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Preliminary Analysis of REDD on Indonesian's Economy

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Preliminary Analysis of REDD on Indonesian's Economy

Budy P. Resosudarmo, Arief A. Yusuf and Ditya A. Nurdianto

1. Introduction

Approximately 10 per cent of the world's tropical forests or around 144 million ha are located in Indonesia, scattered from the westernmost tip of Sumatra to the eastern border of Papua, occupying approximately 70 per cent of the country's land area (Barbier, 1998). Thus, Indonesia ranks third — after Brazil and Zaire — in its endowment of tropical forests (Forest Watch Indonesia, 2002). Indonesia's forests have been one of its most important natural assets. Forestry related activities have provided an important source of formal as well as informal employment for many people and have generated large amounts of both government revenue and foreign exchange (Indonesia-UK Tropical Forest Management Program, 2001).

Meanwhile, deforestation and forest degradation has been the main source of Indonesia's Green House Gas (GHG) emission; i.e. 70-80% of Indonesia's GHG emission. Incentive to reduce the rate of deforestation, through the Reducing Emissions from Deforestation and Forest Degradation (REDD) program, has recently widely discussed. In general, the program allows international communities to transfer a certain amount of funding to Indonesia to compensate its successful efforts to reduce its rate of deforestation. The question is what will the likely impact on the Indonesian economy, if Indonesia commits to be involved in this REDD program.

This report illustrates the impacts of reduced deforestation have on the Indonesian economy and demonstrates the complexity in distributing Reducing Emissions from Deforestation and Forest Degradation (REDD) fund to compensate the negative economic impacts of reduced deforestation.

2. Forest Exploitation and Deforestation

Forest exploitation has long been conducted in Indonesia. However, the rate of exploitation significantly increased when Soeharto resumed leadership of the country in 1966–67. The president was quick to realise the potential of the country's abundant forests. In the first year of his presidency, he enacted the Law No. 5/1967 on forestry, which put all forests under state control. This law provided a legitimatization for Soeharto to give forest concessions (HPH) to various individuals or agencies — many of whom were military officers and institutions supporting his regime,[1] who then invited foreign partners to join them in exploiting the forests. By 1971, around 80 forest concession permits, mostly in Kalimantan and Sumatra, had been given to various individuals and institutions (Barr, 1998). The number of forest concessions, and therefore their area, kept increasing. As a result, by the mid 1990s more than 500 forest concessions had been allocated, covering around 54 million ha of the country's forest area (Forest Watch Indonesia, 2001).

Figure 1 shows the production of industrial roundwood (log), plywood, sawnwood, and pulpwood (in m^3) since 1961. It can be seen that log production significantly increased from the end of the 1960s until the mid 1990s. The sawnwood industry started to take off around the mid 1970s, while the plywood industry was flourishing by the mid 1980s. The pulpwood industry started to grow later on — around the early 1990s — and was able to exceed the production of sawnwood and plywood for several years around mid 1990s.

[1] Later on, in the 1970s, the government also established state-owned logging enterprises

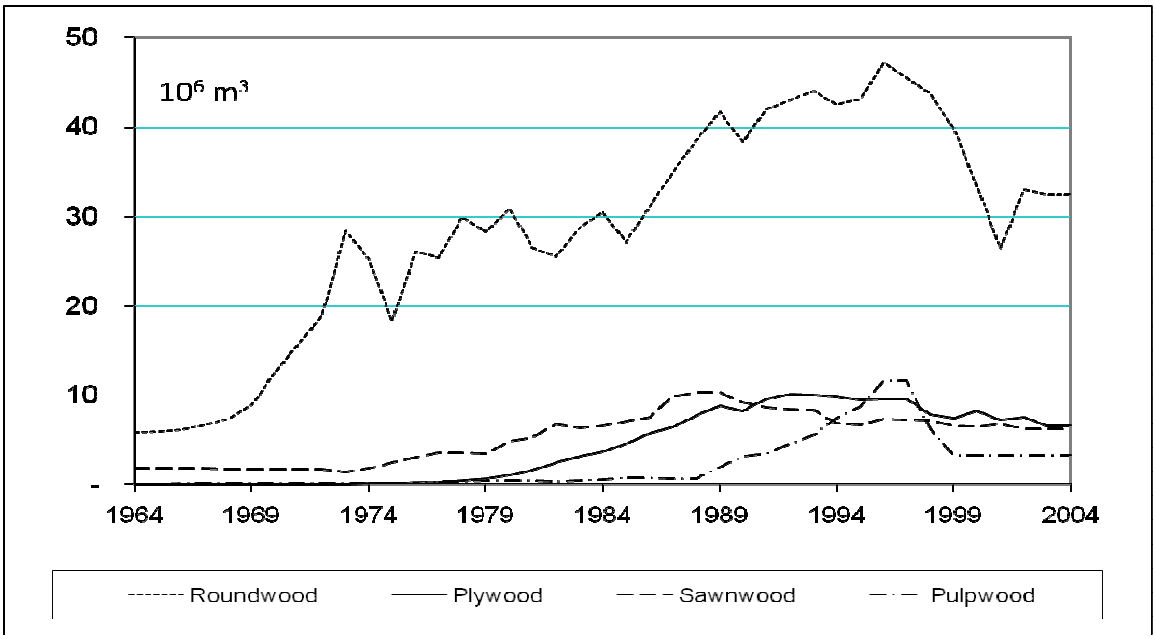


Figure 1. Forest Exploitation

Along with the increase in their production, the contribution of forest-related industries to the national economy also became more significant. By the mid 1990s, it has been conservatively estimated that at least 20 million people depended on Indonesia's forests for the bulk of their livelihood (Sunderlin et al., 2000). The forestry and wood processing sectors accounted for around 4 per cent of the Gross Domestic Product (GDP). The total forestry and wood processing production ranks second — after mining — in export value, and typically accounts for approximately 10 per cent or around 5.5 billion USD (FWI/GWF, 2002).

It is important to note that log production in Figure 1 does not include illegal logging. Note that illegal logging can take various forms, starting with harvesting logs without any permit to under-reporting practices by legal logging companies. This illegal activity obviously goes hand in hand with bribery and corruption practices (Telapak Indonesia and EIA, 2001). The practice of illegal logging was predicted to increase from the 1970s onwards — a case of *banjir kap* (Obidzinski, 2005). It was estimated that, by the end of the 1990s, three times the amount of

logs were harvested illegally than legally (Scotland et al., 1999). The amount of wood harvested from Indonesian forests is most likely much higher than the number in Figure 1.

The direct implication of this significant increase in log harvesting was the acceleration of deforestation. It was suspected that annual deforestation increased from below 0.3 million ha annually before 1970 to 0.6 million annually in the 1970s. The number kept increasing up to around 2 and 3.8 million ha annually between 1990 and 1997 and between 1997 and 2000, respectively; i.e. the rates of deforestation during 1990–1997 and 1997–2000 were around 1.4 per cent and 2.7 per cent annually. These figures are higher than the global rate of tropical deforestation in the mid 1990s, which was approximately 0.7 per cent per year (FAO, 1997). Hence, there is an argument that Indonesia needs to make a significant effort to reduce its rate of deforestation as well as to eliminate illegal logging.

3. Inter-Regional CGE Model

Previous studies into computable general equilibrium (CGE) at both national and international level have been conducted. International trade models include GTAP and LINKAGE, with the latter model developed by the World Bank. In the meantime, standard national CGE models usually disregard regional features for both input-output (IO) and SAM-based models. Nevertheless, there are several different approaches available in order to create an inter-regional CGE model. These different approaches are: (1) regional approach; (2) top-down approach; (3) inter-regional input-output (IRIO)-based model, or bottom-up approach; and (4) inter-regional SAM (IRSAM)-based model, also using a bottom-up approach.

The bottom-up IRSAM-based approach where regional results drive the national results is used for the purpose of report. This is approach is fully SAM-based with inter-regional trade

flow, primary factor flow as well as inter-regional transfer. Figure 2 illustrates how Indonesia is divided into five regions, namely Sumatra, Java-Bali, Kalimantan, Sulawesi, and Eastern Indonesia, and how each region is inter-connected.

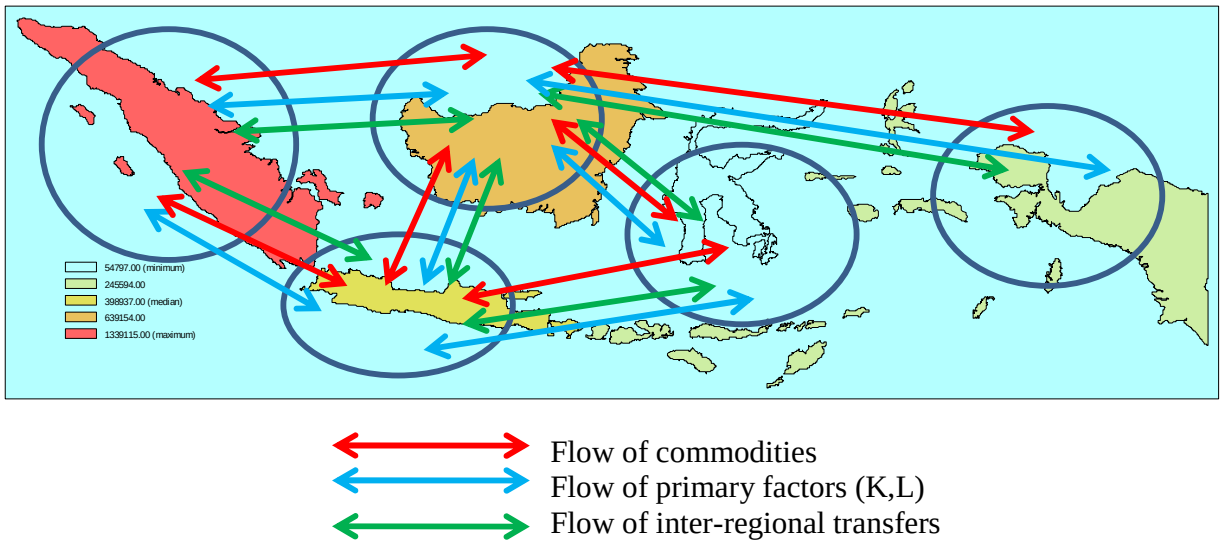


Figure 2. Inter-Regional CGE Model

Furthermore, household in each region is further divided into two distinct categories, rural and urban households. Each category consists of one hundred households based on their income quintile level as figure 3 illustrates below.

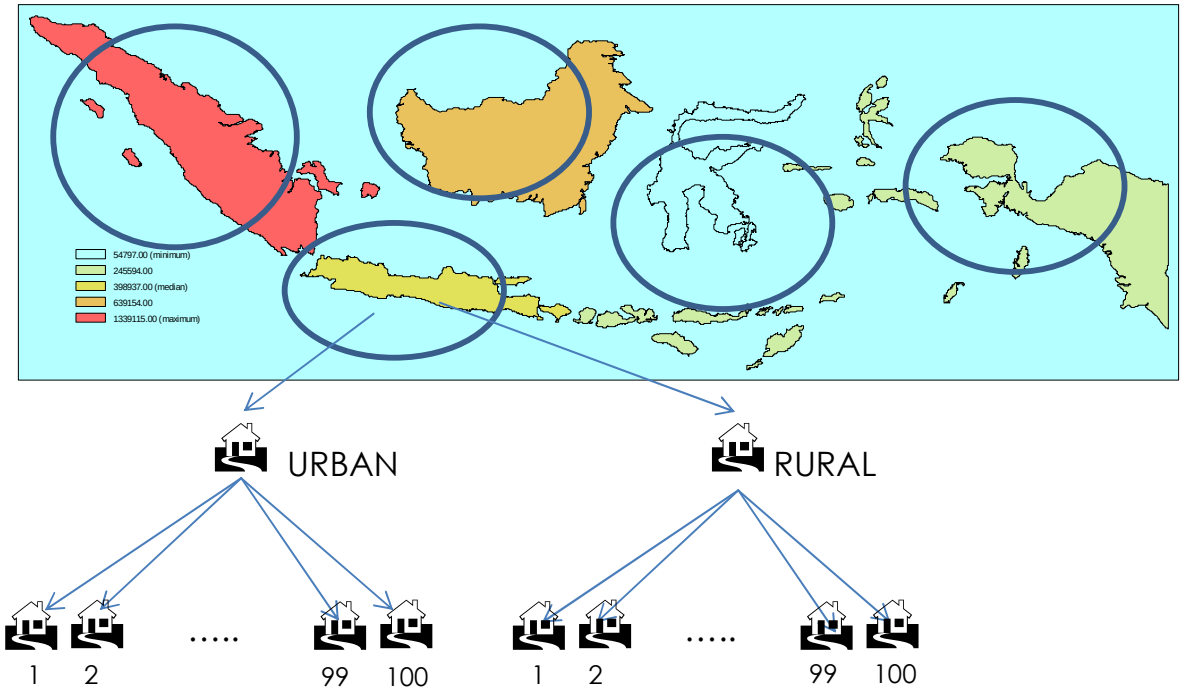


Figure 3. Top-Down Distributional Module

The model also consists of thirty-five sectors as shown in table 1 below. The three sectors in the model that will directly be affected with all simulations are: 1. Forestry Sector; 2. Wood, Rattan, and Bamboo Products; and 3. Pulp and Papers.

Table 1. Sectors Classification

Sector		Sector	
1	Rice	19	Cement
2	Other Food Crops	20	Basic Metal
3	Estate Crops / Plantations	21	Metal Products
4	Livestock	22	Electricity Equipments and Machineries
5	Forestry	23	Vehicle
6	Fishery	24	Other Industries
7	Oil. Gas and Geothermal Mining	25	Electric. Gas and Clean Water
8	Coal and Other Mining	26	Construction
9	Oil Refinery	27	Trade
10	Palm Oil Processing	28	Hotel and Restaurant
11	Marine Captured Processing	29	Land Transportation
12	Food and Beverage Processing	30	Water Transportation
13	Textile and Textile Products	31	Air Transportation
14	Foot wares	32	Communication
15	Wood, Rattan and Bamboo Products	33	Financial Sector
16	Pulp and Papers	34	Government and Military
17	Rubber and Rubber Products	35	Other Services
18	Petrochemical Products		

4. Simulations

Five simulations are conducted in order to analyze the effect of reduced deforestation on the economy. Simulation 1 (w/o REDD) assumes that with business as usual Indonesia is able to reduce the rate of deforestation in Sumatra, Kalimantan, Sulawesi, and Eastern Indonesia (mostly Papua) by 10 percent, represented by a 10 percent reduction in log (forestry) production. The target of this simulation is to observe the impact of 10 percent reduction in log production to the Indonesian economy.

Simulation 2 (REDD5hh) assumes the following. The “cost” to reduce deforestation in Sumatra, Kalimantan, Sulawesi, and Eastern Indonesia is equal to or less than \$5/t CO_2 and it

happens that the net amount received by Indonesia from REDD agreements is \$5/t CO_2. The "cost" is all about compensating rural (forest) communities so as not to cut their surrounding forests and to develop forest community managements to protect their surrounding forests. And so, all the REDD funding is channelled directly to rural (forest) communities in Sumatra, Kalimantan, Sulawesi, and Eastern Indonesia. The proportion for each region equals the proportion of log produce in each area.

Simulation 3 (REDD5hhgov) assumes the following. The "cost" to reduce deforestation rate in Sumatra, Kalimantan, Sulawesi, and Eastern Indonesia is equal to or less than \$5/t CO_2 and it happens that the net amount received by Indonesia from REDD agreements is \$5/t CO_2. The "cost" is to compensate rural (forest) communities so as not to cut their surrounding forests and to develop government activities in better managing and monitoring forests. And so, 50 percent of the REDD funding is channelled directly to rural (forest) communities and the rest to regional governments in Sumatra, Kalimantan, Sulawesi, and Eastern Indonesia. The proportion for each region equals the proportion of log produce in each area.

Simulation 2 and 3 simulates a situation that the "cost" of reducing deforestation is relatively low and so Indonesia can have a relatively low price carbon market. Simulation 4 is the same as simulation 2, but the "cost" of reducing deforestation is \$20/t CO2 which is equal to the amount that Indonesia receives from REDD transactions. While simulation 5 is similar to simulation 3 where only the REDD funding is divided equally between rural communities and the government.

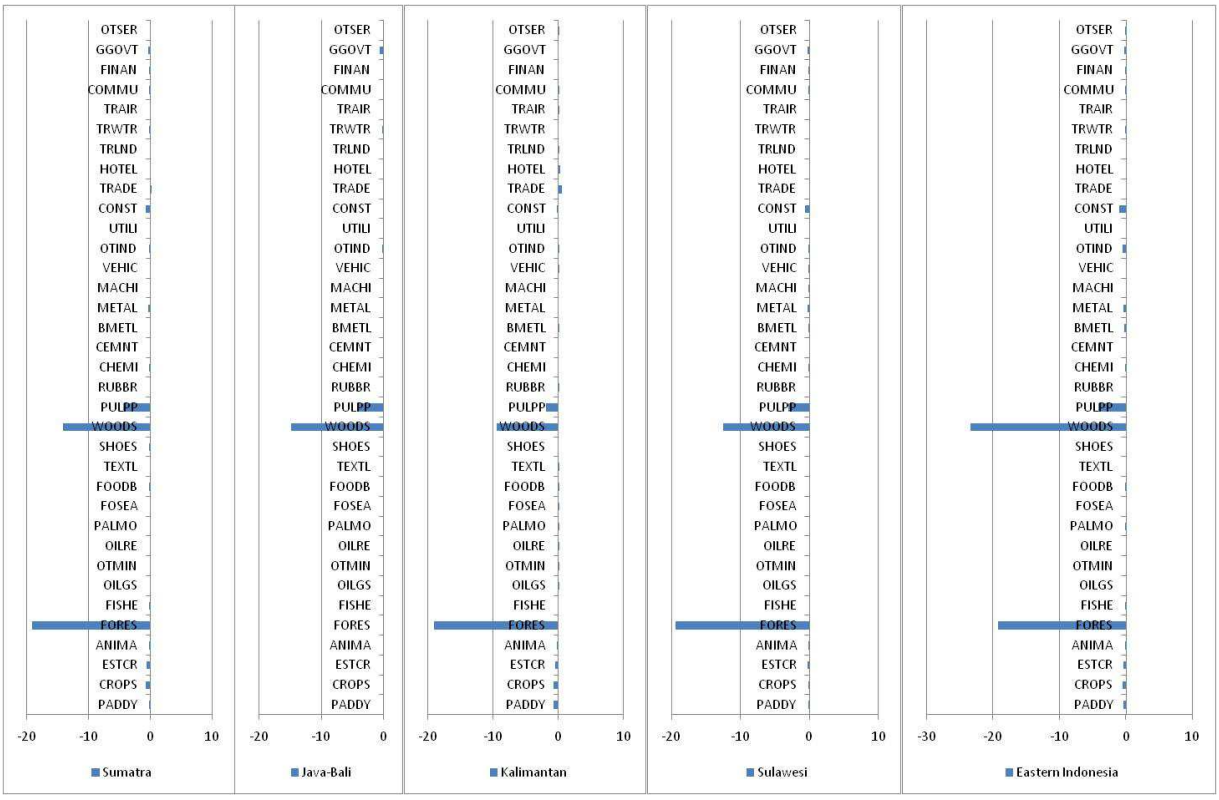
Note, that the initial level of CO_2 emission from deforestation is assumed around 2,500 Mt CO2. Also, import is controlled to be fixed (neither increasing nor decreasing); i.e. equal to

the base condition. Lastly, our simulations do not really capture corruptions and illegal logging issues.

5. Results

Table 2 below shows the result of the simulation 1. The following table shows the impacts that reduced deforestation has on the Indonesian economy without REDD funding. This table shows the impact of a 10 percent reduction in log production on other sectors. It apparently affects mostly Wood, Rattan, and Bamboo products as well as Pulp and Papers sectors. It is important to note that even without a reduced deforestation rate in Java; Wood, Rattan, and Bamboo products as well as Pulp and Papers sectors in Java are significantly affected as they are receiving a lot of log products from other islands.

Table 2. Reduced Deforestation without REDD Funding: Output



Meanwhile, table 3 below shows the impacts of reduced deforestation to household real consumption. The results can be stylized as followed:

1. Even without any compensation, reduction of log production does not negatively affect household real consumption. Yes, reduction of output may reduce the number of labor and capital utilized in the logging industry. However, a reduction of output will allow logging companies to pay higher wage and return to capital per unit labor and capital respectively. In aggregate, the affect of reducing log output is still positive to rural labor;
2. With the exception of Eastern Indonesia, other households (urban households only in off-Java *vis-à-vis* rural and urban households in Java) are negatively affected mostly through multiplier impacts of fewer logs available domestically;
3. Compensation from REDD certainly increases household real consumption in rural area of Sumatra, Kalimantan, Sulawesi, and Eastern Indonesia as they are the ones that receive this funding; and
4. Observing the negative impact on non-receiving REDD fund households induces a thinking to whether or not a need to compensate non-forest related communities.

Table 3. Change in Household Real Consumption

(%)	w/o REDD	REDD5hh	REDD5hhgov	REDD20hh	REDD20hhgov
National	-0.43	0.25	-0.06	2.26	1.04
Sumatra					
- Rural	1.28	6.20	3.79	20.82	11.27
- Urban	-0.16	-0.05	0.04	0.29	0.64
Java-Bali					
- Rural	-0.59	-0.51	-0.52	-0.28	-0.29
- Urban	-0.66	-0.60	-0.58	-0.41	-0.31
Kalimantan					
- Rural	1.29	10.65	6.03	38.45	20.13
- Urban	-0.27	-0.29	-0.17	-0.35	0.12
Sulawesi					
- Rural	0.26	2.11	1.22	7.65	4.12
- Urban	-0.29	-0.21	-0.14	0.04	0.32
Eastern Indonesia					
- Rural	0.76	4.55	2.76	15.87	8.73
- Urban	0.24	0.32	0.47	0.54	1.15

Furthermore, changes in household real consumption are translated into changes in the levels of regional poverty as shown in table 4. Observing the changes, income inequality reduces in all simulations.

Table 4. Change in Proportion of Poor People

(%)	Initial	w/o REDD	REDD5hh	REDD5hhgov	REDD20hh	REDD20hhgov
National						
- Rural	20.63	-0.20	-1.36	-0.73	-3.54	-2.20
- Urban	12.48	0.54	0.49	0.46	0.29	0.07
Sumatra						
- Rural	18.65	-0.96	-2.90	-1.82	-7.25	-4.89
- Urban	14.90	0.17	0.15	0.14	-0.25	-1.05
Java-Bali						
- Rural	20.70	0.38	0.36	0.36	0.33	0.33
- Urban	12.02	0.73	0.68	0.65	0.52	0.42
Kalimantan						
- Rural	13.00	-0.29	-4.06	-2.32	-9.42	-0.02
- Urban	8.05	0.07	0.06	0.05	0.04	-5.96
Sulawesi						
- Rural	20.89	-0.30	-2.15	-1.47	-5.55	-0.07
- Urban	7.79	0.16	0.12	0.10	0.01	-3.53
Eastern Indonesia						
- Rural	31.99	-1.15	-4.07	-1.89	-8.66	-1.36
- Urban	22.25	-0.36	-0.55	-0.80	-1.04	-4.77

However, table 5 shows that all scenarios affect real GDP slightly negatively. Transfers from REDD funding for \$5/t CO_2 or \$20/t CO_2 does increase rural household real consumptions, reduce rural poverty, and income inequality; but they are not able to compensate the reduction of GDP due to fewer logs being produced. When the government also receives REDD funding, the reduction to GDP is less than when all the funding is given to rural communities.

Table 5. Change in Real GDP

(%)	w/o REDD	REDD5hh	REDD5hhgov	REDD20hh	REDD20hhgov
National	-0.47	-0.45	-0.43	-0.37	-0.31
- Sumatra	-0.89	-0.84	-0.82	-0.71	-0.60
- Java-Bali	-0.27	-0.25	-0.24	-0.20	-0.18
- Kalimantan	-0.61	-0.56	-0.55	-0.40	-0.39
- Sulawesi	-0.52	-0.50	-0.47	-0.44	-0.34
- Eastern Indonesia	-0.63	-0.62	-0.57	-0.56	-0.37

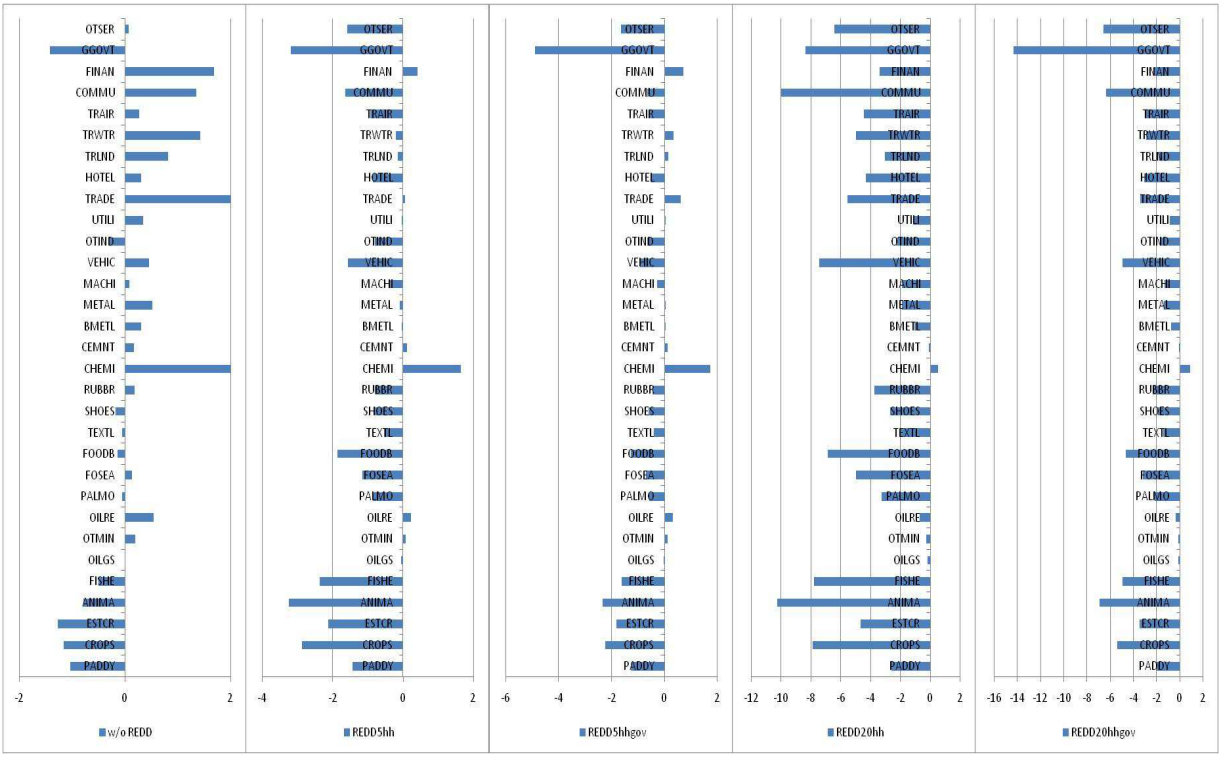
Table 6 below shows the changes in export of forestry-related products. The reduction of log output significantly decreases log exports, mostly since log exports is already anyway due to the log export ban policy. What is more worrying is the reduction of wood products such as furniture etc.

Table 6. Change in Forest-Related Exports

(%)	w/o REDD	REDD5hh	REDD5hhgov	REDD20hh	REDD20hhgov
Forestry	-92.85	-92.74	-92.78	-92.39	-92.53
Wood, Rattan, and Bamboo Products	-30.51	-30.80	-30.70	-31.67	-31.26
Pulp and Paper	-6.61	-6.94	-6.87	-7.95	-7.67

Lastly, table 7 shows the changes in export in the other sectors. When no REDD transfer, composition of trade changes due to less logs available domestically. Some sectors increase while others decrease their exports. However, when REDD funding is available for the country, domestic demand increases, with rupiah most likely to appreciate, and so exporting becomes that much less attractive. The more money is distributed in the country, the less attractive export becomes.

Table 7. Change in Other Exports



6. **Conclusions**

This study is aimed at understanding the impacts of reduced deforestation to the economy. By running the CGE model, it is possible to see the results of implementing different strategies. In turn, it is hoped that from such an understanding, it is possible to choose the most feasible policy with the greatest overall benefit.

The study concludes that one such strategy is to achieve a high price of carbon. Such strategy would discourage forest deforestation as it increases the opportunity cost of this activity, assuming that a REDD transfer scheme is in effect, of course. With the availability of REDD funding, a higher carbon price translates directly into more fund transfer to compensate the

losses from reduced deforestation. Thus, benefits from the fund transfer can be greater than the costs of reduced deforestation such that the net benefit is positive for the overall economy.

Furthermore, a policy should also be implemented to compensate non-forest communities, i.e. urban households in off-Java and all households in Java, as they are the most likely to lose from the implementation of a REDD scheme. These groups of people are the ones who stand to lose from reduced deforestation without any compensation. As such, the government should bear in mind these groups as reduced deforestation is promoted to avoid greater inequality due to a lack of compensation.

One possible solution to avoid such situation is to give the government higher share of REDD funding. Greater share of REDD funding to the government can at least improve on one issue, i.e. change in the proportion of poor people, as gains from reduced deforestation can be more evenly distributed. This would hopefully decrease resistance to reduced deforestation despite a reduction in the overall gain *vis-à-vis* a non-participating government.

Lastly, two other important considerations to these policies involve a long-run analysis, i.e. investment strategy, and timing in distributing the fund. Investment strategies are likely to change as people's behaviors are affected by these new incentives. Also, timing is a crucial aspect as it ultimately impacts the results of whichever scheme is implemented. Nevertheless, whether a quick one time payment is more effective than a time-scheduled payments scheme is something worth studying further.

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