Feasibility Study on
Sustainable Peatland Management in Indonesia under NAMAs

- Peatland mitigation in coastal lowlands -

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Shimizu Corporation

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1. Action/project outline

(1) About the action/project

(i) <u>Overview</u>

- Host country: Republic of Indonesia
- Project site: Irrigated land in the East Tanjung Jabung regency of Jambi, Sumatra, covering an area of approximately 10,000 ha (see Figure 1.1)
- Project objectives:
  - To raise water table in the project area by installing water gates, etc. and improving management of existing water gates
  - To inhibit aerobic decomposition of peat and limit carbon dioxide emissions by raising water table in the peat layer (see Figure 1.2)
  - To enable dual or double cropping by raising water table and increase yield per crop, thereby contributing to sustainable development of significant benefit to the host region
- Project implementers: It is envisaged that implementation of the project will be funded by a consortium (including Shimizu Corporation) under a bilateral agreement between Japan and Indonesia to reduce greenhouse gas (GHG) emissions.
- Term of project: Envisaged to be a 10-year period beginning in 2015

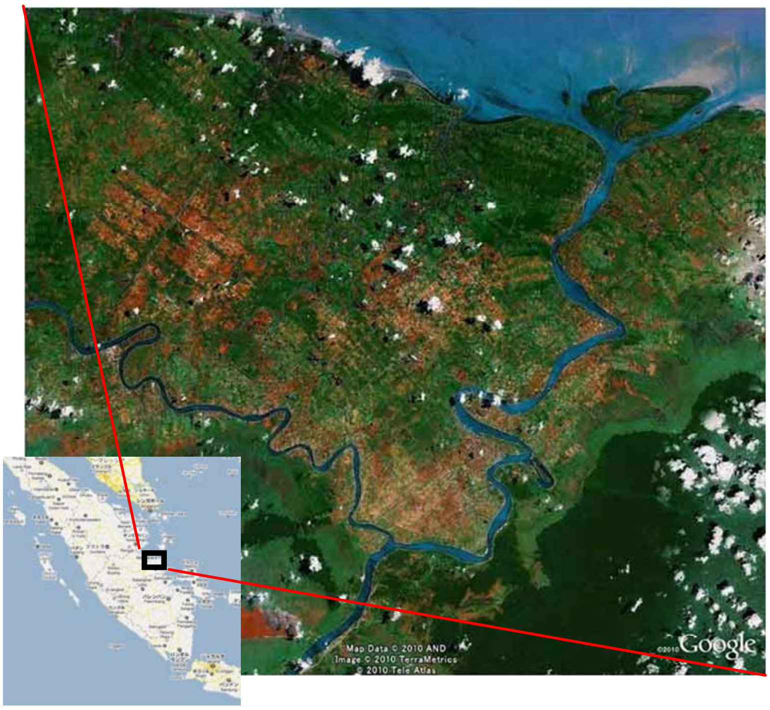

Figure 1.1 Project site (irrigated land in East Tanjung Jabung in Jambi, Sumatra)

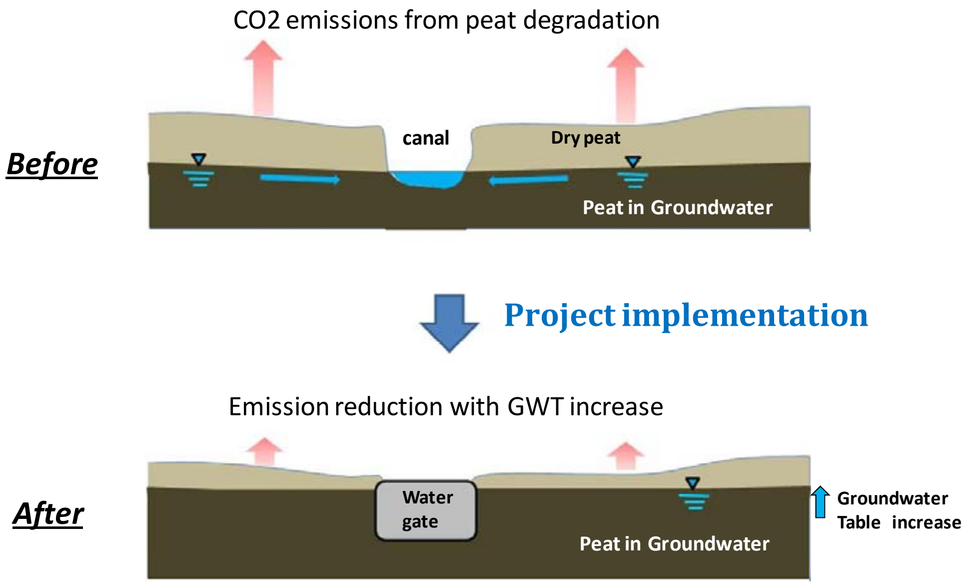

Figure 1.2: Reduction of CO_2 emissions through recovery of water table in peat

(2) Contribution of action/project to reduction of GHG emissions

(i) How the project will reduce GHG emissions

Water gates will be operated to allow tidal zone river water onto the site to raise and keep water table there at a certain level. Raising water table will inhibit aerobic decomposition of peat by microorganisms, thereby enabling peat CO_2 emissions to be reduced.

(ii) Grounds for approach

Method of calculation of emissions: Reduction in GHG emissions from the project is estimated based on the following approach described in PEAT-CO2 (Hooijer et al., 2006):

1. CO_2 is emitted as a result of aerobic decomposition of peat caused by drainage in peatland.
2. The relation between CO_2 and drainage depth is given by the following expression, which is applicable to drainage depths of 0.5-1 m in Southeast Asia:
   91t-CO_2/ha/y per m of drainage depth in peatland (Hooijer et al., 2006)
3. Considering rewetting condition of peat in the current project case, more conservative rate of its half <u>45t-CO2/ha/y</u> is adopted in this study. The conservative approach is also found in DNPI document (2010).

(3) Situation in host country

(i) Host country policy on new flexible mechanisms, NAMA and REDD

- The government ministries and agencies involved in peat conservation are the Ministry of Forestry, the Ministry of Public Works, and the Ministry of Environment, Bappenas and BPPT. The Ministry of Public Works is involved in peat conservation through its responsibility for swamp development.
- The designated national agency (DNA) responsible for GHGs in Indonesia is the National Council of Climate Change (NCCC), which in January 2010 reported on Indonesia's policy on NAMA initiatives to the UNFCCC. In the report, peatland comes first:
  1) Sustainable peatland management
  2) Reduction in rate of deforestation and land degradation
  3) Development of carbon sequestration projects in forestry and agriculture
  4) Promotion of energy efficiency
  5) Development of alternative and renewable energy sources
  6) Reduction in solid and liquid waste

7) Shifting to low emission transportation mode

- The report states that the aim is to voluntarily reduce GHGs by 26% by 2020 through the NAMAs.
- Present and future emissions in Indonesia and the proportions of the totals accounted for by peat emissions are shown in Figure 1.3 and 1.4.
- Development of NAMAs arrangements in Indonesia is currently led by the National Development Planning Agency (Bappenas).
- The Indonesian government's organizational response to REDD has been to form UKP4, which comes under the direct authority of the president, and a cross-governmental taskforce is presently being set up with Norwegian assistance.
- As regards relations with Japan, what form bilateral cooperation between Indonesia and Japan will take remains undecided.
- President Yudhoyono of Indonesia is to visit Japan this year (2011), and it is hoped that this will lead to progress on bilateral mechanisms.
- On the question of how credits will be generated by forest management projects under REDD, it is understood from meetings with NCCC that moves are underway to develop an Indonesian I-VER scheme modeled on Japan's J-VER.
- It was decided at COP16 that the Japanese government would seek to expand the J-VER credit scheme to include Indonesia (including, where necessary, making revisions to the scheme) and contribute to capacity building through, for example, educational programs, and this may be seen as part of Japan's support for implementation of NAMA by developing countries.
- Application of an existing scheme in this manner offers the advantage of making it possible to reduce social costs on the Indonesian side. It is also consistent with frameworks of bilateral cooperation.

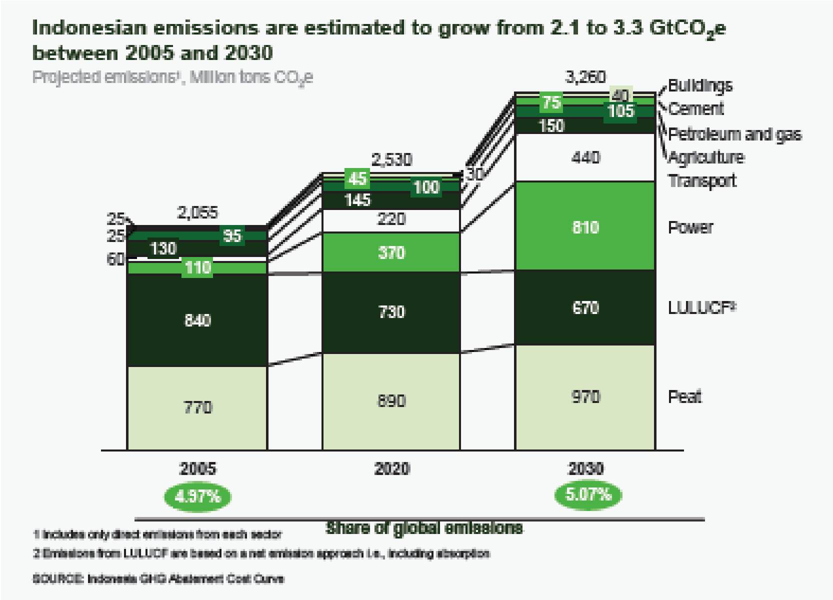

Figure 1.3 Forecast Indonesian emissions*[1]

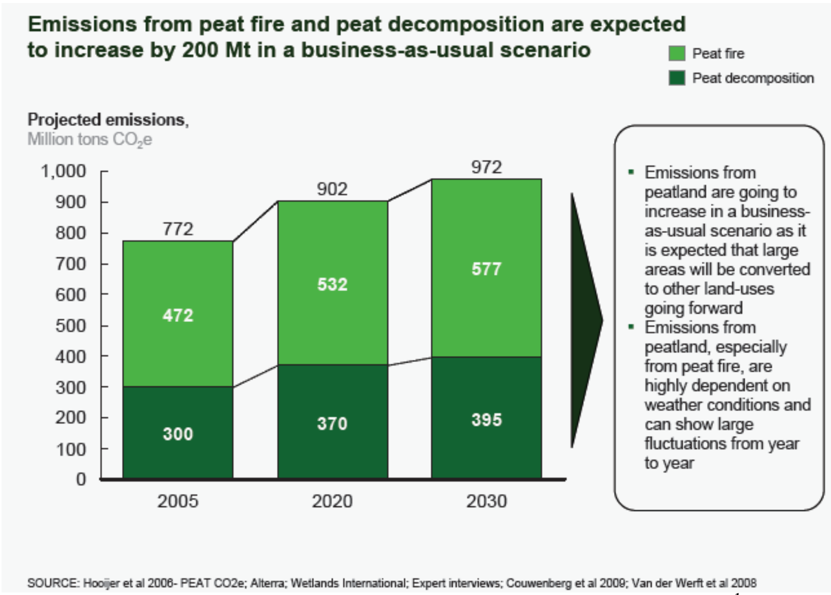

Figure 1.4 Impact of Indonesian peatland on emissions*[1]

*1. DNPI, 2010: Indonesia's Greenhouse Gas Abatement Cost Curve

(4) Strategy to promote expansion of action/project

- Action under the project should serve to both reduce GHG emissions and increase crop yields as a result of improved farmland management.
- Farmland development in lowland areas and conservation of agricultural land in Indonesia

has traditionally been the preserve of the Ministry of Public Works, and the improvement of water table management that is sought through the project coincides with ministry policy.

- It is essential for Indonesia to continue to develop agricultural land in lowland coastal areas, including areas of peatland, to ensure food security (i.e., a sufficient food supply for its population), and adopting effective water table management will thus be a necessary part of this strategy to secure crop yields.
- Accordingly, requiring the strict implementation of water table management along the lines envisaged under the project in the course of development of farmland by the Ministry of Public Works and other agencies should lead to the wider adoption of practices that reduce GHG emissions from peatland.

2. Survey method

(1) Organization of survey

Survey partner in Japan and its role

- Telecommunication Technology Committee:
  Initial coordination at survey site and study of remote sensing

Counterpart and other partners in host country and their roles

- Indonesian Ministry of Environment:
  Provision of information on peat conservation policy in Indonesia
- Indonesian National Council of Climate Change (NCCC):
  Provision of information on Indonesia's international GHG policy
- Indonesian Ministry of Public Works:
  Provision of information on various policies as the project counterpart
  Conclusion of MoU regarding cooperation on the project
- University of Jambi, Jambi State Government:
  Provision of local information on the project site, etc.
  Conclusion of MoU regarding cooperation on the project

(2) Survey questions

- Indonesian government policy on NAMA initiatives and production of credits
- Compilation of information on Indonesian government policy on peat management and state of its implementation
- Indonesia's biomass of peat
- Methodology regarding peat CO_2 emissions
- Estimation of CO_2 emissions due to peat decomposition
- Monitoring of CO_2 emissions due to peat decomposition
- Securing of site
- Ascertainment of present state of the site
- Feasibility study of peat conservation and monitoring at the site
- Assessment of project feasibility

(3) Survey contents

The following literature review and surveys in Indonesia were conducted to help answer the above questions.

1) Literature survey: A survey was made of the current situation regarding peat GHG emissions in Indonesia and Indonesian government policy on NAMA*[1] and MRV*[2] , etc.

2) Survey in host country: Necessary information was obtained through meetings with relevant parties in Jambi and Indonesian government officials. Developments at the United Nations (including in relation to COP) were also ascertained and incorporated into the survey.
3) Field survey: Current conditions at the project site were ascertained and peat samples taken.
4)

*1. Nationally Appropriate Mitigation Action (NAMA) was incorporated as a component of the Bali Action Plan under the Bali Accord agreed at COP13 in 2007, where agreement was reached on the taking of nationally appropriate actions by developing countries to enable such countries too to contribute to GHG mitigation in the course of their pursuit of sustainable development.

*2. MRV stands for 1) measurable, 2) reportable, and 3) verifiable. One sentence of the Copenhagen Accord that delegates at COP15 agreed to take note of stated, “The actions of the parties shall be measurable, reportable, and verifiable.” It was also decided under this accord to report internationally domestic efforts made by developing countries to reduce emissions.

The specific components of the survey methodology were as follows:

- Literature survey: Acquisition and analysis of survey and research reports.
- Acquisition of information from relevant parties in Indonesia: A study was made of the Indonesian government’s policy on NAMAs based on interview findings and information published by the NCCC, Ministry of Environment, Ministry of Public Works, and other relevant bodies. A similar study was also made of policy on peat conservation.
- Compilation of information from relevant parties in Jambi: Information on land use at the site and meteorological and hydrological data was gathered by interviewing officials in Jambi and obtaining further relevant information from them.
- Field survey: The current state of waterways and water gates and the situation regarding peat biomass were determined, and peat samples were taken and analyzed.
- Study by committee members: Several meetings were held with Ministry of Public Works officials and academic experts to examine the policy and technology aspects to putting the project into effect.
- Japannese committee: A taskforce of Ministry of the Environment officials, personnel from the Global Environment Center (GEC), and academic experts met three times during

the feasibility study to comment on its content, and their views were incorporated into the study's subsequent conduct.

- Assessment of feasibility of project actions and implementation of the project: Shimizu personnel with extensive knowledge and experience of areas such as GHG reduction projects, civil engineering, hydrology, and conditions in Indonesia analyzed the above information, considered how the project could be implemented in a manner suited to local conditions, and assessed feasibility.

3. Findings of feasibility study of new flexible mechanisms

(1) Development of reference scenario

The opinion of the NCCC, as the DNA in Indonesia, on the development of a reference scenario is shown in the figure below.

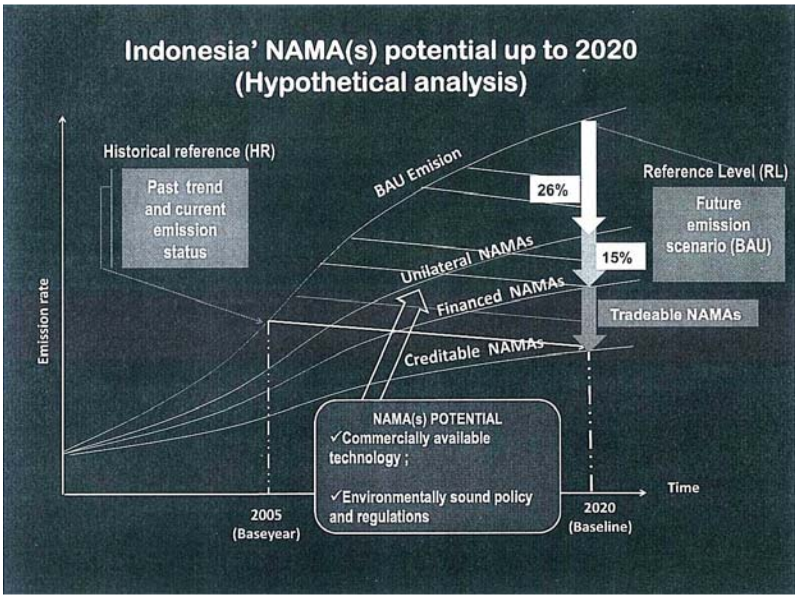

Figure 3.1 Proposed role of mitigation action in Indonesia (February 2011)

The reference level (RL) as of September 2010 is indicated as being the financed NAMAs line in the diagram, and the scenario obtained by adding the financed NAMAs portion at the 15% reduction level to unilateral NAMAs of up 26% from BAU in 2010 is considered the reference scenario. (In this case, any reduction in excess of the reference level is assumed to be available for trading as tradable NAMAs.)

While such an interpretation of the reference level is conceivable given that action to reduce emissions through peat management represents a key element of Indonesian NAMAs, this would mean that a considerable portion of the reduction in emissions actually achieved as a result of the project would not be convertible to credits, thus significantly lowering the incentive to implement it.

The diagram depicts the position on Indonesian NAMAs as a whole, and it remains to be determined whether this approach to reducing emissions through peatland management will be adhered to. Particular consideration should be paid to the position at the national level when developing rules for its application to the project level. Possibly reflecting such consideration, the reference level in the diagram as of February 2011 has been changed to represent the BAU line, and the reference level in the project's case (i.e., the base scenario) may be regarded as being BAU. The terms used in the diagram have also changed slightly (e.g., from "supported NAMAs" to "financed NAMAs"), and the diagram itself is titled a "hypothetical analysis." It can thus be seen that the meaning attached to the diagram is the subject of evolving discussion.

As regards the present state of peatland, peat destruction due mainly to slash-and-burn agriculture and development is expected to be considerable, thus resulting in increased emissions of GHGs, if the project does not take place. The reference scenario should preferably therefore be based on the maintenance of the status quo; in other words, on water table management not being practiced.

(2) Determination of boundaries

The physical boundary of the project is an area of approximately 10,000 ha of farmland in East Tanjung Jabung, Jambi. More specifically, it consists of an area that was developed as farmland by the Indonesian Ministry of Public Works in the 1970s under the Java Transmigration Plan, and it is presently managed by local agricultural unions.

Geographically, it consists of a delta (called the Berbak Delta) sandwiched between the Batang Hari River and the Berbak River, which branches from the Batang Hari River near its mouth.

As action under the project will consist principally of water table control by means of water gates and other devices, the scope of effect of the restoration of water table through water-table level control may be regarded as the project boundary, which coincides with the above area.

The project boundary for emissions is limited to GHGs generated by peat decomposition, as there occur no peat or forest fires in the project area. Regarding generation of GHGs by decomposition, only CO_2 is included, employing the same thinking on peat oxidation from drainage (shown by the blue box in the table below) as described in the VCS methodology (VM0004: Methodology for Conservation Projects that Avoid Planned Land Use Conversion in Peat Swamp Forests).

Although raising water table may increase the amount of methane gas generated, expert opinion (as expressed by members of the Japanese committee) is that as generation of N_2O, which has high global warming potential (GWP_{CH4}: GWP_{N2O} = 21:310), will be inhibited, the two may be conservatively disregarded. In a related study, observations of the generation of N_2O and CH_4 in swamp peat forest and on rice land on central Kalimantan showed that the total values of the two were almost equal (CO_2 equivalents allowing for GWP) (Hadi et al., 2005). At a meeting of the Japanese committee, it was commented that GHG emissions due to peat decomposition are at the forefront of current research, and further research findings in this area are awaited.

Table 3.1 Project boundary employing VM0004

Sources	Gas	Included/ excluded	Justification/explanation of choice
Burning of aboveground biomass	CO_2	**Excluded**	However, carbon stock decreases due to burning are accounted as a carbon stock change
	CH_4	**Included**	Non-CO_2 gas emitted from biomass burning
	N_2O	**Included**	Non-CO_2 gas emitted from biomass burning
Peat oxidation from drainage	CO_2	**Included**	Main gas of this source
	CH_4	Excluded	Drainage has been shown to have a small effect on CH_4 emission budgets; the highest proportional CH_4 flux forms only <0.2% of the CO_2 emissions in drained peat soils.
	N_2O	Excluded	Potential emission is negligibly small
Burning of peat	CO_2	**Included**	Emissions are accounted using an emission factor
	CH_4	**Included**	Non-CO_2 gas emitted from peat burning; emissions are accounted using an emission factor
	N_2O	Excluded	N_2O is not typically a measured trace gas emission from peat burning12; potential emission differential between natural and burned peat is negligible

Even if fires should occur in the project area in the future, it may be assumed that these would have occurred irrespective of project actions, and so they are not included in the project boundary. Should peat resources decline as a result of such fires, however, this would affect the CO_2 emissions reducible by water table management. Assessment of peat loss should therefore be continued.

Regarding future expansion of the project, the physical project boundary (project area) may be expanded by expanding the monitoring area. However, it is assumed that there will be no change for the emissions and limited to the peat oxidation from drainage.

(3) Monitoring method and plan

(i) Method of calculation of CO_2 emissions from aerobic decomposition

GHG emissions covered by the project will be calculated based on the following approach proposed by Hooijer et al. (2006). As the site concerned consists of irrigated land where fires do not occur, CO_2 emissions from peat burning are not included.

1) Aerobic decomposition of peat occurs caused by drainage from manmade canals in

peatland, leading to emission of CO_2.

2) The relation between CO_2 and drainage depth is given by the following expression, which is applicable to drainage depths of 0.5-1 m in Southeast Asia (Hooijer et al., 2006): 91t-CO_2/ha/y per m of drainage depth in peatland. More conservative rate of its half 45.5t-CO2/ha/y is adopted in this study. The conservative approach is also found in DNPI document (2010).

3) Drainage depth in the peat layer (i.e., the water-table level) therefore needs to be monitored. Water table is measured in each sub-area in which water table in peat may be regarded as being largely constant.

4) The peat biomass in a given sub-area will be initially measured.

(ii) Monitoring method

Water table will be continuously measured in each sub-area in which the water table can be assumed to be largely constant. The biomass of peat carbon will similarly be measured in each sub-area before implementation of the project.

(iii) Ensuring reliability on monitoring scale

As water table and peat carbon will be measured at around one point per sub-area, there may arise question marks over whether the area data obtained are necessary and sufficient to ensure their reliability. A quantitative analysis will therefore be made of changes in water table at the project site by means of water table simulation in order to demonstrate that the number of water table measurements is sufficient to allow for area topographical and geological changes.

For reference:

One technique applicable to monitoring peat water table over a wide area is estimation of water table by satellite, research on which is currently being pursued (Takeuchi et al., 2011). The results of actual measurements on Kalimantan have been compared with estimates there, and it is hoped that the technique will enable the estimation of water table of a wide area.

(4) Estimation of GHG emission reductions

(i) Estimation method of GHG reductions (ex-ante)

The above mentioned relation between the average watertable depth and CO_2 emission described by Hooijer et al. (2006) is used (applicable to drainage depths of 0.5-1 m):

91t-CO2/ha/y per cm of drainage depth in peatland

Considering more conservative rate for the rewetting case adopted also in DNPI, 2010: Indonesia's Greenhouse Gas Abatement Cost Curve

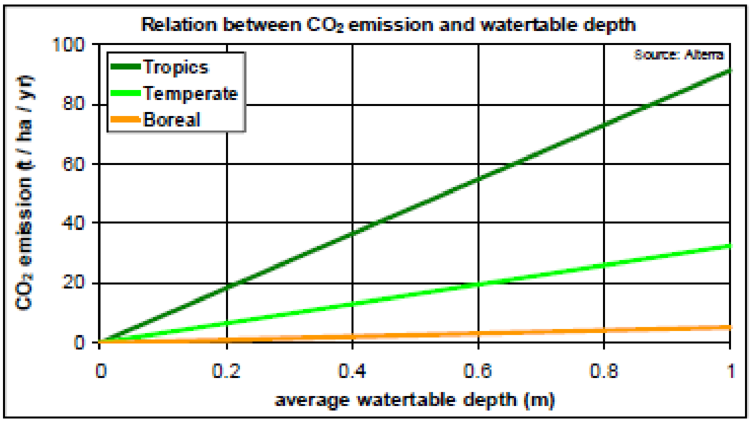

Figure 3.2 Relation between watertable depth and CO_2 emission (Hooijer et al., 2006)

Conditions of emission reduction calculation

1) Project site area: 10,000 ha

2) Average rise in drainage depth: Increase of 0.5 m from -0.9 m to -0.4 m

Calculation results (ex-ante)

45.5 t-CO_2/ha/y x 10,000 ha x 0.5m = 227,500 t-CO_2/ha/y

(ii) Measurement (ex-post)

1) Quantification of reduction of CO_2 emission using observed drainage depth

(a) Let an area where water-table level may be assumed to be constant to be a hydrologically homogeneous sub-area A_i . Water table is measured at one location in this sub-area, and the result becomes the sub-area's average water table.

(b) This hydrologically homogeneous sub-area is continuous with other sub-areas in the project area, and the total area ΣA_i (i =1, k) of A_i equals the project area, where k is the number of sub-areas.

(c) Before implementation of the project, the water table in each sub-area A_i is measured continuously for one year, and the average of the results is the initial water table (this is a water table in the case that the project is not implemented).

(d) Similar measurements will be made on irrigated land outside the project area to provide reference values. Measurements will continue to be made at these reference points after implementation of the project as well. To account for annual variations, the initial values will be corrected using these reference values. The reliability of corrections will be ensured by taking into account data of precipitation.

(e) During the course of the project, continuous measurements will be made of the water table in each sub-area A_i, and the difference between the yearly average and the corrected initial value will be considered the rise in water table due to the project ΔGWT_i (i =1, k), in meter units.

(f) From this ΔGWT_i, the reduction in CO_2 emission due to inhibition of peat decomposition in each sub-area A_i will be calculated by the following equation (see Figure 3.2):

$$\Delta CO2_{reduced, I} = 45.5 \text{ t-}CO_2\text{/ha/y} \times A_i \times \Delta GWT_i$$

(g) Accordingly, the total reduction in CO_2 emissions in the project area may be obtained by the following:

$$\Sigma 45.5 \text{ t-}CO_2\text{/ha/y} \times A_i \times \Delta GWT_i \ (i = 1, k)$$

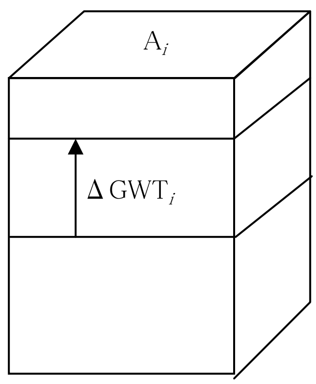

Figure 3.3 Estimation of CO_2 emission reductions in each sub-area due to rise of water table

2) Assessment of initial peat stock based on measurement of amount of peat carbon

- Peat samples will be taken in each sub-area by hand auger. The amount of carbon will then be calculated from their volumes and carbon concentrations (gC/cm^3), and the result used as the initial peat stock in the sub-area. Carbon concentration will be determined using the method described by Shimada et al. (2001).
- If the initial amount of carbon in each sub-area is $C_{0,i}$ (t-C/ha), then the amount of CO_2 that would be generated if it were to be entirely aerobically

decomposed would be $C_{0,\,i}$ x 44/12 (t-CO2/ha).

- This represents the maximum amount of CO_2 in each sub-area whose emission can be reduced by implementation of the project. It is thus possible to avoid calculating an emission reduction that would exceed the actual amount of carbon present.

(5) Methods of Measurement, Reporting, and Verification (MRV)

(i) Project level MRV

Below we consider MRV in the case that the project is implemented, as assumed for this study, as a "project to reduce GHG emissions from peat by raising water table on irrigated farmland" under a bilateral scheme.

1) Measurement method

The CO_2 generated by aerobic decomposition would be calculated as described in (4) ii above. The data of drainage depth required for these calculations would be measured continuously using water level sensors.

The approach used places an upper limit on the amount of emission of CO_2 that can be reduced through restoration of water table to prevent the resulting figure from exceeding the amount of CO_2 that would be generated by decomposition of all peat present. This ensures that the reduction claimed for the project is not greater than the actual amount of carbon present.

2) MRV cycle

The principal bodies presently approving GHG reduction projects and issuing carbon credits are the United Nations Framework Convention on Climate Change (UNFCCC), J-VER and the Voluntary Carbon Standard (VCS), and the last two of which issue credits on a voluntary basis. Below we briefly describe the main features of each.

- UNFCCC: This provides a "clean development mechanism" (CDM) to enable projects to be implemented by developing countries with funding and technical assistance from developed countries in accordance with UN rules., and 270 million tons of credits had been issued under it as of December 31, 2010. Although NM0297 was put forward as a methodology for handling peat emissions, as described above, this was rejected and there is not at present any approved methodology. Hooijer et al. (2006) serves as a reference for the calculation of CO_2 emissions from dry peat by the Intergovernmental Panel on Climate Change (IPCC).

- J-VER: This is a scheme for certifying projects as highly reliable "offset credit" projects and issuing credits by confirming and verifying their validity under the offset credit (J-VER) system. The emission reductions verifiable under the scheme are reductions and sinks arising from voluntary GHG mitigation and sink projects undertaken in Japan.
- VCS: This seeks to provide a global standard for voluntary carbon offsets. February 2011 saw the issuance of the first 1.16 million tons of voluntary carbon units (VCUs) under REDD. Although an approved methodology covering peat fire and decomposition does exist (VM0004), as described above, this is limited to land subject to concessions and so is not applicable to the present project. The VCS aims to add the peat rewetting and conservation category to its methodologies in 2011, and public comment was sought in 2010 (http://www.v-c-s.org/news.html).

While the question of which framework to adopt for issuing credits under a bilateral scheme must remain one for future consideration, the main steps in the process of emission reductions crediting are likely to be as follows.

<u>Main steps in MRV cycle</u>

(a) Application to approving body for approval of methodology (if no methodology already exists)

(b) Submission of project implementation document using an approved methodology

(c) Validation of the project

(d) Measurement and monitoring (Measurable)

(e) Submission of monitoring report on emission reductions (Reportable)

(f) Verification by validating body (Verifiable)

(g) Issuance of credits by approving body

(ii) MRV cycle at the national level

The DNPI and Indonesian Ministry of Environment are currently leading a study of the steps to follow in the measurement, reporting, and verification (MRV) process, and their thinking at this stage may be represented as follows.

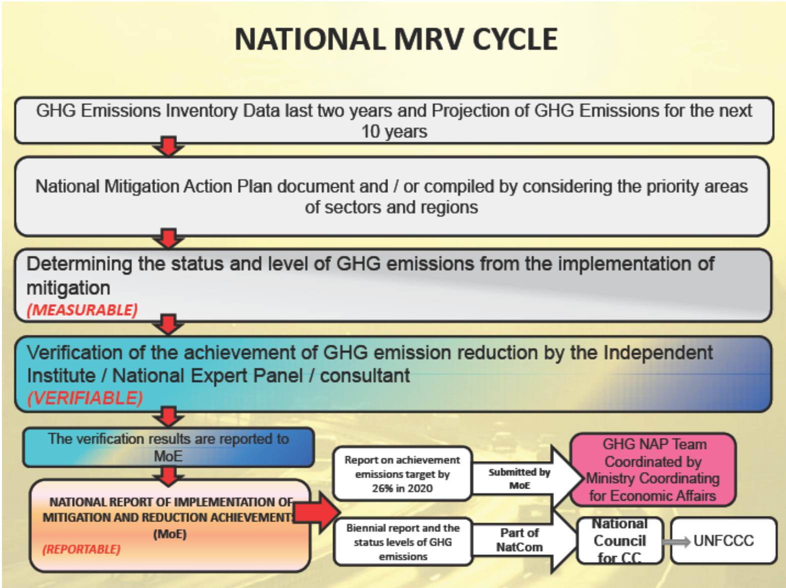

Figure 3.4 MRV cycle in Indonesia

A system for carrying out measurements over geographically extensive areas of peatland at the national level is currently being researched as a JICA-JST project by Hokkaido University in collaboration with Indonesia's NCCC, and six research presentations have so far been held. This system may be summarized diagrammatically as follows.

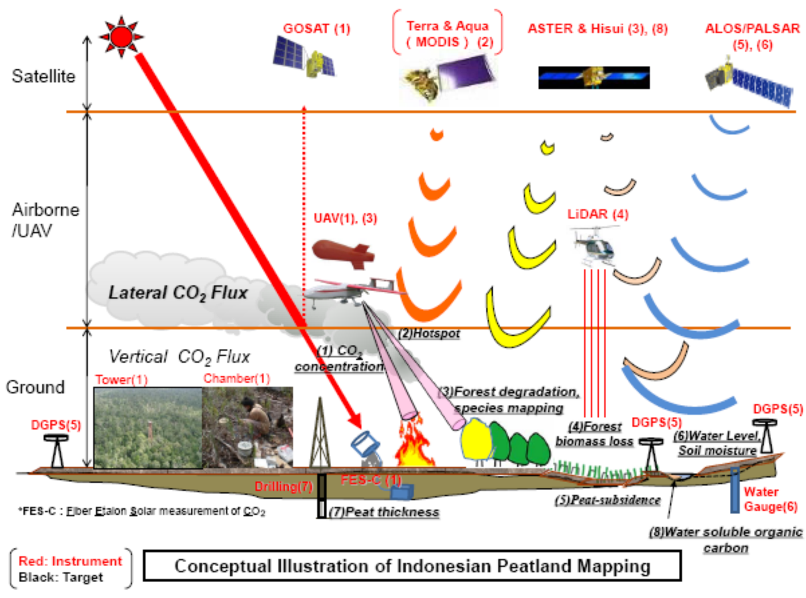

Figure 3.5 Conceptual illustration of peatland mapping (from materials presented at the 5th MRV Technology Roundtable)

If the project is implemented with financing from the Japan Finance Corporation's Japan Bank for International Corporation (JBIC), then it is likely that "The Guidelines for Measurement, Reporting and Verification of GHG Emission Reductions in JBIC's GREEN (the J-MRV Guidelines)" will have to be followed.

(6) Potential of credits from GHG mitigation

GHG emissions from peatland account for a large proportion of global GHG emissions. Because of consequently high expectations around the world of the potential to earn credits for GHG mitigation from peat management, it is extremely likely that it will be possible for credits to be generated under some kind of arrangement.

Regarding project actions, the difficulty of developing the methodology to qualify as a CDM project owing to the shortage of data for quantifying GHGs reduced (inhibited) as a result of implementation of a project, it is envisaged that project actions will be put into effect under a credit mechanism introduced at some future date further to bilateral consultation.

The Indonesian government, on the other hand, sees GHG mitigation through peatland management as falling within the REDD framework. But while it may thus be regarded as being more interested in producing credits under a multilateral framework, future developments concerning such a policy should be watched closely.

Whether multilateral or bilateral, the existence of a framework for converting emission reductions to credits is a prerequisite for credit trading in the future. In order to monetize credits, therefore, it is essential that relatively objective methods of calculating credits be developed.

An excessive concern with the objectiveness of such methods of calculation for the traditional CDM, however, has led to nitpicking over monitoring methods and verification, making the credit conversion process inefficient and introducing greater risk to the credit issuance process. The "new credits" must remedy this, and it will be necessary to explore a framework for trades between a developed country and a developing country (like Track 1's JI) that allows for credits to be issued with the approval of the two countries' governments in line with the outline agreement of the intentional community.

The usability of credits earned under existing mechanisms in existing carbon markets, such as the EU ETS, and carbon markets that may be created in the future (such as in Japan) needs to be maintained, which makes it worth considering the introduction of arrangements such as discount rates. Even with existing CDM credits, however, there have occurred cases of energy-saving projects of the kind that should really be considered not becoming more prevalent owing to the impact of the supply of large quantities of credits that can be generated comparatively cheaply (a prime example of which being CFC credits). Systems therefore need to be designed that integrate old and new credit arrangements to promote the projects that really need to be supported through the issuance of credits for them.

While thus learning from past experience to establish arrangements such as credit discount rates offers the advantage of encouraging the projects that are really necessary, it at the same time entails artificial intervention in the market's pricing of credits, creating the real possibility of detracting from market soundness. Consequently, some are of the opinion that balance should be ensured by adopting regulation, rather than by establishing discount rates for credits.

If active private investment is to be engaged, it is crucial that the new credits' legal position, and particularly their position in relation to domestic policy, be clearly established. There presently exist several credit systems in Japan other than CDM credits, and it is important that their and the new credits' relative positions also be made clear.

In fields covering large areas (such as action under the present project) and fields that involve international negotiation between several countries at the national level, it is also essential that active negotiations on credit-conversion mechanisms be undertaken by public agencies.

(7) Measures to ensure environmental integrity

The project area was originally wetland where the drying of peat to lower water table through the development of irrigation canals was accompanied by burning and decomposition. The purpose of the project's actions is to make the water-table level higher than at present by introducing water table management so as to restore water table to something approaching what they were prior to development.

As conditions will more closely resemble the original natural conditions, there will be hardly any negative impact on the environment, including ecosystems.

Although no peat burning occurs in the area selected for the projects, the effects of smog caused by peat fires around Indonesia extend beyond its borders to impinge on other countries too, such as Singapore and Malaysia. The application of project actions in areas where such fires occur may therefore help combat air pollution.

The term "environmental integrity" is also used in the sense of making environmental policy effective. To ensure the effectiveness of environmental policy in the shape of water table management on peatland, it is necessary to not only be mindful of the limited applications to which land in the area can be put, but also to ensure that, for example, rural communities do not deliberately practice slash-and-burn farming in locations that have been made less susceptible to fires as a result of the raising of water table.

(8) Measures against other impacts

The aim of action under the project is to inhibit microbial decomposition of peat and curb GHG emissions by raising the water-table level (especially in the dry season), thus keeping peat moist.

One of the problems presently experienced with farmland in the project site is the severe drying of the soil, especially during the dry season, which renders it impossible to cultivate rice due to the shortage of water. This is compounded by the oxidation of acidic soil below the ground when it comes into contact with air, producing substances that inhibit cultivation.

As a result of these problems, some farmers report that rice yields per hectare have fallen from 3-4 tons in the past to only 1 ton at present.

Implementation of the project will enable rice cultivation during the dry season and help limit the generation of cultivation inhibitors, thus making it possible to increase agricultural yields.

Indonesia's Ministry of Public Works, meanwhile, has made the irrigation and development into farmland of low-lying coastal land in the interests of food security an object of state planning for the next few decades. Such development could lead to extremely substantial GHG emissions from peatland if conventional large-scale waterways are built. To avoid such an outcome while securing the stable food supply that is essential to Indonesia's sustainable development, projects such as the present one have an extremely valuable role to play in limiting GHG emissions through water table management on irrigated farmland.

(9) Framework for implementation of action/project

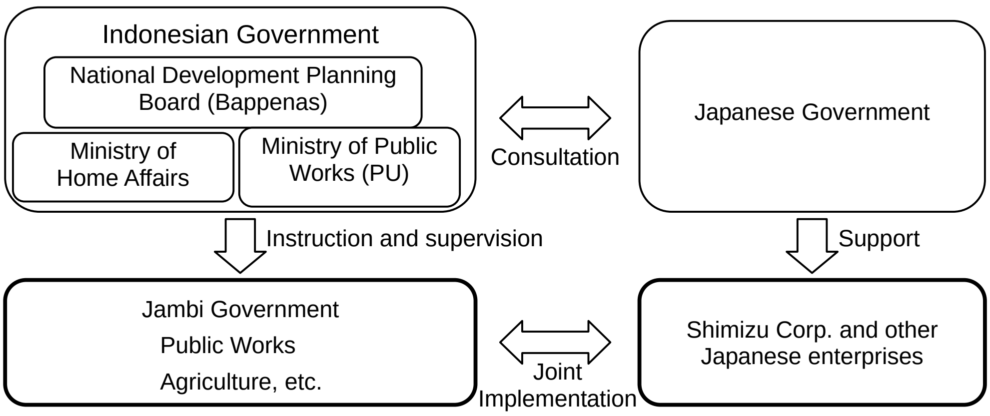

Figure 3.6 Framework for project implementation

The counterpart if the project is implemented would, under normal circumstances in Indonesia, be the local government concerned. This is because it is the local government that actually monitors activities and administers the area. In the case of the present project, therefore, the Japanese implementers' counterpart(s) would likely be an agency such as the Public Works or Agricultural Bureau of the Jambi Provincial Government.

While the Indonesian central government's point of contact for local administrative affairs is the Ministry of Home Affairs, the Ministry of Public Works would also be involved due to the history of the area's development. Due also to the cross-ministerial nature of the project, the National Development Planning Board is also likely be involved. The Japanese government would be expected to enter consultations with these central government agencies, with instruction and supervision then being provided by the central government on this basis.

The principal stakeholders would be farmers in the area concerned, and we understand that their views may be collectively ascertained through the local agricultural union.

(10) Funding plans

It is estimated that the following funding will be required for implementation of the project in the anticipated project area (covering approximately 10,000 ha for 10 years).

Items	Preliminary estimation of expenditure
Water gate and canal maintenance with bypass filling	2 million USD (200 gates and canals x 10,000USD)
Water level monitoring	10 million USD (5,000 locations x 2,000USD)
Other monitoring and pumps etc.	3 million USD
Total	15 million USD

* The estimated expenditures are for implementation of the project in the East Tanjung Jabung region (assuming no construction of new water gates, etc.).

Financing is likely to require not only private finance premised on revenue from the sale of credits, but also the direct injection of public funds by the Japanese government, and the injection of funds by the Indonesian government covered by lending received by it.

It is estimated that the project will generate about 230,000 tons per year of credits. Given the cost of expenditures on items such as operation and maintenance, payback will require around 10 years relying on income from credits alone. Considering the risks surrounding credit arrangements under the new flexible mechanisms, the length of the payback period means that private finance by itself will be insufficient, and public money from developed countries will be essential.

As the increased agricultural yield made possible by action under the project will be of considerable benefit to the Indonesian government, it will be important to also take into consideration funding contributed by the Indonesian government.

(11) Likelihood of implementation

Reduction of GHG emissions from Indonesian peatland is presently attracting interest from countries around the world, and concrete project action is being pursued with funding from Norway, for example.

There are numerous uncertainties on the institutional side that must be considered if the project is to be led by the private sector, including the handling of credits under new flexible mechanisms, progress on the development of a bilateral framework between Japan and Indonesia, and the position of peat management projects under REDD.

As the design of these arrangements is likely to take several years, it is important to adopt a "thinking by doing" approach of designing arrangements while implementing actual projects.

For the time being (FY 2011-2012), therefore, it is essential to proceed by implementing pilot projects with Japanese government assistance, so as to develop know-how and analyze risks on the technical as well as institutional side for application in subsequent actual projects.

Of the possible areas, the proposed project area is comparatively well served by water gates and waterways, making it an area where the technical barriers to implementation are low. The biggest obstacle to the project's implementation is therefore institutional. Provided that the necessary arrangements can be put in place, therefore, there is an extremely high likelihood that the project actions can be implemented.

4. Proposal of arrangements for new flexible mechanisms

Some of the arrangements being put forward as new flexible mechanisms for the incoming framework include a system for generating credits from NAMAs, sector-specific credit-generation mechanisms, and arrangements for generating credits through REDD (Reduced Emissions from Deforestation and forest Degradation in Developing countries). The present study was conducted envisaging a system for generating credits through NAMA. However, it has been discovered that NAMA might function to a limited extent as a flexible mechanism in some cases, depending on the position of the host country.

Regarding REDD, meanwhile, several methodologies are being developed for programs such as the VCS, and it appears that these are taking into consideration flexible mechanisms (credits) based on events most likely to occur in the future.

Be they under NAMA or REDD, arrangements are also currently being discussed in the context of multilateral frameworks led by the UN. (NAMA was proposed as a concept at COP13, and REDD too is being considered under the UNFCCC).

Projects to curb GHG emissions through peatland management are characterized by the geographically wide scope of their project areas and their susceptibility to the effects of the natural environment, making it difficult to carry out precise monitoring and calculate consequent reductions in emissions. This makes them unsuited to be CDM projects, which is why it is hoped that it will be possible to generate credits from them under the new flexible mechanisms. If, therefore, the new flexible mechanisms are introduced under a multilateral or UN framework, similar problems to those posed by CDM at present will be faced. In other words, there is a risk that the need to ensure transparency, accuracy, and maintainability will mean that the sort of action that is really needed to cut GHG emissions may not necessarily be taken.

In other words, the application of new flexible mechanisms in this field and development of associated arrangements for issuing credits for them under bilateral frameworks or multilateral frameworks involving limited numbers of countries are likely to make the project more likely to be implementable.

For such systems to function under a bilateral framework, it is essential that they be government designed and run by public agencies of the two countries concerned. Quite apart from the funding of projects themselves, therefore, public assistance will be required to assist with the operation of the arrangements.

As mentioned in the section on development of a reference scenario, various categories of NAMA are being considered in relation to thinking on the reference scenario to form the basis for determining reductions, including unilateral NAMAs, supported NAMAs, and creditable NAMAs. In practice, however, these elements are not so readily distinguishable, and a more realistic approach would be to adopt BAU as the reference scenario.

As arriving at an international consensus on such matters is likely to take considerable time, trials are needed under the above frameworks involving two or a small number of countries in order to assist the wider uptake of the new flexible mechanisms.

5. Survey findings regarding contribution to sustainable development

Any consideration of sustainable development in Indonesia must also address the question of food supply stability. This is because there are concerns that Indonesia, with its estimated population of

231 million in 2009, could suffer food shortages as rising living standards in Indonesia push up food demand and the world population grows.

To ensure food security, therefore, the Indonesian Ministry of Public Works has made planning of the irrigation of coastal lowlands over the next decades. If this results in the construction of large-scale canals without proper water table management, however, it could lead to a large scale emissions of GHGs from peatland, and may also cause air pollution by peat fires.

To avoid such an outcome and secure the stable food supply that is essential to Indonesia's sustainable development, projects such as the present one have a valuable role to play in limiting GHG emissions through water table management on irrigated farmland.

If revenue from credits can be directed into enabling ongoing water table management in existing farmland, where such management has been lacking due primarily to a shortage of funds, it may be possible to increase crop yields per unit of land area, and thereby contribute to increased food production and improvements in living standards in rural communities.

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