LULUCF GHG Inventories: Indonesia

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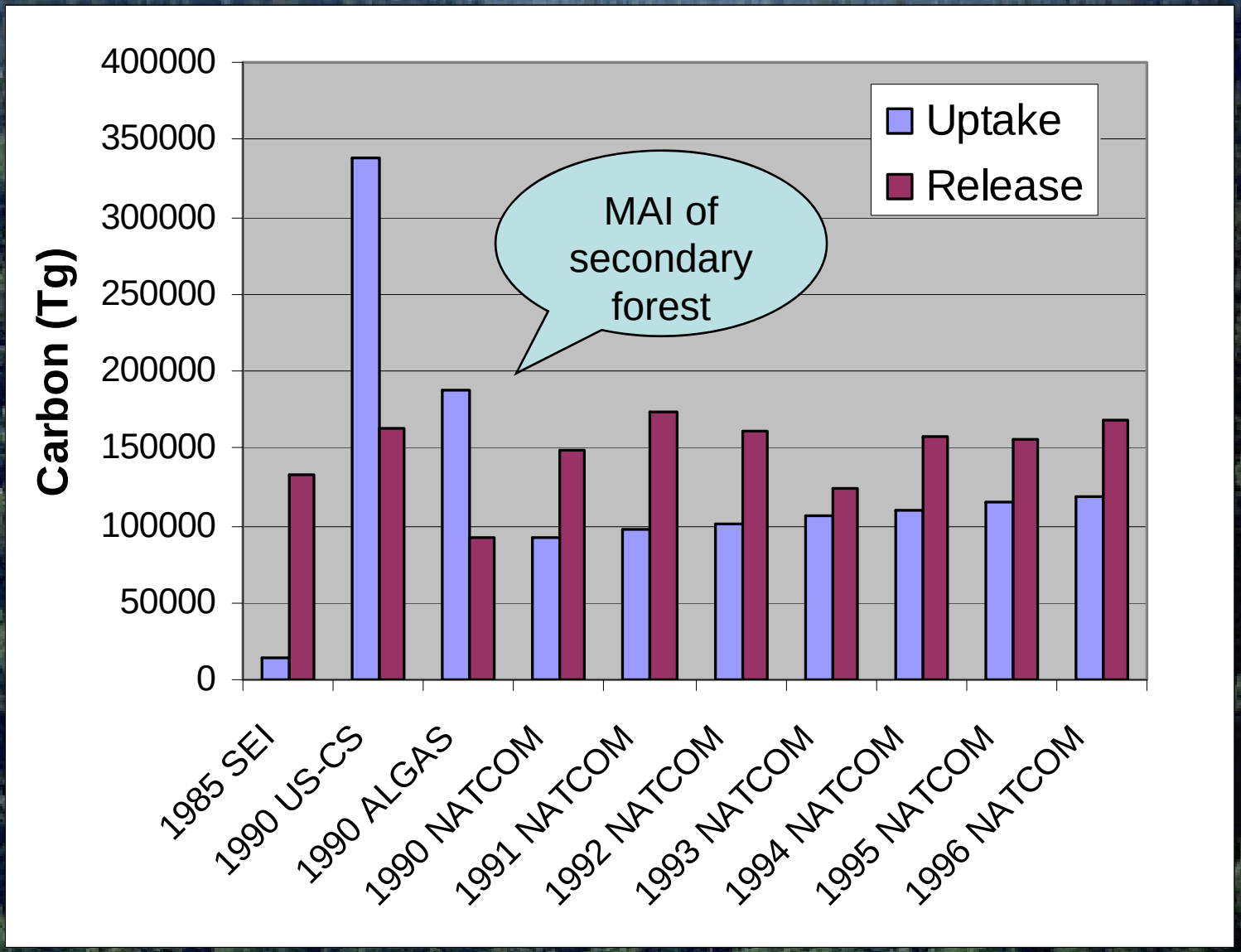
Indonesia GHG Inventory: 1994

Sources and Sinks	CO_2 Uptake	CO_2 Release	CH_4	CO	N_2O	NOx
Energy		373,609	674		6	
Industrial Processes		19,120	1		0	
Agriculture			3,244	331	53	19
LUCF	403,846	559,471	367	3,214	3	91
Waste			402			
TOTAL	403,846	952,200	4,687	3,545	61	110
BIOMASS ENERGY		124,417				
INT. BUNKER		1,684				

Source: MOE (1999)

Using Revised 1996 IPCC Guideline

GHG Inventory: Forestry Sector



Approaches 1: Forest Inventory Data from Concessionaires

Diameter class (D in cm)	Mean number of stems/ha	Volume of stem (V in m^3)[1]	Total Volume of stem (m^3/ha)	Diameter after growing (Dg in cm)[2]	Volume of stem after growing (V in m^3)[1]	Total Volume of stem (m^3/ha)	Volume increment (m^3 ha^{-1} yr^{-1})[3]
(1)	(2)	(3)	(4)=(2)x(3)	(5)=(1)+*Di*	(6)	(7)=(2)x(6)	(8)=(7)-(4)
14.50	249.4	0.087	21.8	14.82	0.093	23.1	
24.50	104.1	0.347	36.1	24.91	0.362	37.7	
34.50	50.2	0.852	42.8	34.93	0.880	44.2	
44.50	22.2	1.662	36.9	44.92	1.704	37.8	
54.50	10.4	2.831	29.4	54.90	2.887	29.9	
64.50	5.2	4.407	22.7	64.92	4.484	23.1	
70.00	3.6	5.464	19.7	70.47	5.560	20.1	
			209.3			215.9	**6.5**

[1]Allometric equation for estimating volume of wood is $V=0.00007771D^{2.267}$, and [2]$Di=0.000006D^3 - 0.0008D^2 + 0.0335D - 0.0178$ (R^2=48%). [3]Using BEF of 1.5 (Ruhiyat, 1995) and wood density of 0.6, the mean annual biomass increment of logged-over forest was about 5.9 t ha^{-1} yr^{-1}

Approach-2: From NFI (wood volume)

- $MAI_{LoF}=((WV_{VF}–WV_{LoF})/Rotation)*WD*BEF$
  - wood volume of virgin (WV_{VF}) and logged-over (WV_{LoF}) forests
  - WD wood density and BEF Biomass expansion factor (1.5 for natural forest: Ruhiyat, 1995)
- The MAI of logged-over forests for (PF+CnF), (LPF+NCF) and CF are 3.3, 1.9 and 2.5 m3/ha/year respectively. Using specific gravity of 0.6 t/m3 and expansion factor of 1.41 (Ruhiyat, 1995), the productivity for the respective forest categories would be 2.78, 1.61 and 2.11 t/ha/year.

Estimation of area of secondary forest

- Define the reference year (Indonesia case)
- Get series log production data (m^3) from production forest (not plantation forest)
- Divide the log production data with potential wood cut per ha (subtracting the volume of wood in the virgin forest and logged-over forest) to get new logged area.
- Add and subtract the area of logged over forest in reference year with estimated new logged area to develop series of logged over forest

Forest Category	Forest types by function	Area (1000 ha)		Volume (m^3/ha) dbh 20cm+	
		Virgin Forest	Logged-over forest	Virgin Forest	Logged-over forest
Lowland forest	PF+CnF	18363,7	5966,2	165,4	66,9
	LPF+NCF	23012,9	16645,3	162,0	106,8
	CF	8211,7	6711,5	141,4	56,8
Swamp	PF+CnF	1777,4	1067,9	117,6	32,1
	LPF+NCF	4224,6	3540,4	132,8	83,8
	CF	3542,2	3090,0	100,8	47,0
Mangrove	PF+CnF	904,5	194,9	115,0	-
	LPF+NCF	446,6	609,4	103,4	2,4
	CF	624,6	304,4	84,6	39,2

Calculate Carbon Foot Print for REDD

- How this group can assist the developing countries to prepare for REDD?
- Is there any simple technique but consistent with IPCC-GPG and reasonable level of accuracy?
- What type of strategies can be done to reduce the emission from DD ? Should we accommodate the inherited and delayed emissions from harvested wood product (e.g. making wood has longer lifetime will reduce the delayed emission) ?
- Capacity to calculate emission from deforestation and forest degradation is very important in setting up reference emission?

A simple approach for estimating emission from harvested wood

- Ratio between total wood consumption for the products and log production represents proportion of log becoming waste (waste proportion). As decomposition period used in this study was five years, thus carbon emissions from decomposition of woody biomass produced by past deforestation (E_{pwb}) was estimated as the following

$$E_{pwb} = \{1/5 \sum_{i=1986}^{1990} (l_w * Log_i) + (f_w * Log_i)\} * 0.5$$

l_w and f_w are waste produced during processing of log (0.61) and woody biomass left in forest after logging/deforestation (0.41) respectively. Log_i is log production in year-*i*

- Carbon emission from past forest products (E_{pfp}) was estimated as follows

$$E_{pfp} = \{1/30 * T_{wb}\} * 0.5$$

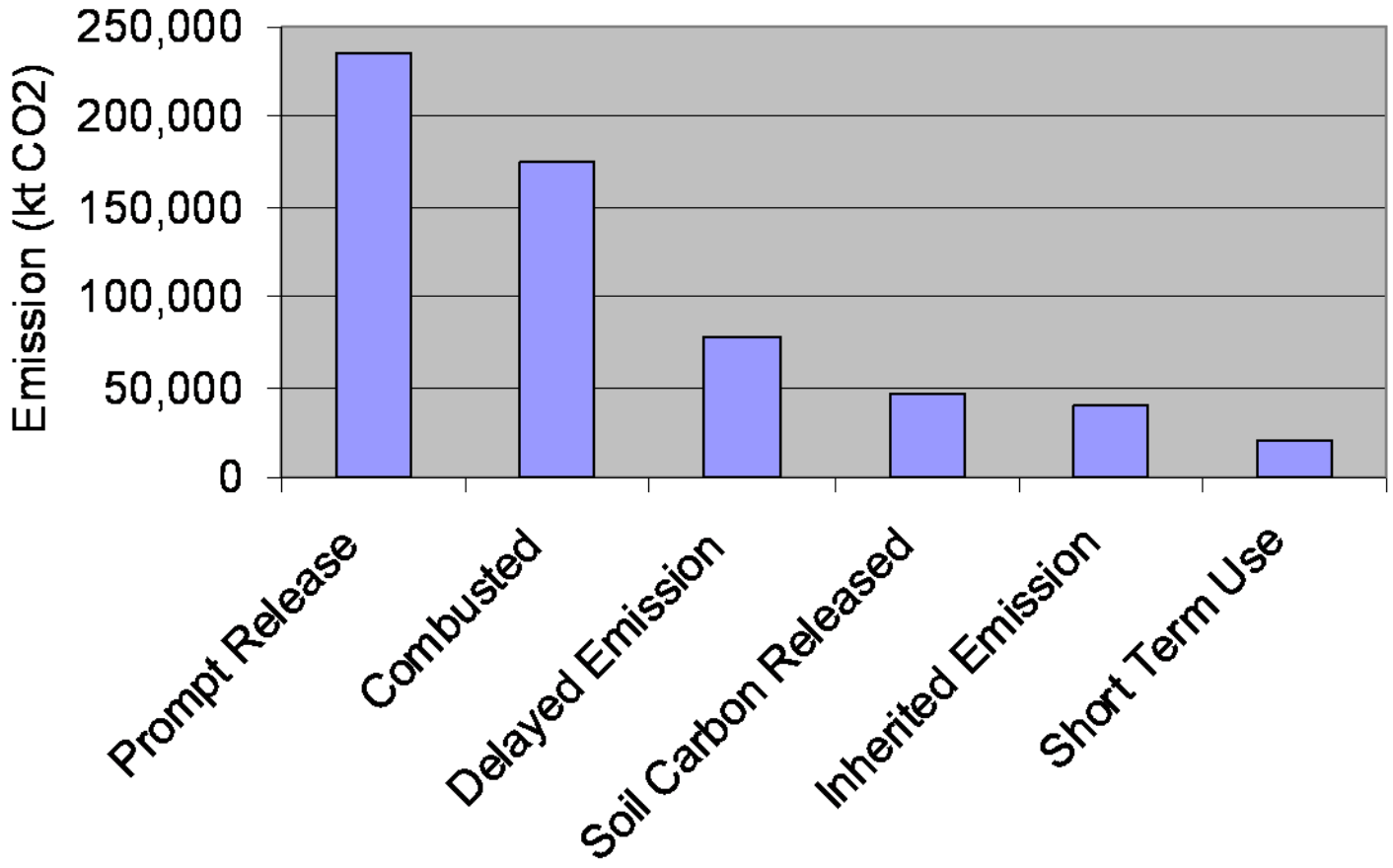
T_{wb} is total wood stored in the products in the inventory year. Value of 30 is average period of product use. Value of 0.5 is carbon content. In this analysis, total wood used for houses and buildings (T_{wbh}) was estimated from the multiplication of total area of houses and building (apartment, hotel, shops, office etc.) in the inventory year (CIC, 1995) and wood consumption per unit area (Perum Perumnas, 1996). *The longer the lifetime of forest products the less the emissions*

- Total wood stored in the form of furniture and other forest products for the inventory year was not available. The available data was only annual production of the products. Therefore, the total wood stored the products (*Twb*) in the inventory year was estimated as follows:

$$T_{wb} = T_{wbh} + (\frac{AP_f}{AP_h} * T_{wbh})$$

- AP_f is annual production of furniture and other wood products and AP_h annual production of houses and buildings. Annual production on houses and buildings in the inventory years is the difference between total wood used in the inventory years and that used in (the inventory year-1).

Emission from Deforestation and Forest Harvesting



Carbon emission from deforestation and forest harvesting

Emission Categories	Agriculture (kt C)	Pasture (kt C)	Degradation of existing forest (kt C)	Clear cutting[2] (kt C)	Selective cutting (kt C)	Forest Fire (kt C)	Total (kt C)	Total (kt CO_2)
Prompt Release	39,201	3,442	7,857	5,647	8,202	-	64,350	235,950
Soil Carbon Released[1]	3,452	303	225	4,334	4,067		12,382	45,401
Combusted	35,749	3,138	7,632			1,235	47,755	175,102
Short Term Use				1,313	4,135		5,449	19,980
Delayed Emission	10,725	942	1,018	6,255	2,297		21,236	77,865
Inherited Emission							11,065	40,572
Total	49,926	4,384	8,875	11,902	10,500	1,235	97,886	354,387

How to capture these changes of practice accurately?

Do conversion in degraded forest (e.g. palm oil)

Practice sustainable forest management

Shift from clear to selective cutting

How to reduce level of emission from DD

Thank you