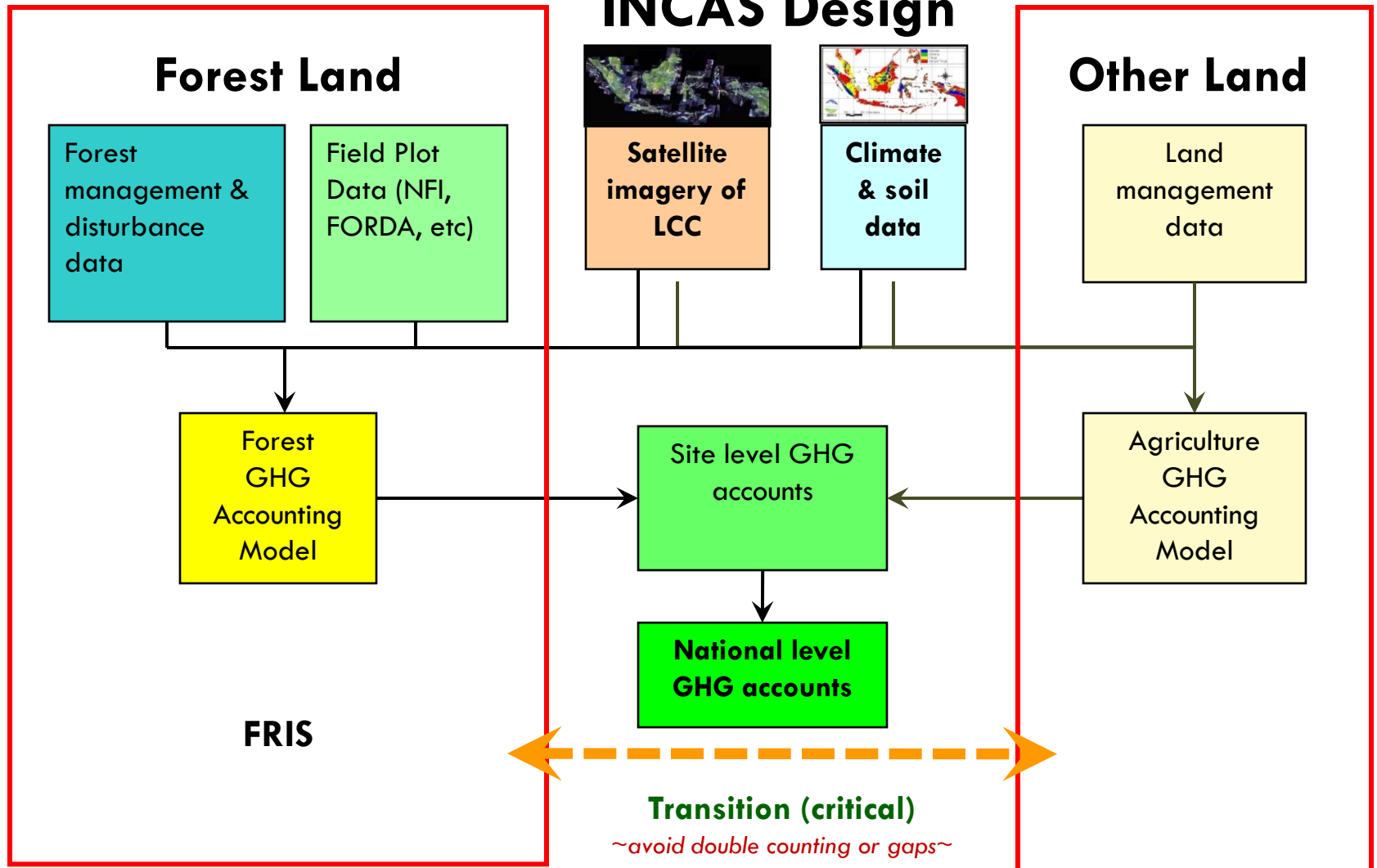
Near future development (INCAS)

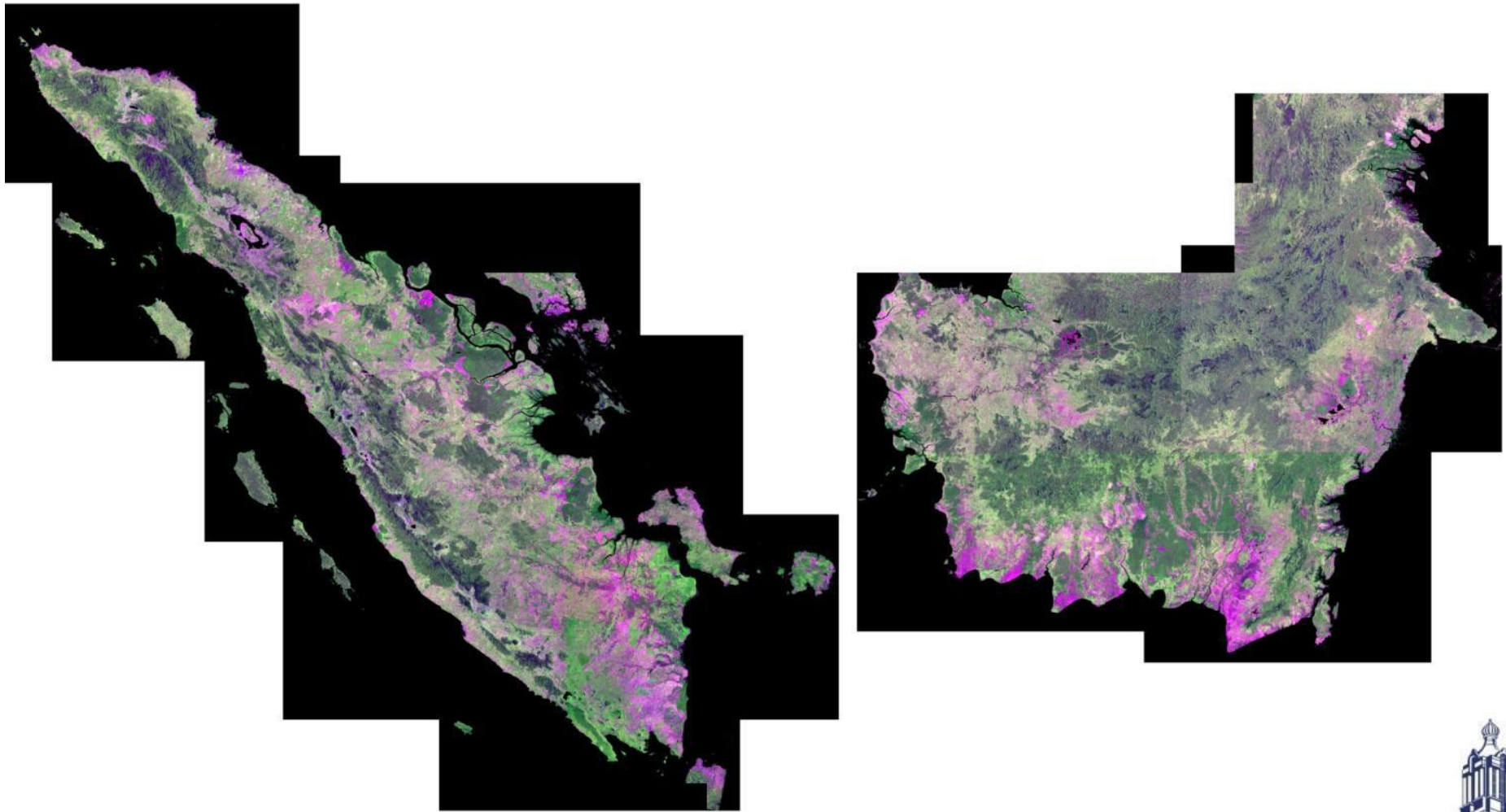
Indonesia's National Carbon Accounting System (INCAS)

INCAS will provide a comprehensive account of carbon pools and GHG emissions resulting from *deforestation, degradation and other land use changes occurring throughout the Indonesian archipelago, not just within the forest land area.*

INCAS DESIGN

INCAS Design



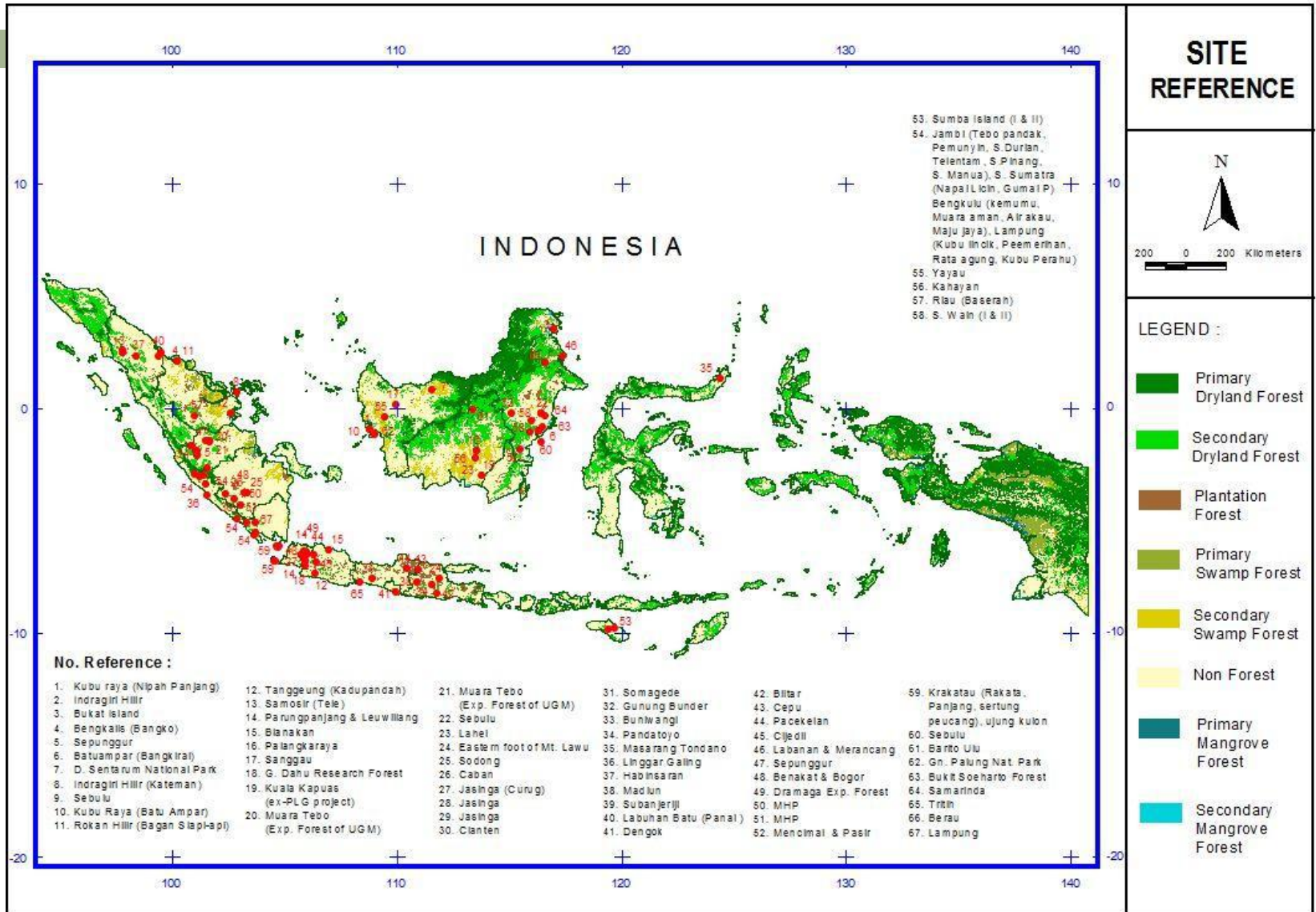


System Image of 1999 to 2003 composite for Sumatra and Kalimantan



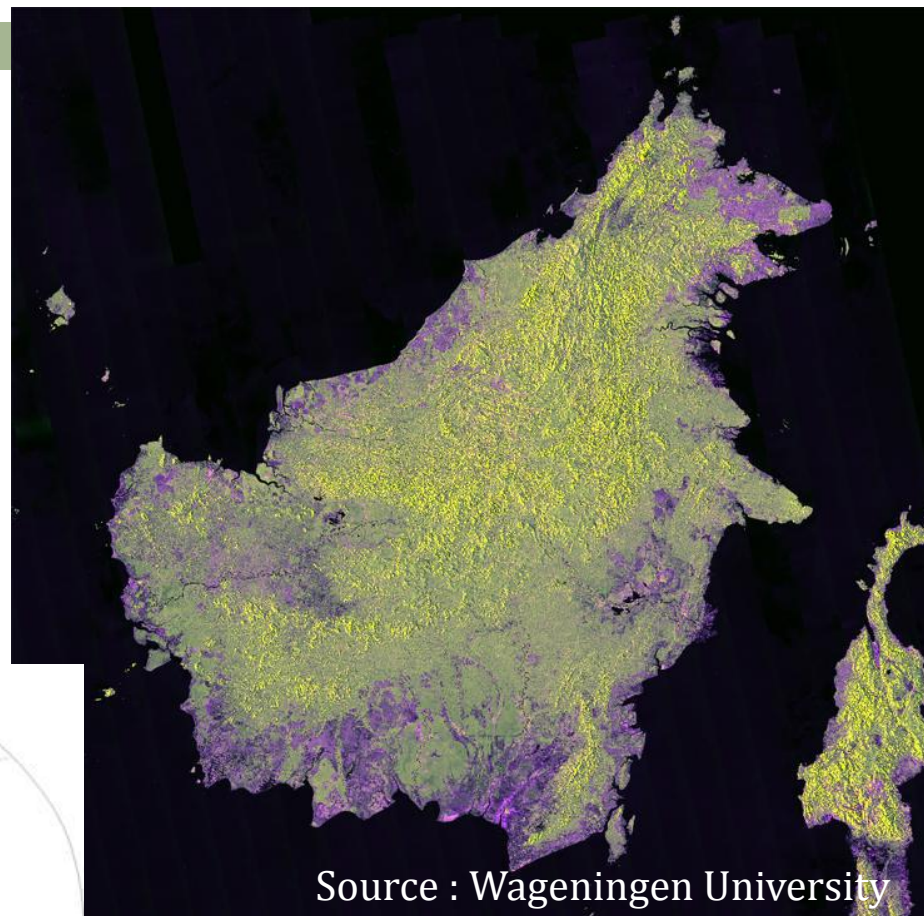
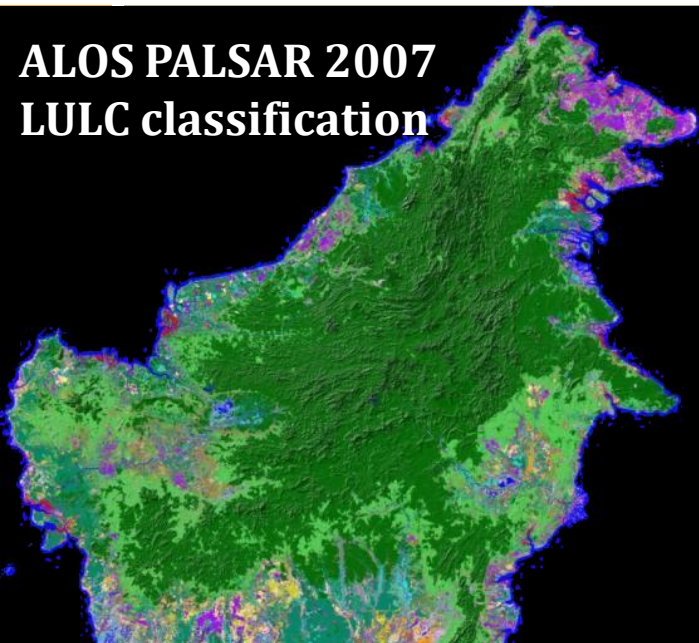
Best imagery from Google –persistent cloud cover

SPATIAL DISTRIBUTION OF EXISTING BIOMASS DATA



RESEARCH WITH OTHER REMOTE SENSING SOURCES (ALOS PALSAR) GEO FCT NATIONAL DEMONSTRATORS

**ALOS PALSAR 2007
LULC classification**



A low-angle, upward-looking photograph of a tree trunk. The trunk is dark and textured, extending from the bottom center towards the top. The surrounding area is filled with a dense canopy of vibrant green leaves, some in sharp focus and others blurred. The sky is visible through the gaps in the foliage, appearing bright and slightly overcast. The overall mood is natural and serene.

THANK YOU