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FOREST REL/RL
for implementation of REDD+ activities

Ruandha Agung Sugardiman

Expert meeting on "*Forest reference emission levels and forest reference levels for implementation of REDD+ activities*"
Bonn, Germany
14-15 November 2011

Reference Emission Level

- **UN Doc FCCC/SBSTA/2008/6 (SB 28 Bonn, June 2008) Annex III Main methodological issues; 2. Reference emissions levels:**

  "Means to establish reference emission levels, **based on historical data**, taking into account, inter alia, trends, starting dates and the length of the reference period, availability and reliability of historical data, and other specific national circumstances."

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Reference Emission Level

- **REDD-UNFCCC Expert Meeting on "Methodological Issues relating to Reference Emission Levels" (Bonn, 23-24 March 2009):**

  "The reference emissions level (**REL**) is **the amount of gross emissions** from a geographical area estimated within a reference time period (REDD)."

  "The reference level (**RL**) is **the amount of net/ gross emissions and removals** from a geographical area estimated within a reference time period (Conservation, SMF, EFCS)."

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Reference Emission Level

- **UN Doc FCCC/CP/2009/11/Add.1 (COP 15 Copenhagen, December 2009) 4/CP.15 Methodological guidance for activities REDD+; Para 1. (d), point (i).**

  "Use a **combination of remote sensing and ground-based forest carbon inventory** approaches for estimating, as appropriate, anthropogenic forest-related greenhouse gas emissions by sources and removals by sinks, forest carbon stocks and forest area changes"

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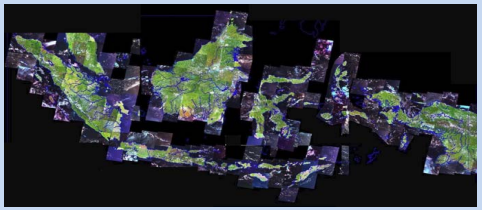
GHG inventory for the LULUCF sector

Following Good practices and Guidelines of the Intergovernmental Panel on Climate Change (IPCC)

ACTIVITY DATA



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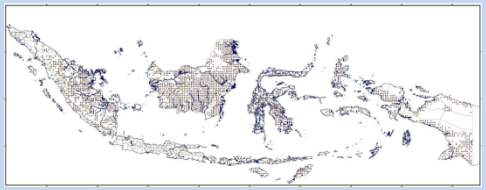
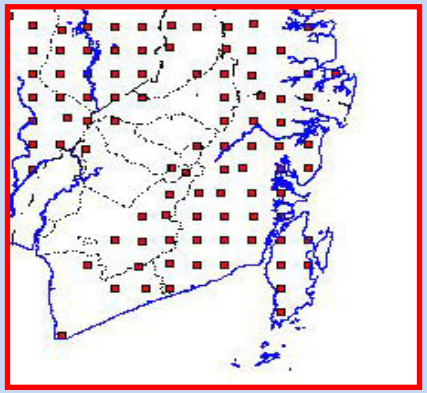
EMISSION FACTOR





=

EMISSION ESTIMATE

CO_2 equivalent

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Modified from: Alberto Sandoval , Rosa Ramon – UNREDD general and MRV framework COP, 2010

Defining National REL

- **Activity data:**

  Land cover change: Landsat 5, Landsat 7 ETM+ (1990, 1996, 2000, 2003, 2006, 2009)

- **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)
  - 2006-2011 (>3.000 cluster plots) → **Redesign NFI**

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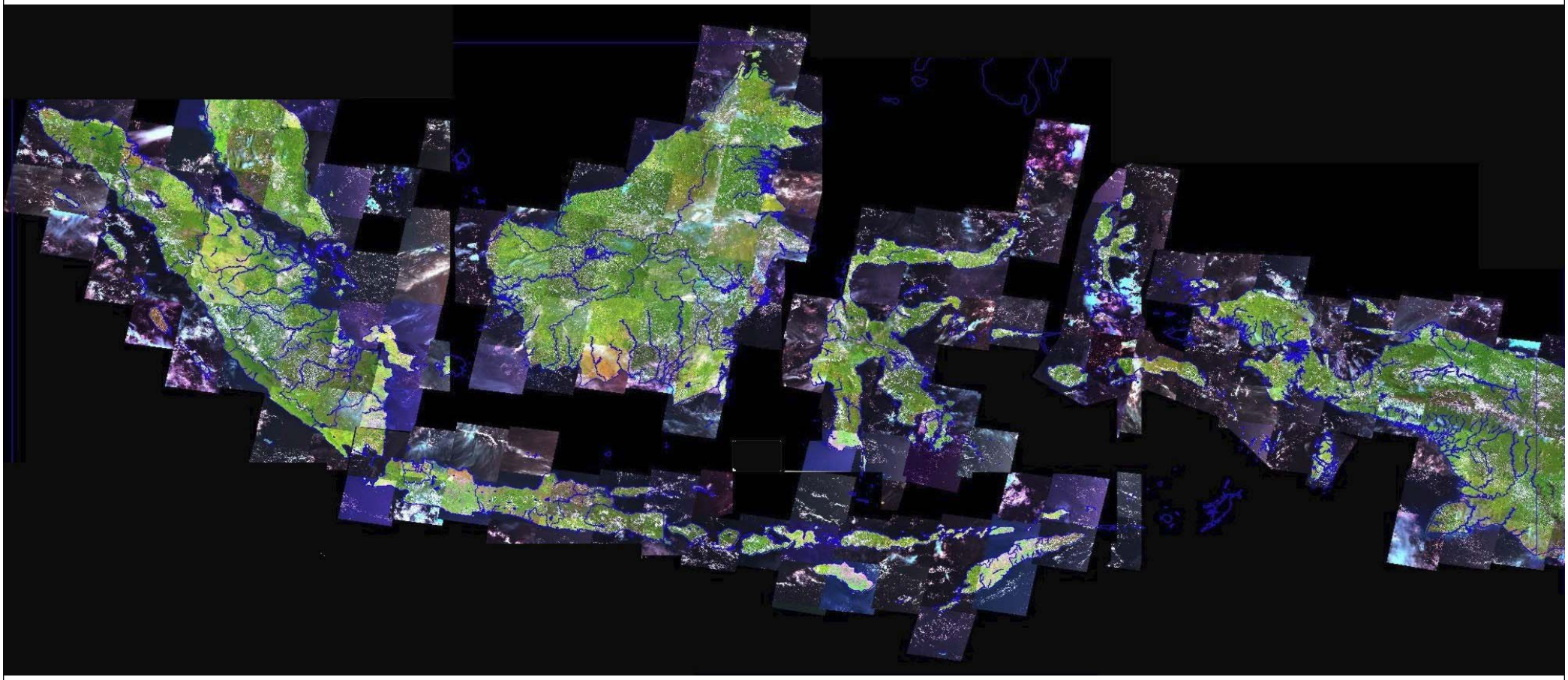
Satellite Images Mosaic of Indonesia



Remark: Landsat 7 ETM+ coverage for the whole Indonesia (217 scene)

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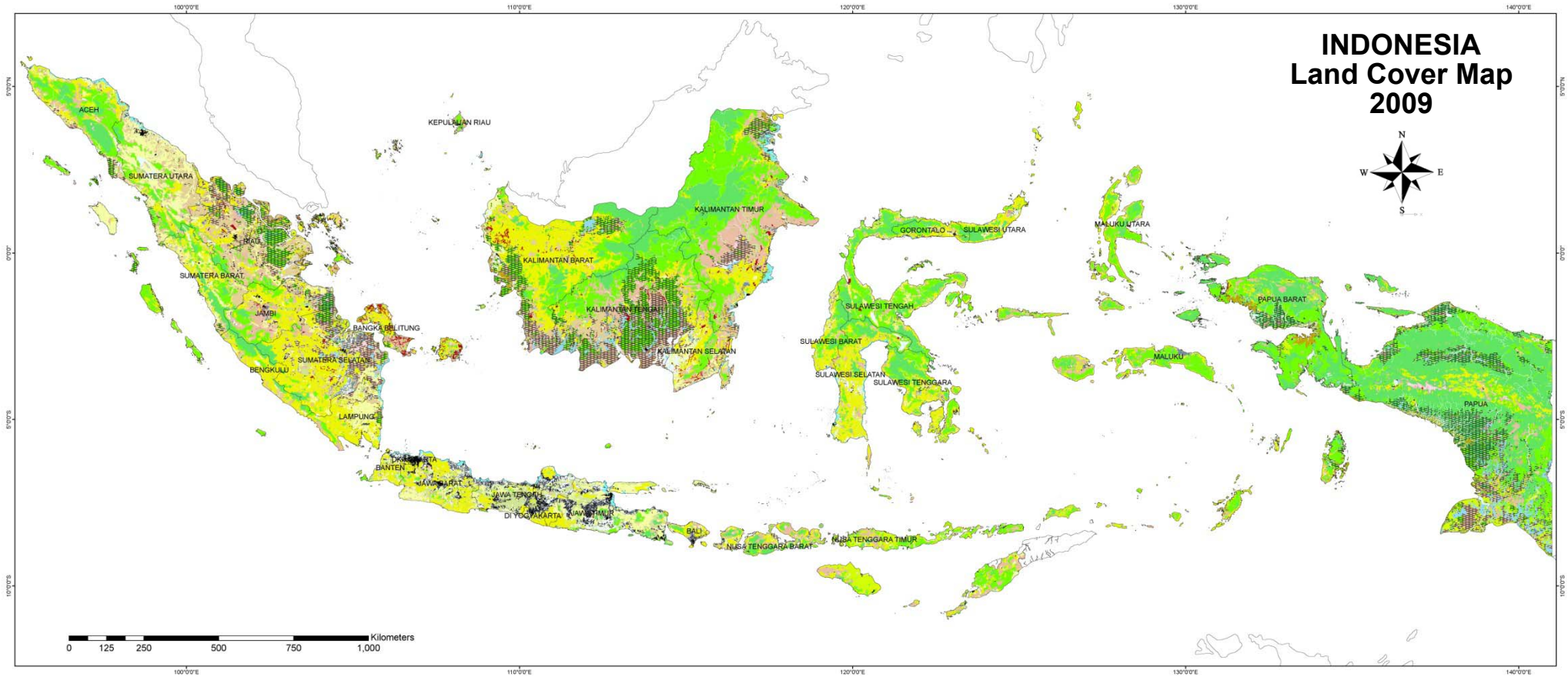
Satellite Images Interpretation (Land Cover Map) of Indonesia



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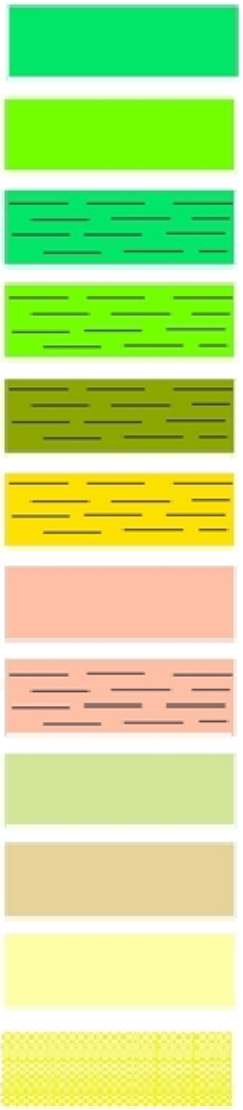
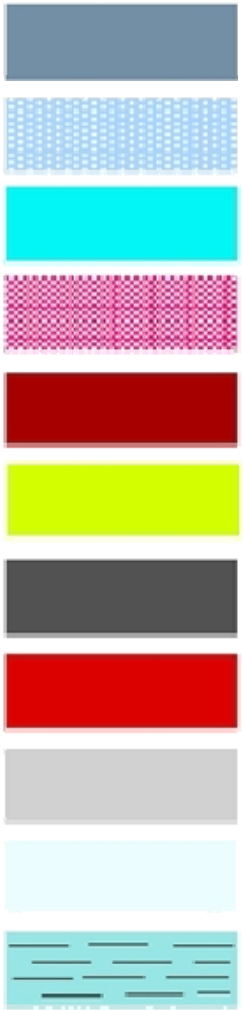
LEGEND



Primary Dryland Forest
Secondary Dryland Forest
Primary Swamp Forest
Secondary Swamp Forest
Primary Mangrove Forest
Secondary Mangrove Forest
Bush/Shrub
Swamp Shrub
Plantation Forest
Estate Cropplantation
Dryland Agriculture
Shrub-Mixed Dryland Farm



Transmigration Area
Rice Field
Fish Pond
Barren Land
Mining Area
Grassland
Settlement Area
Airport
Cloud Covered
Water
Swamp

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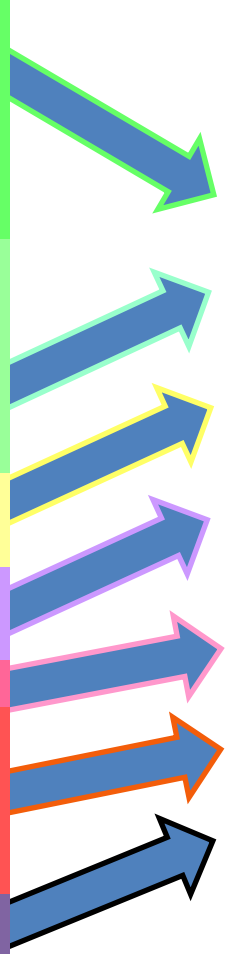
Reclassify for UNFCCC

No.	MoF Land Cover Class
1	PRIMARY DRYLAND FOREST
2	SECONDARY DRYLAND FOREST
3	PRIMARY SWAMP FOREST
4	SECONDARY SWAMP FOREST
5	PRIMARY MANGROVE FOREST
6	SECONDARY MANGROVE FOREST
7	PLANTATION FOREST
8	DRYLAND AGRICULTURE
9	SHRUB-MIXED DRYLAND FARM
10	TRANSMIGRATION AREA
11	RICE FIELD
12	ESTATE CROPPLANTATION
13	GRASSLAND
14	BUSH/SHRUB
15	SWAMP
16	SWAMP SHRUB
17	SETTLEMENT AREA
18	BARREN LAND
19	FISH POND
20	AIRPORT
21	MINING AREA
22	WATER
23	CLOUD COVERED



No.	IPCC Class
1	Forestland
2	Cropland
3	Grassland
4	Wetland
5	Settlement
6	Other Land

LAND COVER CALCULATION

Unit: million hectare

LAND COVER	FOREST AREA		NON-FOREST AREA		TOTAL	
	Area (ha)	%	Area (ha)	%	Area (ha)	%
FORESTED	91,132 (Primer=41,954, LOA=49,179)	48%	7,465	4%	100,740	52%
NON FORESTED	42,381	23%	46,692	25%	87,047	48%
TOTAL	133,514	71%	54,157	29%	187,787	100%

Source: ***Satellite Images of Landsat 7 ETM+ year 2009/2010 (217 scenes)***
Interpretation on 2009/2010, Published on 2011

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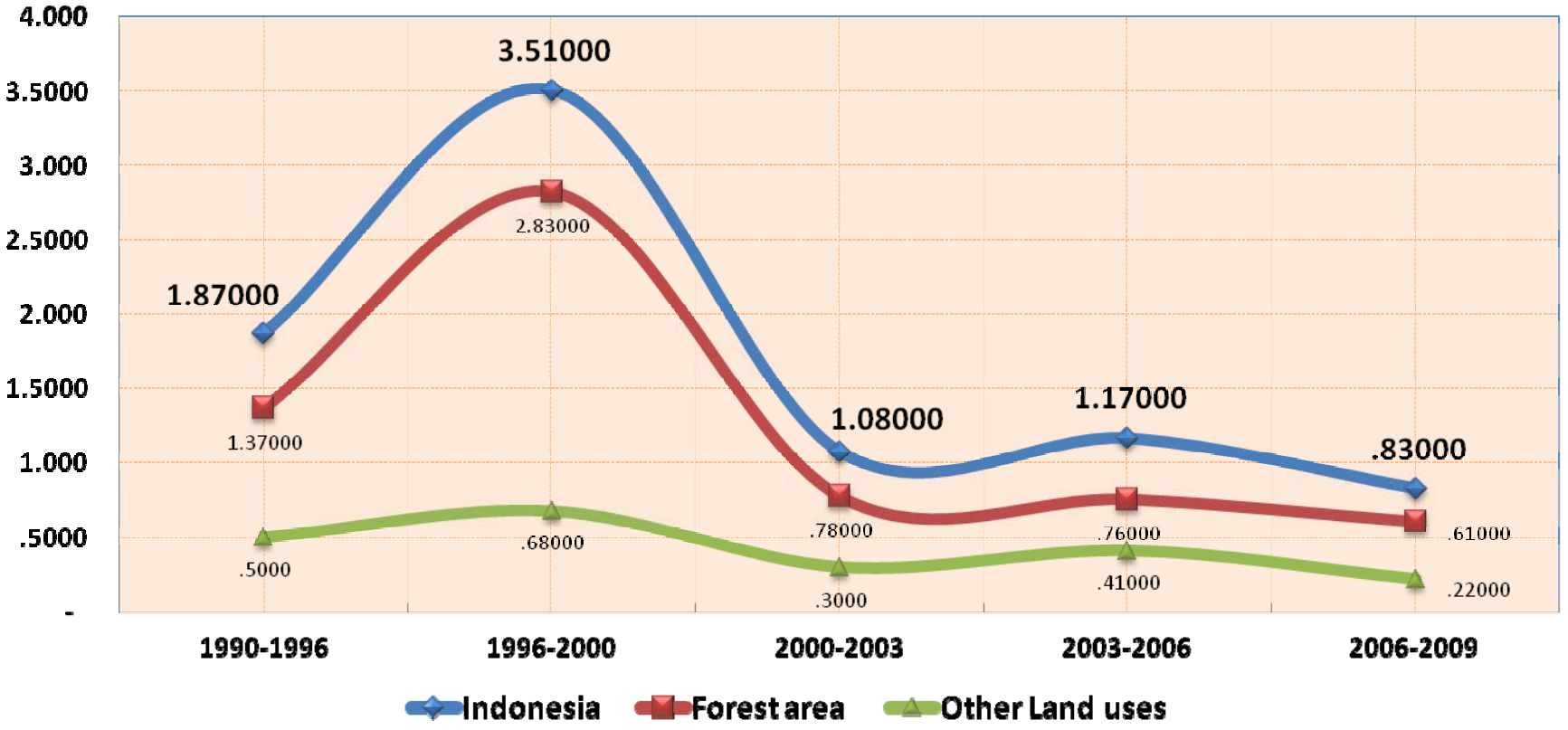
DEFORESTION RATE



million ha/ year	1990-1996	1996-2000	2000-2003	2003-2006	2006-2009
Indonesia	1,87	3,51	1,08	1,17	0,83
Forest Land	1,37	2,83	0,78	0,76	0,61
Non Forest Land	0,50	0,68	0,30	0,41	0,22

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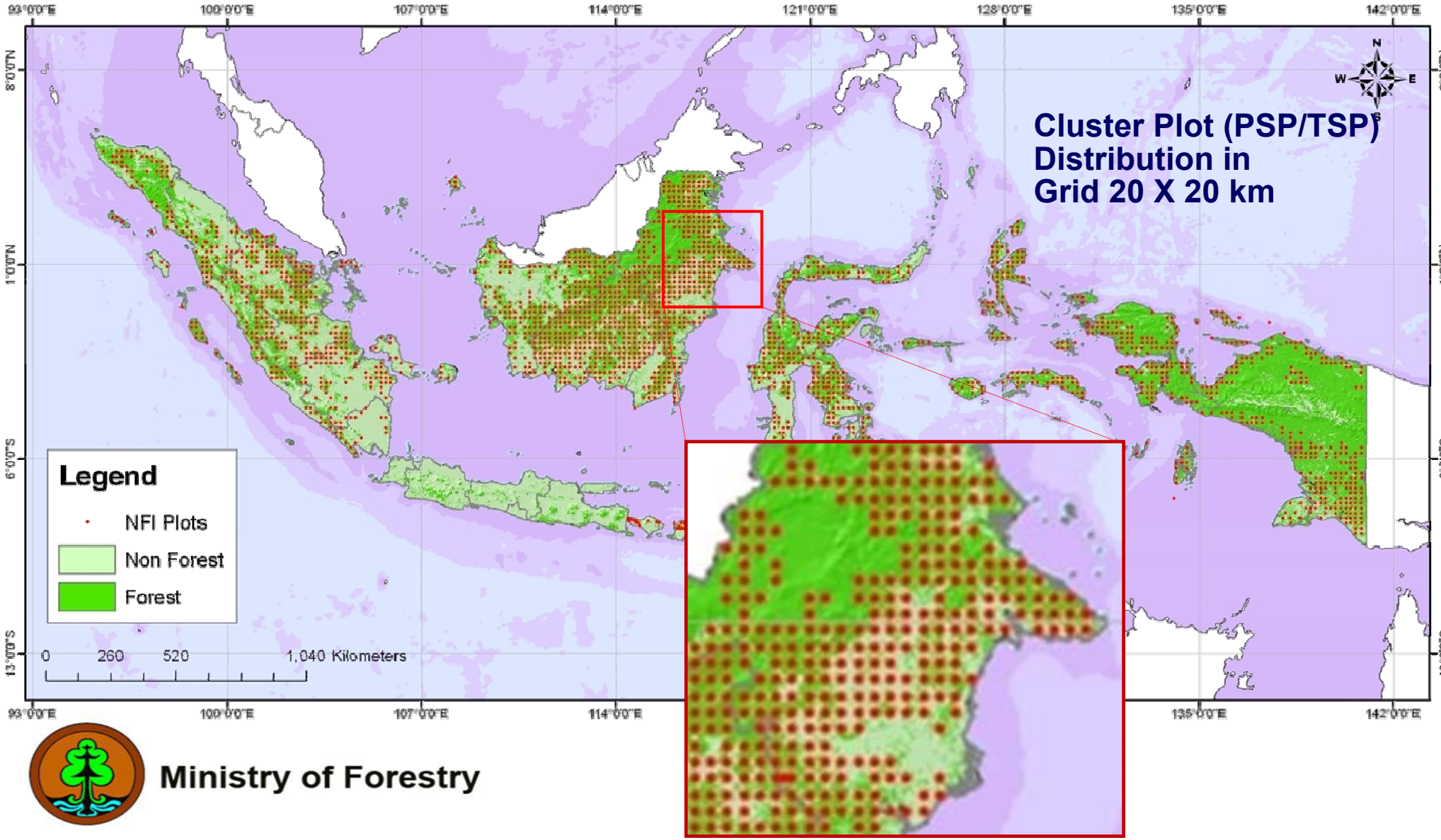
Source:
Reducing carbon emissions from Indonesia's peat lands. Interim Report of a Multi-Disciplinary Study December 2009 (BAPPENAS, 2009)

NFI-Cluster Plot Distribution



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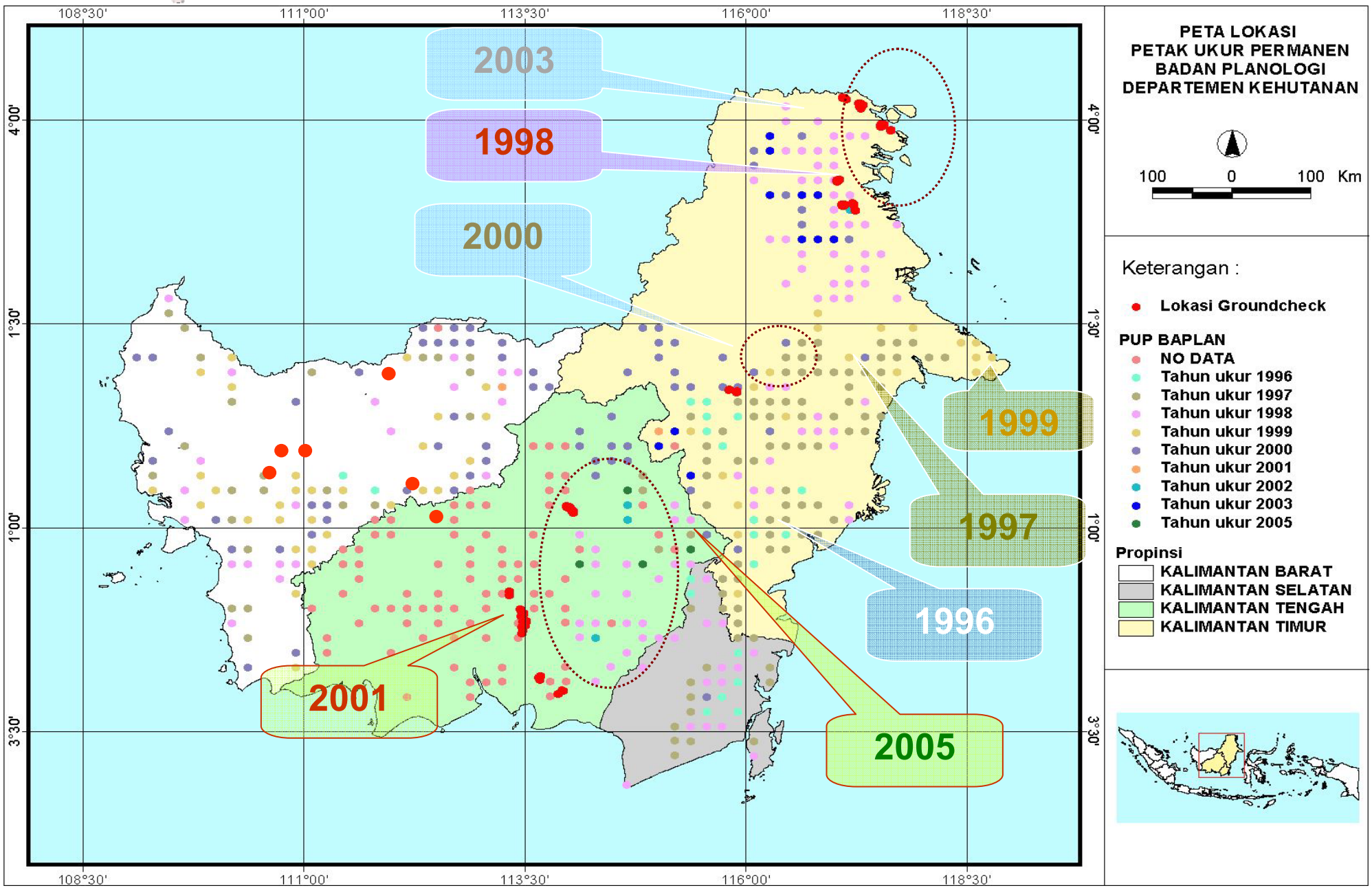
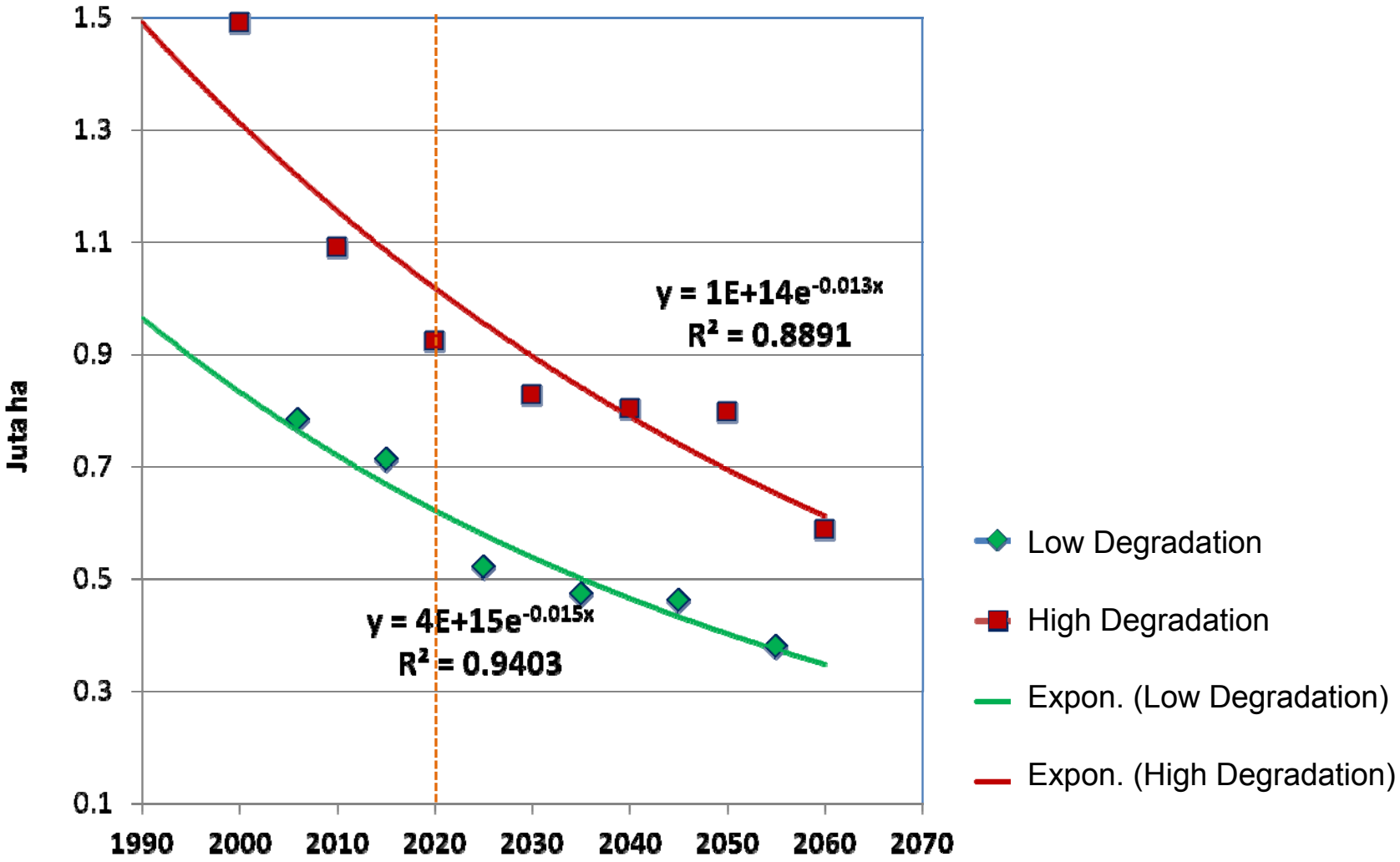
TSP/PSP DISTRIBUTION IN KALIMANTAN



DEGRADATION RATE



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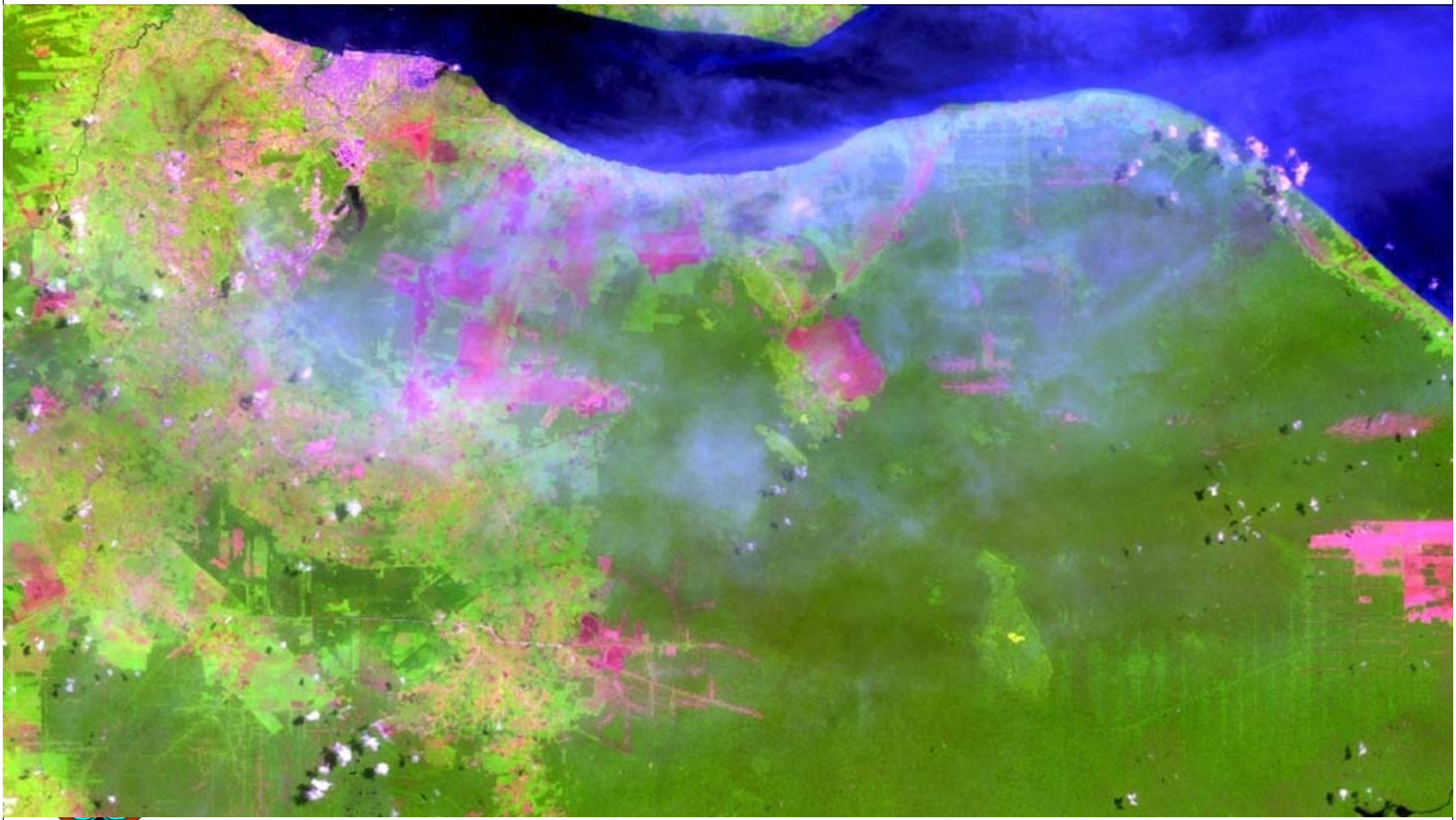
DEFORESTATION vs. DEGRADATION

DEFORESTATION

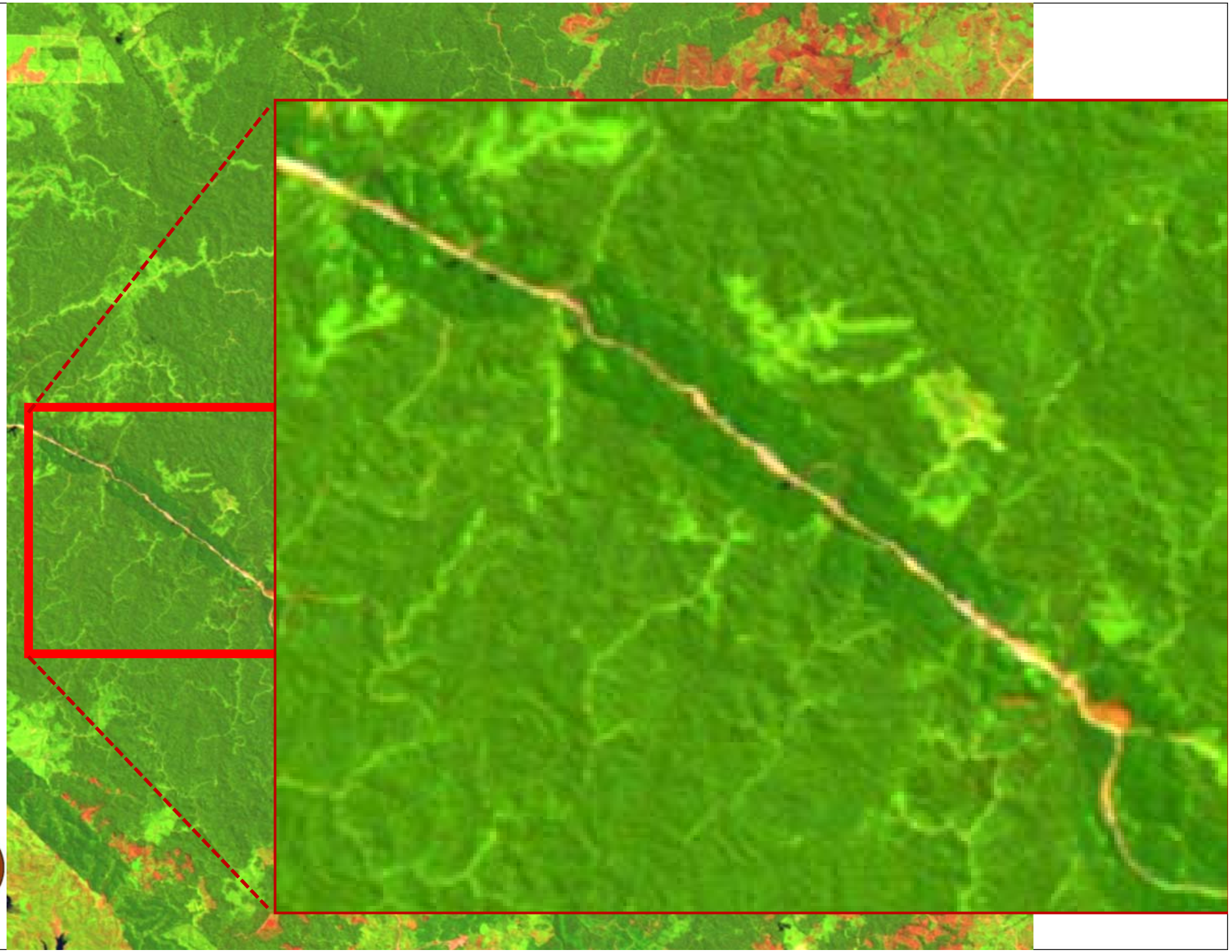
FOREST DEGRADATION

I (100-80%) II (80-60%) III (60-40%) IV (40-20%) V (20-0%)

Dumai, Riau – 2000/09/05



Dumai, Riau – 2005/07/29



Above Ground Biomass in Forest Land

Forest	Mean of AGB (ton/Ha)	Mean of Carbon AGB (ton/Ha)	Mean of CO2e (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

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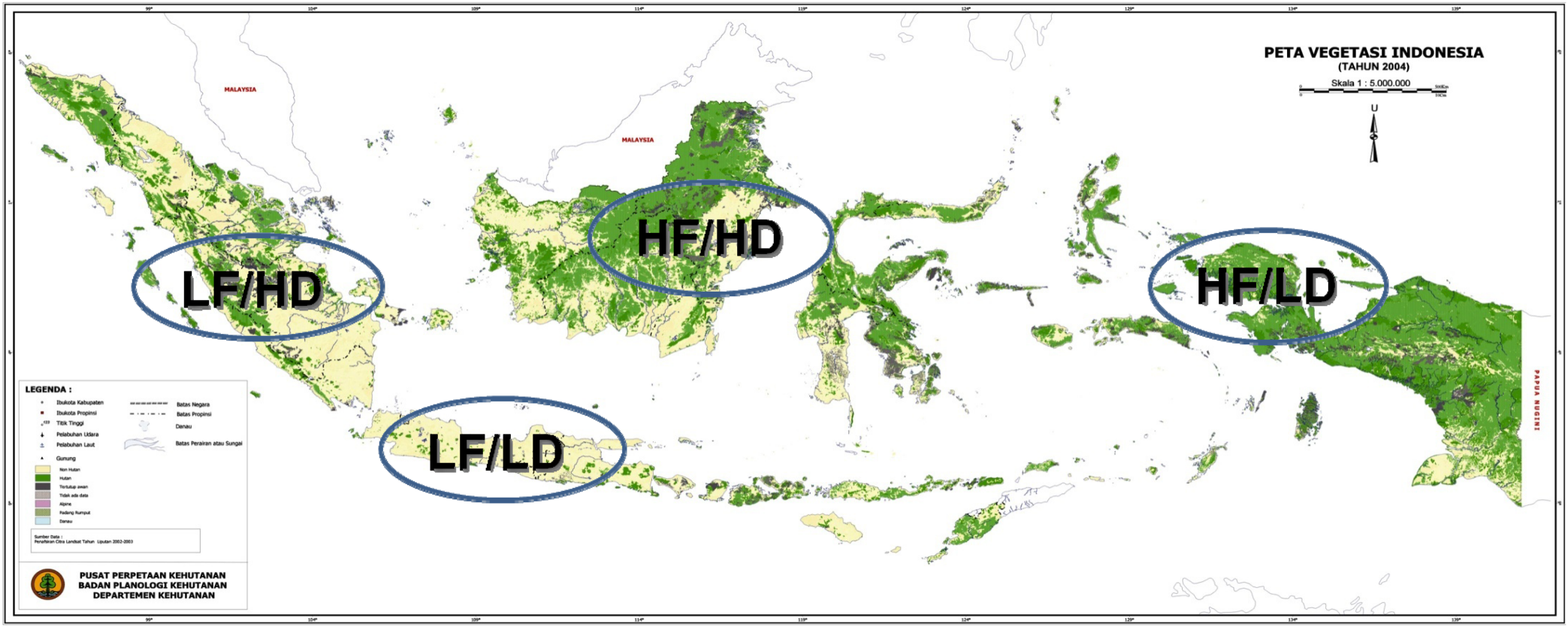
CLUSTER OF FOREST COVER AND DEFORESTATION RATE



Note:
Low-High
Forest-Deforestation

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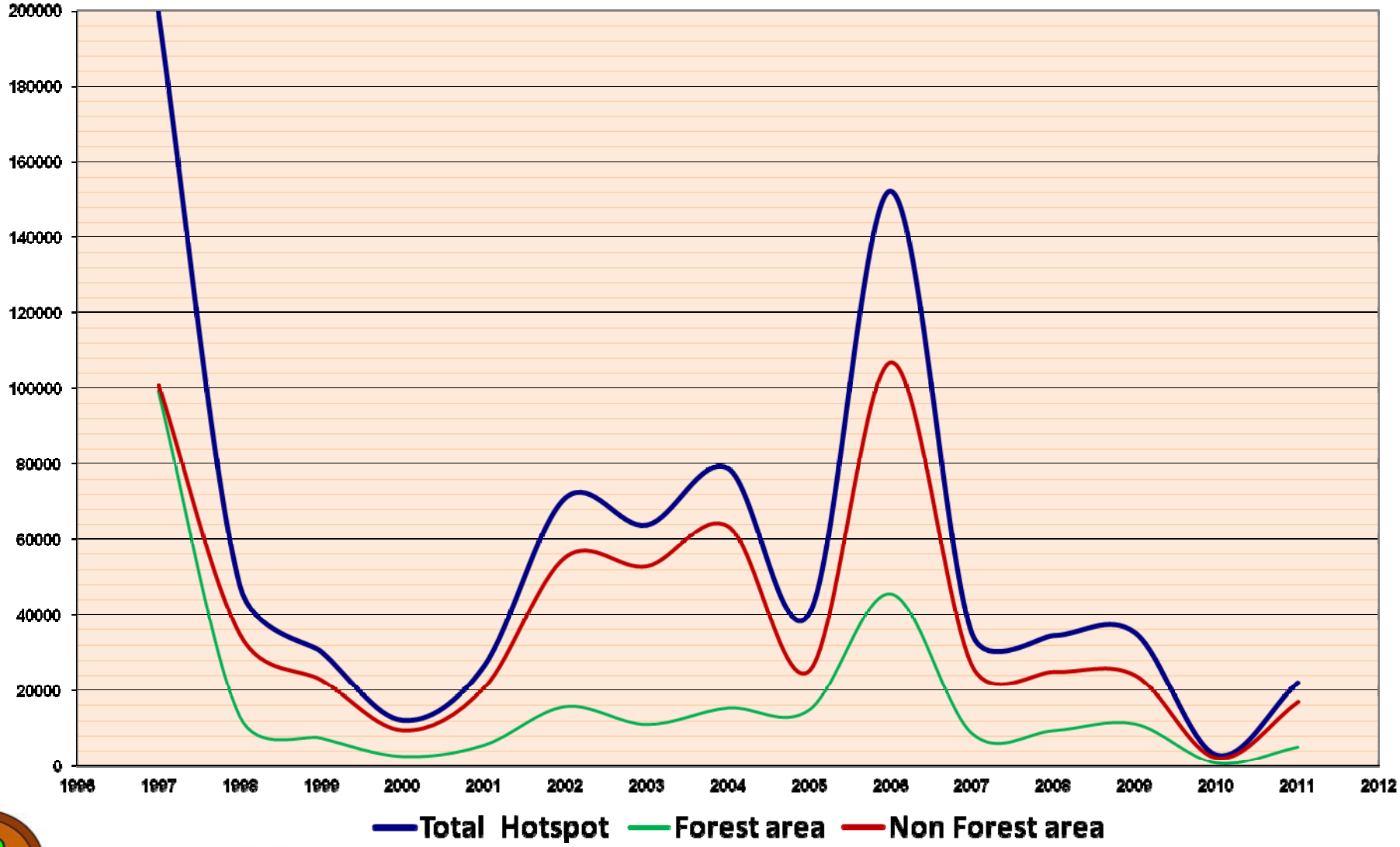
Forest Fires 1997-2011



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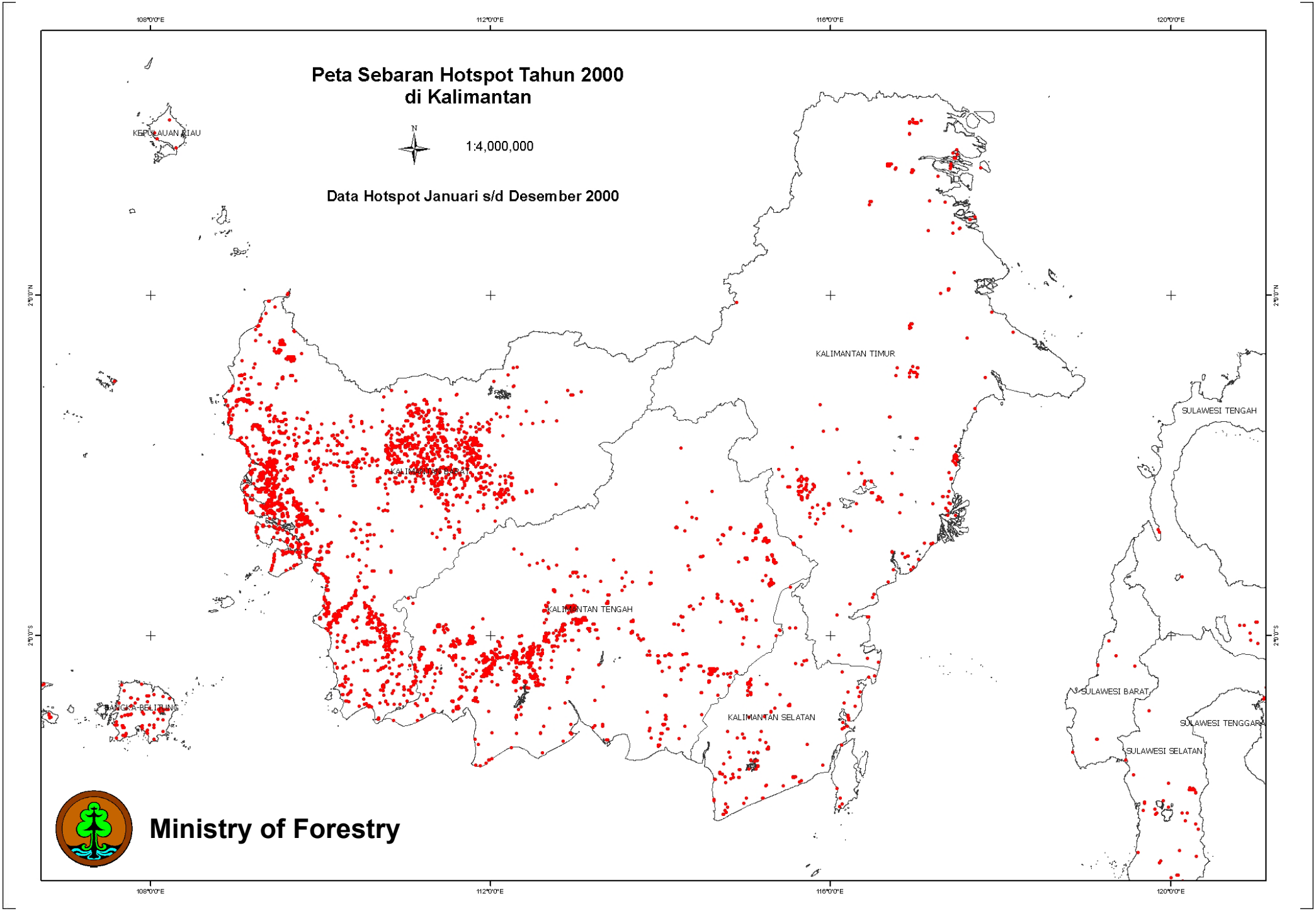
Peta Sebaran Hotspot Tahun 2000
di Kalimantan
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Data Hotspot Januari s/d Desember 2000
KEPULAUAN RIAU
KALIMANTAN BARAT
KALIMANTAN TIMUR
KALIMANTAN TENGAH
KALIMANTAN SELATAN
BANGKA-BELITUNG
SULAWESI TENGAH
SULAWESI BARAT
SULAWESI TENGGARA
SULAWESI SELATAN
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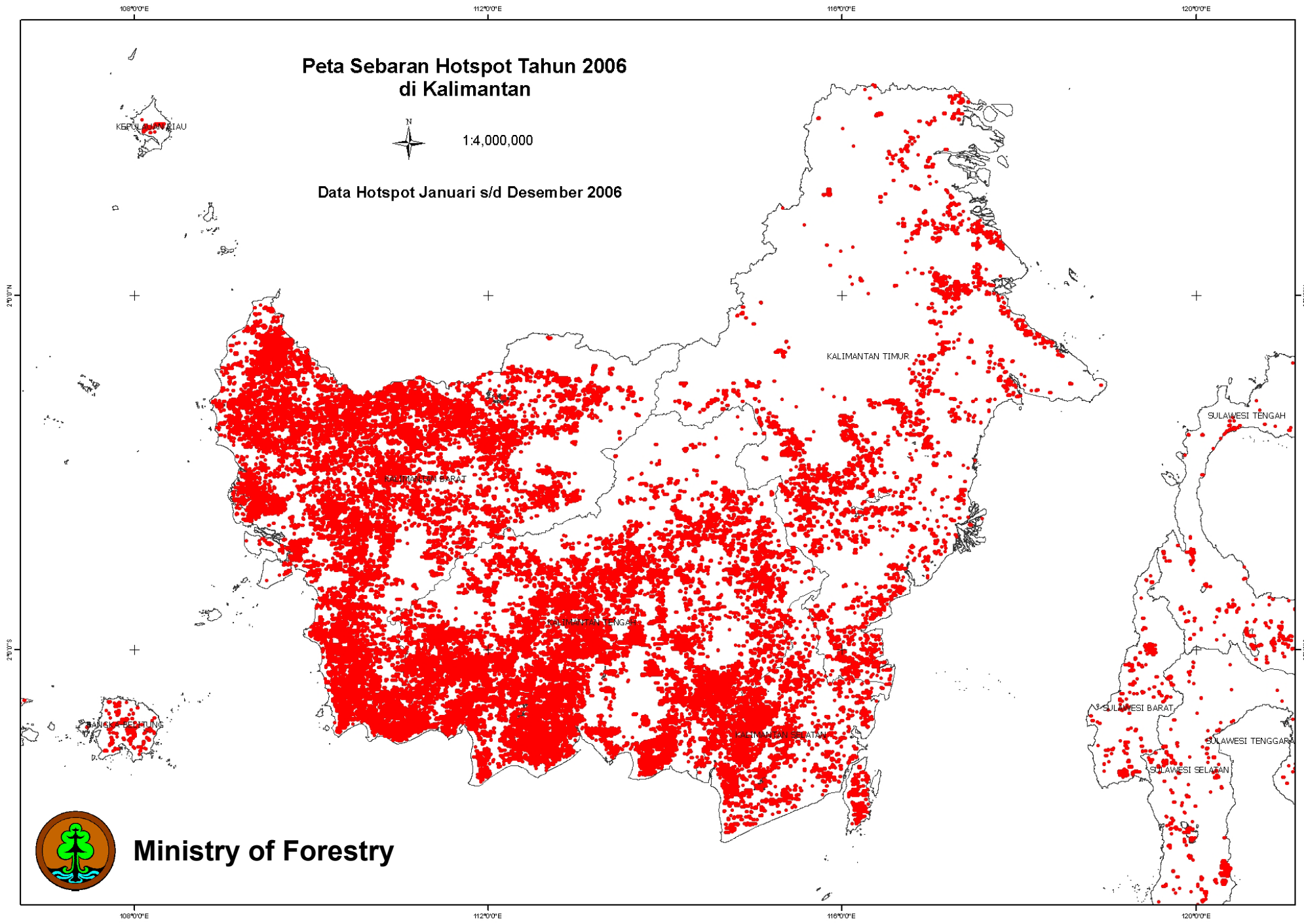
Peta Sebaran Hotspot Tahun 2006
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KEPULAUAN RIAU
KALIMANTAN BARAT
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KALIMANTAN SELATAN
BANGKA BELITUNG
SULAWESI TENGAH
SULAWESI BARAT
SULAWESI TENGGARA
SULAWESI SELATAN
108°0'0"E
112°0'0"E
116°0'0"E
120°0'0"E
2°0'0"N
2°0'0"S
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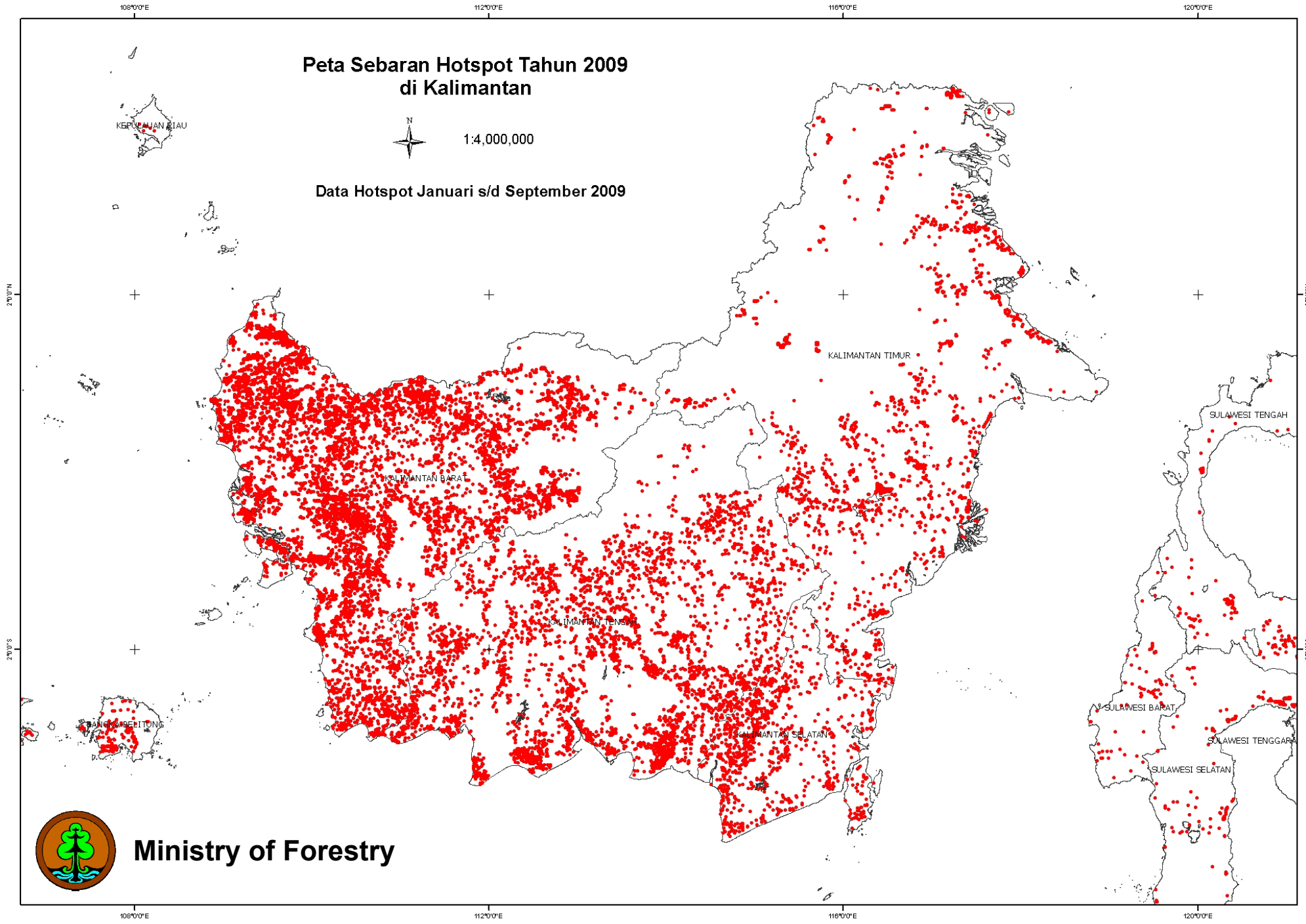
Peta Sebaran Hotspot Tahun 2009 di Kalimantan

1:4,000,000

Data Hotspot Januari s/d September 2009



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Peta Sebaran Hotspot Tahun 2010 di Kalimantan

1:4,000,000

Data Hotspot Januari s/d Agustus 2010

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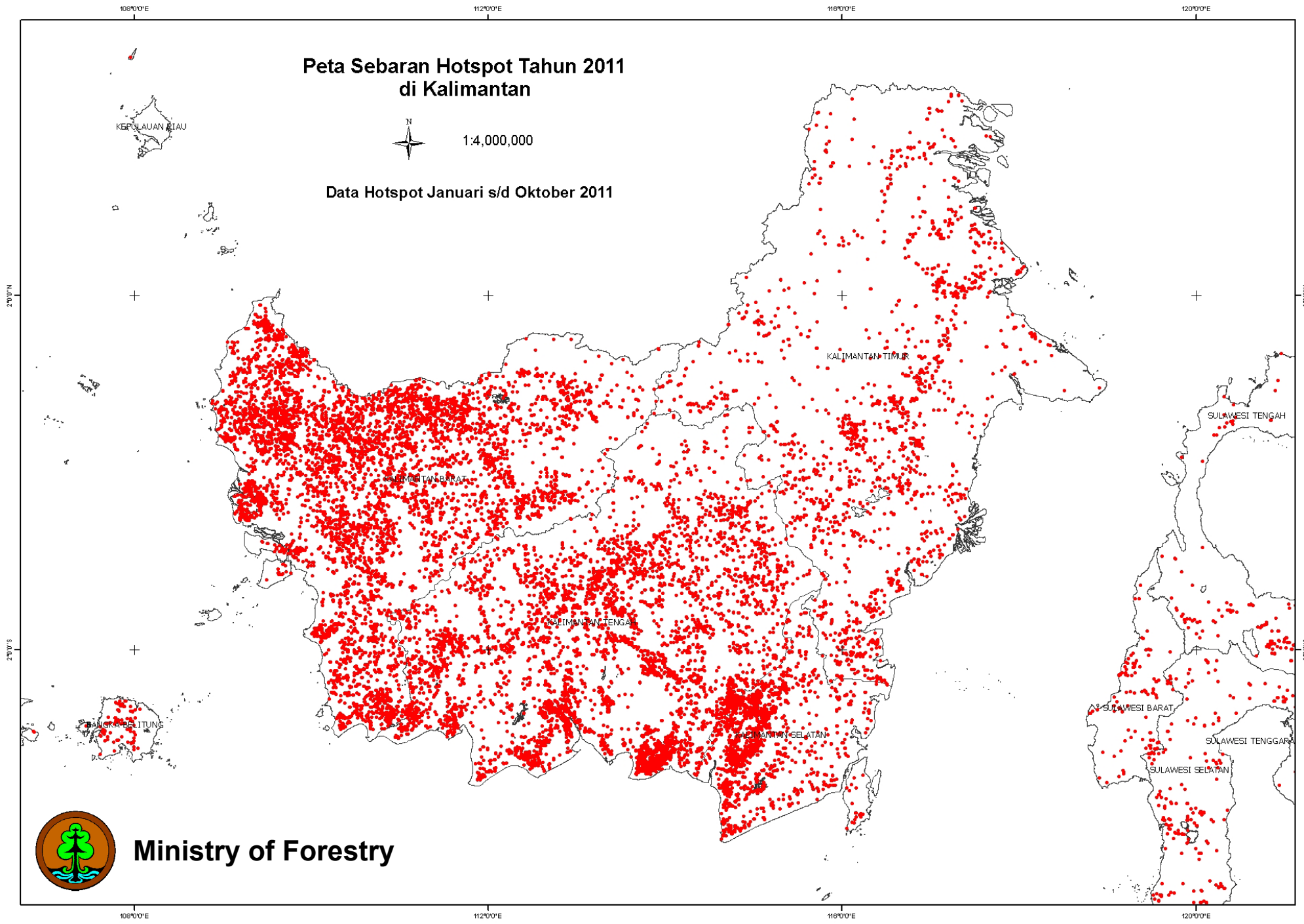
Peta Sebaran Hotspot Tahun 2011
di Kalimantan
1:4,000,000
Data Hotspot Januari s/d Oktober 2011
KEPULAUAN RIAU
KALIMANTAN BARAT
KALIMANTAN TIMUR
KALIMANTAN TENGAH
KALIMANTAN SELATAN
BANGKA BELITUNG
SULAWESI TENGAH
SULAWESI BARAT
SULAWESI TENGGARA
SULAWESI SELATAN
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Calculations and Assumptions in Defining REL

- Deforestatation rate: based on average rate 1990-2009 → 1,125 million ha/year
- Future Deforestation: Flat (until 2020)
- Forest Degradation: logging activities = 626.000 ha/year
- Biomass Conversion and Expansion Factors/BCEF) = 1,67 (IPCC, 2006)
- Biomass growth average in natural forest = 2,9 ton/ha or 5,32 ton/ha CO_2e (NFI, from 2 measurement period)
- Biomass growth average in plantation forest 20,0 ton/ha or 36,7 ton/ha CO_2e (IPCC, 2006)

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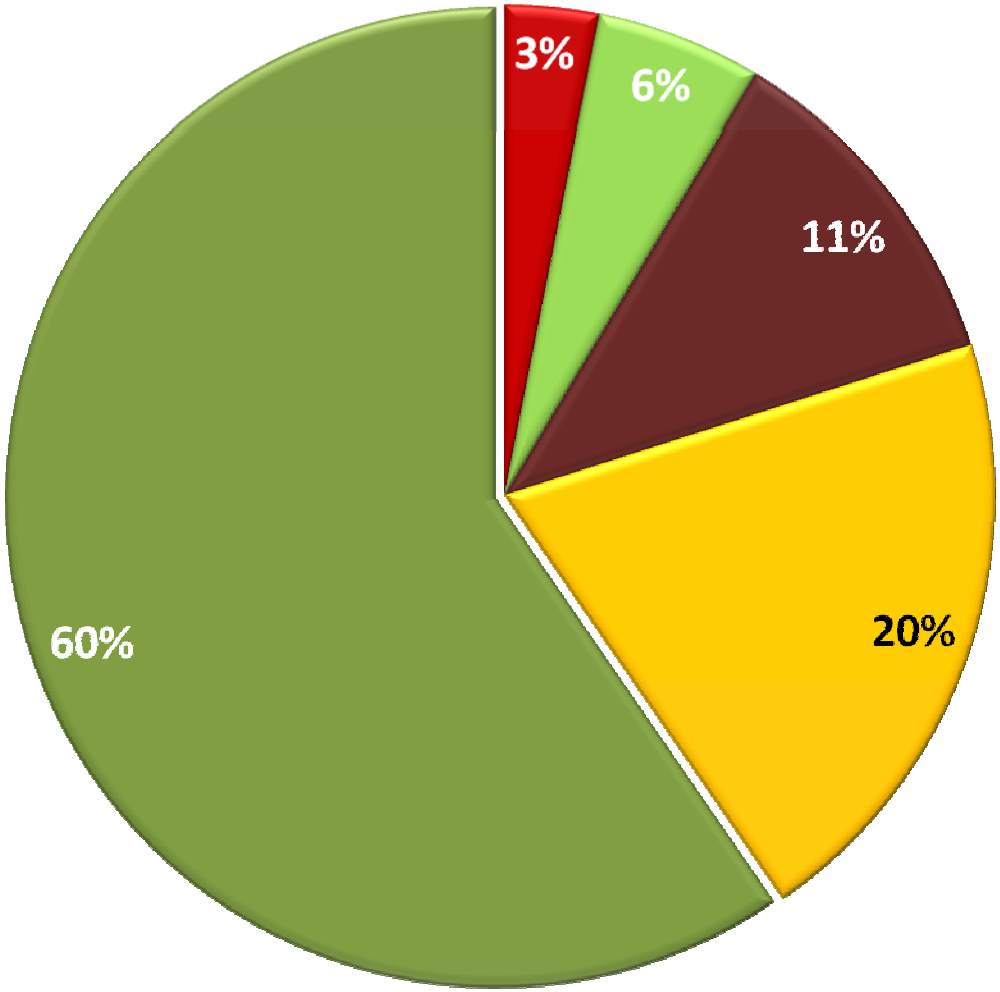
NATIONAL EMISSION



- Industrial Process
- Agriculture
- Waste
- Energy
- LUCF *(Emission from peat fire was included)*

Sources	Total	Percent
Energy	280.937,58	20,4%
Industrial Process	43.043,52	3,1%
Agriculture	75.419,73	5,5%
LUCF	821.254,17	59,6%
Waste	157.327,96	11,4%
Total	**1.377.982,96**	**100,0%**

Source:
Indonesia Second National Communication, Under The United Nations Framework Convention on Climate Change (UNFCCC), Ministry of Environment, Republic of Indonesia, Jakarta, November 2010

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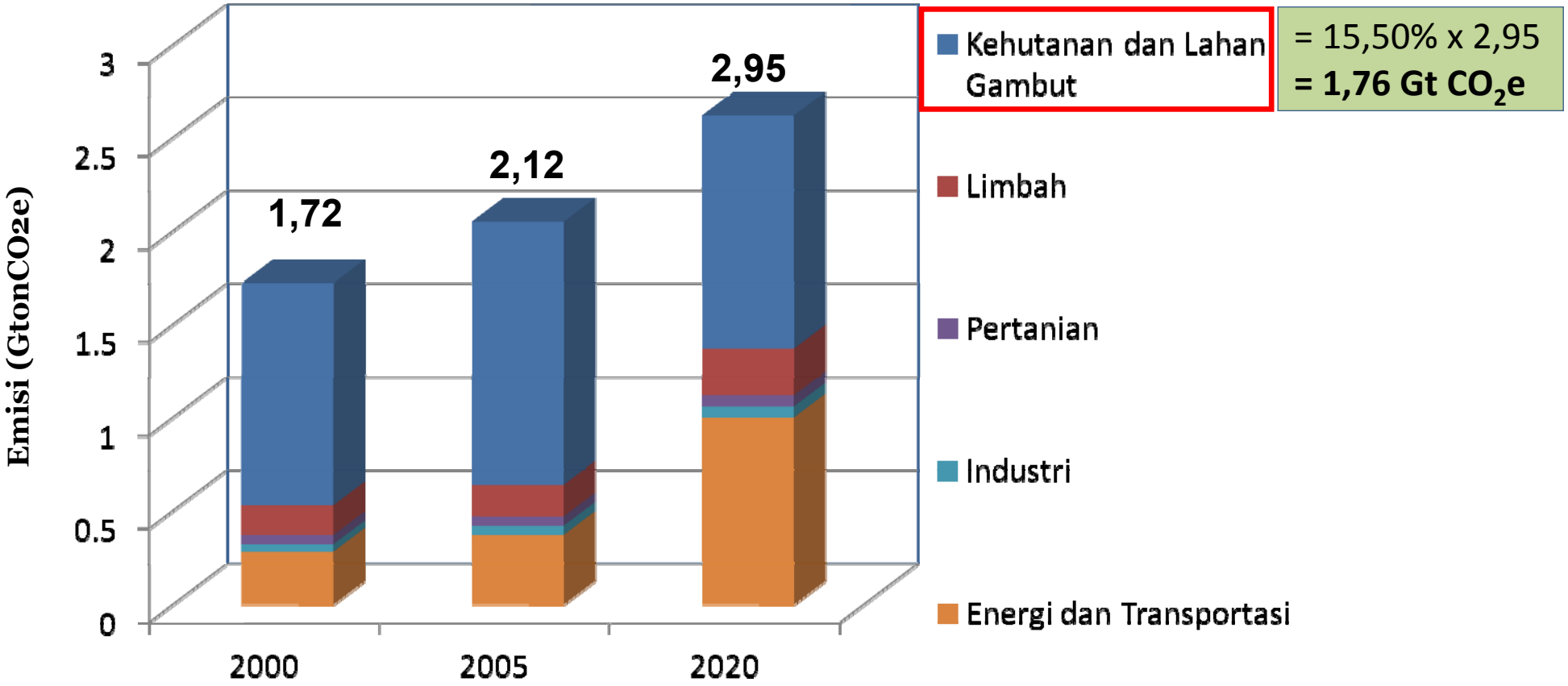
NATIONAL EMISSION REDUCTION

Target Emission Reduction = 26%

LUCF= 60% (~15,50%)



= 15,50% x 2,95
= **1,76 Gt CO_2e**

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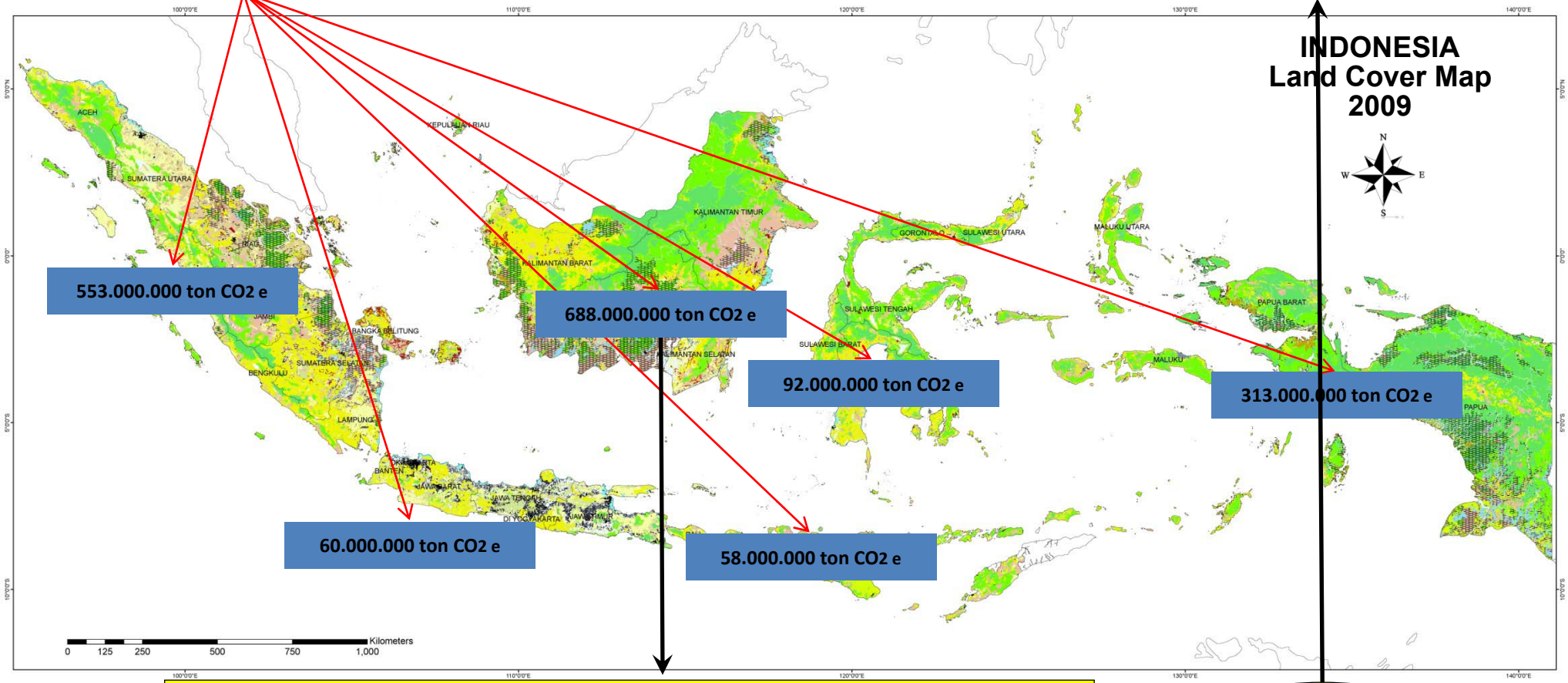
NATIONAL CONSULTATON

1.760.000.000 ton $CO_{2\,e}$

REDD+ NATIONAL STRATEGY

Accumulation of all provinces/ regional (sub-national) Action Plan to reduce GHG emissions



553.000.000 ton CO2 e

688.000.000 ton CO2 e

92.000.000 ton CO2 e

313.000.000 ton CO2 e

60.000.000 ton CO2 e

58.000.000 ton CO2 e

Province Central Kalimantan:

- **REL** is defined by central government
- **Regional Action Plan to reduce GHG emissions** must be taken into account Regional/ Province **Development Plan** and Province **Spatial Planning**

Result:

1.Source carbon

2.Sink carbon

What are the specific 'National Circumstances'?

- Other regulations that may exist in the country such as regulation on minimum forest area that has to be maintained by a region or taking historical data of forest fraction vs. population density in the region.
- Apply different REL for unprotected and protected forests.
- Future scenario relating to national development needs and goals including addressing poverty, maintaining economic growth while responding to climate change, consistent with the objective of environmental integrity and take into account the multiple functions of forests and other ecosystems.
- Including projected development activities, population growth, GDP, and other development trajectories.


Thank You
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