The use of the IPCC guidelines in the estimation of emissions and removals, forest carbon stocks and forest area changes : **Indonesia Experience**

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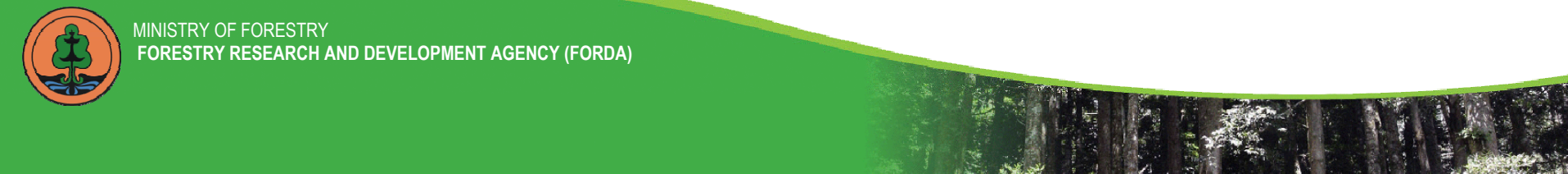
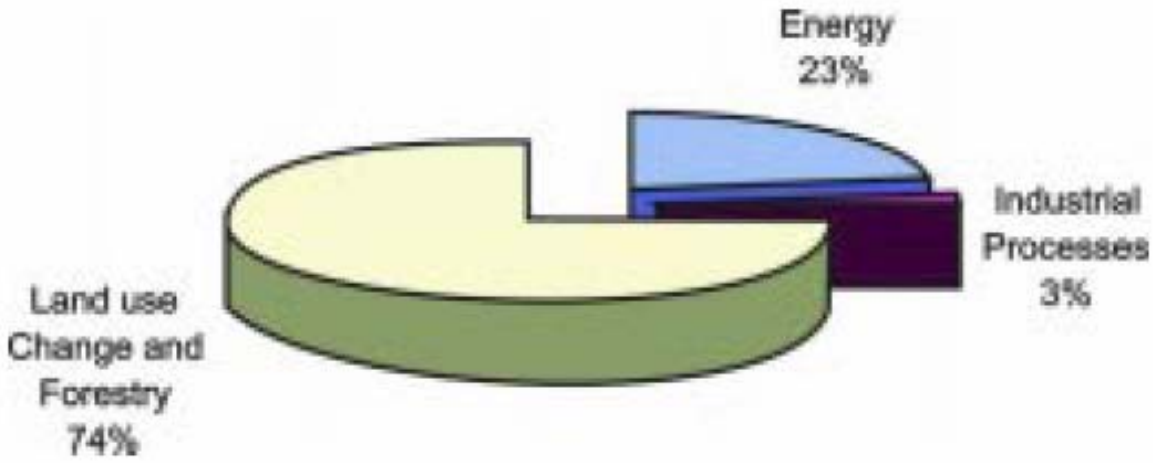
MINISTRY OF FORESTRY
FORESTRY RESEARCH AND DEVELOPMENT AGENCY (FORDA)



The Importance of GHG Emission Estimation for Indonesia

- Obligation of countries that ratified UNFCCC, to prepare National Communication to the UNFCCC
- LULUCF as important sector : National 74% (1st NC), 48% (2nd NC), Global 18%.
- Monitoring the target of emission reduction (Indonesia target 26% by 2020)
- To support MRV for REDD, REDD+
- Current draft for MRV GHG inventory (Presidential Regulation)

First Experience : Using IPCC GL Revised 1996 for 1st Natcom (1999)

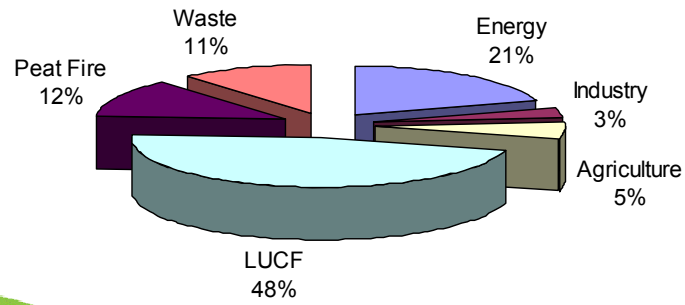


Use of IPCC GL 2006 for 2nd Natcom

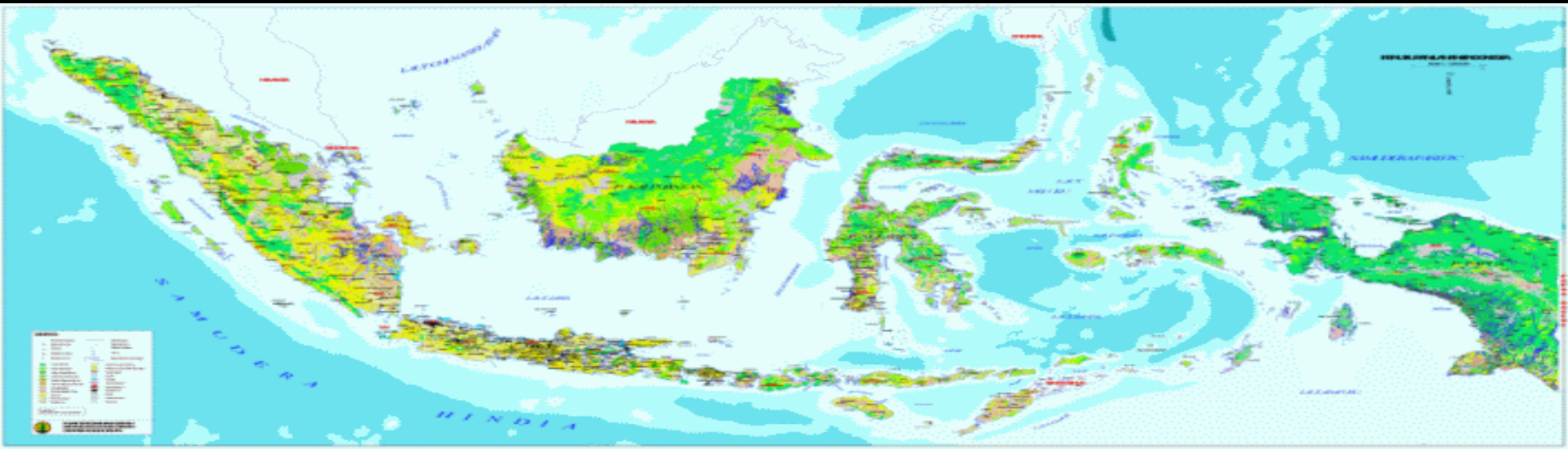
- Tier 1-2
- Emission reported 2000-2005
- Difficulties to produce Land Change Matrix
- Lack of activity data and emission/removal factors
- High uncertainties
- Emission = activity data x emission factor Using Excel Tables of IPCC 2006
- Activity Data using reports, official publications (forestry statistics, Indonesia Statistics and references → Tier 1)
- Emission and removal factor use country specific and IPCC default

Result of Inventory 2000 (SNC)

Sector	CO2 emission	CO2 removal	CH4	N2O	PFC	CO2e
Energy	247,522		1,437	10		280,938
Industry	40,342		104	0.43	0.02	42,815
Agriculture	2,178		2,419	72		75,420
LUCF	1,060,766	411,593	3	0.08		649,254
Peat Fire*	172,000					172,000
Waste	1,662		7,294	8		157,328
TOTAL	1,524,472	411,593	236,388	28,341		1,377,754



Indonesia Condition



1. Country land area : app. 187 millions ha, population : app. 230 millions
2. 7 major islands (from total of > 16 thousands islands), > 300 tribes,
3. 33 provinces, > 300 districts, autonomous governance system
4. ±60 % of the country area are forest land/state forest (± 37 % of them are degraded at various levels)
5. Forest transition from the east (Papua : low historical DD) to the west (Sumatera : high historical DD, Java : forest cover increases)
6. The Law No. 41/1999 on Forestry and Law No. 5/1990 on Biodivesity Conservation are the main references for managing forest.

Types of Forests in Indonesia

- Function : protection, conservation, production
- Legal : Forest area (132 mha→ 40 mha non forested), other land use (55 mha)
- Inundation/soil: swamp, peat, mineral soil
- Management : primary, secondary, plantation
- Altitude: coastal, low land, high land, mountain
- Climate : rain forest, arid, semi arid

Main Source of Emission: Deforestation rate using SPOT VEGETATION image of 2000-2005

Year	Deforestation (1.000 ha/year)							
	Sumatera	Kalimantan	Sulawesi	Maluku	Papua	Jawa	Bali and Nustra	Indonesia
2000-2001	259,5	212,0	154,0	20,0	147,2	118,3	107,2	1.018,2
2001-2002	202,6	129,7	150,4	41,4	160,5	142,1	99,6	926,3
2002-2003	339,0	480,4	385,8	132,4	140,8	343,4	84,3	1.906,1
2003-2004	208,7	173,3	41,5	10,6	100,8	71,7	28,1	634,7
2004-2005	335,7	234,7	134,6	10,5	169,1	37,3	40,6	962,5
2000-2005	1.345,5	1.230,1	866,3	214,9	718,4	712,8	359,8	**5.447,8**

Average of Deforestation Rate period 2000-2005 :
1.089.560,00 ha/year

IPCC and MOF land categories

	Category (MoFor, 2008)	IPCC 2006 Land Category
	Primary Dryland Forest (UD)	Forest Land
	Primary Swamp Forest (UD)	Forest Land
	Primary Mangrove Forest	Forest Land
	Secondary Dryland Forest	Forest Land
	Secondary Swamp Forest	Forest Land
	Secondary Mangrove Forest	Forest Land
	Plantation Forest	Forest Land
	Other land use (APL)	
	Shrubs	Grassland
	Swamp shrubs	Wetland
	Open lands	Other Land
	Swamp	Wetland
	Agriculture	Cropland
	Mix agriculture shrubs	Cropland
	Transmigration	Cropland
	Settlement	Settlement
	Grassland	Grassland
	Rice field	Cropland
	Estate crops	Cropland
	Dyke	Other Land
	Airport	Other Land
	Water	-
	Clouds	-

Examples of Removal Factors in Indonesia

Land use/cover category	MAI (tB/ha/y)	Sdev of MAI
Lowland and hill forest formation (0-1000 m a.s.l.)	0.25	0.10
Lowland and hill logged-over forest (0-1000 m a.s.l.)	6.70	1.40
Secondary re-growth	2.23	0.85
Grassland	0.00	0.00
Mountain forest (>1000 m a.s.l.)	0.25	0.10
Fresh water swamp forest	6.04	2.20
Peat swamp forest	2.32	0.85
Secondary re-growth on swampy	0.04	0.01
Mangrove forest	0.25	0.10
Industrial forest plantation	9.29	3.39
Mosaic of fruit trees, cinnamon, coffee and habitation	9.70	2.20
Small holder rubber	3.57	1.59
Estate plantation (rubber, oil palm, coconut)	6.00	1.26

Important Source of Emission: PEAT FIRES
Studies of peat fire emissions (MT CO_2)

Year	Heil et al, 2007	Levine, 1999	Page 02 Lowest	Page 02 Highest	Duncan, 2003	Van der Werf et al (2007)
1997	4026	898	2970	9423	2567	
1998	1082	242	799	2534	689	
1999	623	139	458	1459	396	
2000	304	66	224	711	194	172±106
2001	645	143	477	1511	411	194±181
2002	2204	491	1624	5155	1404	678±246
2003	1188	264	876	2783	759	246±121
2004	1907	425	1408	4462	1217	440±180
2005	1694	378	1250	3960	1078	451±264
2006	3560	796	2625	8334	2270	1111±433
2007	524	117	385	1225	334	
Mean	1614	360	1191	3778	1029	469±187

Monitoring methodology: approaches and Tiers

Approach for activity data: Area change	Tiers for emission factors: change in C stocks
1. Non-spatial country statistics (e.g. FAO)—generally gives net change in forest area	1. IPCC default values at a continental scale
2. Based on maps, surveys, and other national statistical data	2. Country specific data for key factors
3. Spatially specific data from interpretation of remote sensing data	3. National inventory of key carbon stocks, repeated measurements or modelling

Issues related to emission factor, activity data and GHG inventory

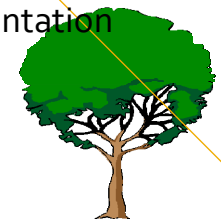
- The use of IPCC GL 2006 requires activity data and EF/RF for 5 carbon pools and 6 land uses
- Lack of activity data for deforestation and degradation : land cover change and other data , use of Tier 1-2.
- No specific institutions deal with climate change issue particularly for inventory.
- Cost of GIS/Remote Sensing data processing and analysing to cover the whole area of Indonesia takes time and expensive (lack of resources)
- Some EF/RF still use IPCC default values, over estimate or under estimate
- Studies are still required to obtain emission factor for many types of forest in different islands with variation in climate, soil and topographic conditions
- Peat and peat fires should be considered

REDD-DEMONSTRATION ACTIVITIES IN INDONESIA

Infrastructure required for REDD

Historical emission /future scenario

National approach, sub-national implementation



- Forest cover and carbon stock changes,
- National registry

CO_2

Attractiveness, Source of fund

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Responsibilities and benefits

1 Reference Emission Level → 2 Strategy → 3 Monitoring → 4 Market/ Funding → 5 Distribution

Awareness raising
Capacity building
Access to data
Access to technology
Stakeholders communication

WG-FCC
REDDI Guideline
REDDI Committee

Recommendation (IFCA 2007):
Strategy of REDD in 5 landscapes :
1.Production forest,
2.Conservation and protection forests,
3.Plantation forest,
4.Peat lands,
5.Oil palm plantation.

International Guidance for DA (Indicative guidance for DA : Annex of Dec. 2 / CP. 13)

1. Approval of the host Party;
2. Be results based, demonstrable, transparent, and verifiable, and estimated consistently over time;
3. The use of most recent IPCC-GL for estimating and monitoring emissions;
4. Emission reductions from national demonstration activities should be assessed on the basis of national emissions from deforestation and forest degradation;
5. Subnational demonstration activities should be assessed within the boundary used for the demonstration, and assessed for associated displacement of emissions;
6. Be based on historical emissions, taking into account national circumstances;
7. Subnational1 approaches, where applied, should constitute a step towards the development of national approaches, reference levels and estimates;
8. Be consistent with SFM, UNFF, UNCCD, CBD,
9. Should be reported and made available via the Web platform;2
10. Report should include a description of the activities and their effectiveness, and may include other information
11. Independent expert review is encouraged.

National Guidance for DA

- Equal distribution among regions and represent all bio-geographical conditions,
- Commitment from local government,
- Pressure to the forests,
- Participation of Indigenous people and local communities,
- Potential Co-benefits (e.g. social, biodiversity).

Existing DA-REDD

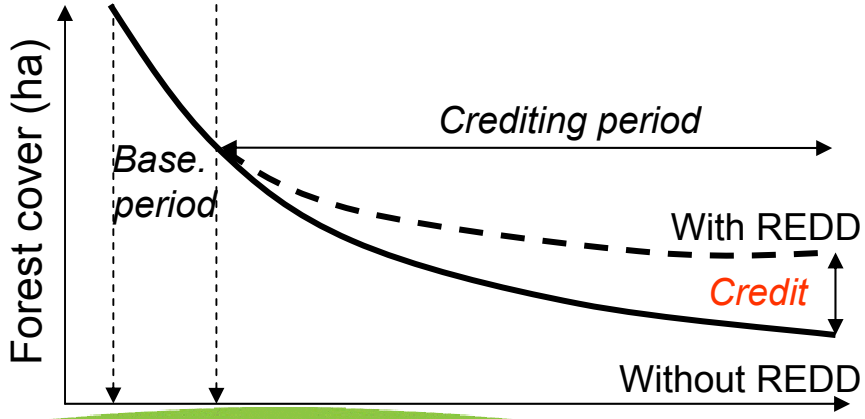
Approved by Government :

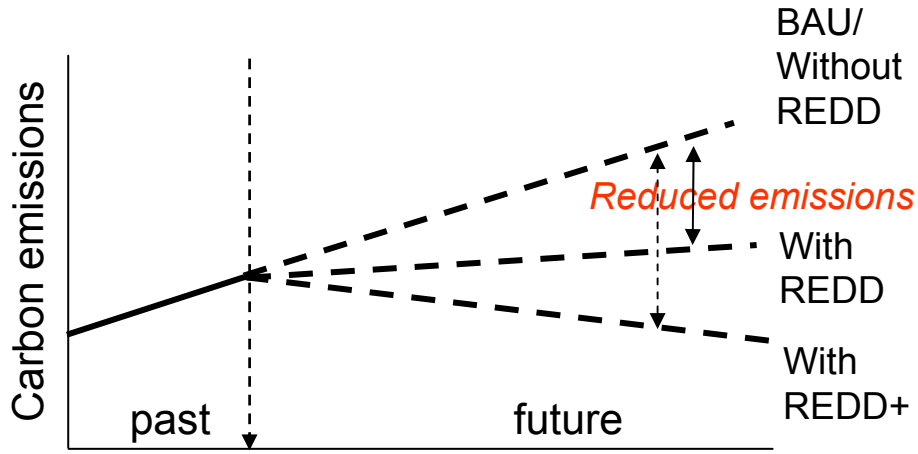
1. Central Kalimantan (peat land) : Indonesia-Australia,
2. South Sumatera and Kalimantan : Indonesia – Germany
3. East Kalimantan (Berau) : MoF – TNC
4. East Java (Meru Betiri NP) : ITTO
5. West Nusa Tenggara : Indonesia - Korea

Many more for Voluntary DA (20-22 DA)

Implication of REL/RL settings

- Period :
  - How long for history ?
  - When to start?
  - How long for future projection?
  - When to review?





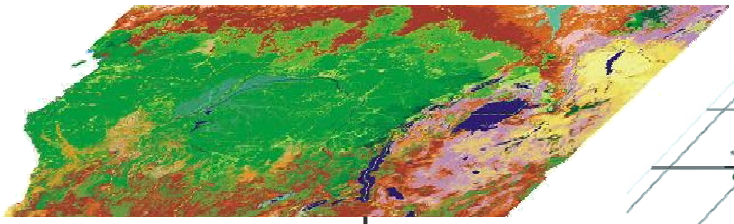
Source: Murdiyarso, 2009

Cost-efficient RL and MRV

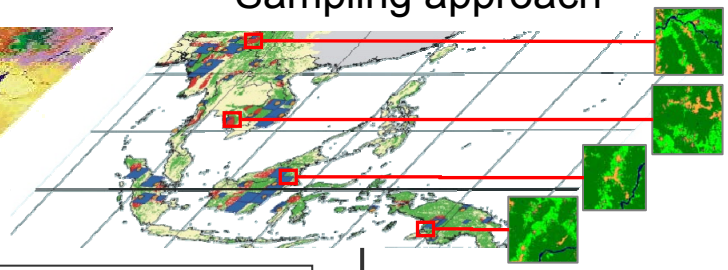
large deforestation detection

Regional/national observations

Wall-to-wall mapping



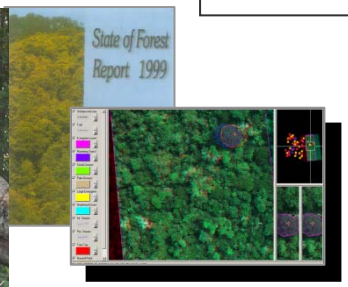
Sampling approach



Landsat/Spot-type / SAR
Deforestation (<0.5-1 ha)
(inter-)annual
Regionally-tuned forest degradation mapping
Bottom-up flexibility

Change in forest area and C-stocks

Sub national observations



Nat./Reg. forest inventories
In-situ/plot data
Targeted remote surveys
FAO statistics
Models relating forest change to C-emissions
IPCC-LULUCF / AFOLU

Estimation of carbon emissions

Combination Remote sensing data and ground survey

Source: GOFC-GOLD (2008)

Improvement Plan by Indonesia

- Current draft of presidential regulation for MRV GHG inventory Including time interval, role of central and local government)
- Incorporation of MoF land cover categories into IPCC categories
- Current work to establish NCASI (in cooperation with Australia, in its initial stage) : processing remote sensing data, analysis of biomass changes, training, TA and establishment of REL/RL
- More studies for country specific emission/removal factors (NFI data and other studies)
- Current draft of regulation on peat land
- Activities of Readiness Plan under FCPF, DA REDD

Closure

- A need for capacity building for application of IPCC GL (National, local, sectors)
- Simplification of IPCC GL or minimum data requirement for AD and EF/RF ??
- Minimum data (remote sensing data and local EF/RF) for selection of Tier and to reduce uncertainties ?
- Good Example of Capacity Building through ALU Program by Colorado State University and UNFCCC. For SE Asia, Through Workshop and in-house training.
- Encourage to develop local/national EF/RF
- Attention for emission from peat, management and fires

THANK YOU