Summary Report by Sumitomo Forestry Co., Ltd. in February 2002

Study on Evaluation Method of a Reforestation Project in the Republic of Indonesia, as CDM Project Feasibility Study by the Ministry of the Environment of Japan in 2001

1 Objective of Our Study

Our theme is about reforestation project. We studied a CDM project in East Kalimantan Province in the Republic of Indonesia from the viewpoint of private enterprise's business purpose to secure raw material for timber processing industry. It can be classified as carbon removals by sinks (carbon storage) project. As the Kyoto Protocol defines the purposes of CDM in the Article 12, CDM is to achieve sustainable development in Parties not included in Annex I., we presume that the concept of sustainable forest management can be applicable to the purpose. The objective of our study is to collect accurate data, evaluate primary elements of CDM projects including base line setting, indirect and associated impacts, risks and carbon accounting system, and to propose monitoring methods.

2 Host Country's Acceptance (Basic Conditions)

At the interview with the Deputy Minister for Environmental Management Policy, Ministry for Environment, Government of Indonesia, he told us that the official stance and policies of the Government of Indonesia toward the Kyoto Protocol and the Clean Development Mechanism (CDM) including the "absorption by sink" such as forest plantation projects were clear. They aim to obtain ratification for Kyoto Protocol as soon as possible and also to start preparation for CDM. They will develop legal aspects in to ratify the protocol and other related regulations as well as to establish institutional aspects. The Ministry of Forestry has not released any official statement on CDM nor implemented any official policies. According to our survey, however, we obtained suggestions that Government of Indonesia would decide to request separate funding for undertaking national CDM strategy study for forest component as issues related to this sector were sufficiently complex and require deeper attention.

For our study, S company joined as our counterpart, because the company possesses 300,000 hectare ("ha" hereinafter) of industrial plantation site and abundant experience and technologies.

3 Baseline

A base line of reforestation project is carbon removal in the project area if its project did not exist. Therefore, quantity of project carbon removal by sinks is difference between actual carbon removal and the base line. Based on our survey at site, we determined the three cases of baseline as following Table-A;

Table-A Three cases of baseline

Forest Type	Description	Baseline
Case 1	Deteriorated secondary forest with sparse surviving trees forming principally bush type forest. This type is seemingly objects for afforestation and reforestation projects.	0.30 carbon ton per ha per year. This baseline is acquired by averaging maximum storage quantity 9.6 carbon ton per ha per 30 years into yearly average and then subtracted by risk rate 2.5% per year.
Case 2	Relatively rich secondary forest with many surviving trees. Future growth is predictable. This type is seemingly objects for forest preservation projects and/or forest management.	0.78 carbon ton per hectare per year. This baseline is acquired by averaging minimum storage quantity 24 carbon ton per hectare per 30 years into yearly average and the subtracted by risk rate 2.5% per year.
Case 3	No biomass or very scarce biomass is observed. This type is also objects for afforestation and reforestation projects.	Nothing

We studied and analyzed that the method of distribution of relatively large trees with dbh≧30cm in the project secondary forest is
effective by aerial photograph for the purpose of classification of forest types in setting a baseline in larger area.

Carbon storage survey in underground soil showed that there contained 15.34 carbon ton per ha. There is no correlation between aboveground biomass and underground soil carbon, therefore we need not to consider the increase of underground carbon in comparison with aboveground carbon.

We estimated the period of the project to be 30 years because of the Indonesia regulation. Most Japanese companies seeming make 30-50 years forest management plans in domestic markets and developed nations for example in New Zealand.

Monitoring is to be implemented by measuring changes of carbon storage both aboveground and underground. In expanding to larger scale of area, estimation of each forest types by utilizing remote sensing is effective. We also studied accurate warranty and collecting method of data and its expense.

4 Indirect and Associated Impacts

Indirect and associated impacts are the influence which the project can offer to the area and carbon fixing. We surveyed the area by direct questioning and analysis method. According to our survey, we found following four leakage;

1) Slash-and-burn agriculture

2) Firewood
3) Housing material
4) Illegal logging

The project boundary should be set inside of the system boundary which indirect and associated impacts offer to the site. We made examples of setting project boundaries and quantitative volume of relating leakages.

Monitoring can be implemented by selecting initial factors including land-use, infrastructure, population, change of number of households, statistics of occupation and wages, by classifying immediate causes and remote causes and identifying emerging places inside and outside the site.

5 Risk Evaluation

Pest and insects are peculiar risk to forest management. We made analysis and evaluated that 15% of Teak trees and 30% of Gmelina trees could be damaged. The results were introduced to our feasibility study. Monitoring could be implemented by such items as existence of damage, ratio of damage and quantitative area. It should be measured once three or five years by utilizing measuring plots.

Risk of forest fire was analyzed and evaluated that 20% of project site can be burn every eight years after our survey. Monitoring is possible by such items as existence of damage, ratio of damage and quantitative area by utilizing aerial survey, remote-sensing data, meteorological data, forest fire spot data, forest register book and survey plots. Frequency of monitoring is expected to be after every large scaled fire.

6 Feasibility Study and Evaluation

(1) We made feasibility study of a project. As for forest management, we studied following items; area, planted species and area, growth and harvest year, cost and income, risk, project period. We selected *Acacia mangium*, *Gmelina arborea*, *Duabanga moluccana Paraterianthes falcataria, Tectona grandis, Swietnia macrophyla, Peronema canescence* and *Dipterocarpaceae* for the purpose of sawn timber, plywood and fiber-board raw materials. Planting will be implemented 2,000ha in the first year and 4,000ha in 2nd and 3rd years totally 10,000ha for the first three years. Plantation cost include planting, tending, felling, clearing and transportation. Logging year, logging conditions and sales conditions should be considered. Management cost includes personnel, depreciation, capital for reforestation, and other conditions include exchange rate, capital, loan, dividends and payment schedule. We introduced such indications to evaluate feasibility of the project as a rate of break-even point, the break-even year of a cumulative deficit, loan payment years, investment amount per carbon removal.

(2) We calculate the quantity of carbon removal by removal by sink by the growth of the forest in the project area. The growth is grasped by analyzing past years growth data of each tree species in the area. Soil carbon should be included in the quantity, however we didn't count in our projection, because there should be little change of

soil carbon. Carbon removal is converted from growth volume. Thus the carbon removal mentioned in this article is so-called nominal carbon removal by the project. Numerical expressions are as follows:

Quantity of Growth=Forest biomass of the project – Forest biomass on the start of the project

Carbon Removal = Quantity of Growth (m3) x specific gravity in ovendry x carbon ration (0.5) x 1.6
* 1.6 : a coefficiet to include branches, leaves

(3) We studied the project as a CDM project. Firstly we worked out a baseline, considering risk evaluation of insects/pest and forest fire and then, calculated the quantity of carbon storage volume by subtracting the baseline from above mentioned so-called nominal removal. Carbon release at the time of harvesting is negative count.

(4) We made simulation by each baselines and accounting systems as Table-B;

Table-B Feasibility study by each baseline and carbon price

No.	Accounting Method	Rate of Profit against Sales Amount	Rate of Break –Even Point	Break-Even Year of Cumulative deficit	Loan Payment Period	Loan Payment Completion Year	Maxi-mum Loan Amount US$	Invest-ment Amount per Carbon Removal US$ /Cton	Invest Amount after Profit per Carbon Removal US$ /Cton
8-7-1	Nil	87%	17%	11th year	19years	15th year	11,909	270	100
8-7-2	Nil	87%	17%	11th year	19years	15th year	11,909	430	160
8-7-3	Nil	87%	17%	11th year	19years	15th year	11,909	210	90
8-7-4	Stock Change Method C=20	88%	17%	11th year	18years	15th year	9,071	270	90
8-7-5	Stock Change Method, C=50	88%	15%	11th year	13years	12th year	3,240	270	80
8-7-6	Stock Change Method C=100	90%	13%	2nd year	5years	4th year	1,719	300	70
8-7-7	Advance Ton-year Method C=50	88%	15%	1st year	0year	1st year	0	300	70
8-7-8	Average Method C=50	89%	15%	11th year	14years	13th year	4,743	270	80

(5) Since quantity scale of the baseline heavily reflects to carbon removal by the project, it is considerably important to set a proper and accurate baseline with wide scope and careful survey in connection with forest types, geographical and meteorological conditions.

(6) We studied carbon accounting system. This is an issue when the project counts in the carbon credit are obtained from the project. We know that more than 3 types of methods have been already introduced.
The income by way of carbon storage can be an incentive for the project. Our simulation shows large difference in feasibility between the case of carbon storage income and otherwise. In particular, our simulation shows it grows to be a remarkable incentive when it is more than US$50 per carbon ton.

(7) According to our simulation, there are a lot of differences by each carbon accounting system. The ton-year accounting method is fit for such CDM projects as forest preservation as well as industrial plantation projects. The advance ton-year method works as an incentive for such CDM projects that need initial investment for early stage whether they are preservation projects or industrial plantation projects. Average accounting method is fit for such CDM projects as industrial plantation that repeatedly continue planting and logging.

(8) We estimated that 358,880 carbon ton would be fixed by the project case 1 for 30 years. It means 1.2 carbon ton per hectare per. Following Table-C shows the results by three cases.

Table-C Carbon Removal by each case Unit: Carbon ton

	30years	Yearly average	Average Yearly Per hectare	1-10year	11-20year	21-30year
Case 1	358,880	11,963	1.2	144,938	109,968	103,973
Case 2	220,639	7,355	0.7	102,697	61,968	55,973
Case 3	445,280	14,843	1.5	171,338	139,968	133,973

(9) Our simulation shows the project has economical sustainability on long time basis. Generally in the case of industrial plantation projects, investors wait for the first harvest nearly 10 years, therefore it results to be low profitability but after starting of commercial logging, profitability changes drastically. Therefore, if carbon storage is introduced as CDM income, it will surely work as strong incentive to encourage the project especially at the early stage.

(10) We expect ripple effects on to the other areas. In the first place, there are strong wishes from Indonesia for reforestation projects whether it is industrial plantation or otherwise. There are, still more, suitable areas for reforestation projects anywhere in the world. We understand that secondary forests in the tropical zone are strongly disturbed and consequently resulted to be extremely thin canopy structure(climax tree species). Te pattern of disturbance characterizes the transition starting from commercial logging followed by illegal logging, slash-and-burn agriculture and ending by forest fire. It means that huge secondary forests of this type are located widely in East Asia and it creates great potentiality of reforestation projects.