９．　プロジェクト設計書

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PROJECT DESIGN DOCUMENT FORM
FOR AFFORESTATION AND REFORESTATION PROJECT ACTIVITIES (CDM-AR-PDD)
- Version 02

CLEAN DEVELOPMENT MECHANISM PROJECT DESIGN DOCUMENT FORM
FOR AFFORESTATION AND REFORESTATION PROJECT ACTIVITIES
(CDM-AR-PDD)

CONTENTS

Annexes

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SECTION A. General description of the proposed A/R CDM project activity:

A.1. Title of the proposed A/R CDM project activity:

A.2. Description of the proposed A/R CDM project activity:

The project will be implemented in four sub-districts (called "Kecamatan" in Indonesia) in Probolinggo Regency covering an area of about 1,500 ha. Type of activities will be planting trees in unproductive lands owned by local communities. Some of the lands are abandoned and some are cultivated once a year for annual crops (mostly maize and cassava) because the length of rainy season is very short (3 – 4 months). According to local communities, such condition has been lasting since a long time a go (more than 50 years[1]).

In principle, the proposed project will not change the farming activities of the community but farmers will be engaged in planting a number of trees in their land but still allowing them in planting annual crops. From interview with farmers who use their land for farming activities, they expected that project will provide water pumping facilities so they can increase planting intensity from once a year into twice a year. This is to compensate the reduction of area that can be planted with annual crops due to the increase of tree crown cover.

The objectives of the projects are:

1) To increase carbon stock by planting trees in community land through Agroforestry system.
2) To reduce pressure on state natural forest to meet demand for future raw material of timber for plywood and wood manufacturing industry.
3) To increase soil productivity by making wells for watering as public utilities
4) To reduce soil degradation at steep slopes surrounding the project area
5) To improve income of local communities

As the project activities will not replace the existing activity while they can increase planting intensity and crop diversity as water for irrigation will be available from wells, thus the project will (i) increase soil productivity and planting index, (ii) reduce land degradation due to erosion as roots and canopy cover can protect land from direct rainfall, (iii) reduce run-off and increase soil water storage, (iv) increase air and water quality, and finally (v) increase income of local communities. Thus, the project may contribute to the sustainable development.

A.3. Project participants:

[1] Official Statement from head of village/sub-districts is required as stated by Ministrial Regulations Number 14/2004 on Guidance for the Implementation of AR CDM Project in Indonesia.

The project is developed by PT. Kutai Timber Indonesia (refereed as " PT KTI" hereinafter), who is plywood manufactures in Indonesia established in 1970 with the head office in Jakarta and factory in Probolinggo, East Java province. The company raises necessary substance to commence the project and will manage it together with local stakeholders, namely University of Panca Marga Probolinggo and leaders of local peoples at the project site. University of Panca Marga is responsible to establish collaboration with local community in using their lands for the project activities.

Sumitomo Forestry Co., Ltd. in Tokyo, Japan will assist the project participants in finding buyers for the CER generated by the project.

Contact Information of the project participants is provided in Annex 1.

A.4. Technical description of the A/R CDM project activity:

A.4.1. Location of the proposed A/R CDM project activity:

A.4.1.1. Host Party(ies):

Indonesia

A.4.1.2. Region/State/Province etc.:

Probolinggo district, East Java province

A.4.1.3. City/Town/Community etc:

The project sites are scattered in four sub-districts, Tongas, Lumbang, Wonomerto and Sumberasih.

A.4.1.4. Detail of geographical location and project boundary, including information allowing the unique identification(s) of the proposed A/R CDM project activity:

The project will be implemented in community lands with total area of about 1500 ha located in four sub-districts, Tongas, Lumbang, Wonomerto and Sumberasih at Probolingo Districts. On average size of land owned by the community in the four sub-districts are 0.5 ha, 0.6 ha, 2.0 ha and 0.9 ha respectively. Community normally planted mimbo (*Azadirachta incica*), jaran, kapok (*Seiba pantendra*) and other trees to fence their lands (Figure A.1). Most of communities plant their land once a year with annual crops, particularly maize and cassava.

Based on interview with farmers, they are willing to use their land for CDM projects and plant trees if they can still use their land for food crops with increasing planting intensity. This means that farmers prefer to have tree-based agroforest system, in which food crop can be planted more than once a year between trees rows to compensate the yield loss due to the establishment of the trees. To meet this condition, the KTI will establish wells in the project areas and water pumping facility for irrigation that allow farmers to plant crops more than once a year. As the capacity of one pumping facility about 20 ha, total number of wells and pumping facilities that should be developed is about 75 units.

It is estimated that total number of project participants (farmers) is about 2210 households (Table A.1).

Figure A1. Typical condition of land used for the project

Table-A.1 Project area and number of household that will participate in the projects

Name of sub-district (Kecamatan)	Area (ha)	Average landholding (ha)	Estimated number of farmers
Tongas	500	0.5	1000
Lumbang	500	0.6	835
Wonomerto	300	2.0	150
Sumberasih	200	0.9	225
TOTAL	**1,500**		**2210**

Farmers who want to joint the project will sign an agreement under the coordination of University of Panca Marga. PT KTI has made Memorandum of Understanding with the University to carry out the CDM project in the four sub-districts. As the exact location of lands being used for the project depends on which farmers will joint the project, boundary of the project is defined as the administrative boundary of the sub-districts as shown in Figure A.2.

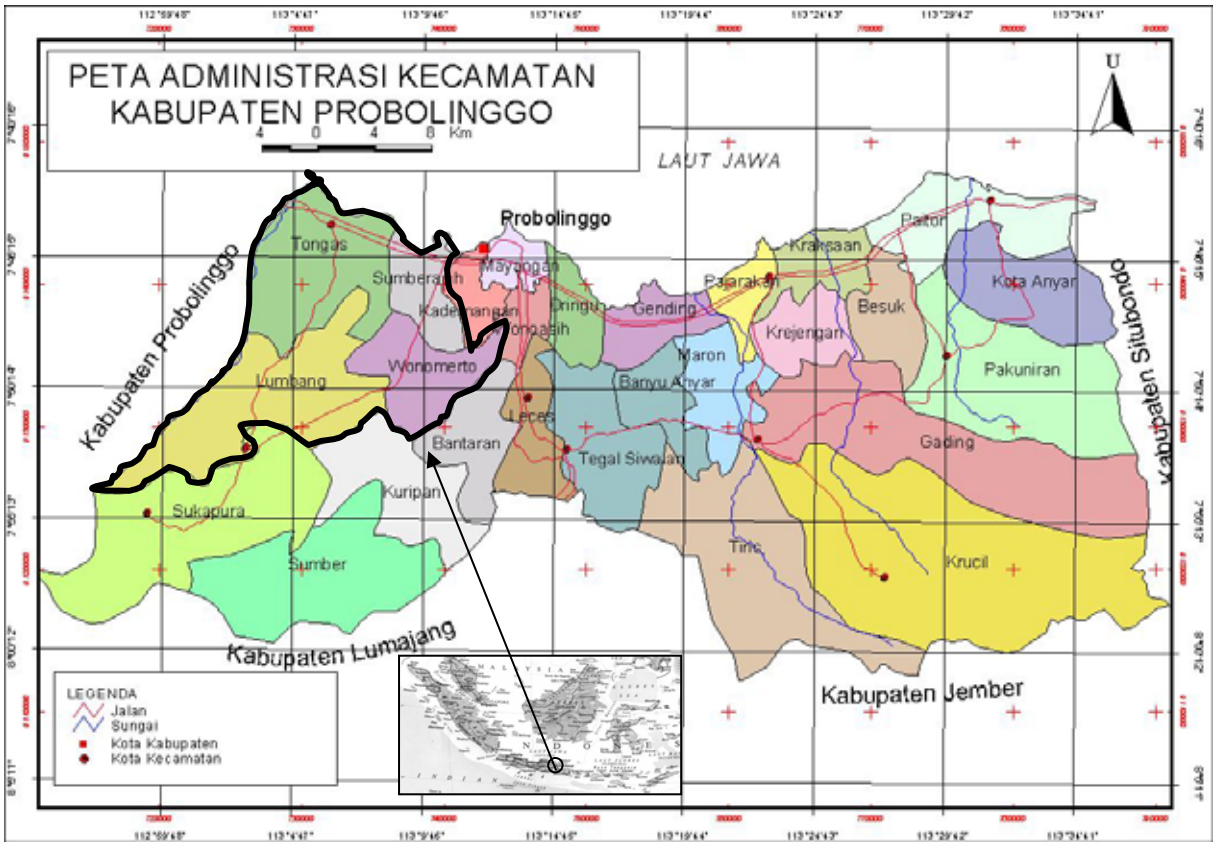


Figure A.2.　Administrative boundary of the four sub-districts where the project will be located.

A.4.1.5. A description of the present environmental conditions of the area, including a description of climate, hydrology, soils, ecosystems, and the possible presence of rare or endangered species and their habitats:

Physiographic

Project location and its surrounding area is placed on undulating to rolling region with elevation of between 50 and 100 m above sea level (asl). Geomorphology of the region is volcanic foot slope with parallel drainage pattern and 3-12% of slope. The soil surface commonly covered by various stones, ranges from pebble to gravel in size. Geologically, this region is formed by volcanic rocks and weathered volcanic rocks of Tengger and Lamongan volcanoes formation. This formation consists of volcanic sandstone, volcanic breccias, fine tuff, and andesite.

Climate

The type of climate of East Java is Tropical monsoon. Annual rainfall of Probolinggo ranges between 1.500 to 1.750 mm per year, where dry season falls between April to November, and rainy season between December to March. In the dry season the monthly rainfalls are less than 100 mm, while in wet season, they are more than 200 mm (Figure A.3). Number of rainy days is between 60-80 days a year. The maximum temperature is about 32° C and the minimum temperature around 26° C. The relative humidity is around 85 %. In dry season, particularly between July and September, sometime there is a strong wind with speed of about 81 km/hour from South East (SE) to northwest (NW). This wind is commonly called as **"***Angin Gending***"**.

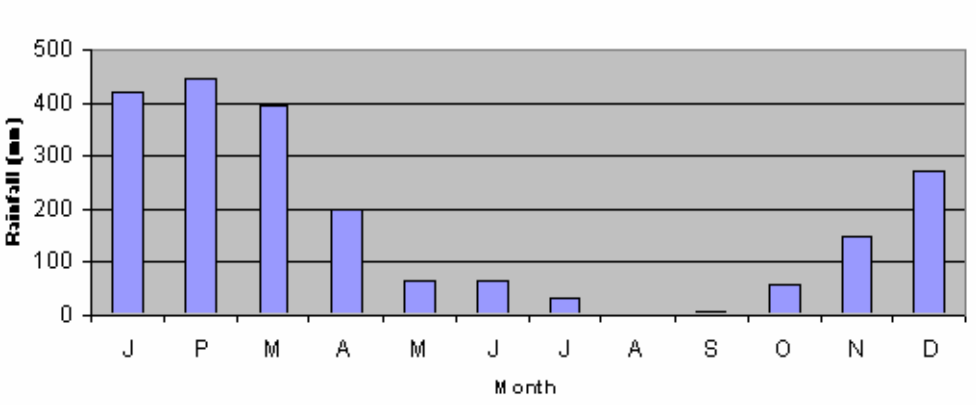


Figure A.3.　Average monthly rainfall in the project sites

Hydrology

Probolinggo has six rivers namely Kedunggaleng, Umbul, Banger, Legundi, Kasbah and Pancur rivers. In addition to rivers, it also has a number springs namely Langse, Pilang renes, Kareng, Grinting, Ardi, Sentong, Taman Pacar and Jedingan. These rivers and springs are the main source of irrigation water of rice paddy field.

Ecosystems

Existing land use are mixed garden, rainfed rice field, forest, and settlement.

Rare or endangered species and their habitats

In the project site no rare or endangered species were found

A.4.2. Species and varieties selected:

Based on the interview, farmers are strongly willing to use their land for AR-CDM projects as long as the project can increase their income. If the lands used are agriculture lands, they expect that they can still use their land for annual crops. Considering this condition, the project will employ tree-based agro-forestry system. Since this project requires additional profit for the participants, trees will cut and sold for industry. After cutting, the project will replant the same trees and continue planting activity until the end of the project. Tree species used for the project will be Gmelina (*Gmelina arborea*), waru (*Hibiscus simillis*) and Teak (*Tectona grandis*). The planting density will be a bit lower than the normal practice to allow planting annual crops between tree rows for about 5 years. Annual rate of planting will depend on number of farmers that agree to joint the project. From KTI experiences in making agreement with local community, it is targeted that number of farmers that agree to sign agreement with KTI to carry out the AR-CDM project in Probolinggo will be equivalent to 500 ha per year. Total area allocated for each species is given in **Table A2**.

Table A.2 Total area allocated for each species

No.	Local name	Common name	Scientific name	Family	Area allocated (ha)	Rate of planting (ha/yr)
1	Gmelina	White teak	*Gmelina arborea*	VERBENACEAE	675	225
2	Jati	Teak	*Tectona grandis*	VERBENACEAE	675	225
3	Waru	-	*Hibiscus simillis*	MALVACEAE	150	50

A.4.3. Specification of the greenhouse gases (GHG) whose emissions will be part of the proposed A/R CDM project activity:

CO_2, and N_2O

A.4.4. Carbon pools selected:

Above ground biomass, below ground biomass and soil organic carbon. Litters and deadwood is excluded as contribution of these pools to the total carbon will be insignificant. Some studies showed that the fine litter only contributed 0.6% and 4.99% to the total C stock in secondary forest and degraded land respectively, and only 0.3% of the dead wood is contributed to the total C stocks in the secondary forest; 1.73% litter and 3.19% dead wood in the primary forest, 1.92% litter and 34.22% dead wood in the two years old logged over forest; 1.59% litter and 2.58% dead wood in lowland tropical forest or in general it can be said that the last two pools only contributes to about less than 5% of the total C-stock (Zaini & Suhartatik, 1997; Tresnawan & Wasrin, 2002; Tiepolo, *et al.*, 2002). However, the reforestation activity will only be implemented in the secondary and degraded lands, hence the high percentage of dead wood in the logged over forest is less relevant.

A.4.5. Compliance with the definition for afforestation or reforestation:

According to Ministrial regulation Number 14/2004, forest is defined as a land whose minimum area is 0.25 ha, minimum tree crown cover is 30% and a minimum tree height is 5 m.

A.4.6. A description of legal title to the land, current land tenure and land use and rights of access to the sequestered carbon:

Legal title to the land: The land used for the project is community land, and according to Ministrial Regulation Number 14/2004, the project participants must provide proof of land ownership in the form of land certificate or '*girik*' (letter from village authorities explaining that ownership of the land).

Current land tenure and land use. Project will be implemented in community lands which are now used by communities for planting annual crops (see Figure A.1) and some are abandoned. Current land use at the four sub-districts are forests, water bodies, garden, rainfed rice, irrigated rice, dryland agriculture, resettlement and others (Table A.3).

Table A.3. Land use area at the four sub-districts

Land use	Lumbang	Sumber Asih	Tongas	Wonomerto
Irrigated rice	407,000	1,633	1,325,920	269,000
Rainfed rice	278,000	36	808,750	62,000
Dry land	4,195,000	2,598,385	4,096,720	555,600
Resettlement/Garden	363,000	501,699	1,002,230	67,658
Plantation	0	54	99,000	14,000
Forest	3,850,000	188,118	122,000	229,500
Waterbody	0	75,179	58,500	0
Others	180,000	1,481,590	346,580	43,254
TOTAL	**9,273,000**	**4,846,694**	**7,859,700**	**1,241,012**

Rights of access to the sequestered carbon: Ministrial Regulation Number 14/2004 stated that community lands are eligible to be used for AR CDM projects and this regulation provides rights of access to the sequestered carbon.

A.4.7. Type(s) of A/R CDM project activity:

Some of lands used for the project are agriculture lands that have been cultivated for more than 50 years. Some lands are grassland, and they may be a forest before 1990. Thus types of CDM projects at Probolinggo would be Afforestation and Reforestation.

A.4.8. Technology to be employed by the proposed A/R CDM project activity:

The tree species used in the A/R CDM project at Probolinggo is Teak (*Tectona grandis*) as main wood product combine with some agricultural crops such as annual food crops, horticultural crops, fruit trees and Manioc. The other species is Gmelina (*Gmelina arborea*) usually used for block-board. The planting spacing of trees is 4m x 4m for teak while annual crops are planted between the trees with

maximum harvesting period of 2 times a year (3 months –4 months). The seedlings of teak species are obtained from high quality seeds with potential increment of 37.72 m3/ha/year in average (KTI, 2003). While for Gmelina and Waru the spacing of trees planting is 3m x 3m with annual crops planted in between the trees with maximum harvesting period period of 2 times a year. As for teak, the seedlings of gmelina and waru are obtained from high quality seed stands with average potential increment of 110.2 m3/ha/yr for gmelina and 93.m3/ha/yr for waru. Combination of trees and crops selected by the project will depend on the preference of the project participants. For simplification, in these analysis types of annual crops being planted by the community are only maize and peanut in year-1 and 2 (two times of harvest), while cassava in year 3, 4 and 5 (harvesting once a year).

First cutting (harvesting) of trees is done in year 5 for Gmelina and year 6 for Waru. Total harvesting area varied from year to year. After harvesting the land is planted again. This variation is done in order to allow the total carbon standing stock in the project area increased from time to time. Annual total harvesting and planting area Gmelina and Waru is presented in Table A4.

Table A4. Total harvesting and planting area each year starting in year 5 for Gmelina and Waru. First harvesting for Teak is in year 30 (beyond the crediting period)

Year	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Gmelina	125	100	125	100	25	125	75	75	100	125	50	50	50	75	50	100
Waru	0	75	50	75	100	50	50	25	50	50	50	65	60	75	25	25

Silvicultural system used in the project locations is tree-alley crops system, where the main tree crops are combined with the agricultural crops. New silvicultural methodology that will be transferred to the farmer (planter) is new technique for forest management such as pruning, zoning, technique to combine plantation of fast growing species with medium growing species. Technology to support a sustainable forest management that compatible with international standard of ITTO will be introduced and transferred.

A.4.9. Approach for addressing non-permanence:

The project will adopt lCER.

A.4.10. Duration of the proposed A/R CDM project activity / Crediting period:

20 years

A.4.10.1. Starting date of the proposed A/R CDM project activity and of the (first) crediting period, including a justification:

Starting date of the project: November 1, 2005

Crediting period: November 1, 2005 to November 1, 2025

Justification: As the project will be implemented in community land, choosing crediting period of 20 years should be reasonable and this will ensure the environmental integrity of the project as the validity of the project baseline may change after 20 years.

A.4.10.2. Expected operational lifetime of the proposed A/R CDM project activity:

Operational life time of the proposed A/R CDM project is expected to be the same as the length of the crediting period.

A.4.10.3. Choice of crediting period and related information:

The crediting period will start on the date on which the implementation or real action of an A/R CDM project activity begins, resulting in actual net GHG removals by sinks. The date is expected will start after the project is registered by Executive Board, November 1, 2005

A.4.10.3.1. Renewable crediting period, if selected:

The decision for the renewal of the crediting period will be made at the last verification time.

A.4.10.3.1.1. Starting date of the first crediting period:

Starting date for the first crediting period is November 1, 2005

A.4.10.3.1.2. Length of the first crediting period:

20 years

A.4.10.3.2 Fixed crediting period, if selected:

A.4.10.3.2.1. Starting date:

Not Applicable

A.4.10.3.2.2. Length:

Not Applicable

A.4.11. Brief explanation of how the net anthropogenic GHG removals by sinks are achieved by the proposed A/R CDM project activity, including why these would not occur in the absence of the proposed A/R CDM project activity, taking into account national and/or sectoral policies and circumstances:

One of potential sources of raw materials for pulp and paper industries in East Java is community forest. However, number of farmers that practiced tree planting using either three-based agro-forestry system or monoculture is very little. The main reason is lack of financial capacity. From socio-economic survey, it was revealed that the expenditure of most farmers is higher than the income. About 97% of the income is for meeting primary needs (food 75% and transportation 22%) and only 3% for secondary needs. According to BKKBN classification (1995), farmers in these sub-districts can be categorized as poor.

Another factor that limits the development of timber plantation is water scarcity problem. According to farmers, local government has implement afforestation program by about 50 ha using Mahogani, Teak, Rambutan and Manggo, but the survival rate was less than 5% due to water stress[2]. With the above conditions, without financial and technical support from outside parties, it is very unlikely that local communities will plant trees with their own effort.

Willingness of entities such as pulp and paper industrial companies or investor from overseas to provide financial support for community to establish tree plantation (HTI) is very low as the internal

[2] Official Document is required to support the statement.　District Forest Office may have the document.

rate of return of the HTI is low (APHI, 2002; Subhan, 1998; Kusuma, 1995; Hakim, 1995; Utami, 1995), and B/C could be less than 1.0 (Boer, 2001). On the other hand, investor from overseas are also not interested to invest in the country for the development of HTI due to unfavorable climate for investment, such as high transaction cost (APHI, 2002). Through AR-CDM project, forest industrial companies are willing to provide the financial support for communities, as they will get additional benefit from the carbon incentive. This condition will increase community participation in developing tree-based agroforest system in East Java and finally it will increase anthropogenic removals of greenhouse gas (GHGs) by sinks.

From the interview, the local communities at Probolinggo have shown their interest to develop tree-based agro-forestry system as this activity would increase their income significantly. From two hectare of land, farmers could get additional income of about Rp100 million after 12 years (from 80 trees using 6 years rotation). Some studies also showed that agro-forestry system is economically attractive as the Internal Rate of Return (IRR) is higher than commercial interest rate (Ahmad, 1989; De Graff & Dedwinarsito, 1987; Ferguson, 1988; Hout, 1984; Leeuwen, 1989; Michon, G. 1987; Boer & Hendri, 2003). Even though such activities are economically feasible, however, it **would not be in place** in the project location due to a number of reasons. Some of the important reasons are:

1. Lack of financial support. Most farmers in Java are subsistence farmers and many of them are trapped by Money Lenders. Therefore, without financial support from outside sources, such activities will not exist.
2. High drought risk. The project site has long dry season (with Dry season of more than or equal to 8 months), and therefore survival rate of trees is very low. This condition discourages local communities to implement such activities.
3. Market barrier. Without the project, PT KTI would have purchased their timber from another local market. Eventually people in this area would not have participated in the market of the timber.

Thus the proposed project will increase the net anthropogenic GHG removals by sinks as the project will increase the total carbon stock in community lands from the tree planting. Under normal practice, farmers only plant their lands with annual crops. Risk of leakage may be low as the proposed project will not displace the current activities, thus it will not encourage local community to open new land in other forest areas.

A.4.11.1. Estimated amount of net anthropogenic GHG removals by sinks over the chosen crediting period:

The project is expected to sink an average of 7 tones of CO2 equivalent per hectare/year. At the expected project size of 1.500 hectares there would be approximately 216,996 net tones sunk over the crediting period (20 years).

A.4.12. Public funding of the proposed A/R CDM project activity:

No public fund will be used (see Annex I).

SECTION B. Application of a baseline methodology

B.1. Title and reference of the approved baseline methodology applied to the proposed A/R CDM project activity:

There is no specific baseline methodology available to apply at the present. The new baseline methodology is proposed "*Reforestation of crop land using tree-based agroforest system*"

B.1.1. Justification of the choice of the methodology and its applicability to the proposed A/R CDM project activity:

There are three general approaches to define baseline for A/R CDM projects

- ☑ Existing or historical, as applicable, changes in carbon stocks in the carbon pools within the project boundary;
- ☐ Changes in carbon stocks in the carbon pools within the project boundary from a land use that represents an economically attractive course of action, taking into account barriers to investment;
- ☐ Changes in carbon stocks in the pools within the project boundary from the most likely land use at the time the project starts.

The proposed project use first approach as most of farmers of dry land agriculture are subsistence farmers with a very small land holding and low income. Normally they rely very much on their land to supply food. Thus the existing condition will continue to the future if no interventions from outside or change in land use policy. With this argument, the first approach is considered as the most appropriate.

B.2. Description of how the methodology is applied to the proposed A/R CDM project activity:

The proposed new methodology used the following assumptions:

- The proposed project area are implemented in dry land which have been used by local community for agriculture activities for a long time or in abandoned land
- Communities in the project area are financially not capable of establishing forest plantation without any support from others.
- The community will not change their attitude in using their land if no intervention or forcing from outside, while industrial forest companies is not willing to establish tree-based agroforest in community land without carbon incentive.

- There will be no drastic change in government policy and regulation.
- All the emission factors, conversion factors (such as biomass expansion factors) adopted from IPCC-GPG are assumed to be applicable for the project.
- Price of fossil fuel and fertilizers is assumed to be stable for the whole project period.

Key information and data used to determine the baseline scenario are:

- Land use policy (land use plan map) and rehabilitation program were taken from official documents
- Land use map was interpreted from satellite LANDSAT TM+
- Biomass data (baseline carbon standing stock) in crop lands where the project will be located was measured through field sampling while those of other land uses were taken from available local data or IPCC-GPG.
- Mean annual increment of species was estimated based on available local data and local research
- Emission factors used for estimating GHG emission from energy and fertilizer consumption were derived from the revised 1996 IPCC guideline.
- Energy and fertilizer consumption of household were collected from household survey

B.3. Description of how the actual net GHG removals by sinks are increased above those that would have occurred in the absence of the registered A/R CDM project activity:

To test whether the project is additional or not, the baseline methodology includes the proposed additionality test as the following:

Based on data from 1880 to 1990, it was found that after 1950 area of agriculture land in Java did not increase significantly (Table A.4). It tends to be constant as the availability of land for agriculture development. This condition can justify that agriculture lands allocated for AR-CDM project in the four sub-districts may not change in the future. While lands outside the project locations and within the project boundaries may change in the future under the baseline condition. The main change would be conversion from agriculture land into resettlement/industrial areas, as the demand for resettlement will increase in the future. Data in Table A.5 indicated that after 1970 total area of rice paddy start to decrease a rate of about 0.11% per year. Many reports stated that the rice field area in Java decreased due to its conversion to resettlement and industrial areas. In addition, some of critical lands may be reforested by local government using rehabilitation fund. In the period from 2004-2007, local government has a target to rehabilitate the critical land in each sub-district at rate of about 50 ha per year (Table A.6).

Table A.5.　Area of agriculture land in Java from 1880 to 1990 (in thousand ha)

Year	Rice Field	Dry Lands	Gardens	Total
1880	2.427	1.261	756	4.444
1890	2.745	1.197	868	4.819
1900	2.855	1.493	991	5.338
1910	2.910	1.965	1.116	5.991
1920	3.146	2.757	1.243	7.121
1930	3.274	3.228	1.144	7.646
1940	3.384	3.132	1.411	7.928
1950	3.415	3.364	1.361	8.140
1960	3.483	3.490	1.422	8.395
1970	3.499	3.238	1.505	8.241
1980	3.491	2.695	1.554	7.740
1990	3.421	3.136	1.659	8.216

Source: Van der Eng (1997).

Table A.6. Rate of planting in the four districts under government plan in the period of 2004-2007

Sub-district	2004	2005	2006	2007
Lumbang	100	50	50	50
Sumber Asih	50	75	50	25
Tongas	75	75	50	100
Wonomerto	0	0	25	0

Source: Forestry Office (2004)

Considering these facts, we can adopt that the conversion of agriculture land to residential areas or housing complex and conversion of critical land to plantations using rehabilitation fund are not attributable to the AR-CDM. We can simply said that the change in carbon stock within the project boundary due to these two changes should not affect the actual net GHG removals by sinks as long as the rate of planting is not more than the government target. In order to confirm the validity of this assumption, any change in land use that occurs within project boundary after the implementation of AR-CDM project should be monitored.

From the above explanation we can conclude that the baseline net GHG removals by sinks scenario would be likely below actual net anthropogenic GHG removals by sinks in the project scenario (see explanation in section A4.11). Under the baseline scenario, the carbon stock in the project location will be the carbon stock of agriculture land or fallow/abandoned

land (Table A.7) and under project scenario, the carbon stock from trees planted under AR CDM project will be additional.

Table A.7.　Total carbon stock in lands used for AR CDM project under baseline scenario

Location	Baseline	Object	Amount (CO_2-ton/ha)
Probolinggo	Agriculture land with some trees	Existing tees	0.92
Probolinggo	Fallow and bare land	Grassland	0.35

This table was developed by PT KTI estimation based on ground survey from 2003 to 2004.

B.4. Detailed baseline information, including the date of completion of the baseline study and the name of person(s)/entity(ies) determining the baseline:

Date of the final text of this baseline section:
31 March 2005

Name of Person/Entity Determining the Baseline:
Sumitomo Forestry Co., Ltd.,
Tokyo, Japan
Contact: Dr. Ryo Soda (rsoda@sfc.co.jp)
and
Bogor Agricultural University
Kampus IPB Darmaga
Bogor
Contact: Dr. Rizaldi Boer (rboer@fmipa.ipb.ac.id)

SECTION C. Application of a monitoring methodology and of a monitoring plan

C.1. Title and reference of approved monitoring methodology applied to the project activity:

No approved monitoring methodology available when the project is developed thus new monitoring methodology is proposed under this project.

C.2. Justification of the choice of the methodology and its applicability to the proposed A/R CDM project activity:

As the monitoring methodology for the proposed project is not available, new monitoring methodology is proposed under this project called “Monitoring/verification protocol for reforestation of crop land using tree-based agroforestry system”

C.3. Monitoring of the baseline net GHG removals by sinks and the actual net GHG removals by sinks:

C.3.1. Actual net GHG removals by sinks data:

C.3.1.1. Data to be collected or used in order to monitor the verifiable changes in carbon stock in the carbon pools within the project boundary resulting from the proposed A/R CDM project activity, and how this data will be archived:

ID number	Data variable	Source of data	Data unit	Measured (M), calculated (C) or estimated (E)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
S1	AGB	Sampling Plot	Ton/ha	M, C, E	Prior to project implementation and then every 5 years	100%	Electronic and paper	Project participant will measure the DBH of each trees Project Developer will calculate and estimate AGB and C sink
S2	BGB	Sampling Tree	Ton/ha	C, E	Prior to project implementation and then every 5 years	Sampling	Electronic and paper	Project Developer will calculate and estimate DGB from AGB using conversion factors and C content
S3	Soil Carbon	Sampling Sub-Plot	Ton/ha	M, C, E	Prior to project implementation and then every 5 years	Sampling	Electronic and paper	Project Developer will analysis and monitor Soil Carbon using sampling techniques.

C.3.1.2. Data to be collected or used in order to monitor the GHG emissions by the sources, measured in units of CO2 equivalent, that are increased as a result of the implementation of the proposed A/R CDM project activity within the project boundary, and how this data will be archived:

ID number	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
E1	Use of fossil fuel for transportation	Field survey	Litter per HH	C and E	Prior to project implementation, 2010 and then every 5 years	100% for Project Participant (PP) &10% for non-PP	Electronic and Paper	Due to project activity, transportation intensity may increase
E2	Fossil fuel consumption for harvesting	Field survey	Litter per m^3 wood	C and E	The same as rotation period	100% for Project Participant (PP)	Electronic and Paper	Will be monitored at harvesting time
E3	Use of fossil fuel for pumping water	Field survey	Litter per m^3 water	C and E	Every year	100% for Project Participant (PP)	Electronic and Paper	Will be monitored based on the number of days of operation
E4	Use of Nitrogen fertilizer	Field survey	Ton per ha	C and E	Every year	100% for Project Participant (PP)	Electronic and Paper	Increase of nitrogen application due to the tree planting
E5	Energy: Fossil fuel and electric energy	Field survey	Liter and Kwh	M/C/E	Annually started from the 7^{th} year and the end of crediting period	100 %	Electronic and or paper	Increase of energy consumption due to the increase of income

C.3.1.3. Description of formulae and/or models used to monitor the estimation of the actual net GHG removals by sinks:

C.3.1.3.1. Description of formulae and/or models used to monitor the estimation of the verifiable changes in carbon stock in the carbon pools within the project boundary

CO_2	Above ground biomass: (S1=ton CO_2)	AGB=(0.3*D^2H*N)*D*BEF*0.5*44/12
CO_2	Below ground biomass: (S2=ton CO_2)	BGB=R*AGB
CO_2	Amount of soil organic carbon increase after the project is started. (S2=ton CO_2).	Area (ha)*rate of soil carbon increment at a depth of 20 cm (t/ha/year)* 44/12

Note: D: diameter breast height (m), H: tree height (m), N: number of tree per ha, 0.3 is coefficient of the allometric equation estimated from field data, D is wood density (0.4 t/m^3 for Gmelina, 0.45 t/m^3 for Waru and 0.7 t/m^3 for Teak), and BEF, biomass expansion factor for conversion of merchantable volume to above ground tree biomass (1.85), 0.5 is carbon fraction and 44/12 factor to convert carbon into CO_2. R is root:shoot ratio (0.24). With BEF=1.85 and R=0.24, the total biomass (AGB+BGB) is the same as 2.29* weight of merchantable wood. Based on findings in Jambi and Lampung (Palm et al., 1999), it was suggested that if degraded land or imperata grassland were reforested into agro-forest systems with 25 years rotations, the amount of soil carbon at 0-20 cm depth would increase from 25 tC ha^{-1} to about 50 tC ha^{-1} or equivalent to about 1.0 tC ha^{-1} yr^{-1}. As the land used for the project is agriculture lands, the conversion of this land to agro-forest systems may increase the soil carbon. In this analysis, we assumed that the increase in soil carbon at year 1 in newly planted area is 0.2 tC ha^{-1}, in year 2 is 0.40 tC ha^{-1}, in year 3 is 0.60 tC ha^{-1}, in year 4 is 0.80 tC ha^{-1}, in year 5 to year 20 is 1.0 tC ha^{-1}.

C.3.1.3.2. Description of formulae and/or models used to monitor the estimation of the GHG emission by sources, measured in units of CO_2 equivalent, that are increased as a result of the implementation of the project within the project boundary

CO_2	Emission from transportation of seedling materials (E1=ton CO_2)	Number of seedling (N)/loading capacity of vehicle*2 driving distance from nursery to planting site (km)*fuel efficiency of the vehicle (km/liter)*calorific factor (MJ/liter)* emission factor (kg CO_2/MJ)/1000
CO_2	Emission from wood harvesting (E2=ton CO_2)	Number of harvested trees*fuel consumption/100 trees (liter) *calorific factor (MJ/liter)* emission factor (kg CO_2/MJ)/1000
CO_2	Emissions from water pumping facilities (E3=ton CO_2)	Length of pump operation (days)*Pump efficiency (liter/day)*calorific factor (MJ/liter)* emission factor (kg CO_2/MJ)/1000

N_2O	Emissions due the increase use of nitrogen fertilizer for tree (E4=ton CO_2-eq)	Planting Area (ha)*fertilizer consumption (ton N/ha)* emission factor*conversion ratio*310
CO_2	Emission due to the increase use of fossil fuel by project participant due to increase of the income from the AR-CDM projects (E5= ton CO_2)	Fuel consumption (liter)*calorific factor (MJ/liter) x emission factor (kg CO_2/MJ) / 1000

C.3.2.1. Description of formulae and/or models used to monitor the estimation of the baseline net GHG removals by sinks (for each carbon pool, in units of CO2 equivalent):

CO_2	Carbon loss from agriculture land conversion to housing complex (LU1=ton CO_2)	Area being converted (ha)*(Biomass density before conversion - Biomass density after conversion) (t/ha) *carbon fraction*44/12
CO_2	C-sequestration from reforestation project under government program (LU2=ton CO_2)	MAI (t C ha^{-1} yr^{-1})*Area (ha)*Rotation (yr)*Carbon fraction of the biomass*44/12
CO_2	Carbon loss from agriculture land conversion to other land uses (LU3=ton CO_2)	It would be similar to LU1 or LU2 depending types of conversion.

C.4. Treatment of leakage in the monitoring plan:

C.4.1. If applicable, please describe the data and information that will be collected in order to monitor leakage of the proposed A/R CDM project activity:

ID number	Data variable	Source of data	Data unit	Measured (M), calculated (C) or estimated (E)	Recording frequency
L1	Energy: Fossil fuel for transporting harvested wood	Secondary data from log transportation document	liter	C and E	Daily, during harvesting time
L2	Energy: Fossil fuel used for transportation and industrial activity	Secondary data from Statistic of Sub-district or county and annual report of industries and logging trucks mobility.	Liter and Kwh	C and E	Annually according to the factories' annual report, started from the 7th year and the end of crediting period
L3	Deforestation: Land size	Secondary data i.e. land use land cover map, RTRWP, and Field survey	Ha	E	Annually started from the 7th year and the end of crediting period

C.4.2. Description of formulae and/or models used to estimate leakage (for each GHG, source, carbon pool, in units of CO2 equivalent:

CO_2	Emission due to the use of fossil fuel for transporting harvested wood from project site to wood processing factory (L1= ton CO_2)	Volume of harvested wood (m^3)*loading capacity of vehicle (m3/truck)*2 driving distance from project site to (km)*fuel efficiency of the vehicle (km/liter)*calorific factor (MJ/liter)* emission factor (kg CO_2/MJ)/1000
CO_2	Use of fossil fuel in the region due to the increase of transportations and industrial activities as the economic condition of the region increase (L2= ton CO_2)	It is not estimated if the project does not affect regional economy. The method use for estimating the emission will follow the 1996 IPCC methodology
CO_2	Deforestation (L3= ton CO_2)	If the project activity does not result in the displacement of activities or people, the project will not cause the increase of deforestation.

[1]Wood from plantation has lower rendement than wood from state natural forest. Thus by changing raw wood material from state natural forest to plantation, the amount of raw wood required to produce 1 m^3 plywood and woodworking will be higher.

C.4.3. Please specify the procedures for the periodic review of implementation of activities and measures to minimize leakage:

Table C.4.3.1. Monitoring of Leakage in Timber Transportation

ID	Planting year	Timber's origin				Transportation capacity for each trip	Transportation's fossil fuel consumption (litres/km)	Notes
		Inside Project		Outside Project				
		Volume (m^3)	Average Distance (km)	Volume (m^3)	Average Distance (km)			
L1	2010							
	2017							
	2024							

Table C.4.3.2. Monitoring of Energy Consumption resulted from Income Multiplier

ID	Year	District	Economic Growth (%)	Industry Growth (%)	Energy Consumption		Note
		Sub District			Industry (l/kWh)	Transportation (l/kWh)	
L2	2010	District - 1					
		-					
		-					
		District - 2					
		-					
		-					
	2011	District - 1					
		-					
		-					
		District - 2					
		-					
		-					

	2024	District - 1					
		-					
		-					
		District - 2					
		-					
		-					

Table C.4.3.3. Monitoring of State Forests Deforestation

ID	Year	Deforestation			Note
		Forest Function (Protection/ Production/ Conservation)	Location (District/ Sub- District)	Size (ha)	
L3	2010				
	2011				
	2012				
	2013				
	2014				
	↓				
	2024				

C.5. Description of formulae and/or models used to estimate net anthropogenic GHG removals by sinks for the proposed A/R CDM project activity (for each GHG, carbon pool, in units of CO2 equivalent):

Formula to calculate the carbon stock change under baseline scenario (under the absence of AR CDM Project) is the following:

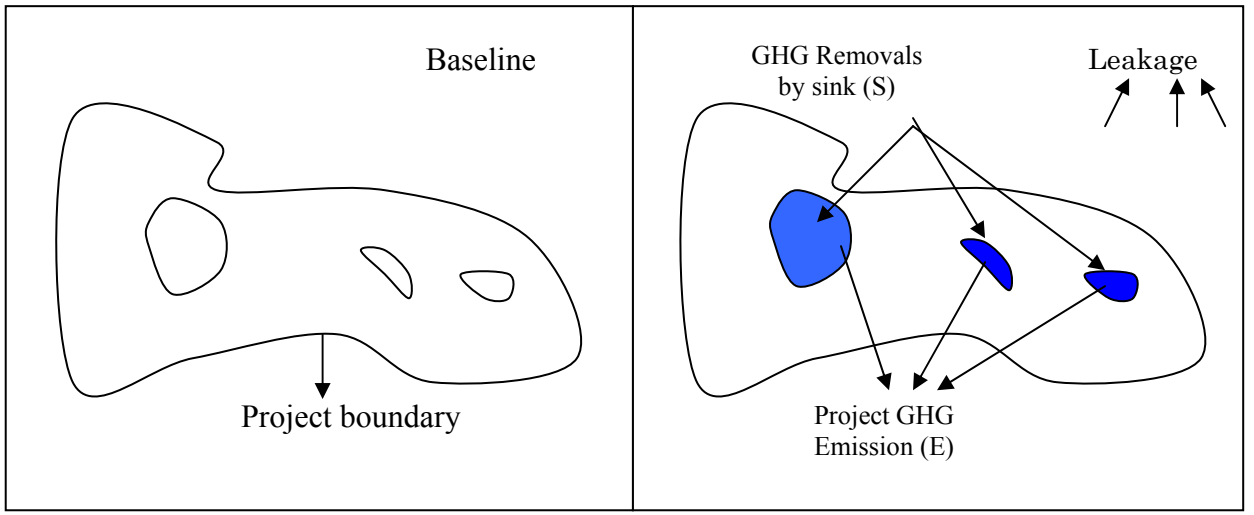
$$C = \sum_{i=1}^{M}\sum_{j=1}^{N}[S_{i,j}(TE) - S_{i,j}(TB)]_B$$

Where,
C is net baseline GHG removal by sinks
i=1, 2, 3,…, M index for landscape unit within the project boundary;
j=1, 2, 3,…, N index for carbon pools (above-ground biomass, below-ground biomass, etc);
$S_{i,j}$ = stock of carbon on landscape unit-*i*, in carbon pool-*j*
TB= Beginning year of the accounting period
TE= Ending year of the accounting period

While formula to calculate carbon stock change under project scenario basically follow land-based accounting system proposed by IPCC Special Report on LULUCF namely (Noble *et al.*, 2000):

$$Q = \sum_{i=1}^{M}\sum_{j=1}^{N}[S_{i,j}(TE) - S_{i,j}(TB)]_P - \sum_{k=1}^{R}A_k$$

Where,
Q is total carbon sequestered or released (*net anthropogenic GHG removal by sinks*),
i=1, 2, 3,…, M index for landscape unit within the project boundary;
j=1, 2, 3,…, N index for carbon pools (above-ground biomass, below-ground biomass, etc);
k=1, 2, 3, …, R index for adjustment;
$S_{i,j}$ = stock of carbon on landscape unit-*i*, in carbon pool-*j*
TB= Beginning year of the accounting period,
TE= Ending year of the accounting period,
A= Adjustment term to account for leakage, baseline, uncertainty etc.　Based on COP-9 decision, the A factors are limited to baseline (C), and leakage (L) (Figure C.1).



C. Baseline net GHG removal by sinks: − By present vegetation − By anticipated future scenario	B. Actual net GHG removal by AR-CDM (S-E): − By the AR activity (S) − Reduced by actual project emissions (E) A. Leakage (increase GHG emission outside project boundary) Q. Net anthropogenic GHG removal by sinks = (B-C-L)

Figure C.1.　Illustration of the calculation net anthropogenic GHG removal by sinks

Formulas used for estimating the net anthropogenic GHG removal by sinks are presented in the previous sections (sections C3.1.3, C.3.2.1 and C4.2).

C.6. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored:

Data	Uncertainty level of Data (High/Medium /Low)	Are QA/QC procedure are planned in these data?	Outline explanation why QA/QC procedure are or are not being planned
S1	Low	Yes	This data constitute the important information for the forest stand increment, therefore its QA/QC procedures are regularly improve and standardize to get an accurate estimation of the AGB and C content of the said land use type.
S2	Medium	Yes	This data constitute the important information for the forest stand increment, therefore its QA/QC procedures are regularly improve and standardize to get an accurate estimation of the BGB and C content of the said land use type
S3	Medium	Yes	This data is important particularly for the area with steep slope that is potential for erosion. However, since the measurement is done on sampling procedure, the uncertainty level is consider as medium, although the methodology of measurement is regularly improve in order to increase the QA/QC.
E1	Low and Medium	Yes and No	Cross checking with others will be done
E2	High	Yes	Cross checking with others will be done
E3	High	Yes	Same as above
E4	High	Yes	Same as above
E5	High	Yes	Same as above
LU1	Medium	Yes	QA/QC is existed for the initial data on land use and land cover inventory using satellite data. However, since the estimation of AGB is based on the sampled land use land cover (multi-strata measurements) the estimation of AGB for removals sinks is consider as medium level, although it is varies according to the types of land uses and land covers.
LU2	Medium	No	Data will be supplied by other organization at the local and provincial levels.
LU3	Medium	No	Data will be supplied by other organization at the local and provincial levels
L1	High	Yes	Break down of timber volume and origin as well as the vehicle transporting entering PT. KTI recorded well, thus enable to count the fossil fuel needed.
L2	Medium	No	Data is to be supplied by SUSENAS, however it is considered to be negligible
L3	-	-	It is considered to be negligible

C.7. Please describe the operational and management structure(s) that the project operator will implement in order to monitor actual GHG removals by sinks and any leakage generated by the proposed A/R CDM project activity:

Project operators that will monitor actual GHG removals by sinks and any leakage generated by the proposed A/R CDM project activity are:

1. Farmers who engage in the project (project participants) will monitor diameter of all tree planted in their land as AR CDM project
2. Staff of KTI will do socio-economic survey to monitor fuel and fertilizer consumptions by project participants and monitor the use of fossil fuel for transportations and for wood processing attributable to the project as well as land use change within the project boundary

C.8. Name of person/entity determining the monitoring methodology:

Name of Person/Entity Determining the Baseline:
Sumitomo Forestry Co., Ltd.,
Tokyo, Japan
Contact: Dr. Ryo Soda (rsoda@sfc.co.jp)
and
Bogor Agricultural University
Kampus IPB Darmaga
Bogor
Contact: Dr. Upik Rosalina Wasrin (wasrinsy@indo.net.id) and Dr. Hardjanto (hardjanto@cbn.net.id)

SECTION D. Estimation of net anthropogenic GHG removals by sinks:

D.1. Estimate of the actual net GHG removals by sinks:

Decision 19/CP.9 defined that "Actual net greenhouse gas removals by sinks" is the sum of the verifiable changes in carbon stocks in the carbon pools within the project boundary, minus the increase in emissions of the greenhouse gases measured in CO_2 equivalents by the sources that are increased as a result of the implementation of the afforestation or reforestation project activity, while avoiding double counting, within the project boundary, attributable to the afforestation or reforestation project activity under the CDM. Figure A.2 (see also illustration in Figure C.1) shows that the boundary of this project is administrative boundary of the four sub-districts. However, as the change in carbon stock outside the location of the project but within the project boundary under the absence and the presence of the AR CDM project is assumed to be the same, therefore, in this methodology, actual net greenhouse gas removals by sinks is calculated only in lands where the AR CDM project is implemented (using equations described in C.3.1.3.1). However, if after the project is implemented, land use conversion other than LU1 and LU2 occurs within the project boundary, the reasons for such conversion should be investigated, except for LU2, if the rate of conversion is still less than the that of government plan, then it is still defined as baseline. If the change is attributable to the AR-CDM, it would affect the Net anthropogenic GHG removal by sinks. Furthermore, the increase in GHG emissions as a result of the implementation of the afforestation or reforestation project activity is estimated using equations described in section C.3.1.3.2. The result of analysis is given in Table D.1 and D2.

Table D1. Total aboveground biomass, below ground biomass and total increase in soil carbon

Year	AGB	BGB	Soil Carbon	Total
	S1	S2	S3	
1	26	6	367	399
2	273	66	1100	1439
3	2438	585	2200	5223
4	11835	2840	3300	17976
5	29237	7017	4033	40287
6	56217	13492	4345	74054
7	83715	20092	4418	108224
8	103081	24739	4253	132074
9	120158	28838	4363	153360
10	123655	29677	4327	157659
11	125849	30204	4437	160490
12	126203	30289	4583	161075
13	136220	32693	4528	173441
14	145244	34858	4418	184521
15	153130	36751	4528	194410
16	154016	36964	4393	195373
17	154427	37062	4283	195772
18	153181	36764	4026	193971
19	170993	41038	4154	216186
20	171888	41253	4118	217259

Table D.2. *Emissions of the greenhouse gases measured in CO_2 equivalents by the sources that are increased as a result of the implementation of the AR CDM Project*

	E1	E2	E3	E4	E5	E
1	151.6	0.0	9.1	373.7	0.0	534.4
2	287.3	0.0	18.3	373.7	0.0	679.3
3	407.3	0.0	27.4	373.7	0.0	808.4
4	363.7	0.0	27.4	0.0	0.0	391.1
5	341.5	6.4	27.4	93.4	0.3	469.0
6	340.5	8.9	27.4	130.8	0.8	508.4
7	328.9	8.9	27.4	130.8	1.1	497.1
8	264.0	8.9	27.4	130.8	1.1	432.2
9	264.0	6.4	27.4	93.4	1.7	393.0
10	264.0	8.9	27.4	130.8	1.4	432.5
11	189.4	6.4	27.4	93.4	2.5	319.1
12	189.4	5.1	27.4	74.7	3.1	299.8
13	189.4	7.6	27.4	112.1	1.6	338.2
14	189.4	8.9	27.4	130.8	1.5	358.0
15	189.4	5.1	27.4	74.7	2.7	299.4
16	183.1	5.9	26.5	85.9	2.7	304.1
17	6.3	5.6	25.6	82.2	3.0	122.7
18	0.0	7.6	24.7	112.1	2.2	146.6
19	0.0	3.8	24.7	56.0	3.4	88.0
20	0.0	6.4	24.7	93.4	2.2	126.6

D.2. Estimated baseline net GHG removals by sinks:

"Baseline net greenhouse gas removals by sinks" is defined as the sum of the changes in carbon stocks in the carbon pools within the project boundary that would have occurred in the absence of the afforestation or reforestation project activity under the clean development mechanism (CDM). The change in carbon stocks in the pool under baseline is estimated as follows: (1) the carbon stock in lands where the project will be implemented is measured through survey as shown in Table A.6) and (2) the carbon stock in lands outside the location of the project but within the boundary of the project is measured if LU2 occurs at a rate of more than government plan and LU3 occurs due to the implementation of the project. In this analysis the calculation is only done for (1) not for (2) since it was assumed that there will be no difference in carbon stocks in the pools outside the location of project activities but within project boundary under the presence and the absence of project activities. Considering the project will not displace the current activities and the participant farmers may increase planting intensity of annual crops to compensate the loss of lands due to tree planting after the project is implemented and no cutting for fence trees, the carbon stock in lands under the absence of the project will be similar to the carbon stock prior to the implementation of the project. With this argument we can estimate that the changes in carbon stock in lands where the project being implemented under the absence of the projects will be insignificant.

D.3. Estimated leakage:

"Leakage" is the increase in greenhouse gas emissions by sources which occurs outside the boundary of an afforestation or reforestation project activity under the CDM which is measurable and attributable to the afforestation or reforestation project activity.

In this project, the increase in emission outside project boundary is only due to the increase of transportation intensity for transporting harvested wood from project location to wood factory

(L1). The effect of project on community is positive, however, it is not large enough to affect regional economy. The result of financial calculation shows that the project has a - 6,5 % IRR rate. This means that the project which will be executed is able to return on investment in such level of interest rate, where the project can only be executed through soft loan. With that indicator, it can be assured that even the project give beneficial to the participants, it is relatively very small, where the increase of income will be used for primary consumption. Therefore, there will not be any increase in fuel consumption. With such small increase of income, further multiplier effect will not happen even if the whole income is spent within the area where the people live. It means that the activity of regional economy before and after A/R CDM project will not change. This also means that the income acquired from A/R CDM project will not be able to increase the activity of regional economy. Thus, the increase in the use of fossil fuel for transportations and industrial activities as a result of the improvement of economic condition of the region from the project can be ignored (L2). Similarly for L3, the project will not increase the rate of deforestation outside project boundary as the project activity does not result in the displacement of activities or people. Result of analysis is presented in Table D.3.

Table D3. The increase in emission outside project boundary

Year	L1	L2	L3	Total
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	31	0	0	31
6	50	0	0	50
7	81	0	0	81
8	103	0	0	103
9	94	0	0	94
10	136	0	0	136
11	140	0	0	140
12	141	0	0	141
13	113	0	0	113
14	117	0	0	117
15	106	0	0	106
16	136	0	0	136
17	143	0	0	143
18	157	0	0	157
19	91	0	0	91
20	136	0	0	136

D.4. The sum of D.1 minus D.2 minus D.3 representing the net anthropogenic GHG removals by sinks of the proposed A/R CDM project activity:

The Net anthropogenic GHG removal by sinks is the actual net GHG removal by sinks (D1) minus baseline (D2) minus leakage (D.3).

D.5. Table providing values obtained when applying formulae above:

Table D.4. Actual net GHG removal by sinks, baseline, leakage and net GHG removal by sinks

Year	ANGR	Baseline	Leakage	NGR
1	-135	0	0	-135

2	760	0	0	760
3	4415	0	0	4415
4	17584	0	0	17584
5	39818	0	31	39787
6	73545	0	50	73495
7	107727	0	81	107646
8	131642	0	103	131539
9	152967	0	94	152873
10	157227	0	136	157091
11	160171	0	140	160031
12	160775	0	141	160634
13	173102	0	113	172989
14	184163	0	117	184046
15	194110	0	106	194004
16	195069	0	136	194933
17	195649	0	143	195506
18	193824	0	157	193667
19	216098	0	91	216007
20	217132	0	136	216996

SECTION E. Environmental impacts of the proposed A/R CDM project activity:

E.1. Documentation on the analysis of the environmental impacts, including impacts on biodiversity and natural ecosystems, and impacts outside the project boundary of the proposed A/R CDM project activity:

In general, the CDM project would have negative impacts faced, but positive impact might be much higher than the negative ones. Though environmental negative impact may occur for example the loss of topsoil caused by nursery, erosion after land clearing, however, the positive impacts will be higher after the AR-CDM project physically succeeds. The social-economic impact would also be higher than its negative ones. Employment vacancies, increasing income etc., were more valuable than the possibly generated negative impact.

In case of timber plantation with large-scale coverage (usually minimal 10 – 12 thousand ha), Environmental Impact Assessment (EIA) must be conducted (Minister of Environment Decree No.3 Year 2000 on ”Type of Business Plan and/or activity that must be accompanied by EIA”). As the size of the project was only 1500 ha, the EIA is not required. However, based on regulation the EIA should be implemented for any activities/project that may have significant impact to the environment and socio-economic aspect of the community irrespective of scale of activities (Minister of Environment Decree No.17 Year 2001 on ”Type of Business Plan and/or activity that must be accompanied by EIA”). In the case of LULUCF-CDM project, where planting trees normally took place in critical land or opened land, the impact on environment might be mostly positive.

Based on Government Regulation No.29/1986 in Article 3, Verse 2, the important indicators that need to be monitored to evaluate the impact include number of people that will be harmed, size of the region that will be affected, period and intensity of impact, number of other environment components that will be harmed and the characteristics of the impacts. Characteristics of the impact include no impact (0), positive impact (+), negative impact (-), usefulness (U), contradictory (C), problems (P), the impact would be short-term (S); long-term (L); reversible (R) and irreversible (I).

Table 12. Source of impact and the characteristics of impact on socio-economic condition

Source of impacts	Positive impacts	Negative impacts
Pre-planting activities		▪ Social unrest concerning certainty of land use ▪ Fear on the reduction of rights on land ownership.
Planting	▪ Employment opportunity ▪ Income source	
Maintenance (tending)	▪ Employment opportunity ▪ Income source ▪ Encouraging the emergence of business for supplying production factors.	
Harvesting	▪ Employment opportunity ▪ Income source ▪ Encouraging the emergence of supporting business, such as transportation business.	

Source: KTI and ITS (2004)

Table 13.　Source of impact and the characteristics of impact on biophysical condition

Source of impacts	Positive impacts	Negative impacts
Pre-planting activities:		
Land clearing	Not applicable as the project will be done in dry land where the lands are already clear	Not applicable as the project will be done in dry land where the lands are already clear
Planting activities:		
Planting	▪ Increase soil carbon	
Nursery		▪ increase the use of water
Transportation of seedlings		▪ increase road damage and GHG emissions from vehicle
Soil treatment/digging		▪ increase soil erosion in steep areas
Maintenance (tending):		
Enrichment planting	▪ decrease soil erosion	
Fertilization	▪ increase soil fertility	
Pest control		▪ Increase water pollution
Weeding		▪ decrease the composition floristic
Thinning		▪ increase soil erosion in the steep slope
Watering/irrigation		▪ increase GHG emission due to the use of fossil fuel for pumping the ground water
Harvesting		
Felling		▪ increase air pollution and noise ▪ soil erosions ▪ increase pollution of water body
Logging and transportation		▪ increase road damage and GHG emissions from vehicle

Source: KTI and ITS (2004)

E.2. If any negative impact is considered significant by the project participants or the host Party, a statement that project participants have undertaken an environmental impact assessment, in accordance with the procedures required by the host Party, including conclusions and all references to support documentation:

The project will develop wells for pumping ground water for watering the trees and crops. The wells establishment is part respond of KTI to the request of local community as incentive for their participation in the projects. The EIA of wells establishment is presented in the Annex.

E.3. Description of planned monitoring and remedial measures to address significant impacts referred to in section E.2. above:

The impact monitored is as follows:

1. Impact on Physiography
2. Impact on Hydrogeology
   a) Impact on water surface
   b) Impact on ground water table
   c) Impact on water quality
   d) Impact on aquifer productivity
3. Impact on Socio-Economy
   a) Impact on working opportunity and income
   b) Impact on community perception

Environmental monitoring on physiography and hydrogeology as the impact of water deep well includes:

1) The measurement of production well (discharge and water table) and monitoring well and is done monthly by Head of Group using Groundwater. The results are recorded and kept by the official of Public Works in Probolinggo Regency;
2) The measurement of river discharge and water level in the study area, and this activity is done by Irrigation Unit of Public Works Office in Probolinggo District.
3) The withdrawal of a groundwater and surface water sample once a year to be analyzed in the laboratory by Irrigation Unit of Public Works Office in Probolinggo District.

The increase of job opportunity and income coming from labor recruitment in the project by PT. KTI on deep well construction and derived impact on the increase of the agricultural yields can be categorized as positive degree of impact and it also will persist continuously during the project. Dispersion of impact is not wide because it only absorbs 5 persons. Impact management should be done by giving priority to the community working for this project as long as they fulfill the requirement.

Monitoring analysis method on employment aspects can be done by encoding the number of manpower recruited in this project. Monitoring of location is done at the deep well withdrawal site, and it is carried out every 6 months. Meanwhile, the monitoring institution can come from the Labor Office of Probolinggo Regency.

There will be a positive response regarding the community perception if there is fairness in the distribution of water which it needs for its agricultural irrigation and drinking water consumption; on the other hand, the negative response impact might rise iif there is unfairness in distribution of water. The perception will remain continuous during the project and dispersion of impact is wide and includes villages of Sumberrejo.

Monitoring analysis method on community perception aspect is done by iinterviewing people in Sumberrejo Village. This is important to do because their aspiration must be explored. Location of monitoring can be done at deep well project site in Sumberrejo Village. Monitoring of location is done twice a year (every 6 months), that is once during the rainy season and once during the dry season.　Meanwhile, the monitoring institution can be done by Regional Government of Probolinggo, that is Public Works Office, Agriculture Office, and BAPEDALDA. The monitoring plan is will follow environment monitoring matrix as shown in Table 7.1.

Table 7.1. Environment Monitoring Matrix

No	Prediction of Impact	Impact Degree *)					Environment Monitoring			
							Analysis Method	Monitoring Site	Monitoring Time	Monitoring Executor
1	2	3	4	5	6	7	8	9	10	11
1	Physiographic									
A	Land Subsidence		X				▪ Measuring land surface to the building foundation. ▪ Investigating whether there is the damage at construction of production well. ▪ Investigating whether there is the cracking at building of pump house, and machine of pump (*genset*) as sign of is existence of land subsidence ▪ Analysis the results of long-range investigation. ▪ Taking conclusion whether there is land subsidence or not.	▪ Production well (project)	▪ Every month	PT. Kutai Timber Indonesia
2	Hydrogeology									
	The decrease of water table		X				▪ Measuring a groundwater level (water table) ▪ Analyze fluctuation of water table and is drawn becoming a graphic. ▪ Specifying a minimum months of ground water face. ▪ Taking a conclusion whether there is the decrease of water table or does not.	▪ Production well (at project site) and common well around of project site	▪ Every month	PT. Kutai Timber Indonesia

Table 7.1.　*Continues*

No	Prediction of Impact	Impact Degree *)					Environmental Monitoring			
							Analysis Method	Monitoring Site	Monitoring Time	Monitoring Executor
1	2	3	4	5	6	7	8	9	10	11
b	Degradation of ground-water quantity.		X				• Measuring withdrawal of water at production well. • Analyze fluctuation of withdrawal of groundwater at well of production and is drawn becoming a graphic. • Taking a conclusion whether there is the decrease of groundwater quantity or does not.	▪ Production well (project)	▪ Every month	PT. Kutai Timber Indonesia
c	Degradation of ground-water quality		X				• Decreasing the amount of groundwater is pumped. • Providing the water supply from other source, except groundwater. • Management of waste water before thrown to the water body. • Others	▪ Production well (project)	▪ Every month	PT. Kutai Timber Indonesia

Table 7.1. *Continues*

No	Prediction of Impact	Impact Degree *)					Environmental Monitoring			
							Analysis Method	Monitoring Site	Monitoring Time	Monitoring Executor
1	2	3	4	5	6	7	8	9	10	11
3	**SOCIO ECONOMY**									
a	Manpower and income are increasing		X				◆ Encode manpower which come from labor recruitment in project	◆ Production well project (Sum-berrejo Village)	◆ Every 6 months	◆ PT. KTI ◆ Labor Office of Probolinggo District
b	Withdrawal and distribu-tion of water are impact on community perception		X				◆ Interview to people of Sumberejo Village about the water problem	◆ Production well project (Sum-berrejo Village)	◆ Every 6 months, that is one time monitored on rainy season and one time in dry season	◆ PT. KTI ◆ Irrigation Unit of Public Works Office, Agriculture Office and BAPEDALDA

Remark: *) Degree of Impact. Column 3: decrease important; Column 4: fairly important, Column 5: important, Column 6: more important; Column 7: very important

SECTION F. Socio-economic impacts of the proposed A/R CDM project activity:

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F.1. Documentation on the analysis of the socio-economic impacts, including impacts outside the project boundary of the proposed A/R CDM project activity:

Statistical Bureau Office of East Java stated that in 2000 and 2001, monthly per capita consumption of community in East Java is mostly between Rp 60.000 and Rp 150.000,- which is categorized as poor (Table 1). This condition is consistent with Probolinggo. Based on the last five years observation, percentage of people with such income tended to increase (Suyanto, 2003). Number of poor families in Probolinggo is about 27.25 %, and in rural areas number of poor families is much higher than urban areas.

Tabel 1. Population Percentage by Monthly Percapita Consumption Classes, 2000-2001

Monthly Percapita Consumption (Rp.) (1)	2000 (2)	2001 (3)
<40.000	1,73	0,37
40.000-59.999	11,38	5,37
60.000-79.999	22,77	16,35
80.000-99.999	20,78	20,74
100.000-149.999	28,12	33,72
150.000-199.999	8,69	11,85
200.000-299.999	4,58	7,49
300.000+	1,93	4,10
Total	100,00	100,00

Source : Sosio-Economic National Survey, 2000 & 2001

Population of Wonomerto, Sumberasih, Tongas and Lumbang are 30,571; 48,833; 56,700 and 27,035 people respectively. The population growth rate is between 0.4% and 0.8% per annum. Main religion of the community is Moslem (Islam). Number of family member in the project area is about 6 people per household (HH). The average land holding per household is 0.5 ha in Tongas, 0.6 ha in Lumbang, 2 ha in Wonomerto and 0.9 ha in Sumberasih. About 90% of the land are dry land agriculture with low fertility.

The annual income per household in Tongas is Rp 7.200.000,-, in Lumbang Rp. 9.000.000,-, in Wonomerto Rp.10.200.000,- and in Sumberasih Rp 6.360.000,-. Sources of income are from agriculture, animal husbandry, trading and labor works. Main source of income is agriculture (± 45 % in Tongas, 55% in Lumbang, 55% in Wonomerto and 60% in Sumberasih: visit http://www.jatimonline.org). According to BKKBN classification (1995) such income is categorized as '*pra sejahtera'* household (below poverty line). It is expected that with their participation in the project, income of the project participants will increase.

Average monthly expenditure at Tongas per household is about Rp 610.000,-, at Lumbang Rp 780.000,- at Wonomerto Rp 860.000,- and at Sumberasih Rp 535.000,-. About 65% of their expenditure is for food, and the remaining is for services and others (education, house utensils, energy, transportation etc). Energy and transportation is categorized as primary expenditure, thus primary expenditure is more than 90% of the income. At Tongas and Sumberrejo all of their expenditures are for meeting primary needs. This indicates that most of community is these sub-districts are poor. With such condition, efforts to improve their livelihood should consider the followings: (a) improvement of livelihood of such community will not occur without intervention from outside, (b) improvement of livelihood should be done by increasing their capacity and ability to do practical works than can generate income and role of government is very important, and (c) dissemination of information should be well distributed to all communities.

The implementation of AR-CDM may change the farming system from annual crop to tree-based-agroforest system. Tree-based-agroforest system has been practiced by rural community in Java called community forest. A number of studies indicated that impact of this system to farmers' income is not very huge. It will increase farmers' income by about 20% (Hardjanto, 2003). This increase will not change behavior of the communities in consuming energy.

F.2. If any negative impact is considered significant by the project participants or the host Party, a statement that project participants have undertaken a socioeconomic impact assessment, in accordance with the procedures required by the host Party, including conclusions and all references to support documentation:

Negative impact may occur if KTI does not meet the needs of local community as described in the agreement. The impact in socio-economic will be monitor through household survey

F.3. Description of planned monitoring and remedial measures to address significant

impacts referred to in section F.2 above:

Household survey will be conducted every year to monitor the energy consumption for cooking, transportation and light and fertilizer consumption. The monitoring plan has been described in section C4.3.

SECTION G. Stakeholders' comments:

G.1. Brief description of how comments by local stakeholders have been invited and compiled:

Stakeholder process was done in three stages. The first process is aimed to inform stakeholders about the AR-CDM (what CDM project is, why CDM project, how CDM project will be conducted, where and when it will be, and who will undertaken). The first stakeholder process was conducted through survey and interview with a number of stakeholders namely: (a) community and Non Governmental Organization, (b) community, NGO, and plantation companies, (c) local government of Probolinggo Regency.

The second stakeholder process is carried out by the end of May 2005 after the draft of PDD is finalized. This process is aimed to inform wider stakeholder in the districts about the project through an integrated forum of a bigger event, including inviting media. The third process will be organized by the DNA if it is necessary before the approval is given.

G.2. Summary of the comments received:

All stakeholders' responses are generally positive and they are basically welcome to the planned CDM project. However, each of them has different expectation according to their position and needs. These were as follows:

a) Regent of Probolinggo Regency had expressed his support to the AR-CDM project, as he believed that the project would provide some benefits, particularly farmers' income, job opportunities in the villages, better environmental quality. He emphasized the need of having fair and transparent collaboration with communities as the farmer participants will sacrifice to some extend i.e. reducing allocation of their land and time for annual crops.
b) Staff of Planning Office has also expressed their support to the AR CDM projects, and they again emphasized the need for additional socialization of the project to other

agencies so that the project could get enough support from other government agencies.

c) Kepala Desa (Village Leader) as government representative commented that a) KTI should provide a general guideline to socialize CDM activities to community so that the misperception about CDM could be avoided, b) collaboration should be fair and transparent, and c) technical and financial assistant should be provided as farmers' lands within the village were not utilized optimally due to low fertility and inexistence of farmers' capital ability.

d) Community/Farmers' commented that they would like to use their land for planting trees only if they were provided with capital aid and the project could increase their income level and establish well and pumping facility for irrigation. This irrigation facility is required in order to allow them to increase their planting intensity as a way of compensating the decrease in crop production due to tree planting. If these requirements could be met, they would be ready to fully involve in the project and agreed to use their land for the project for a long period (20 years). However, they expected that any agreement made with them should be known and coordinated by village leaders.

G.3. Report on how due account was taken of any comments received:

In response to the comments provided by the stakeholders, PT KTI will:

1. Provide fair and transparent process in developing the contractual agreement with community. Right and responsibility of each party involve in the project will be stated clearly. Initial commitment of the KTI to community was that the KTI will provide initial capital to buy seedlings, make wells for watering, buy all timber produced by the project, undertake silviculture technology transfer to the farmers, ensure fair benefit-sharing, cover cost for developing PDD of the AR-CDM, getting approval from DNA for CDM, validation, monitoring, verification and certification
2. Use tree-based agroforest system that allows the annual crop to be planted in the system for at least five years in the seven years rotation.
3. Establish water pumps in order to allow project participants to increase planting intensity from one a year to at least twice a year.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROPOSED A/R CDM PROJECT ACTIVITY

Organization:	
Street/P.O.Box:	
Building:	
City:	
State/Region:	
Postfix/ZIP:	
Country:	
Telephone:	
FAX:	
E-Mail:	
URL:	
Represented by:	
Title:	
Salutation:	
Last Name:	
Middle Name:	
First Name:	
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Annex 3

BASELINE INFORMATION

Key elements used in defining baseline are presented in the following Table.

Data	Parameter	Data Source
Area of critical land at local and national level	Total area of critical land	Ministry of Forestry
National policy and budget plan for land rehabilitation program	Amount of funding allocated for rehabilitation of critical land	Ministry of Forestry
Historical data on the implementation of critical land rehabilitation program	Annual rate of planting	Ministry of forestry
Government plan for land rehabilitation at local level	Annual rate of planting	Ministry of Environment and Ministry of Forestry.
Historical Land use	Total agriculture land	Van der Eng (1997)
Carbon stock of land being used for AR CDM projects	Total carbon stock under baseline condition (ton per hectare)	Survey

National budget called Reforestation Fund (DR) is very limited. Ministry of Forestry (2001) reported that the domestic funding (DR) currently available for forest rehabilitation only Rp10,000 billions (approximately 0.75 billion US$; Kompas 27 June 2000,). The use of this funding will be prioritized for rehabilitating critical land located in the main watershed. At present, it was estimated that the total critical land in Indonesia is about 42 million ha (MoE, 2003). The available funding may only be able to rehabilitate about one tenth of the total critical area (Boer *et al.*, 2001a). Without support from other sources such as CDM, the reforestation rate might not increase.

On the other hand, development of Industrial Forest Plantation (HTI) is very low recently as the government does not provide any more subsidies for forest companies to implement such activities. In

the past, forest companies could get forest rehabilitation fund from government either in the form of financial sharing with government or loan with zero interest (Minister of Forestry RI Decree No. 375/ Kpts-II/ 1996 date: July 19th 1996). In addition, the internal rate of return of the HTI is low (APHI, 2002; Subhan, 1998; Kusuma, 1995; Hakim, 1995; Utami, 1995), and B/C could be less than 1.0 (Boer, 2001). On the other hand, investor from overseas are also not interested to invest in the country due to unfavorable climate for investment, such as high transaction cost (APHI, 2002).

Considering the facts that HTI companies earn low IRR and B/C nowadays, it is very unlikely that investors want to invest for establishing HTI without any incentive. Carbon incentive is one of the factors that may attract investors' interest to develop HTI. The historical data clearly shows that rate of planting under rehabilitation program (reforestation, afforestation, and timber plantation) has decreased consistently after the economic crisis in 1997, in particular the HTI establishment (Figure Annex 3.1). Without the existence of carbon incentive and clear regulation, the development of Industrial Forest Plantation (HTI) would be very low. *Thus it is very unlikely that timber plantation would be initiated within the public and private sector in the absence of the CDM*.

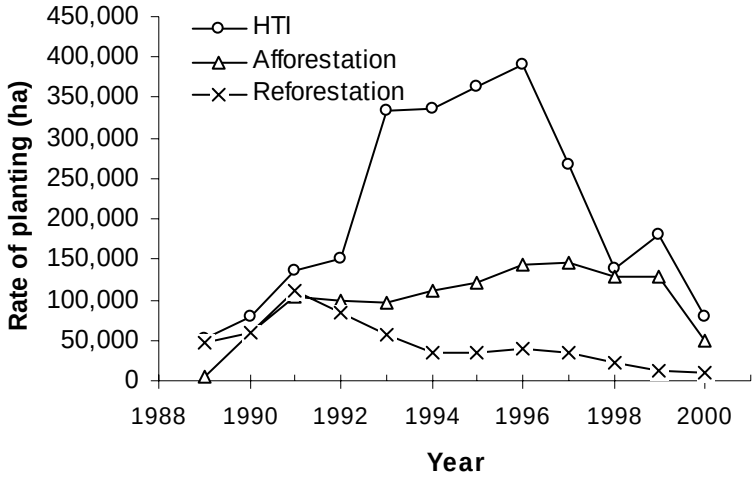


Figure A.3.1. Rate of planting under the rehabilitation program (MoE, 2003)

As it is mentioned previously, the development of Industrial Forest Plantation (HTI) is very low recently as the government does not provide any more subsidies for forest companies to implement such activities. If income from the plantation is only from wood, KTI is not interested in establishing the plantation with communities. Main source of wood may remain from state natural forests. The target to increase wood supply from plantation may be hardly to be achieved. The possibilities of getting carbon incentive from planting trees have motivated the KTI to develop AR-CDM project with local communities. Thus, under the absence of CDM, it is very unlikely that the KTI is willing to initiate the project.

Annex 4

MONITORING PLAN

Plan for monitoring in this project can be divided into two:

1. Monitoring plan for carbon pools. This will follow procedures which are commonly used in forest inventory
2. Monitoring plan for GHG emission from sources. This will be done through periodic interview and field observation.

Monitoring plan for carbon pools

For AR CDM project activities, monitoring plan should be designed in the beginning or at the same time of project design phase.

At the landscape level, monitoring land use land cover change should be done 2 years after the AR CDM project implementation. The information could be assessed by using:

- Remote sensing data, at least from two different date ; first at the initial of the project and in the next two year intervals depending on the dynamic of the region
- Historical data in land use in the form of maps or recording / statistic of village / county which include land ownership at the village / county / sub-district and transaction of land that may have occurred.
- Interview with local communities which has been living in the project area before 31 December 1989 or from the old people.
- Any significant change in farming practices occurred within the defined periods, and what factors that drives the changes.
- Interview to a number of households to know the dependency of farmer on land. The main questions include what main source of incomes (whether land is important source of incomes or food supply).

The observation on land use cover type change is in principle from type on the left column into combination of types in column on the right, as showed by the following table.

Initial Type 1st year	Type 2nd year
Abandoned plantation/ fallow land/ shrubs/ thickets	Plantation
Resettlement/Garden	Resettlement/Garden
Dry land	Fallow land/bush/thickets

For monitoring changes of carbon stocks in the carbon pools, a permanent sample plots should be established. Clustering of the plots shall be based on criteria ecological condition in particular typopology of reforestation (species planted, rotation), soil condition, micro/local climate inside the project boundary and that is based on statistical approach. The plots should be distributed randomly according to the stratification or clustering based on criteria mentioned earlier. A total number of sample plots should at least 0.1 % of the total project areas (sampling intensity). The size of the plot is 20 x 20 m2 and located randomly inside the project boundary (see Fig.1).

Monitoring carbon stock of carbon pools within the project area can be done inside permanent sample plots.

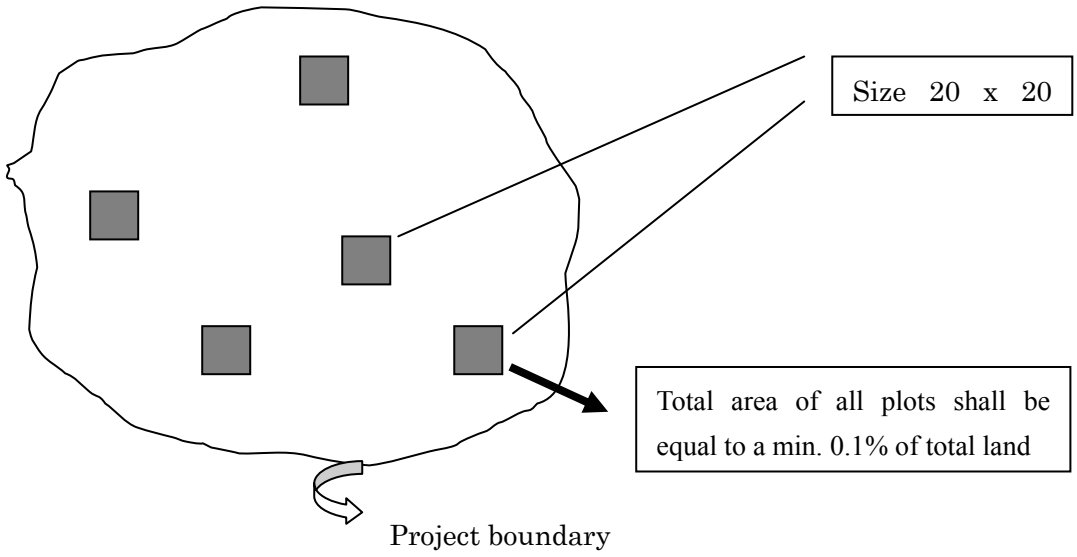


Fig.1. Position of sample plots within project boundary

Measurement of trees inside the plots is done with sampling intensity of at least 10% or can also census. The parameters measured are mainly height and diameter at breast height.

Calculation of biomass and carbon stock using equation/common formula in forestry management as follow:

Volume = 0.3 x л x D^2 x H

D = diameter　H = height　л = 3.14

Biomass = Volume x specific density

C content = 0.5 * Vol. Biomass

Below ground biomass will be estimated from aboveground biomass using conversion factors developed from destructive sampling, while deadwood and litter will not be considered as they are usually very small compared with the carbon stock of the above ground (Zaini & Suhartatik, 1997; Tresnawan & Wasrin, 2002; Tiepolo *et al*., 2002).

Calculation and estimation of below ground biomass follow the formula:

Below ground tree biomass = Σ_i a D_i^b

a and b = parameters for a root allometric equation as derived in FBA

D_i refer to all proximal root diameters, measured at the stem base

BGB tree = AGB/SRatio

C content = 0.5 * Vol. Biomass

Soil-carbon is monitored in the steep areas only.　Planting trees in this land will increase soil carbon significantly following the increase in biomass of the aboveground (Smith & Scherr, 2002; Tomich *et al*, 2002; Haris *et al.*, 2003).

Estimation and calculation of soil carbon following the procedure:

Sample soil of approximately 1 kg from 0.5 x 0.5 m^2 sample size is taken

Analysis C_{org} content *) in the laboratory using Wet oxidation (Walkley and Black)

*) Soil sampling for C organic content analysis has been developed by ICRAF and standardized, and continuously improved to get more accurate results.

Estimation of biomass stock on a given landscape is done by multiplying total area with the biomass standing stock of the corresponding landscape.　Thus total biomass stock within project boundary outside the project sites are summation of the biomass stock of all landscape units within the project boundary.

Monitoring plan for GHG emission from sources

For the GHGs the element monitored are CO_2, CH_4 and N_2O.　The estimation of actual GHGs emission from project and those occur outside project boundary is done using revised IPCC guideline

methodology, where the emission is the multiplication of Activity Data (AD) and Emission Factor (EF). The assessment of the increase of GHGs emission from sources outside project boundary (leakage) will be evaluated using multiplier effect analysis (CDM-AR-NMD Section E6).

Method for Monitoring Progress of actual GHGs emission from project

As this a new approach, this has not been applied elsewhere. However, survey method used is a common practiced. The increase in actual GHG emissions is monitored based on change of the income of the project participants. It is assumed that income increase will change behaviour of the project participants in consuming energy, transportation, fertilizers etc.

Use of fossil fuel for transportation seedlings

Estimation of fossil fuel consumption for transportation of seedling during plantation establishment will be obtained through secondary data recorded on public and private vehicles in monthly basis. This data will be extrapolated to estimate potential emission from this activity.

Fossil fuel consumption for wood harvesting

Recording of number of trips in transporting log from harvesting activity will be used to estimate total fuel consumption from which the potential emission will be estimated.

Use of fossil fuel for pumping water

Gathering data on volume of pumped water, fossil fuel consumption and area of irrigated land are the important parameters in order to estimate the amount of fossil fuel consumption for pumping water.

Use of Nitrogen fertilizer

Number of fertilizer and pesticides/insecticides used in the nursery and plantation, as well as labour and other supporting input in agricultural farming and also in forestry plantation are key factor to predict the balance between input and output of GHG emission from nitrogen fixation and organic decomposition of the system.

Energy: Fossil fuel and electric energy

Cooking and lighting are particularly important for the estimation of household consumption of fossil fuel for energy. Different source of energy i.e. fire wood, kerosene, gasoline, liquid gas, bricks, charcoal and other, will have different impact on quality of energy and also number of potential GHG emission, especially if the burning process is not perfect. Predicting household characteristic to get small scale energy will help in calculating the potential emission from the project.

９．２　新規ベースライン方法論

PROPOSED NEW METHODOLOGY FOR A/R: BASELINE (CDM-AR-NMB) - Version 01

CLEAN DEVELOPMENT MECHANISM
PROPOSED NEW METHODOLOGY FOR AFFORESTATION AND REFORESTATION
PROJECT ACTIVITIES: BASELINE (CDM-AR -NMB)

CONTENTS

SECTION A. Identification of methodology

A.1. Title of the proposed methodology:

Reforestation of crop land using tree-based agroforest system

A.2. List of type(s) of A/R CDM project activity to which the methodology may apply:

Reforestation or afforestation in dry land agriculture for timber production

A.3. Conditions under which the methodology is applicable to A/R CDM project activities:

The proposed new methodology is applicable to A/R CDM project under the following conditions:

- The proposed project area are used for dry land agriculture or abandoned for long time
- Community in the project area rely much on their land for producing their food consumption
- Community in the project area are financially not capable of establishing forest plantation
- Planting trees in the project areas is not economically viable and no incentive from government to establish such plantation.
- There are enough agricultural labor in project location

A.4. Carbon pools covered by the methodology:

Above ground biomass, below ground biomass (roots) and soil organic carbon

A.5. What are the potential strengths and weaknesses of this proposed new methodology?

At present, there is no approved Methodology for Baseline. Thus strengths and weaknesses of the proposed methodology given below are not referred to any methodology.

Strengths:
The methodology is simple and easy to use as it will use historical information in defining the baseline either from official documents or from community survey surrounding the project areas.

The assumption used in this methodology is that the community will not change their attitude in using their land if no intervention or forcing from outside. This assumption can be easily validated by validator/verifier during site visit.

Weakness:
The validity of the assumption may expire if land-use policy changes in the future. For example, the project location is designated as industrial area or housing complex.

SECTION B. Overall summary description:

Baseline net greenhouse gas removals by sinks is defined as the sum of the changes in carbon stocks in the carbon pools within the project boundary that would have occurred in the absence of the AR CDM project activity under the clean development mechanism (CDM). The methodology use survey method in determining the baseline net GHG removals by sinks. The four major steps for defining the baseline are:

1. Analyze the history of land use in the project area.
2. Asses the dependency of community on their land in meeting their needs.
3. Identify key barriers for the implementation of AR-CDM Projects
4. Measure or estimate carbon stock in the carbon pools from lands being used for AR-CDM project

The developed methodology does not use quantitative methods for predicting the baseline due to lack of quantitative historical data and clear policies. The qualitative information is collected through survey and interview with the authorized personnel, community leaders, NGOs in the districts, sub-districts, and villages. The questions that have been answered substantiated with documented evidence if available, in such a way as to clarify why the project would not occur in

the absence of the CDM. A selected validator can validate the information provided during site visit.

Targeted respondents and types of main questions being asked during the survey are the following:

1. The history of land use in the project location is assessed base on interview with local communities which has been living in the project area before 31 December 1989 or old people, and local government officials. The main questions include what types of farming activities commonly practice by communities, whether significant change in farming practices occurred within the defined periods, and what factors that drives the changes.
2. The dependency of farmers on land is assessed through interview to a number of households. The main questions include what main source of incomes (whether land is important source of incomes or food supply), and whether or not the land only has economic value or the combination of other values (economic, social, and political values).
3. Main barriers for the implementation of AR-CDM projects are also assessed through interview to a number of households. The main questions include whether the household had plan to change the farming practices from annual crops to the tree-based agroforest system; If yes, what reasons that prevent them from converting to the tree-based agroforest system; If not, what factors that caused them not to convert to the tree-based agroforest system; what conditions that will encourage them to convert their farming activities to the tree-based agroforest system. The above three steps will confirm whether the tree-based agroforest system will or will not occur under the absence of the AR-CDM Projects.
4. Carbon stock of the crop lands from selected pools are measured in a number of sample plots following the IPCC-GPG

SECTION C. Choice of and justification as to why one of the baseline approaches listed in paragraph 22 of CDM A/R modalities and procedures is considered to be the most appropriate:

C.1. General baseline approach for A/R project activities:

☑ Existing ~~or historical, as applicable,~~ changes in carbon stocks in the carbon pools within the project boundary;

☐ Changes in carbon stocks in the carbon pools within the project boundary from a land use that represents an economically attractive course of action, taking into account barriers to investment;

☐ Changes in carbon stocks in the pools within the project boundary from the most likely land use at the time the project starts.

C.2. Justification of why the baseline approach for A/ R project activities chosen in C.1. above is considered the most appropriate:

Most of farmers of dry land agriculture are subsistence farmers with a very small land holding and low income. Normally they rely very much on their land to supply food. Thus the existing condition will continue to the future if no intervention from outside or change in land use policy. With this argument, the first approach is considered as the most appropriate.

SECTION D. Explanation of how, by applying the baseline methodology, baselines are developed in a transparent and conservative manner:

By applying the methodology, the process of developing the baseline is transparent as the data and information use for developing the arguments can be easily checked by validator and verifier during site visit.

Biomass values used in estimating baseline net greenhouse gas removals by sinks are best estimates derived from independent, published data or field studies.

The quantification of baseline net greenhouse gas removals by sinks use method outline in the GPG for LULUCF.

SECTION E. Explanation and justification of the proposed new baseline methodology:

E.1. Explanation of how national and/or sectoral policies and circumstances could be taken into account by the application of the methodology:

Land use changes in particular regions can not be separated from national and sectoral policies. As type of AR-CDM activities being proposed by the project is tree-based agroforest system which is aimed to produce food for community and raw wood materials for wood industries, the relevance national and sectoral policies related to the development of timber plantation has to be taken into consideration in developing the baseline condition. These policies are used to assess whether under the absence of the AR-CDM project, implementation of the project is likely to happen. Steps that should be followed to explain how national and/or sectoral policies and circumstances could be taken into account are as the following:

1. Identify regulations and/or decrees related to industrial timber development, particularly on source of raw material for wood industries.
2. Analyze policies/plans of wood industrial company to get raw materials.
3. Analyze economic viability of establishing tree-based agroforest in community land to assess whether in the absence of carbon incentive (without CDM) private company is still willing to establish tree-based agroforest in community land
4. Provide additional data or documents that can confirm the result of analysis (if available).

The following paragraphs provide example how national and/or sectoral policies and local circumstances be considered in defining the baseline and type of supporting data/information that can confirm the baseline.

National Policies. Development of Industrial Timber Plantation (HTI) is very low recently as the government does not provide any more subsidies for forest companies to implement such activities. In the past, forest companies could get forest rehabilitation fund from government either in the form of financial sharing with government or loan with zero interest (Minister of Forestry RI Decree No. 375/ Kpts-II/ 1996 date: July 19th 1996). In addition, the internal rate of return of the HTI is low (APHI, 2002; Subhan, 1998; Kusuma, 1995; Hakim, 1995; Utami, 1995), and B/C could be less than 1.0 (Boer, 2001). Considering the facts that HTI companies earn low IRR and B/C nowadays, it is very unlikely that investors including from overseas want to invest for establishing HTI without any incentive (APHI, 2002). Carbon incentive is one of the factors that may attract investors' interest to develop HTI. The historical data clearly shows that rate of planting under rehabilitation program (reforestation, afforestation, and timber plantation) has decreased consistently after the economic crisis in 1997, in particular the HTI establishment (**Figure-1**). Without the existence of carbon incentive and clear regulation, the development of Industrial Forest Plantation (HTI) would be very low. Thus it is very unlikely that timber plantation would be initiated within the public and private sector in the absence of the CDM.

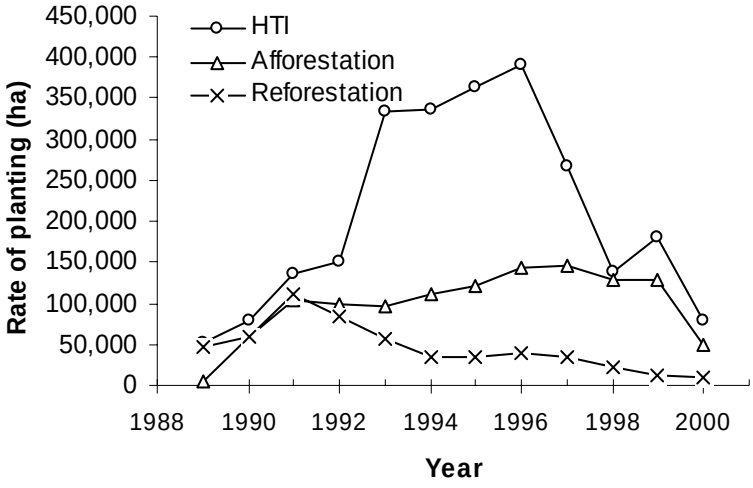


Figure-1. Rate of planting under the rehabilitation program (MoE, 2003)

Local Circumstances. Based on data from 1880 to 1990, it was found that after 1950 area of agriculture land in Java did not increase significantly (**Table-1**). It tends to be constant as the availability of land for agriculture development. The main change would be conversion from agriculture land into resettlement and industrial areas, as the demand for resettlement will increase in the future. There are no evidences available that the decrease of agriculture lands due to conversion into timber plantations.

Table-1. Area of agriculture land in Java from 1880 to 1990 (in thousand ha)

Year	Rice Field	Dry Lands	Gardens	Total
1880	2,427	1,261	756	4,444
1890	2,745	1,197	868	4,819
1900	2,855	1,493	991	5,338
1910	2,910	1,965	1,116	5,991
1920	3,146	2,757	1,243	7,121
1930	3,274	3,228	1,144	7,646
1940	3,384	3,132	1,411	7,928
1950	3,415	3,364	1,361	8,140
1960	3,483	3,490	1,422	8,395
1970	3,499	3,238	1,505	8,241
1980	3,491	2,695	1,554	7,740
1990	3,421	3,136	1,659	8,216

Source: Van der Eng (1997).

In the project site, the community used their land for planting food crop mainly for their consumption. Farmers plan their land once a year during wet season (December-March) and then fallowed and they use the yields of the crop mainly for their own consumption. Therefore it is very unlikely that the community would like to covert their land for timber plantation if they can not use any longer their land for planting food crops. From survey, it was revealed that communities are willing to plant trees if they can still use their land for food crops with increasing planting intensity. This means that farmers prefer to have tree-based agroforest system, and food crop can be planted more than once a year to compensate the yield loss due to the establishment of the trees. To meet this condition, establishment of well and water pumping facility for irrigation that allow farmers to plant crops more than once a year is compulsory. Without this facility, tree-based agroforest system in the community land will not exist.

E.2. Explanation of how the methodology determines the baseline scenario (that is, how it indicates the scenario that reasonably represents the sum of the changes in carbon stocks in the carbon pools within the project boundary that would occur in the absence of the proposed A/R project activity):

The basic assumption used in this methodology is that the community will not change their attitude in using their land if no intervention or forcing from outside, while industrial forest companies is not willing to establish tree-based agroforest in community land without carbon incentive. Using this assumption, static baseline can be applied in which the current farming practice in lands designated for A/R CDM project will not change in the future. However, if there is and intervention or forcing from outside, the land use may change. In this methodology, the form of intervention or forcing from outside would be change in regulation, and the implementation of government rehabilitation program or land use policy.

The key analytical steps to estimate the likely changes in carbon stocks in the carbon pools within the project boundary under the baseline scenario are as the following:

1. Identify land use cover within the project boundary before project is implemented
2. Project future land use change within the project boundary under the absence of the project taking into account land use history and government plan or policy
3. Estimate biomass carbon pools of each land use within the project boundary using best available biomass data before the project is implemented.
4. Calculate the change in carbon stock using the result of land use projection describe in the step 2 above.

Based on the assumptions and local circumstances, the likely land use change in the future would be the conversion of agriculture land to residential/development areas (LU1), and reforestation of bare land or critical land (LU2). If after project implementation, the land use conversion other than LU1 and LU2 occurs within the project boundary, the reasons for the conversion should be investigated. If the change is attributable to the AR-CDM, it would affect the Net anthropogenic GHG removal by sinks

E.3. Explanation of how, through the methodology, it can be demonstrated that a proposed A/R project activity is additional and therefore not the baseline

The steps to demonstrate that the proposed A/R project activity is additional are the following:

- Step 1: Provide legal/official documents that the project is not part of government laws and regulations and other activities similar to the project (activities that produce outputs or services comparable with the proposed CDM project) are not widespread.
- Step 2: Perform analysis to show that the project is economically and financially less attractive than the other similar activities (excluding revenue from sale of CERs) through investment and sensitivity analysis. The sensitivity analysis is to show that the result of the investment analysis is robust to reasonable variations in critical assumptions. If the investment analysis shows that the CDM project is economically and financially attractive (excluding revenue from sale of CERs) then go to step 3.
- Step 3: Show that there are barriers that may prevent the projects from occurring such as low of survival rate due to climate condition. The project should show how the barriers are removed and their associated cost. If the associated cost is included (excluding revenue from sale of CERs) the project is becoming economically and financially less attractive.

E.4. Explain and justify formulae/algorithms and/or models used to determine the baseline scenario. Variables, fixed parameters, values and different strata identified have to be reported (e.g. species, growth rates):

Formula to calculate the carbon stock change under baseline scenario is the following:

$$C = \sum_{i=1}^{M}\sum_{j=1}^{N}[S_{i,j}(TE) - S_{i,j}(TB)]_B$$

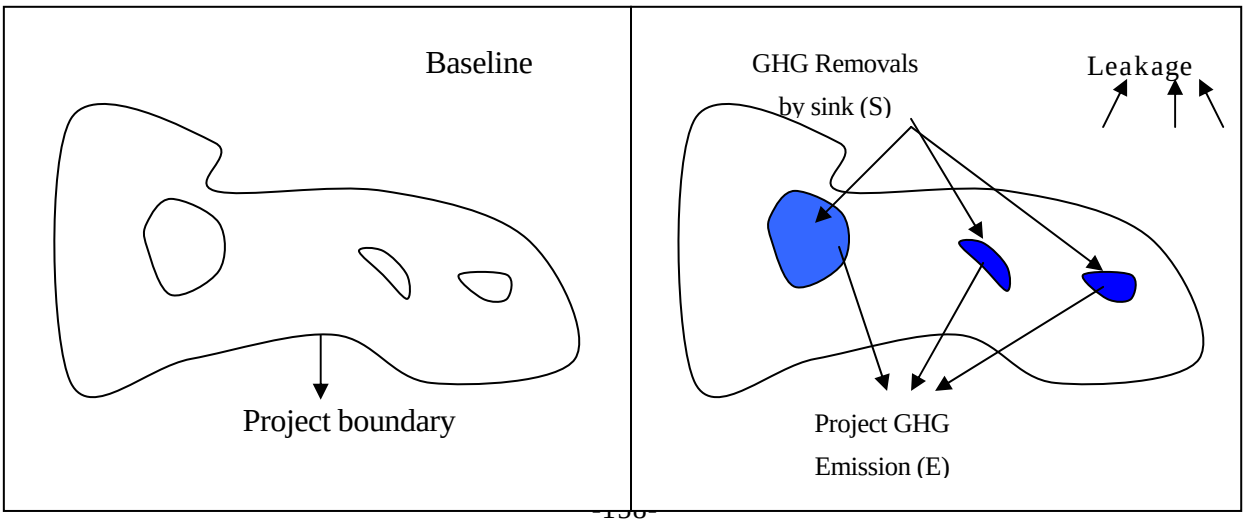
Where,
C is net baseline GHG removal by sinks
i=1, 2, 3,…, M index for landscape unit within the project boundary;
j=1, 2, 3,…, N index for carbon pools (above-ground biomass, below-ground biomass, etc);
$S_{i,j}$ = stock of carbon on landscape unit-*i*, in carbon pool-*j*
TB= Beginning year of the accounting period
TE= Ending year of the accounting period

E.5. Explain and justify formulae/algorithms and/or models used to determine the actual net GHG removals by sinks from the proposed A/R CDM project activity. Variables, fixed parameters, values and different strata identified have to be reported (e.g. fuel(s) used, fuel consumption rates):

The approach proposed for carbon accounting under project scenario basically follow land-based accounting system proposed by IPCC Special Report on LULUCF namely (Noble *et al.*, 2000):

$$Q = \sum_{i=1}^{M}\sum_{j=1}^{N}[S_{i,j}(TE) - S_{i,j}(TB)]_P - \sum_{k=1}^{R}A_k$$

Where,
Q is total carbon sequestered or released (*net anthropogenic GHG removal by sinks*),
i=1, 2, 3,…, M index for landscape unit within the project boundary;
j=1, 2, 3,…, N index for carbon pools (above-ground biomass, below-ground biomass, etc);
k=1, 2, 3, …, R index for adjustment;
$S_{i,j}$ = stock of carbon on landscape unit-*i*, in carbon pool-*j*
TB= Beginning year of the accounting period,
TE= Ending year of the accounting period,
A= Adjustment term to account for leakage, baseline, uncertainty etc. Based on COP-9 decision, the A factors are limited to baseline (C), and leakage (L) (Figure 1).



C. Baseline net GHG removal by sinks: - By present vegetation - By anticipated future scenario	B. Actual net GHG removal by AR-CDM (S-E): - By the AR activity (S) - Reduced by actual project emissions (E) L. Leakage (increase GHG emission outside project boundary) Q. Net anthropogenic GHG removal by sinks = (B-C-L)

Figure 1. Illustration of the calculation net anthropogenic GHG removal by sinks

The actual GHGs emission by project is assessed by firstly identifying types of activities that emit the GHGs emission and then determine the rate of the emissions under the absence and the presence of the project. Formula used for estimating the net anthropogenic GHGs removal by sinks within the project boundary followed IPCC approach (1996). The formulas are given in Table 1.

Table 1. Formulas used for estimating GHG removals by sinks

GHGs	Source/Sinks	Formula
CO_2	Amount of carbon sequestered by the AR-CDM project (S1=ton CO_2)	MAI (t C ha^{-1} yr^{-1})*Area (ha)*Rotation (yr)*Carbon fraction of the biomass*44/12
CO_2	Amount of soil organic carbon maintained in the step project area as a result of decreasing soil erosion (S2=ton CO_2).	Area (ha)*annual rate of soil erosion (t/ha)* % Soil organic carbon*44/12.
CO_2	Emission from transportation of seedling materials (E1=ton CO_2)	Number of seedling (N)/loading capacity of vehicle*2 driving distance from nursery to planting site (km)*fuel efficiency of the vehicle (km/liter)*calorific factor (MJ/liter)* emission factor (kg CO_2/MJ)/1000
CO_2	Emission from wood harvesting (E2=ton CO_2)	Number of harvested trees*fuel consumption/100 trees (liter) *calorific factor (MJ/liter)* emission factor (kg CO_2/MJ)/1000
CO_2	Emissions from water pumping facilities (E3=ton CO_2)	Length of pump operation (days)*Pump efficiency (liter/day)*calorific factor (MJ/liter)* emission factor (kg CO_2/MJ)/1000

N_2O	Emissions due the increase use of nitrogen fertilizer as a result of increasing income from the project (E4=ton CO_2-eq)	Planting Area (ha)*fertilizer consumption (ton N/ha)* emission factor*conversion ratio*310
CO_2	Emission due to the increase use of fossil fuel by project participant due to increase of the income from the AR-CDM projects (E5= ton CO_2)	Fuel consumption (liter)*calorific factor (MJ/liter) x emission factor (kg CO_2/MJ) / 1000
CO_2	Carbon loss from agriculture land conversion to housing complex (LU1=ton CO_2)	Area being converted (ha)*(Biomass density before conversion - Biomass density after conversion) (t/ha) *carbon fraction*44/12
CO_2	C-sequestration from reforestation project under government program (LU2=ton CO_2)	MAI (t C ha^{-1} yr^{-1})*Area (ha)*Rotation (yr)*Carbon fraction of the biomass*44/12
CO_2	Carbon loss from agriculture land conversion to other land uses (LU3=ton CO_2)	It would be similar to LU1 or LU2 depending types of conversion.
CO_2	Emission due to the use of fossil fuel for transporting harvested wood from project site to wood processing factory (L1= ton CO_2)	Volume of harvested wood (m^3)*loading capacity of vehicle (m3/truck)*2 driving distance from project site to (km)*fuel efficiency of the vehicle (km/liter)*calorific factor (MJ/liter)* emission factor (kg CO_2/MJ)/1000
CO_2	Emission due to the increase of fuel consumption as a result of increasing proportion of plantation wood used for producing plywood and wood working (L2= ton CO_2)	(Volume of raw wood material (m^3)*electricity efficiency (kwh/m^3)*conversion factor (TJ/kwh)*emission factor (tC/TJ) + Volume of raw wood material (m^3)*diesel efficiency (toe/m^3)*conversion factor (TJ/10^6toe)*emission factor (tC/TJ))*44/12
CO_2	Use of fossil fuel in the region due to the increase of transportations and industrial activities as the economic condition of the region increase (L3= ton CO_2)	It is not estimated if the project does not affect regional economy. The method use for estimating the emission will follow the 1996 IPCC methodology
CO_2	Deforestation (L4= ton CO_2)	If the project activity does not result in the displacement of activities or people, the project will not cause the increase of deforestation.

Note: S is carbon sequestration by project, E is GHG emissions from project, LU land use conversion and L is leakage. The growth of trees or biomass annual increment (MAI) in the project site is estimated from: MAI = VAI x WD x BEF, where VAI is wood volume annual increment m^3/ha, WD wood density (oven dry: 0.30 t m^{-3} for Sengon), and biomass expansion factor, ratio between wood biomass and total biomass (1.6). The VAI is estimated using the following formula: VAI = (WV_{ER})/R, Where VIA mean annual wood volume increment, WV_{ER} wood volume at the end of rotation, and R is rotation cycle (year). Total wood volume at a given age is estimated

from Diameter Breast Height (DBH) using allometric equation. Based on this equation, the MAIs of the Sengon at good, medium and poor soils are 27, 24, and 20 tB/ha respectively

E.6. Explain how the baseline methodology addresses any potential leakage of the proposed A/R project activity:

Leakage is defined as the increase in greenhouse gas emissions by sources which occurs outside the project boundary of an AR project under CDM which is '*measurable and attributable*' to the AR- project activity. This definition implies that type of activity data that leads to GHG emission are only those attributable to AR-CDM project and can be measured by the project participants. Therefore, approach to assess the potential leakage of the proposed A/R CDM project will follow the following steps. First is to identify types of activity data that may directly and indirectly affected by the project which are measurable. Second is to assess how the project will affect the change of activity data whether the effect will be at micro level or macro level using '*multiplier analysis*'. Third is to determine emission factors used for estimating the rate of emission for each corresponding activity data. Fourth is to estimate the increase of GHGs emission outside project boundary.

The idea of using the multiplier effect on leakage analysis was based on assumption that new initiative activities that create additional income for communities may change the behavior of the communities and the change may affect activity data that lead to the GHG emissions, such as increasing the fossil fuel consumption due to the increase of mobilization of community, electricity etc, increasing the use of fertilizers etc. The multiplier analysis will indicate whether the project will have significant impact or not on local and regional economic activities. If the project is not big enough to cause such effect, then leakage can be assumed to be zero (no leakage).

According to Miller and Blair (1985), multipliers are used to asses the effect of exogenous changes to important economic variables in economy. Three types of multipliers most frequently used are those that estimate the effects the exogenous changes on (a) outputs of the sectors in the economy, (b) income earned by household because of the new outputs, (c) employment (in physical terms) that is expected to be generated because of the new outputs. Multiplier analysis in developed countries is one of the major uses of input-output tables.

Richardson (1972) outlined the three most common types of multipliers; i.e. (1) output multipliers, (2) income multipliers, and (3) employment multipliers. According to Noor (1996) in Sudharto (1998), the output multipliers indicate the degree of interdependence between the sector and the rest of economy. The larger the multiplier implies a greater independence of the sector to the rest of the economy. The income multiplier is often considered more useful than the output multiplier because the former indicates the impact of economic changes on households. While the employment multiplier in addition to the output and income multipliers. This multiplier is being used by the policy maker to forecast changes in jobs in a particular area.

In this approach, the income effect characteristics can be static and dynamic. The static effect is that growth of certain output sector at a t period will follow by the increase of worker's salary. Under dynamic effect, the increase of worker's salary will then cause the increased in demand of the respective sector goods or other local sectors and this will result in the increase

of the respective sector goods and other sectors total production etc.

The growth impact of a sector on a local economics depend the proportion size of income increase which is spent under area ("c"). In a short term, the proportion ("c") is perceived as constant, thus the income multiplier which counts on "c" value will also constant.

The income multiplier (M) of the AR-CDM project in a short term can be formulated as: M = 1/(1-c). In this case, the Gross Regional Domestic Product., PDRB (Y) region would be the sum of income from the AR-CDM (Y_{cdm}) and income from other local sectors (Y_n), thus $Y = Y_{cdm} + Y_n$. If the proportion of income increase from the AR-CDM which is already spent return to the region amounting c, then it can be formulated as: $c = (Y-Y_{cdm})/Y$, or $M = Y/Y_{cdm}$. M = 1 means 100 percent PDRB resulted from the AR-CDM.

In the context of AR- CDM project using tree-based agroforest system, the farmer's income goes up to about ± 20 % from the prior income. The actual increase of income will happen at the end of rotation, and this means that the static income effect occur. Nevertheless, since the average of farmer's income will spent mainly for primary goods consumption, especially for food, the increase of income will only create small amount of output from food (agriculture) sector due to small number of project's participant. This means that the dynamic income effect has actually happened but limited to food sector. The income effect definitely has not able to create other sector production, changing people's consumption pattern, and so on. On the other hand this project will also not displace the current activity. Thus, under this type of project the increase of GHG emission outside project boundary from the increase rate of deforestation will not occur, and also from the increase of transportations and industrial activities except from activities which is directly related to the projects, i.e. increase of emissions from wood factory who use the wood production from the project and from vehicle that carry wood (factory-project location-factory). .

This multiplier method has been widely used in many countries. Therefore, the preciseness and appropriateness is well known. The strength of the method is on its simplicity and easiness in its assessment. Nevertheless, in order to find out the precise multiplier value, accurate data is required and this needs skilled surveyors.

E.7. Explain and justify formulae/algorithms and/or models used to determine the net anthropogenic GHG removals by sinks from the proposed A/R CDM project activity:

The formula use in the calculation of GHG emission and Carbon sequestration used follow revised 1996 IPCC methodology. To increase certainty, emission factors for main activity data should be developed locally, while emission factors for activity data which are not significantly contribute to the total GHG removal by sinks will be adopted from the IPCC-GPG and revised 1996 IPCC guideline.

SECTION F. Data sources and assumptions:

F.1. Describe all parameters and assumptions (e.g. regarding biomass expansion factors and activity levels):

Description of assumption used in estimating the net greenhouse gas emission is presented in Table 2.

1. The basic assumption used in defining baseline scenario is that the community will not change their attitude in using their land if no intervention or forcing from outside, while industrial forest companies is not willing to establish tree-based agroforest in community land without carbon incentive.
2. There will be no drastic change in government policy and regulation
3. All the emission factors, conversion factors (such as biomass expansion factors) adopted from IPCC-GPG are assumed to be applicable for the project
4. Price of fossil fuel is assumed to be stable for the whole project period.

F.2. List of data used and their sources:

- Land use policy (land use plan map) and rehabilitation program were taken from official documents
- Land use map was interpreted from satellite LANDSAT TM+
- Biomass data (baseline carbon standing stock) in crop lands where the project will be located was measured through field sampling while those of other land uses were taken from available local data or IPCC-GPG.
- Mean annual increment of species was estimated based on available local data and local research
- Emission factors used for estimating GHG emission from energy and fertilizer consumption were derived from the revised 1996 IPCC guideline.
- Energy and fertilizer consumption of household were collected from household survey

F.3. Vintage of data (e.g. relative to starting date of the proposed A/R CDM project activity):

- Land use map is year 2000– current
- Land use plan and government rehabilitation program from latest official document - current
- Biomass data – current
- Mean annual increment of species – current
- Emission factors – 1996
- Energy and fertilizer consumption - current

F.4. Spatial resolution of data (e.g. local, regional, national):

Not applicable

SECTION G. Assessment of uncertainties:

Source of uncertainty in the estimation of net anthropogenic GHG removal by sinks is from the process of selecting activity data and emission factors. Some of the data are derived from field measurement (e.g. carbon stock of various land uses in the project sites, income level of community and their economic activities) and some from existing studies. Sample size used in the field measurement is not big enough, thus the uncertainty may reasonably high. Therefore, the development of appropriate monitoring system is very crucial. Some of data used in developing baseline need to be adjusted when the data is becoming available. Sample size should be increased and land use analysis to some extend should use high resolution of satellite image data or aerial photo. Activity data and emission factors that may affect greatly the certainty of the net anthropogenic GHG removal estimates will be monitored intensively with reasonable number of sample size. The uncertainty analysis will use Monte Carlo simulation, the standard deviation, and distribution of activity data and emission factors being monitored will be incorporated in the process of estimating net anthropogenic GHG removal by sinks (IPCC, 2002). Table 2 describes how uncertainty being addressed in estimating the net GHG removal by sinks defined in Table 1.

Table 2. Addressing uncertainty in the calculation of net GHG removal by sinks

Data	Uncertainty level of Data (High/Medium /Low)	Are QA/QC procedure are planned in these data?	Outline explanation why QA/QC procedure are or are not being planned
S1	High	Yes	This data constitute the important information for the forest stand increment, therefore its QA/QC procedures are regularly improve and standardize to get an accurate estimation of the AGB and C content of the said land use type.
S2	Medium	Yes	This data is important particularly for the area with steep slope that is potential for erosion. However, since the measurement is done on sampling procedure, the uncertainty level is consider as medium, although the methodology of measurement is regularly improve in order to increase the QA/QC.
E1	Low and Medium	Yes and No	Cross checking with others will be done
E2	Low	Yes	Cross checking with others will be done
E3	Low	Yes	Same as above
E4	Low	Yes	Same as above
LU1	Medium	Yes	QA/QC is existed for the initial data on land use and land cover inventory using satellite data. However, since the estimation of AGB is based on the sampled land use land cover (multi-strata measurements) the estimation of AGB for removals sinks is consider as medium level, although it is varies according to the types of land

			uses and land covers.
LU2	Medium	No	Data will be supplied by other organization at the local and provincial levels.
LU3	Medium	No	Data will be supplied by other organization at the local and provincial levels
L1	Low	Yes	Break down of timber volume and origin as well as the vehicle transporting entering wood processing factory recorded well, thus enable to count the fossil fuel needed.
L2	Low	No	Since this is historical data, no QA/QC procedure are being planned
L3	Medium	No	Data is to be supplied by National Socio-economic survey (SUSENAS)
L4	-	-	It is considered to be negligible as the project will not displace activities of the people.

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９．３　新規モニタリング方法論

PROPOSED NEW METHODOLOGY FOR A/R: MONITORING (CDM-AR-NMM) - Version 01

CLEAN DEVELOPMENT MECHANISM
PROPOSED NEW METHODOLOGY FOR AFFORESTATION AND REFORESTATION PROJECT ACTIVITIES: MONITORING (CDM-AR-NMM)

CONTENTS

SECTION A. Identification of methodology

A.1. Title of the proposed methodology:

Reforestation of crop land using tree-based agroforestry system

A.2. List of type(s) of A/R CDM project activity to which the methodology may apply:

Reforestation or afforestation in dry land agriculture for timber production

A.3. Conditions under which the methodology is applicable to A/R CDM project activities:

The proposed new methodology is applicable to A/R CDM project under the following conditions:

- The proposed project area are used for dry land agriculture or abandoned for long time
- The proposed project area is consider as non forest with typology grassland, shrubs, and abandoned scattered fruit trees eligible for afforestation
- Community in the project area rely much on their land for producing their food consumption
- The proposed project site will be planted with fast growing forest tree species in combination with cash crops planted temporarily at the initial plantation period at the most 2 years
- The proposed project site will be planted only during the rainy season or if there is water available
- Community in the project area are financially not capable of establishing forest plantation
- Planting trees in the project areas is not economically viable and no incentive from government to establish such plantation.
- Trees will be harvested at the rotation period of minimum 7 years
- The project areas are not targeted for government’s rehabilitation program

A.4. Carbon pools covered by the methodology:

Above ground biomass, below ground biomass (roots) and soil organic carbon

A.5. What are the potential strengths and weaknesses of this proposed new methodology?

No approved methodology is available yet for the proposed project types tree based Agrofoerstry system

Method for Monitoring Progress of CO_2 Removal

The strength of this methodology is simple, easy, low cost and user friendly approach. Project participants can easily measured the girth at breast height and tree height, while methods for measuring trees, calculating AGB and analyzing soil carbon are already used by project developer, hence do not need special training to do. In addition, the project developer can easily develop some of default values such as biomass expansion factor at the time of harvesting.

Method for Monitoring Progress of actual GHGs emission from project

The strength of this method is its ability to give high precision in measuring the actual GHG emission from the project as the monitoring is carried out for each data type. However, to carry out monitoring, diligent and careful employees are needed and this becomes the weakness of the method.

Method for Monitoring Land Use Change within Project Boundary

Records on land use and land use changes obtained from the forestry and other related offices at the regency or district levels may not be always available due to unavailability of good archiving system, and this becomes potential weaknesses of this methodology. On the other hand, monitoring using satellite data is a standardize approach and it has been widely applied for land use land cover inventory and mapping in Indonesia and globally. However, as the remote sensing data and aerial photographs, are still expensive and very often cloud cover hampered the continuous acquisition of the data, these satellite data and aerial photographs are not always available according to the needs.

Method for Monitoring Leakage

The strength of this methodology is on its "multi-parties" characteristics, consecutively the parties which have data resulted from their routine activities, will contribute in data collection, and this will save project's budget. Other data shall be provided for the project gathered by simple and easy-done method, which need no special trainee to run.

The weakness will be if the survey carried out would not be run by appropriate and capable persons, thus the data quality will be not eligible for the assessment/ counting of green house gas emission.

This methodology enables project participants to

(i) Monitor project progress based on real project management data,

(ii) Monitor whole removals, leakage and emission associated from the project activity based on real measurement data,

(iii) Monitor socio-economic and environmental impacts based on necessary and reliable data

SECTION B. Proposed new monitoring methodology

B.1. Overall summary description of the methodology:

To acquire accurate growth data, monitoring is required to be implemented at least every 5 years.

Data being monitored are those related to the process of:

- calculation baseline net GHG removals by sinks,
- actual net GHG removals by sinks and
- leakage

Carbon pools being considered and monitored in the project are:

- above ground biomass
- below ground biomass and
- soil-carbon

Below ground biomass will be estimated from aboveground biomass using conversion factors developed from destructive sampling, while deadwood and litter will not be considered as they are usually very small compared with the carbon stock of the above ground (Zaini & Suhartatik, 1997; Tresnawan & Wasrin, 2002; Tiepolo *et al.*, 2002). Soil-carbon is monitored in the steep areas only. Planting trees in this land will increase soil carbon significantly following the increase in biomass of the aboveground (Smith & Scherr, 2002; Tomich *et al*, 2002; Haris *et al.*, 2003).

Estimation of biomass stock on a given landscape is done by multiplying total area with the biomass standing stock of the corresponding landscape. Thus total biomass stock within project boundary outside the project sites are summation of the biomass stock of all landscape units within the project boundary.

For the GHGs the element monitored are CO_2, CH_4 and N_2O
The estimation of actual GHGs emission from project and those occur outside project boundary is done using revised IPCC guideline methodology, where the emission is the multiplication of Activity Data (AD) and Emission Factor (EF). The assessment of the increase of GHGs emission from sources outside project boundary (leakage) will be evaluated using multiplier effect analysis (CDM-AR-NMD Section E6).

B.2. Monitoring of the baseline net GHG removals by sinks and the actual net GHG removals by sinks:

B.2.1 Actual net GHG removals by sinks data:

B.2.1.1. Data to be collected or used in order to monitor the verifiable changes in carbon stock in the carbon pools within the project boundary from the proposed A/R CDM project activity, and how this data will be archived:

ID number *(Please use numbers to ease crossreferencing to D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

S1	AGB	Sampling Plot	Ton/ha	M, C, E	Prior to project implementation and then every 5 years	100%	Electronic and paper	Project participant will measure the DBH of each trees Project Developer will calculate and estimate AGB and C sink
S2	BGB	Sampling Tree	Ton/ha	C, E	Prior to project implementation and then every 5 years	Sampling	Electronic and paper	Project Developer will calculate and estimate DGB from AGB using conversion factors and C content
S3	Soil Carbon	Sampling Sub-Plot	Ton/ha	M, C, E	Prior to project implementation and then every 5 years	Sampling	Electronic and paper	Project Developer will analysis and monitor Soil Carbon using sampling techniques.

B.2.1.2. Data to be collected or used in order to monitor the GHG emissions by the sources, measured in units of CO2 equivalent, that are increased as a result of the implementation of the proposed A/R CDM project activity within the project boundary, and how this data will be archived:

ID number ***(Please use numbers to ease crossreferencing to D.3)***	**Data variable**	**Source of data**	**Data unit**	**Measured (m), calculated (c) or estimated (e)**	**Recording frequency**	**Proportion of data to be monitored**	**How will the data be archived? (electronic/ paper)**	**Comment**
E1	Use of fossil fuel for transportation	Field survey	Litter per HH	C and E	Prior to project implementation, 2010 and then every 5 years	100% for Project Participant (PP) &10% for non-PP	Electronic and Paper	Due to project activity, transportation intensity may increase
E2	Fossil fuel	Field	Litter	C and E	The same as	100% for	Electronic	Will be monitored at

	consumption for harvesting	survey	per m^3 wood		rotation period	Project Participant (PP)	and Paper	harvesting time
E3	Use of fossil fuel for pumping water	Field survey	Litter per m^3 water	C and E	Every year	100% for Project Participant (PP)	Electronic and Paper	Will be monitored based on the number of days of operation
E4	Use of Nitrogen fertilizer	Field survey	Ton per ha	C and E	Every year	100% for Project Participant (PP)	Electronic and Paper	Increase of nitrogen application due to the increase in planting intensity
E5	Energy: Fossil fuel and electric energy	Field survey	Liter and Kwh	M/C/E	Annually started from the 7th year and the end of crediting period	100 %	Electronic and or paper	Increase of energy consumption due to the increase of income

B.2.2. Description of formulae and/or models used to monitor the estimation of the actual net GHG removals by sinks:

B.2.2.1. Description of formulae and/or models used to monitor the estimation of the verifiable changes in carbon stock in the carbon pools within the project boundary (for each carbon pool in units of CO2 equivalent):

ID Number	Data Variabel	Source of Data	Data unit	Measures (M), Calculated (C) or	Recording frequency	Proportion of data to be monitored	How will the data to be archived	Comments

				Estimated (E)				
S1	AGB	Sampling Plot	Ton/ha	M, C, E	Prior to project implementation and then every 5 years	100%	Electronic and paper	Project participant will measure the DBH of each trees Project Developer will calculate and estimate AGB and C sink
S2	BGB	Sampling Tree	Ton/ha	C, E	Prior to project implementation and then every 5 years	Sampling	Electronic and paper	Project Developer will calculate and estimate BGB from AGB using conversion factors and C content
S3	Soil Carbon	Sampling Plot	Ton/ha	M, C, E	Prior to project implementation and then every 5 years	Sampling	Electronic and paper	Project Developer will analysis and monitor Soil – C using sampling techniques.

B.2.2.2. Description of formulae and/or models used to monitor the estimation of the GHG emissions by the sources, measured in units of CO2 equivalent, that are increased as a result of the implementation of the proposed A/R CDM project activity within the project boundary (for each source and gas, in units of CO2 equivalent):

Table. B.2.2.2.1. Monitoring C-sequestration on AGB from planting *Paraserianthes falcataria* and *Gmelina arborea*
County: …….
Date and Year : …….. Recorder: ……..
Type of AR CDM project : plantation of *Paraserianthes falcataria* and *Gmelina arborea*

ID Number	**Plot**	**Activity**	**Unit**	**Formula**	**Actor(s)**

S1	A1	Measure girth of trees (G) and Diameter (D)	cm	Using diameter tape, convert into D = (G)/3.14	Project participants - farmers
	A2	Measure height of trees	m	Using　Haga meter / Chisten meter	Project participants - farmers
	A3	Calculate *) biomass	ton/ha	V = 0.3 x n x D^2 x H (common formula in forestry management) Biomass = Volume x specific density	Project Developer
	A4	Calculate C sequestration	ton/ha	C content =　0.5 * Vol. Biomass (Murdiyarso,2002)	Project Developer

Note: *) QC and QA have been carried out to calculate the biomass volume and its conversion into C content of the biomass. The method has been widely used by forester and well accepted by the IPCCC for the conversion into C stock.

Table. B.2.2.2.2. Monitoring C-sequestration on BGB from planting *Paraserianthes falcataria* and *Gmelina arborea*

County　: ……

Date and Year : ……Recorder : ……

Type of AR CDM project : plantation of *Paraserianthes falcataria* and *Gmelina arborea*

ID Number	Plot	Activity	Unit	Formula	Actor(s)
S2	A1	Calculate and Estimate **) biomass	ton/ha	1). Below ground tree biomass = Σ_i a D_i^b 2).BGB tree　= AGB/SRatio a and b = parameters for a root allometric equation as derived in FBA, and D_i refer to all proximal root diameters, measured at the stem base	Project　Developer
	A2	Calculate C sequestration	ton/ha	C content =　0.5 * Vol. Biomass (Murdiyarso,2002)	Project　Developer

Note : **) Tree sampling for C organic content analysis has been developed by ICRAF and standardized, and continuously improved to get more accurate

results.　The QC and QA have been properly implemented for this measurement and calculation.

Table.B.2.2.2.3. Monitoring Soil organic carbon increment due to planting trees in the slope areas
County　：……
Date and Year：……Recorder：……..
Type of AR CDM project：plantation of *Paraserianthes falcataria* and *Gmelina arborea*

ID Number	Plot	Activity	Unit	Formula	Actor(s)
S3	A1	Sampling soil at ***) 5-10; 10-15; and 15-20 cm depth	kg	Sample soil ± 1 kg from 0.5 x 0.5 m^2 sample size	Project participants - Farmers
	A2	Analysis C_{org} ***) content in the lab.	%	Wet oxidation (Walkley and Black)	Project　Developer

Note：***) Soil sampling for C organic content analysis has been developed by ICRAF and standardized, and continuously improved to get more accurate results.　The QC and QA have been properly implemented for this measurement and calculation.

Table B.2.2.2.4. Monitoring of Transportation Energy Consumption Monitoring of each household

ID Number	County	Monthly Expenses for transportation			Fossil fuel price/litre	Estimated fossil fuel consumption/ month (litre)	Note
	Household status	Private vehicle	Public vehicle	Total			
E1	County						
	1. Project participant						
	2. Non-Project participant						
	Others						

	1. Project participant						

Table B.2.2.2.5. Monitoring of Fossil Fuel Consumption During Harvesting Time

ID Number	Planting year	Timber Volume (m^3)	Transporting per trip		Total Fuel Consumption	Note
			Volume (m^3)	Fuel consumption (litres)		
E2	2010					
	2017					
	2024					

Table B.2.2.2.6. Monitoring of Fossil Fuel for Pumping Water

ID Number	Year	Volume of pumped water (m^3/year)	Fossil fuel consumption (litre/year)	Irrigated acreage (ha)	Note
E3	2004				
	2005				
	2006				
	2007				
	2008				
	⋮				
	⋮				
	⋮				
	2024				

Table　B.2.2.2.7. Monitoring of Agricultural Farming Input-output

ID Number	Year	County	Agricultural Farming Cost (Rp)					Yield	Benefit-Cost
			Seedling	Fertilizer and Pesticides/Insecticides	Labour	Supporting Input	Total		
E4	2004								
	2005								
	2006								
	⋮								
	⋮								
	2024								

Table B.2.2.2.8.　Monitoring of GHG emissions from the use fossil fuel by project participants

ID	Year	County	Household expenses/ month for (Rp)		Note
			Cooking	Lighting	
E5	2010	County-1			
		County-2			
		County-3			
		Others			
	2011	County-1			
		County-2			
		County-3			
		Others			
	↓				
	2024	County-1			
		County-2			
		County-3			
		Others			

B.2.3. As appropriate, relevant data necessary for determining the baseline net GHG removals by sinks and how such data will be collected and archived:

Table B..2.3.1.　Monitoring of land use changes within project boundary

ID number	Activity	Data to be monitored	Monitoring
LU1	Conversion of agriculture land to residential areas within the project boundary	Converted area and removed biomass from the agriculture land during the conversion	Planning at the projection and monitoring after the commencement of the project
LU2	Reforestation of critical land by local government	Number of trees being used in the rehabilitation program	Planning at the projection and monitoring after the commencement of the project
LU3	Other land use conversion	If the land use conversion other than LU1 and LU2 occurs within the project boundary after the start of the project, the reasons for the conversion should be investigated[1)]	Planning at the projection and monitoring after the commencement of the project.

Note:　[1)] If the change is attributable to the AR-CDM, it would affect the Net anthropogenic GHG removal by sinks

Table B.2.3.2.　Data to be collected and or used in order to estimate carbon stock change within project boundary and how this data will be archived

ID number ***(Please use numbers to ease cross referencing to***	**Data variable**	**Source of data**	**Data unit**	**Measured (m), calculated (c) or estimated**	**Recording frequency**	**Proportion of data to be monitored**	**How will the data be archived? (electronic/ paper)**	**Comment**

D.3)				**(e)**				
LU1	AGB	Field measurement	Ton/ha	M, C in a number of sample plots	Prior to project implementation and then every 5 years	Sampling	Electronic and paper	Project Developer will sample the AGB in each land use category subject to A and R at land use change
LU2	AGB	Field measurements	Ton/ha	M, C in a number of sample plots	Prior to project implementation and then every 5 years	Sampling	Same as above	Project Developer will sample the AGB in reforestation project as planned by the local government
LU3	AGB	Field measurement	Ton/ha	M, C in a number of sample plots	Prior to project implementation and then every 5 years	Sampling	Same as above	Project Developer will sample the AGB in LUC other than LU1 and LU2 occurs within the project boundary, and investigate the reasons for the conversion.

B.2.4. Description of formulae and/or models used to monitor the estimation of the baseline net GHG removals by sinks (for each carbon pool, in units of CO2 equivalent):

Table　B.2.4.1. Conversion of agriculture land to residential areas within the project boundary

ID number	County	Year initial	No. HH*	Land use Type	Location	Acreage (ha)	Year change	No. HH*	New owner identity	Converted New Land use type
LU1	A	2004								
		1005								

		2024								
LU1	B									
LU1	C									

Note: * = House Hold

Table B.2.4.2. Reforestation of critical land by local government as planned

		Reforestation of critical land by local government as planned (ha)										
ID number	County	Year-1	Year-2	Year-3	Year-4	Year-5	Year...	Year...	Year...	Year...	Year...	Year 21
LU2	A											
	B											
	C											

Table B.2.4.3. Monitoring other land use conversion

ID number	County	Year initial	Land use type	Location	Acreage (ha)	Year change	No. of contract	New ownership	New Land use as proposed / planned

LU3	A	2004							
		2005							
		2024							
LU3	B								
LU3	C								

All the above information can be assessed from:

1. Interview with local communities which has been living in the project area before 31 December 1989 or from the old people.
2. Historical data in land use in the form of maps or recording / statistic of village / county
3. Is there any significant change in farming practices occurred within the defined periods, and what factors that drives the changes.
4. The dependency of farmers on land is assessed through interview to a number of households. The main questions include what main source of incomes (whether land is important source of incomes or food supply).

B.3. Treatment of leakage in the monitoring plan:

B.3.1. If applicable, please describe the data and information that will be collected in order to monitor leakage of the proposed A/R CDM project activity:

ID number ***(Please use numbers to ease cross referencing to D.3)***	**Data variable**	**Source of data**	**Data unit**	**Measured (m), calculated (c) or estimated (e)**	**Recording frequency**	**Proportion of data to be monitored**	**How will the data be archived? (electronic/ paper)**	**Comment**
L1	Energy: Fossil fuel for transporting harvested wood	Field survey	liter	C	Daily, during harvesting time	100 %	Electronic/ and or paper	Counted by timber volume data which is transported and transportation capacity and the fossil fuel consumption estimation per trip (undertaken by project developer)
L2	Energy: Fossil fuel used by wood factory	Field survey	liter	C	Daily, during harvesting time	100 %	Electronic and or paper	Counted from the timber transported to industries both from the project's location and non-project's participant community (undertaken by project developer)
L3	Energy: Fossil fuel used for transportation and industrial activity	Field survey	Liter and Kwh	E	Annually started from the 7th year and the end of crediting period	100 %	Electronic and or paper	Estimated and effect multiplier value as well as economic development
L4	Deforestation: Land size	Field survey	Ha	E	Annually started from the 7th year	100 %	Electronic and or paper	It is considered to be negligible

					and the end of crediting period			

B.3.2. Description of formulae and/or models used to estimate leakage (for each GHG, source, carbon pool, in units of CO2 equivalent):

Table B.3.2.1. Monitoring of Leakage in Timber Transportation

ID	Planting year	Timber's origin				Transportation capacity for each trip	Transportation's fossil fuel consumption (litres/km)	Notes
		Inside Project		Outside Project				
		Volume (m^3)	Average Distance (km)	Volume (m^3)	Average Distance (km)			
L1	2010							
	2017							
	2024							

Table B.3.2.2. a. Monitoring of Fossil fuel Consumption by the wood industry

ID	Year	Production						Notes
		Plywood			Woodworking			
		Capacity (m^3/th)	Energy Consumption		Capacity (m^3/th)	Energy consumption		
			Fossil fuel (litre)	Electricity (kWh)		Fossil fuel (litre)	Electricity (kwh)	
L2	2004							
	2005							
	2006							
	2007							

	2024							

Table　B.3.2.2.b.　Monitoring on Woodprocessing (PT. KTI)

L2	Year	Realization for timber as Raw material (per year)			Capacity (m^3/tahun)			Machine Replacement (Yes/No)
		Natural forest (m^3)	Plantation forest (m^3)	Total (m^3)	Plywood	Woodworking	Total	
	2004							
	2005							
	2006							
	2007							
	2024							

Table B.3.2.3. Monitoring of Energy Consumption resulted from Income Multiplier

ID	Year	District	Economic Growth (%)	Industry Growth (%)	Energy Consumption		Note
		Sub District			Industry (l/kWh)	Transportation (l/kWh)	
L3	2010	District - 1					
		-					
		-					
		District - 2					
		-					
		-					
	2011	District - 1					
		-					
		-					
		District - 2					
		-					

		-					
	2024	District - 1					
		-					
		-					
		District - 2					
		-					
		-					

Table B.3.2.4. Monitoring of State Forests Deforestation

ID	Year	Deforestation			Note
		Forest Function (Protection/ Production/ Conservation)	Location (District/ Sub- District)	Size (ha)	
L4	2010				
	2011				
	2012				
	2013				
	2014				
	↓				
	↓				
	↓				
	2024				

B.4. Description of formulae and/or models used to estimate net anthropogenic GHG removals by sinks for the proposed A/R CDM project activity (for each GHG, carbon pool, in units of CO2 equivalent):

ID number	GHGs	Source/Sinks	Formula
S1	CO_2	Amount of carbon sequestered by the AR-CDM project (S1=ton CO_2)	MAI (t C ha^{-1} yr^{-1})*Area (ha)*Rotation (yr)*Carbon fraction of the biomass*44/12
S2	CO_2	Amount of carbon sequestered by the AR-CDM project (S2=ton CO_2)	1). Below ground tree biomass = Σ_i a D_i^b 2). BGB tree = AGB / S Ratio a and b = parameters for a root allometric equation as derived in FBA, and D_i refer to all proximal root diameters, measured at the stem base
S3	CO_2	Amount of soil organic carbon maintained in the step project area as a result of decreasing soil erosion (S3=ton CO_2).	Area (ha)*annual rate of soil erosion (t/ha)* % Soil organic carbon*44/12.
E1	CO_2	Emission from transportation of seedling materials (E1=ton CO_2)	Number of seedling (N)/loading capacity of vehicle*2 driving distance from nursery to planting site (km)*fuel efficiency of the vehicle (km/liter)*calorific factor (MJ/liter)* emission factor (kg CO_2/MJ)/1000
E2	CO_2	Emission from wood harvesting (E2=ton CO_2)	Number of harvested trees*fuel consumption/100 trees (liter) *calorific factor (MJ/liter)* emission factor (kg CO_2/MJ)/1000
E3	CO_2	Emissions from water pumping facilities (E3=ton CO_2)	Length of pump operation (days)*Pump efficiency (liter/day)*calorific factor (MJ/liter)* emission factor (kg CO_2/MJ)/1000
E4	N_2O	Emissions due the increase use of nitrogen fertilizer as a result of increasing income from the project (E4=ton CO_2-eq)	Planting Area (ha)*fertilizer consumption (ton N/ha)* emission factor*conversion ratio*310
E5	CO_2	Emission due to the increase use of fossil fuel by project participant due to increase of the income from the AR-CDM projects (L4= ton CO_2)	Fuel consumption (liter)*calorific factor (MJ/liter) x emission factor (kg CO_2/MJ) / 1000

LU1	CO_2	Carbon loss from agriculture land conversion to housing complex (LU1=ton CO_2)	Area being converted (ha)*(Biomass density before conversion - Biomass density after conversion) (t/ha) *carbon fraction*44/12
LU2	CO_2	C-sequestration from reforestation project under government program (LU2=ton CO_2)	MAI (t C ha^{-1} yr^{-1})*Area (ha)*Rotation (yr)*Carbon fraction of the biomass*44/12
LU3	CO_2	Carbon loss from agriculture land conversion to other land uses (LU3=ton CO_2)	It would be similar to LU1 or LU2 depending types of conversion.
L1	CO_2	Emission due to the use of fossil fuel for transporting harvested wood from project site to wood processing factory (L1= ton CO_2)	Volume of harvested wood (m^3)*loading capacity of vehicle (m3/truck)*2 driving distance from project site to (km)*fuel efficiency of the vehicle (km/liter)*calorific factor (MJ/liter)* emission factor (kg CO_2/MJ)/1000
L2	CO_2	Emission due to the increase of fuel consumption as a result of increasing proportion of plantation wood used for producing plywood and wood working (L2= ton CO_2)	(Volume of raw wood material (m^3)*electricity efficiency (kwh/m^3)*conversion factor (TJ/kwh)*emission factor (tC/TJ) + Volume of raw wood material (m^3)*diesel efficiency (toe/m^3)*conversion factor (TJ/10^6toe)*emission factor (tC/TJ))*44/12
L3	CO_2	Use of fossil fuel in the region due to the increase of transportations and industrial activities as the economic condition of the region increase (L5= ton CO_2)	It is not estimated if the project does not affect regional economy. The method use for estimating the emission will follow the 1996 IPCC methodology
L4	CO_2	Deforestation (L6= ton CO_2)	If the project activity does not result in the displacement of activities or people, the project will not cause the increase of deforestation.

B.5. Default values used in elaborating the new methodology:

The default values used in elaborating the new methodology is based mainly on the default values as provided by the IPCC on GPG for LULUCF and Forestry.

Description of assumption used in estimating the net greenhouse gas emission are as follows:

1. The basic assumption used in defining baseline scenario is that the community will not change their attitude in using their land if no intervention

or forcing from outside, while industrial forest companies is not willing to establish tree-based agroforest in community land without carbon incentive.

2. There will be no drastic change in government policy and regulation
3. All the emission factors, conversion factors (such as biomass expansion factors) adopted from IPCC-GPG are assumed to be applicable for the project
4. Price of fossil fuel is assumed to be stable for the whole project period.

B.6. Please indicate how quality control (QC) and quality assurance (QA) procedures are applied to the monitoring process:

Data	Uncertainty level of Data (High/Medium/Low)	Are QA/QC procedure are planned in these data?	Outline explanation why QA/QC procedure are or are not being planned
S1	Low	Yes	This data constitute the important information for the forest stand increment, therefore its QA/QC procedures are regularly improve and standardize to get an accurate estimation of the AGB and C content of the said land use type.
S2	Medium	Yes	This data constitute the important information for the forest stand increment, therefore its QA/QC procedures are regularly improve and standardize to get an accurate estimation of the BGB and C content of the said land use type
S3	Medium	Yes	This data is important particularly for the area with steep slope that is potential for erosion. However, since the measurement is done on sampling procedure, the uncertainty level is consider as medium, although the methodology of measurement is regularly improve in order to increase the QA/QC.
E1	Low and Medium	Yes and No	Cross checking with others will be done
E2	High	Yes	Cross checking with others will be done
E3	High	Yes	Same as above
E4	High	Yes	Same as above
E5	High	Yes	Same as above
LU1	Medium	Yes	QA/QC is existed for the initial data on land use and land cover inventory using satellite data. However, since the estimation of AGB is based on the sampled land

			use land cover (multi-strata measurements) the estimation of AGB for removals sinks is consider as medium level, although it is varies according to the types of land uses and land covers.
LU2	Medium	No	Data will be supplied by other organization at the local and provincial levels.
LU3	Medium	No	Data will be supplied by other organization at the local and provincial levels
L1	High	Yes	Break down of timber volume and origin as well as the vehicle transporting entering PT. KTI recorded well, thus enable to count the fossil fuel needed.
L2	High	No	Break down of timber volume and sources thus enable to count the fossil fuel needed for wood processing
L3	Medium	No	Data is to be supplied by SUSENAS, however it is considered to be negligible
L4	-	-	It is considered to be negligible

B.7. Has the methodology been applied successfully for other purposes and, if so, in which circumstances?

Method for Monitoring Progress of CO_2 Removal

The proposed methodology is based on recommendations acknowledged by international institutions, expressed in generic guidelines, rules, and standards. It was designed for inventory and monitoring the growth and dynamic of forest stand volume, above and below ground biomasses in various land uses land covers types i.e. natural tropical forests, plantation forests, agroforestry systems in the tropical regions, therefore it has been widely applied in the country.

Method for Monitoring Progress of actual GHGs emission from project

As this a new approach, this has not been applied elsewhere. However, survey method used is a common practiced. The increase in actual GHG emissions is monitored based on change of the income of the project participants. It is assumed that income increase will change behaviour of the project participants in consuming energy, transportation, fertilizers etc.

Method for Monitoring Land Use Change within Project Boundary

Inventory and mapping land use land cover types using satellite data is commonly used by institutions in Indonesia, as well as in other part of the world. It has a standard methodology of interpretation and the analysis is applicable to all vegetation features on earth. Its consistency, repetitive capability and quick approach for assessment and monitoring make this method is widely used all over the world.

Method for Monitoring Leakage

The approach is similar to the process of monitoring actual GHG emissions from project.