Kyoto Mechanism and the Conservation of Tropical Forest Ecosystem
T. Okuda, Y. Matsumoto (Eds.), 2004

Land Use, Land Use Change and Forestry in the Context of A/R CDM: Indonesian Case[1]

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Abstract

Negotiation process on CDM-LULUCF in SBSTA-19 had shown considerable progress despite many compromised agreements have to be made in order the decision on methodological aspects to be taken in COP-9. A number of outstanding issues have been settled for example : definitions, crediting period, addressing non-permanence, size of small-scale CDM project, and criteria for assessing environmental and socio economic impacts. Some issues of COP-9 decision on CDM-LULUCF which relevant to the theme and objectives of the symposium and their implications to host country will be discussed in this paper, including the question on how benefits of CDM-LULUCF should be seen for a country like Indonesia, possible types of and potential areas for CDM projects, and status of relevant activities in the country.

Discussion on benefit of CDM-LULUCF will be seen from several angles for example CDM : (a) as an incentive for private sectors to practice SFM voluntarily, (b) helps the effort in alleviating poverty in rural areas, (c) helps to speed up restoration of degraded lands in Indonesia, (d) may contribute positively to the implementation of CBD and CCD.

Considering the four possible benefits of CDM-LULUCF and in line with forestry sector policy, both small-scale and large-scale CDM projects are potential to be implemented in Indonesia. The question is what types or forms of CDM project are likely to be the most suitable for large-scale holders especially in tackling heavy criticism on the environmental impact of large-scale plantation? Similar question also applies to small scale CDM considering the COP-9 decision which put upper limit of GHGs removals from a CDM-LULUCF project activity of 8 kilo tones of CO_2 per year.

From the aspect of preparedness of the country to implement CDM-LULUCF, a number of researches, studies, and other initiatives have been carried out by various institutions with various focuses covering technical and/or non-technical (policy and institutional) aspects. Some examples of carbon-based projects and relevant studies which have been conducted in Indonesia, and lessons learnt from those projects will be presented.

Information on potential areas for CDM-LULUCF projects presented in this paper is derived from the Ministry of Forestry data and other sources. As part of the long-term policy focus on rehabilitation of degraded forest/land and conservation of the remaining forests, the Ministry of Forestry has set up a 5 year rehabilitation programme with total areas of 3 million ha. The first year rehabilitation activity (2003) was targeted to cover area of 300,000 ha, funded from domestic source (reforestation fund). It is not clearly stated yet regarding funding sources for rehabilitation activities in the following years (2004-2007), whether the activities will be fully funded from domestic sources or additional funds from external sources will be needed. Referring to the existing government programme and using relevant data currently available, information on potential areas for CDM projects both for large-scale and small-

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[1] The view expressed in this paper is of author and not necessarily represents the view of the Ministry of Forestry or the Government of Indonesia.

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scale CDM-LULUCF projects will be described. Furthermore, taking into account additional requirements for CDM-LULUCF projects (e.g. conformity with other Conventions), possible types or forms of the two different scales of projects will be presented.

Keywords
decision, benefits, projects, rehabilitation, conservation

1. Introduction

Conference of the Parties through its decision in COP-6bis has agreed to include Afforestation and Reforestation activities in CDM. Through negotiation process since then, agreements was finally reached in COP-9 regarding the methodological aspects for the inclusion of Afforestation and Reforestation activities in CDM.

Indonesia is one among view tropical countries with large forest areas. Comprising of about 60 percent of the country land areas, forestry sector play considerable roles in the national economy especially in the past three decades. Along with deforestation problem in the tropics, Indonesia has lost approximately 1.7 million ha of its forest per annum. Based on the MOF data (2001) there were at least 23.5 million ha of degraded forest and non-forest land need to be rehabilitated. These areas are potential for CDM-LULUCF.

In connection with CDM-LULUCF, since for the first commitment period (2008-2012) only Afforestation and Reforestation are eligible for CDM, with one percent cap and without USA ratifies Kyoto Protocol, the potential global market of A/R CDM per year would not be high. National Strategy Study on CDM-forestry sector (2003) estimated the potential of Indonesia to absorb CDM-LULUCF of about 28 million tons CO_2 per year assuming that Indonesia will absorb about 54 percent of the global market of A/R CDM.

This potential, however, will be influenced by many factors such as : requirements for A/R CDM in relation with definition used (forest, afforestation, reforestation), potential risks (forest fire, illegal logging, social conflict), and bio-geographical conditions.

2. COP-9 Decision on CDM-LULUCF and its Implication to Indonesia

COP-9 outcomes brought positive impacts to countries which have potential for CDM project implementation. However, some parts of the COP-9 decision on LULUCF will affect considerably to Indonesian potential to absorb A/R CDM. Definition of forest, afforestation, and reforestation, will affect directly to the size of land areas eligible for CDM projects.

In regard to definition of forest, Decision 19/CP-9 stated that non-Annex I countries may participate in CDM provided it has determined a single value of minimum land area between 0.05-1 ha, minimum tree crown cover between 10-30 percent, and minimum tree height between 2-5 m. And these values must be fixed for all afforestation and reforestation project activities under the CDM registered prior to the end of the first commitment period. The consequences of selecting these fixed values can be illustrated as follows (Rosalina et al. in MOE, 2003) :

1. Taking the lowest values of tree crown cover (10 %), tree height (2 m) and minimum area (0.05 ha), will reduce land availability for CDM. With these minimum values, enrichment planting of degraded forest may not be eligible for CDM as with a lower crown cover a large degraded forest areas may qualify as a forest. However, simple agroforest system (e.g. coffee-based agroforestry) and any other A/R activities that meet this forest definition will be eligible.
2. With the lowest values of tree crown cover and tree height (10 %, 2 m) and the highest value of minimum area (1 ha), any A/R activities under one ha will not be eligible unless bundling of land areas is permitted.
3. Conversely with the highest values of tree crown cover and tree height (30%, 5 m) and the lowest value of minimum area (0.05 ha), any A/R activities using tree species which could meet this forest definition including enrichment planting of highly degraded forest and agroforestry in land area not less than 0.05 ha should be eligible for CDM.
4. Taking the highest values of tree crown cover (30%), tree height (5 m) and minimum area (1 ha), enrichment planting of highly degraded forest and complex agroforestry in land area not less than 1 ha and meet this forest definition shall be eligible for CDM.

From the illustration above, suppose Indonesia select minimum values for land area of 0.5 ha, tree crown cover of 30%, and tree height of 5 m, A/R activities in highly degraded forest will be eligible for CDM with the following reasons : (1) highly degraded forest may not have tree crown cover more than 30%, (2) naturally, the highly degraded forest may not be able to grow and reach tree crown cover more than 30% and height more than 5 m, and (3) many areas in highly degraded forests meet the above two conditions with area of more than 0.5 ha. However, if the above definition is adopted, some agroforestry projects may not be eligible for CDM as some types of agroforestry may not be able to have tree crown cover more than 30% and height more than 5 m.

Other implication is related to definitions of afforestation and reforestation. Definition of afforestation that require 50 years before the start of the project was non-forested, since the history of logging activities in low land forest areas in major outer islands such as Sumatera, Kalimantan, Sulawesi, and Maluku just began in early seventies, only private land that are very likely eligible for CDM through afforestation. As land use in Indonesia is divided into two status of land (state forest land and private land), the implication is on whether activities will be more on state or private lands. Information on land condition (forested or non-forested) in the past 50 years will be more available in private land ownership than in forest land's. As private lands in Indonesia especially in Java are mostly in small patch per ownerships, this will probably more suitable for small scale CDM.

Definition of reforestation on the other hand, which require non-forested condition in 31 Desember 1989 will reduce the potential land for A/R CDM, as existing areas that meet definition of forest are mostly deforested after 1990.

3. Potential Benefits of CDM-LULUCF and Ways to Make It Works

Along with negotiations during several COPs there have been studies and debates regarding the benefits and potential risks of A/R CDM. Learning from those processes and using forestry common knowledges, this paper analyzed how the potential benefits could be obtained through various types or forms of projects.

3.1. CDM as an incentive for private sectors to practice SFM voluntarily

Investment in forestry is known to have long gestation period and high risks. There is a wide range of forest industry operation for example from pulp and paper industry, sawn timber, to furniture, and other down stream industries. The consequences of these wide ranges of industry finished products, is the kind of raw material used which also ranges from fast growing to slow growing species. For example, pulp and paper industries would choose the fastest growing possible species. With rapid development of research on tree improvement, pulp industries enjoy the use of genetically improved seeds for their planting materials which provide high yields and can be harvested in a shorter rotation. Other industries which need different wood qualities will have to use slower growing species with certain wood properties.

In terms of species for A/R in CDM, pulp and paper industries will face the choice between genetically improved fast growing tree species which are generally exotic, potentially invasive on one side and local (slower growing) species which is considered more environmentally friendly. If the two different species categories are compared in terms of productivity (m^3/ha) and log price versus carbon price added by cost for monitoring and other CDM requirements, carbon sequestration project with local species may not be attractive. However, if COP-9 decision on crediting period of maximum 20 years which can be renewed twice or maximum 30 years is applied, A/R CDM can be used by the government of Indonesia to encourage private sectors to plant local (native) species which generally slower growing species than the exotic ones. It is expected that it can compensate the vast use of exotic fast growing species in plantation forest. Furthermore, as CDM project is run with strict rules, lessons learnt from carrying out the CDM will be useful in practicing SFM.

3.2. CDM may help the effort in alleviating poverty in rural areas

COP-9 decision has enabled small scale A/R CDM with the limit of 8 kilo ton CO2 removals per year to be implemented with simplified modalities and procedure. This type of project will encourage both private land owners and small scale holders of state forest land permit to participate in CDM. The common practice with small holders in Indonesia is the form of agroforestry (intercropping). With this forms of forestation, the scheme is not only be able to help the effort in alleviating poverty but also securing biodiversity conservation and social values/objectives as recommended under CBD.

The small scale A/R CDM may also be carried out by adopting the existing practices, for example partnership between small holders (farmers/community groups) with industries. However, this needs a mechanism to ensure that the small holders reap the benefit as targeted by this scheme, and meet the Kyoto Protocol requirement that small scale A/R CDM shall be implemented by low income community or individuals.

3.3. CDM may helps to speed up restoration of degraded lands in Indonesia

It is clear that CDM must be additional to business as usual (BAU). This additionality can be further defined to suit national context as long as it meet additionality from environmental points of view. If this is taken to one of Indonesian programme 'Rehabilitation of degraded forest and land 2003-2007', it may helps to speed up restoration of degraded lands in Indonesia. A/R CDM may be directed to areas not targeted for rehabilitation programme between 2003-2007, or heavily degraded forest where additional costs are needed. This offcourse need to consider whether the A/R CDM may be successful in these areas in terms of level of social

conflicts and other risks which will affect the size of Carbon generation as well as additional benefits obtained by stakeholders with the present of the A/R CDM project.

3.4. CDM may contribute positively to the implementation of CBD and CCD

In the methodological aspects, the A/R CDM does not consider positive leakage, while many forestry projects produce positive leakages or ancillary benefits which are important from CBD and UNCCD contexts. However, into some extent COP-9 decision on crediting period for A/R CDM projects will promote the use of indigenous (local) species. Such A/R CDM are potential for rehabilitation of degraded conservation forest areas, contribute to the achievement of global targets for the year 2010 on conserving plant diversity decided in COP-6 of CBD, as well as UNCCD thematic programmes.

As a Party of UNCCD, Indonesia implements the convention through a set of action programmes addressing underlying causes of land degradation and drought and identifies measures to prevent and rehabilitate the degraded land and areas affected by drought, with the target dry land areas in three Provinces namely East Nusa Tenggara (NTT), West Nusa Tenggara (NTB), and Central Sulawesi.

Types of A/R activities in CDM which can be implemented in Indonesia are clearly relevant to UNCCD implementation (at least two of the 13 thematic programmes of Indonesian National Action Programme/NAP). The two of Indonesian NAP are 'rehabilitation of degraded lands (Thematic Programme 6) and Promoting of Agroforestry (Thematic Programme 3). The funding sources of these activities, however, are still not clear yet. Moreover, at the international level, funding mechanism to address land degradation under CCD is not many compared with the other two conventions such as UNFCCC and CBD. And so, seeking additional benefit from A/R CDM to also addressing this problem is among view options available. Furthermore, a clear policy direction of the host countries as well as proper monitoring and evaluation of the implementation on the ground, will result in synergy effects between UNFCCC, CBD, and UNCCD through A/R CDM projects.

4. Possible Types of CDM-LULUCF

Many developing countries have long experiences in various forest-based practices, hence, in technical aspects there is no substantial problem to carry out afforestation and/or reforestation. Furthermore, definition of Afforestation and Reforestation under the CDM can be easily translated into a number of types of forest plantation activities as long as the activities meet the requirements for A/R CDM.

National Strategy Study on CDM forestry (Rosalina et al. in MoE, 2003) suggested seven types of LULUCF activities that may be eligible for CDM, namely regreening, agroforestry, community forest, enrichment planting, multi purpose tree species (MPTS), reforestation (Id. 'reboisasi'), and timber estate. The study also suggested that the seven activities have positive impacts on social, economic, and environment. The study estimated mitigation potential of the seven project types between 53 and 306 ton Carbon per ha, with establishment cost between US $ 27 to 613 per ha, and Net Present Value (NPV) of benefit between US $ 65 and 5,738 per ha. It was predicted that the projects could generate job opportunity for about 64 to 109 Man Month per ha per year. Among the seven projects, three of them were considered to have potential social conflict, namely afforestation, reforestation and timber estate. Other three

project types may have good impact on poverty reduction, namely agroforestry, MPTS and community forest. In addition, impact on biodiversity and watershed were considered to be between good and very good for the four project types, namely agroforestry, MPTS, reforestation and enrichment planting.

Other study but in limited scales and different purposes for example ACIAR-FORDA (e.g. Ginoga, 2002) which analyzed the role of carbon sequestration credits in influencing the economic performance of farm forestry systems in South Sumatra. Collaborative project carried out by JIFPRO-FORDA (e.g. Gintings et al., 2003) carried out measurement of biomass contents per ha and carbon sequestration capacities for some species such as : *Swietenia macrophylla*, *Acacia mangium*, and *Peronema canescens* in plantation forest areas in South Sumatra; *Aleurites muluccana*), *Peronema canescens* and *Schima walichii* in Tanjungan Lampung. Similar study is also carried out for *Swietenia macrophylla,* and *Pinus merkusii* in Jember, and *Paraserianthes falcataria* in Kediri, both in East Java. Research to find out sequestration capacities of some species receiving different silvicultural treatments has been carried out through collaborative projects of JICA-FORDA since 2001 and recently been expanded to cover analysis on financial, and socio-economic aspects of carbon sequestration project.

In terms of the size of project, small scale A/R CDM as determined in the COP-9 decision to be not more than 8 kilo tons CO2 equivalent per year. The issue of bundling a number of project units will be critical to reduce transaction costs, as suggested by the result of NSS-CDM forestry (Kohn et al. in MoE, 2003) that total CDM costs ranged between US $ 200, 000 to US $ 400, 000 per project regardless the size of the project. Additional challenge is in measuring additional benefits gain by small holders by participating in A/R CDM compared to business as usual (BAU) activities like normal forest practices. Even for common forestry projects, there are some challenges in measuring benefit from forests obtained by small holders when it has to be expressed in terms of income (money value) (see Wollenberg and Nawir, 1998). However, learning from among view existing small scale forestry projects which are normally ecosystem-based forest management, there seem to be potential opportunities to take small holders to participate in CDM. Additional actions which are needed particularly capacity building to potential CDM project proponents to understand the potential benefits and risk of A/R CDM and how to reap benefits from this type of project.

Other possible type of CDM in Indonesia is rehabilitation of degraded conservation forest areas. Forest degradation in Indonesia occurred not only in production forests but also in protected areas including conservation forests. And so, rehabilitation of degraded conservation forest should be eligible for CDM as long as it meet the requirement of A/R CDM including the definition of forest, afforestation, and reforestation. The existing national programme on forest rehabilitation also covers conservation forest. However, as a large area of conservation forest is degraded and the domestic funding may not be sufficient to rehabilitate the areas, additional costs should be possible to be covered through CDM reforestation. The obvious advantage of CDM reforestation in degraded conservation forests is that the project must use indigenous species as it is a requirement under national programme on rehabilitation of conservation forests. Hence, avoiding the use of alien potentially invasive species that is also discouraged under the A/R CDM scheme. Another important advantage is the permanent nature of rehabilitation in conservation forest will ensure the more permanent project. If it is connected with existing programme on local people participation in management of conservation forests, it can also be directed to strengthen the capacity and the economy of the local communities.

5. Potential Areas for CDM-LULUCF

CDM requires minimum possible leakage, and so, there is a need both at the national and local levels to identify such areas, means that areas to be designated as A/R CDM project locations should be guaranteed that leakage can be minimized. Potential sources of leakage in Indonesia includes : land tenure conflict, pressure from community (enchroachment), illegal logging, and forest fire. If a number of factors related to requirement under international agreement (e.g. COP-decisision), national programme on rehabilitation, master plan of industrial plantation development, provincial and district level development priorities, could be addressed properly, the following starting points can be used in identifying appropriate areas for CDM :

Table 1 Degraded forest area in seven major islands

No.	Name of island	Conservation forest & Protection forest (million ha)	Production forest (million ha)
1	Java	0.26	1.06
2	Sumatera	2.77	5.61
3	Kalimantan	1.09	5.32
4	Sulawesi	1.24	1.18
5	Maluku	0.03	0.11
6	Papua	2.21	1.69
7	Nusa Tenggara	0.82	0.50
Total		8.44	15.49

Source : The Agency for Forestry Planning/BAPLAN, Ministry of Forestry (2001)

1. CDM-Afforestation can only be implemented in the area which in the last 50 years prior the project commencement was not forested. In this case, the most clear land status is non-forest land (particularly private land) in Java. However, as land ownership in Java in most cases is very small (average of 0.25 ha), the most possible activity is for small scale CDM with bundling of certain number of land ownerships.
2. CDM-Reforestation is only applied for areas which was already non-forested in 1990). In this case, if the area is ex-HPH, it should be directed to the areas which was logged before 1990. Additional requirement is that whether the definition of forest under the COP decision is also met in regard with area, crown cover and tree height of the residual stands.

At the macro level, there are at least 23.9 million ha of degraded forest area caused by various reasons such as illegal logging, forest fire, abundenment of converted forest land for other uses, and enchroachment (MoF, 2001). Among the 23.9 million ha, 8.44 million ha was located in protected areas (*Conservation forest* and *Protection forest*), while the remaining 15.49 ha was in *Production forest*, distributed into 7 major islands (Table 1).

Result of interpretation of satellite imagery taken in 2000 showed that the degraded forest increase from 23.9 million ha to 54.6 million ha, added by non-forest land of about 41.7 million ha which also need to be rehabilitated. This large area of degraded area demands considerable funds and efforts for their restoration. For this reason, priority setting is critical. In order to determine areas for rehabilitation programme, the MoF has produced indicative maps for each district where the programme is targetted. Table 2 depicted indicative areas in six major

Table 2 Indicative area of forest and non-forest lands under the category of first priority watershed to be rehabilitated

No.	Province	Forest and Non-Forest Lands to be rehabilitated (x1000 Ha)					Total Area to be rehabilitated (x1.000 Ha)
		Forest land				Non-Forest land	
		Protection Forest	Conservation Forest	Production Forest	Total		
1	2	4	5	6	7	8	9
1	Sumatera	477,4	114,8	1795,2	2387,4	2010,7	4397,8
2	Kalimantan	111,4	65,3	1.486,0	1.662,7	861,8	2.524,5
3	Sulawesi	524,3	33,9	375,6	933,8	781,2	1.715,0
4	Jawa	45,8	22,5	124,2	192,7	1.377,0	1.569,7
5	Bali & Nusa Tenggara	180,7	37,9	138,7	357,3	718,4	1.075,7
6.	Maluku & Irian Jaya	0	0	0	0	0	0
	TOTAL	1.339,7	274,2	3.919,9	5.533,9	5.749,2	11.282,6
	Land cover type*) I	613,9	122,4	1313,5	2049,7	3384,4	5434,2
	II	674,1	137,8	2329,7	3141,7	535,4	3676,8
	III	51,7	14,0	276,7	342,5	1829,4	2171,6

***)** Land Cover Types :

I : Shrubs, denuded land, dry land agriculture and shrubs,

II : Secondary dry-land forest, secondary swamp forest, secondary mangrove forest,

III : dry land agriculture, paddy field, settlement area, mining area.

Source : Planning Agency, Ministry of Forestry (2003) 'Satellite Data Interpretation 2000'.

islands which are under the first priority watersheds to be rehabilitated. Among the total area of about 11.3 million ha, only 3 million ha is targetted to be rehabilitated during 2003-2007 under National Programme on Forest and Non-forest Land Rehabilitation (*Ind. GERHAN/ Gerakan Nasional Rehabilitasi Hutan dan Lahan*).

NSS-CDM forestry (Rosalina et al. in MoE, 2003) identified eight districts in six provinces where the government and relevant stakeholders showed interest in CDM-LULUCF, namely :

Table 3 Carbon sequestration capacity of some species for A/R CDM

Species	Growth rate (m3/ha)	Specific gravity	Rotation (year)	Biomass content*) (ton)	C sequestration capacity*) (ton)	C sequestration capacity per year (ton)
Teak	12	0,67	50	402	201	4.0
Pine	15	0,55	25	206	103	4.1
Dalbergia	17	0.83	40	564	282	7.1
Swietenia	16	0,64	40	409	204	5.1
Agathis	19	0,42	35	279	140	4
A.mangium	30	0,50	7	105	52,5	7,5
Paraserianthes	38	0,40?	12	182	91	7,5

Source : Gintings (2003) unpublished data

Note : *) at the end of rotation

Tanah Datar and Pasaman (West Sumatra), Batang Hari (Jambi Province), West Lampung (Lampung Province), Bogor and Kuningan (West Java), Gunung Kidul (Yogyakarta), and Banjarbaru (South Kalimantan) are the districts in the six provinces that have shown their interest to implement LULUCF-CDM projects. The stakeholders varied among district, ranging from local governments including district forest offices, state forest companies, University, community groups, and NGOs, Types of projects they proposed mainly were community forest and timber estate. Current land uses for the proposed project implementation were grassland and shrubs/thickets with biomass of between 30 to 80 tons per ha. The mitigation potential of the proposed projects ranged from 119 to 307 ton Carbon per ha. Estimated carbon sequestration by the eight district varied, ranging from 0.18 to 4.37 million ton carbon with total project finance between US $ 0.49 to US $ 29.29 million.

Furthermore, as in forestry species used will determine the amount of carbon sequestration (example see Table 3), added by site influence, while each species in terms of financial values, each species has its own end uses, and when the BAU product (e.g. timber) has higher than the carbon product, then A/R CDM is only attractive if there is additional benefits. This will affect the land area needed for the A/R activities.

6. Concluding Remarks

Afforestation and Reforestation (A/R) in CDM has been recognized to have both potential benefits and risks from a number of reasons. In this regards, the benefits of A/R CDM need to be seen from various angles, and in order to obtain maximum possible benefits from A/R CDM, host country needs to set priorities for the overall forest and forestry programmes including where A/R CDM will be directed. A number of related studies have been carried out with sets of recommendations to be followed up by all related sectors in order to have better preparation for A/R CDM implementation in Indonesia. Findings and lessons learnt from these studies will be a useful input for determining the most appropriate types of activities and the most suitable land areas for A/R CDM.

Acknowledgement

I would like to express my deep appreciation to Dr. Toshinori OKUDA for inviting me to the Symposium/Workshop, to the National Institute for Environmental Studies and other organizing institutions which provided me funding support for my participation in the symposium/workshop.

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