MOEJ/GEC REDD+ Demonstration Study 2014
Summary of the Final Report

"REDD+ Study in Luang Prabang Province"

(Implementing Entity: Mitsubishi UFJ Research and Consulting)

1. Overview of the Proposed JCM Project

Study partners	Mitsubishi UFJ Research and Consulting, Japan Forest Technology Association and Marubeni Corporation			
Project site	Phonsay District, Luang Prabang Province, Lao PDR			
Category of project	Reducing Emissions from Deforestation and Forest Degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries (REDD-plus) and afforestation and reforestation, or REDD+			
Description of project	The study targeted an area of Phonsay District Luang Prabang Province, Lao PDR; an area with on-going deforestation and forest degradation due to the impact of shifting cultivation and illegal logging etc. REDD+ activities such as forest management etc. were carried out and the effects of reductions in GHG emissions were quantified. Specifically, the study concentrated on rural Land Forest Management Committee (LMFC) that were community organizations, and under the auspices of the LMFC established land use classifications and specified alternative livelihoods to try to curtail shifting cultivation. The efficient implementation of these measures led to the curtailment of deforestation and forest degradation. In carrying out the study, we used the framework developed in JICA project for implementing REDD+.			
Expected project implementer	Japan	Marubeni Corporation		
	Host country	Provincial Agriculture and Forestry Office (PAFO) in Luang Prabang Province		
Initial investment	Approximately 17,000 thousands yen		**Date of groundbreaking**	Year 2009
Annual maintenance cost	Approximately 36,000 thousands yen Note: approximately 50–70 million yen in case of sub-national level		**Construction period**	Year 2009 - 2014
Willingness to investment	Already		**Date of project commencement**	From year 2015
Financial plan of project	The use made of (previous) JICA project outcomes etc. in this project is expected to significantly reduce the initial costs related to the development of the basic framework and the procurement/analysis of satellite images. In the future there will be costs required to manage and maintain the actual implementation and continuance of the project; and consultations are currently underway with funders (investors).			
GHG emission reductions	Approximately 120 Gg-CO_2/year Note: potential value of some millions ton-CO_2/year provided that local, project managers (from community organizations etc.) are trained as a matter of urgency in the event that the pilot project is rolled out (on a quasi-national basis) following this study.			

2. Study Contents
(1) Project development and implementation
(1-1) Project planning
(1-1-1) Project Implementation Framework

When promoting an REDD+ project, it greatly helps the stability (i.e. sustainability) of the project if the host country is encouraged to take ownership. Therefore, this study has assumed a framework of close collaboration between Japanese companies and the Lao PDR (the Government of Luang Prabang Province). To implement the REDD+ project, it is necessary tackle institutional and policy issues such as ensuring compliance with the legal system in Lao PDR and determining a method to divide any profits obtained as a result of the REDD+ project; and the Japanese companies, the Luang Prabang Provincial Government and the Central Government of Lao PDR have decided to continue to hold consultations to address these issues. In addition, grass-root activities are naturally required in the target location when developing projects like the REDD+ project that aim to improve the planning of land use in developing countries (offering incentives for forest conservation). Consequently, it was decided that to move the project forward smoothly and efficiently, we would cooperate with organizations such as local consultants and rural people groups, and that these organizations would take the main role in leading activities at the local level (specifically activities to curtail deforestation and forest degradation) (see Figure 1).

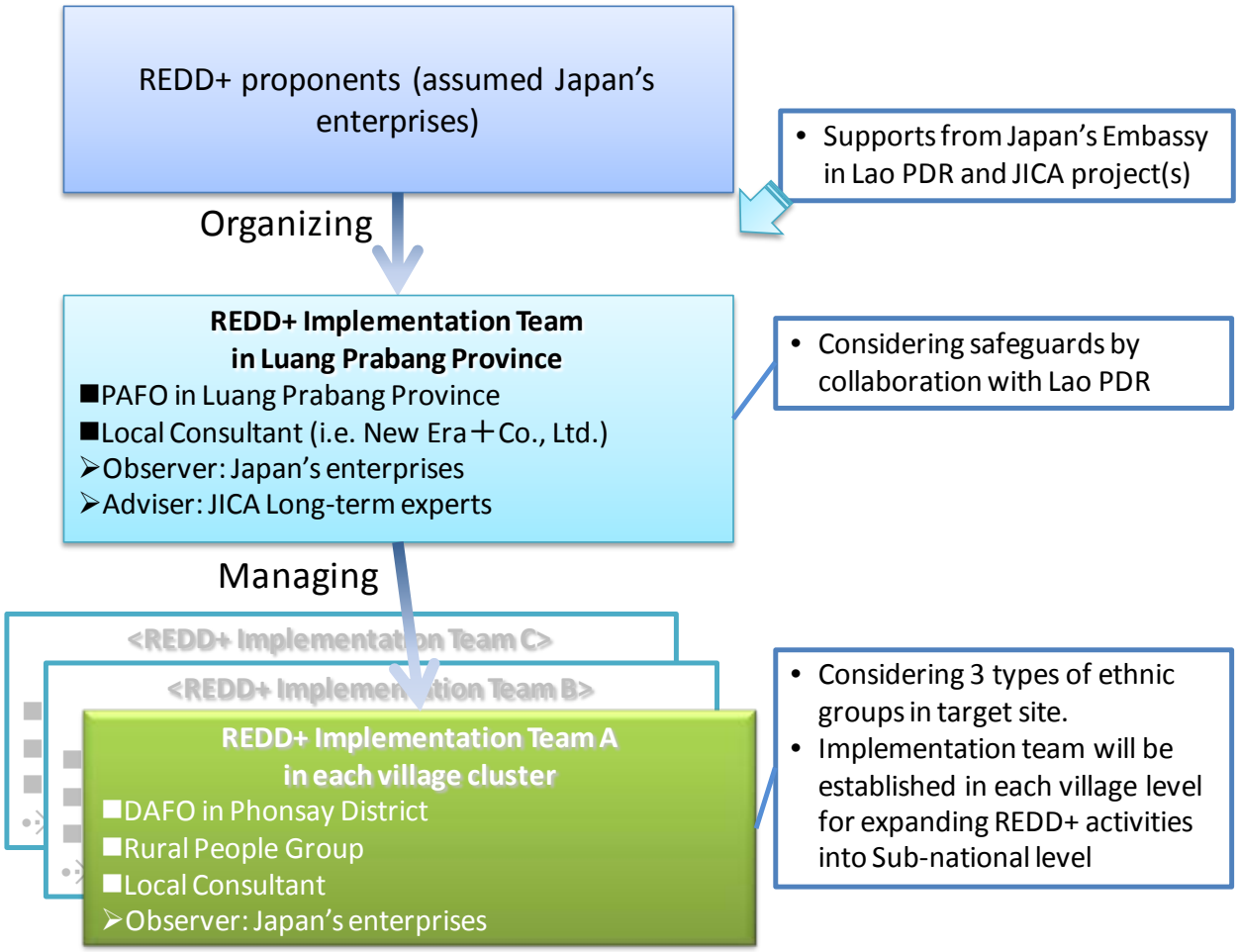

Figure 1 Project implementation team (the team consists of village representatives who have participated in JICA projects, as well as other stakeholders such as Government personnel from PAFO and DAFO)

(1-1-2) Project Funding Plans

Marubeni Corporation has announced its intention to participate in the REDD+ project being developed in this study (i.e. the project) and commercialization is being considered from fiscal year 2015 onwards, depending on future trends in the Joint Crediting Mechanism (JCM). Evaluations of the feasibility of the project to date have been used when considering commercialization and it has been estimated that the REDD+ project will reduce emissions by 1,825.4 Gg-CO_2 over a 15 year period (an annual average of 121.7 Gg-CO_2). When this amount of reduction in emissions is multiplied by the most recent verified carbon unit

(VCS) credit price (which is 7.8 USD/t), the expected results show an average annual income of 416,346 USD. Incidentally, assuming the credit price to be 10 USD/t for the purposes of sensitivity analysis, the average annual revenue becomes 541,298 USD. Calculating the Internal Rate of Return (IRR) on the basis of the estimates above and the costs of the REDD+ project mentioned hereinafter, we obtain a figure of 22% in the event that the credit price is 7.8 USD/t and 28% if it is 10 USD/t; showing project to be sufficiently viable. (see Figure 2).

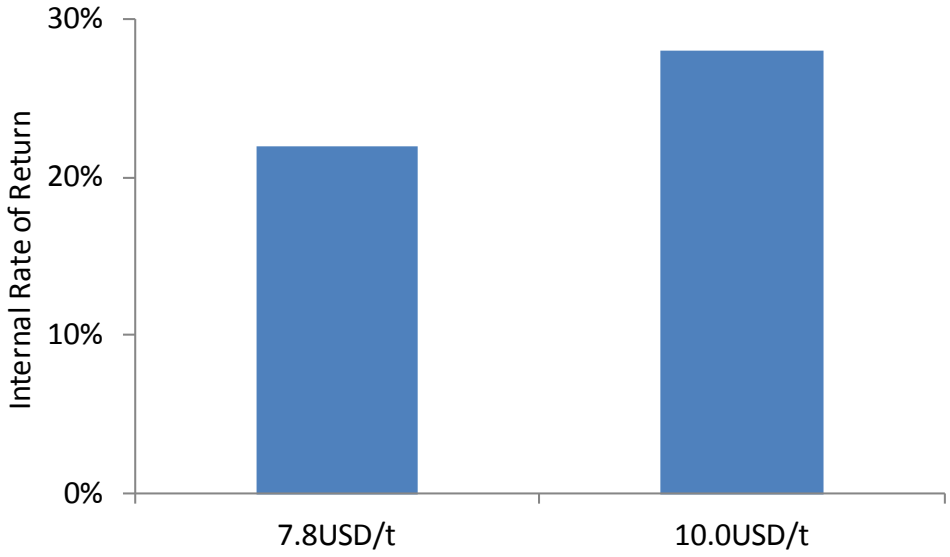

Figure 2 Expected IRR from the Project

(1-1-3) Project Licenses

When implementing a long-term REDD+ project, it is vital to build a forest management system in conjunction with the host country. Consequently, we need to know what levels of the administration (Central, Provincial or District Government) and which presiding ministries have the authority to issue licenses related to forest management (i.e. forestry concessions and concessions on the use of forests); and in addition we must have a clear understanding of exactly what approvals are needed to implement the REDD+ project. Another extremely important point is whether foreign companies are allowed to invest in the REDD+ project.

It has become clear from this study that there is currently no licensing system (legal system) in Lao PDR for the implementation of REDD+ projects. It is assumed that from now on, in consultation with Lao PDR REDD+ Office, which is serving as the REDD+ implementing agency, REDD+ implementation staff will obtain approval to implement the REDD+ project in the target location through the exchange of memoranda with the presiding Government agencies; note that host country has agreed to the use of this method.

(1-1-4) Analysis of Satellite Images to Show Specific Forest Dynamics

It is essential for the REDD+ project to have a satellite images analysis of all aspects of the forest dynamics. For example such information will be used to develop reference levels and monitor the actual results of GHG emission reduction activities to allow us to quantify the amount of GHG emission reductions forecast. In this study, we decided to clarify forest dynamics in the region by observing the study target area using data from high resolution satellite. Previously JICA conducted a technical cooperation project (PAREDD) in the area and in FY2013 Japan's Ministry of Economy, Trade and Industry (METI) carried out a feasibility study in the same region. Bearing in mind the importance of consistency in the analysis methods used to compare past forest dynamics with the most recent forest conditions, we used previous forest distribution maps and the most recently observed satellite data, and devised a method to extract and update those specific spots where land use/land cover had changed (see Figure 3).

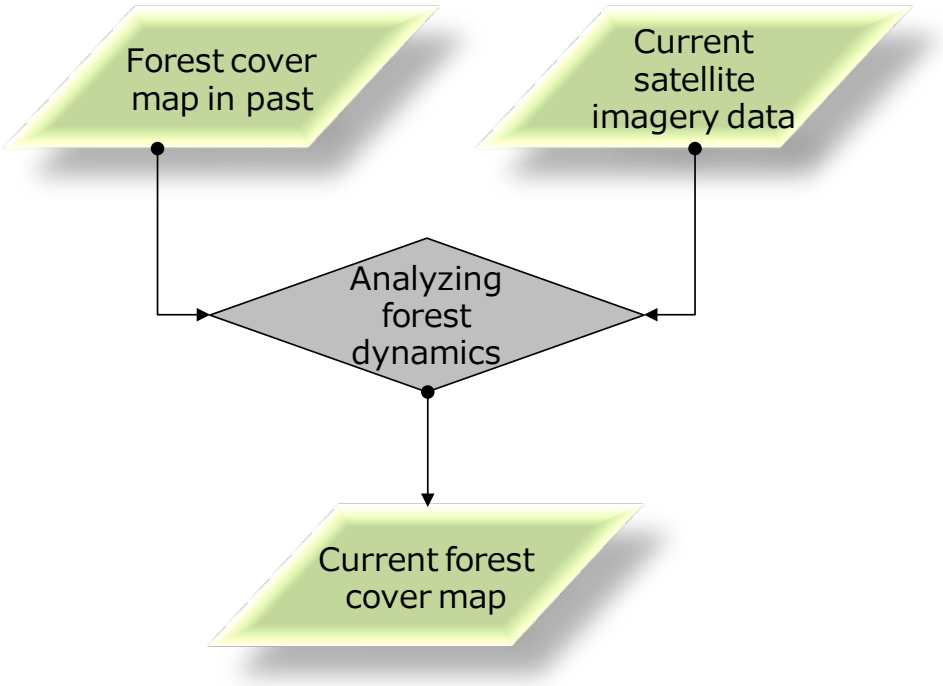

Figure 3 Analysis Method used for Land Cover Maps

(1-1-5) An Empirical Study into the Curtailment of Deforestation/Forest Degradation

The Houaikhing village cluster in the target area of Phonsay District in Luang Prabang Province is made up of 6 villages and is in a mountainous region located some 37 km from Phonsay District's local authorities. Two ethic groups live in the village cluster - the Khmu and the Hmong. The driving force behind the deforestation and forest degradation has been shifting cultivation, and so for the past three years JICA has been carrying out a technological cooperation project (PAREDD). JICA established the PAREDD Approach as a way of curtailing deforestation, setting up a village fund and fostering public awareness of the need to curtail deforestation in the region; and has developed improvements in livelihoods through the use of livestock rotation. In this study, we used the PAREDD Approach introduced by JICA as a basis and decided to examine the implementation and effects of demonstration activities to allow us to select which of the REDD+ activities used to curtail deforestation in the target area to roll out across the whole region.

In the empirical research, we reorganized the existing information gathered to date and examined the introduction of rice paddies and village market system (hereinafter pre-demonstrations) and the introduction of compost production systems (hereinafter demonstration). Based on the results of the demonstration activities, we planned to try specific activities to improve livelihoods aimed at the full-scale implementation of REDD+ activities in the target area of Houaikhing village.

To date studies on pre-demonstrations and demonstration have been carried out with the aim of full scale implementation of REDD activities. From the outcomes of these trials we obtained the results shown in Table 1 with regard to deforestation/forest degradation curtailment activities (i.e. the introduction of alternative livelihoods to alleviate excess pressure on forest resources.)

Table 1 SWOT Analysis of Alternative Livelihoods in the Houaikhing Village Cluster

Strengths	Weaknesses
• There are small streams that allow for the possibility of developing irrigation systems; some are available only in the rainy season, and others can be used all year round. • Many residents grow a variety of fruit trees and vegetables for home consumption around their huts, showing potential for large scale cultivation for commercial use. • According to new zoning regulations, the residents of each village are allocated at least 3 units of farmland (1 unit = 1ha) and if these are turned into regular fields there is the potential to cultivate cash crops. • There are markets in place for the sale of livestock, pepper, coffee, konjac potatoes, and bamboo etc. • Road infrastructure is advancing, which will enable developments in the sale of agricultural produce • The forest is rich in non-cultivated products including bamboo, mushrooms, herbs and konjac potatoes that could be managed and produced on a commercial scale.	• Agriculture is conducted in a non-scientific manner. Rice cultivation etc. is not carried out using sloping rice terraces; this has caused erosion and a reduction in the land's capacity to hold water. • There is a lack of single crop cultivation and farmland optimization. Cultivation only takes place during the rainy season and by growing legumes and other crops in the dry season it would be possible to improve soil fertility. • There are insufficient irrigation systems and equipment to allow the introduction of rice paddies. • Residents are unable to sell high-value crops due to an inadequate market system. • Current transportation conditions are inadequate for the transport of goods. • There is a lack of forest resource management expertise. • Farming is done on a family-unit basis and the labor force is not sufficient for intensive farming. • Rice cultivation is residents only method of livelihood and there is a cultural attitude that slash-and-burn is an easy method of farming. • Farming plots are spread out, making irrigation and the implementation of land development plans difficult.
Opportunities	**Threats**
• Developing the market for agricultural produce by using a market promotion plan will encourage the cultivation of alternative crops (fruit and vegetables etc.) to replace shifting cultivation. • There are areas suitable for growth in cash crops such as cassava, coffee, tobacco, bamboo furniture and handicrafts etc.; crops that can be sold at Luang Prabang City market for high prices. • There are streams that would allow the development of reservoirs and irrigation systems to allow the development of paddy fields for farmland that would last for years	• Increased demand for farmland due to a rise in population will increase slash-and-burn practices. • There is the risk that in promoting the breeding of livestock, animals will be allowed to graze in the forests in the traditional manner and this will advance degradation of the forests. • It is possible that cultivating cash crops will lead to increased demand for agricultural land. • Because prices will be managed by foreign brokers, market selling prices will be unstable

(1-2) Contribution of Japan

(1-2-1) Transfer of Know-How on Forest Conservation

Lao PDR, the subject of this study, produces forestry resources from natural, or naturally regenerated, forests and in the 2000s the country began to cultivate materials in demand for practical use such as teak (*Tectona grandis*) for example; materials that are scheduled to start production around 2020. When that happens, basic forestry management techniques will be essential, such as a prior understanding of how to determine felling periods and also how much timber/wood will be obtained from felling operations. These techniques are considered useful for the sustainable management of forests as a whole -including teak forests. In close cooperation with the Provincial Government of Luang Prabang (primarily the PAFO), this study has developed initiatives and it is felt that with forestry monitoring having actually been developed in the field, the monitoring technology transferred will not only be beneficial to future timber production in Lao PDR, but will also be important in terms of the medium-long term development of forestry management.

(1-2-2) Transfer of Technology used to Calculate GHG Emissions in the Land Use Field

When calculating GHG emissions in the field of land use, the very nature of the field means that there is a large degree of uncertainty in comparison with the energy field. Therefore, we require the technology to minimize such uncertainty and calculate/record GHG emissions in view of it. In addition, to develop calculations of GHG emissions over time, we need to introduce systems to ensure consistency in time series data. This study used the outcome of the JICA project as a basis to analyze land use since the year 2000 and from the degree of change, in conjunction with the Lao PDR, we developed a series of operations to be carried out in the calculation of GHG emissions. This initiative is believed to be beneficial not only in Luang Prabang Province, but also in the future creation of a national GHG inventory in Lao PDR. In particular, it is felt that the fact that over 80% of GHG emissions in Lao PDR come from the field of land use, means that developing the ability to accurately calculate emissions will also prove effective in advancing future policies on climate change.

(1-2-3) Data Obtained from Japan's Satellites and Data Analysis Technology

A long-term, uninterrupted understanding of the land (forest) activity data for the REDD+ project is a very important process; a process based on the establishment of reference levels and the calculation of GHG emissions in the event of the REDD+ project's implementation. It was assumed that the REDD+ project envisaged in this study would use LANDSAT TM images, which have a long track-record. However, in anticipation of future REDD+, we also investigated the possibility of contributing Japanese satellite data. For example the Advanced Land Observing Satellite (ALOS) is thought effective in correcting and verifying land acreage data etc; and in addition there also seems to be room to use the Greenhouse Gases Observing Satellite (GOSAT) to verify conservative calculations of emission/absorption amounts. From this, it seems quite likely that Japan's satellites will be used in the REDD+ project.

(1-2-4) Techniques for Developing Emission Factors

The development of emission factors is significant in terms of greatly improving the accuracy of calculations on GHG emission from forests. As a result and in conjunction with the Lao PDR, this study extrapolated techniques to develop emission factors and furthermore, shared the importance of on-going improvements in emission factors. As a first step to creating emission factors, the study promoted hands-on technical transfer through local training etc.

(1-2-5) Long-term, Sustainable Regional Development Assistance

In the target area of Luang Prabang Province, initiatives are being developed to curtail the expansion of uncontrolled shifting cultivation with the introduction of a land-zoning system that distinguishes between "forests to be conserved" and "forests where shifting cultivation is permitted". Against this backdrop, a land use map of the target area is being developed through the REDD+ project and land management is being developed with the use of portable GPS devices (such as measuring the acreage of agricultural land; something that traditionally has not been measured); and by leveraging these effects it possible to offer lateral assistance to the land zoning system. The REDD+ project is expected to be able to contribute to long-term, sustainable development assistance in the region by focusing on these aspects.

(1-2-6) Evaluation of Japan’s Contribution in terms of JCM Methodology

Currently the "Capacity Development Project for Establishing National Forest Information System for Sustainable Forest Management and REDD+" is underway in Lao PDR with assistance from the JICA; a project that is developing information facilities related to forestry carbon dynamics at a national level. Not only is the methodology to be developed in this study expected to be used as a technical input for such projects, but it is also expected that, thanks to cooperation between the JICA project and this study, it will be evaluated as part of Japan's comprehensive aid to the forestry sector.

(1-3) MRV structure

In this survey we use an MRV system with two separate bodies to develop the REDD+ project; one is responsible for Monitoring and Reporting, while the other is responsible for Verification.

(1-3-1) Monitoring & Reporting

Within Monitoring and Reporting, changes in forest acreage that constitute the amount of activity need to be quantitatively evaluated through the analysis of satellite imagery in terms of Monitoring. However, currently it is difficult to find technology for the analysis of satellite imagery of an international standard in Lao PDR. As a result, the Japanese side has decided to provide ongoing technical assistance and cooperate in periodically analyzing the satellite imagery. Furthermore, the outcomes of the JICA project have led to improved capacity in the development/improvement in accuracy of emission factors to a level where the Lao PDR is more than capable of carrying out this type of monitoring. From now on when work related to the development of emission factors occurs, the system will be such that the Lao PDR will basically proceed with the work, with technical assistance from the Japanese side. Next, Reporting requires that the raw data obtained during Monitoring be analyzed and the results summarized. In this study it is possible to calculate GHG emissions using a spreadsheet, and we believe these values can be used in Reporting. In future, once the REDD+ project has started, monitoring will take place provisionally once every five years and Reporting will basically become the responsibility of the Lao PDR.

(1-3-2) Verification

As regards Verification, the quality assurance/quality control (QA/QC) regime needs to be constructed in line with ISO14064, given that initiatives under the JCM are conducted on the basis of this standard. In this study, quality control (QC) will be performed by a third-party such as a research institute affiliated with a domestic or foreign university etc. and quality assurance (QA) will be supervised by a third-party institute with ISO14065 accreditation, in line with JCM principles.

(1-4) Environmental integrity and Sustainable development in host country

By improving the conventional, unplanned use of land, the REDD+ project exerts a positive influence in terms of environmental and social aspects. On the other hand adequate consideration needs to be given to the burdens placed on local residents (such as relocation of homes etc.) and the risks that the project will fail to become permanent, or that there may be leakages (i.e. displacement of other activities) etc. The points listed above are also recognized as common issues in UNFCCC negotiations and consideration of them (safeguards) is deemed essential. This study has also taken full consideration of UNFCCC opinions in deciding to promote the initiative.

Unplanned use of the land in Lao PDR has caused serious deforestation and forest degradation. REDD+ intends to tackle this problem head on and contribute to sustainable development of the region. In addition, we hope to curtail deterioration in the quality of river water caused by deforestation and forest degradation and also improve the poverty rate associated with job creation.

(1-4-1) Evaluation of Economic Impact

The REDD+ project envisaged in this study is an initiative to conserve the region's forests in the medium-long term and involve the local community in carrying out this conservation. In addition, with regard to the conservation of biological diversity in forest ecosystems, there are plans to take advantage of the research results from the Laos National Agriculture and Forestry Research Institute (NAFRI) via cooperation with the REDD+ project; with no major problems foreseen at this stage.

(1-4-2) Consultations with Local Stakeholders

It is assumed that the REDD+ project will proceed with the participation of rural people. Furthermore, the community organizations at the heart of activities at the grass roots level, will be set up with the approval of the Luang Prabang Provincial Government and Lao PDR Central Government, meaning that the initiatives promoted by the REDD+ project are based on the agreement and approval of stakeholders. As a result, at the current stage there seem to be no conflicts of interest, however proper attention has been paid as to how to handle future issues such as profit distributions etc.

(1-5) Toward project realization (planned schedule and possible obstacles to be overcome)

(1-5-1) Issues (Benefits Distributions etc.)

At the present time, the specific method for distributing benefits from implementation of REDD+ has not been decided in Lao PDR. Benefits distribution is one of the most important elements mentioned to encourage the proactive involvement of the private sector in the REDD+ project; and what is needed is early development in the country and prompt discussions on the JCM. Meanwhile, if no clear provisions are

established for benefits distributions, then we are considering a way to promote the implementation of REDD+ by having those implementing the REDD+ project and the project stakeholders sign benefit sharing agreements.

(1-5-2) Future Schedule

The remaining two months or so of the study coincides with the dry season and provides an environment where we can concentrate on implementing field surveys. With the Lao PDR up to speed, the field surveys will be rolled out from late January through mid February and summarized in the final report.

(2) JCM methodology development

(2-1) Eligibility criteria

In terms of eligibility requirements, we need to bear in mind how we respond to the unique issues in REDD+ and consider the nature of Japan's contributions, including the provision of soft-ware services. This study assumes the 5 items shown in Table 2 to be the (*draft*) eligibility requirements and examines the validity of each item and looks at whether or not there are any other requirements that should be added.

Table 2 Eligibility Requirements for Developing Methodology

Eligibility Requirements (draft proposals)		Reason for Establishing Requirements
1	Drivers of deforestation and forest degradation are slash-and-burn (shifting to rich forests) and/or illegal logging.	There are significant differences in REDD+ methodology depending on the type of driving factor.
2	There are no peat soil in project area	This requirement is essential, as there are no plans to take carbon stocks in soil into consideration in the methodology created in this study
3	Data on population and number of livestock are to be available.	A necessary requirement to establish reference levels that take into account socio-economic indicators.
4	Accuracy of land and forest classification is over 80% by using satellite imagery analysis during reference period.	Assumes the use of image-analysis technology owned by Japan
5	All of project activities are implemented by ownership of rural people's group	It is important to build a model of systems and facilities that include participation by the residents to deal with issues of safe-guarding and scenarios where the project fails to continue. It is assumed that we will take advantage of the expertise and experience learned to date through international aid projects carried out by Japan.

(2-1-1) Eligibility Requirement 1: Status of the Driving Factors behind Deforestation and Forest Degradation

The driving factors behind deforestation and forest degradation in the target area are the analytical material that forms the base for consideration of initiatives to be developed by the REDD+ project; and naturally the methodology applied needs to take this analysis of the driving factors into consideration. For this reason, this study emphasizes the status of the driving factors behind deforestation and forest degradation, and establishes the following as (*draft*) eligibility requirements (see Table 3).

Table 3 Grounds for the Establishment of (*draft*) Eligibility Requirement 1

Eligibility Requirement (draft proposal)		Grounds for Establishment
1	Drivers of deforestation and forest degradation are slash-and-burn (shifting to rich forests) and/or illegal logging.	As a driving factor behind deforestation and forest degradation, it makes a significant difference whether anthropogenic sources are direct or indirect. While the high density of population in the Mekong River basin, which includes Lao PDR, has led to the expansion of shifting cultivation to produce food, the status of such anthropogenic impact is divided into direct impact, such as Kalimantan Island for example, and indirect impact such as that in the Amazon basin (where fires spread to become forest fires etc.)

(2-1-2) Eligibility Requirement 2: Target Area Soil Type

A major issue when measuring forest GHG emissions is which of the 5 carbon pools forms the target of the measurements. In the case of locations such as Kalimantan Island that are peatland, it is impractical to exclude soil organic carbon from the measurements; on the other hand it makes little impact to exclude soil organic carbon from measurements in areas with wide-spread mineral soil. This study examined a review of scientific literature into whether shifting cultivation in the Mekong River basin is related to GHG emitted from the soil and found that the general calculation method could be applied on the basis that there were no distributions of peatland in the region; moreover, on the assumption that activities such shifting cultivation alone were contributing factors, we were able to adjust calculations to exclude soil organic carbon (see Table 4).

Table 4 Grounds for the Establishment of (*draft*) Eligibility Requirement 2

Eligibility Requirement (draft proposal)		Grounds for Establishment
2	There are no peat soil in project area	If the target area has a distribution of peatland, even slight human impacts can have a significant impact on GHG emissions and as well as being included in the measurements, the required degree of accuracy in the calculations becomes an important issue. As a result, we determined the first eligibility requirement to be whether or not there was a distribution of peatland. Note that the definition of peatland clarified in Indonesia is: "Peatland is an area with an accumulation of partly decomposed organic matter, with ash content equal to or less than 35%, peat depth equal to deeper than 50 cm, and organic carbon content (by weight) of at least 12%".

(2-1-3) Eligibility Requirement 3: Basic Information for the Prediction of Future Forest Dynamics

The major task when implementing REDD+ projects is said to be establishing reference levels. Reference levels are used to indicate potential future GHG emissions based on past GHG emissions and national circumstances; and depending on the accuracy of the reference levels there can be a huge variation in GHG emission reductions obtained from the implementation of an REDD+ project. In light of these reference level characteristics, this study cites historical administrative data on population and livestock herd sizes (which are highly correlated with deforestation and forest degradation) as materials for use in the highly accurate calculation of future GHG emissions (see Table 5).

Table 5: Grounds for the Establishment of Eligibility Requirement 3

Eligibility Requirements – Draft Proposal		Grounds for Establishment
3	Data on population and number of livestock are to be available.	As mentioned above, there is a high density of population in the Mekong River basin, an area that includes Lao PDR, and deforestation and forest degradation is advancing due to direct anthropogenic influences (such as shifting cultivation). As a result, fluctuations in population and household income etc., which act as indicators of anthropogenic influence, enable us to predict future dynamics in deforestation and forest degradation.

(2-1-4) Eligibility Requirement 4: Accuracy Thresholds to Satisfy Internationally Required Standards

Clarifying forest dynamics (i.e. trends in the changes of land use) in the REDD+ project target area constitutes the most fundamental information when calculating GHG emissions. As a result a high degree of accuracy is needed in the land use classifications (data on acreage) shown from the analysis of satellite imagery. As described above, the study established the following (*draft*) eligibility requirement (see Table 6).

Table 6: Grounds for the Establishment of Eligibility Requirement 4

Eligibility Requirement – Draft Proposal		Grounds for Establishment
4	Accuracy of land and forest classification is over 80% by using satellite imagery analysis during reference period.	In establishing accuracy standards, we took into consideration the level of accuracy required for JCM and the standards required internationally. The VCS sets a required level of around 80% in the distinction between forest and non-forest and likewise, a level of around 80% for the analysis of forests by type. Consequently, we set an 80% threshold in this study.

(2-1-5) Eligibility Requirement 5: REDD+ Core Implementation Status (in consideration of Social Safeguards)

In REDD+ projects, which are initiatives that deal with improving traditional methods of land use, it is necessary to develop rules to model the project on local community participation to help ensure the improvements. For example if we create rules to enforce a top-down approach to land use, this may end up adversely affecting the traditional system of land use, and depending on the circumstances, there is also the risk that unless they conform to local customs, the rules themselves will become a mere facade (i.e. meaningless). As a result, to ensure that rules are made to a model that includes local community participation, we also established this (*draft*) eligibility requirement to consider social safeguards in the region (see Table 7).

Table 7: Grounds for the Establishment of Eligibility Requirement 5

Eligibility Requirement (Draft Proposal)		Grounds for Establishment
5	All of project activities are implemented by ownership of rural people's group	Collaboration/cooperation with the local community was deemed an eligibility requirement to ensure that rules are made to a model that includes local community participation, and also in consideration of social safeguards in the region

(2-2) Calculation of GHG emissions (including reference and project emissions)

Reference emissions (levels) were established using the process outlined below, based on land use in northern Laos and the adjacent Mekong River basin. When establishing the levels, we analyzed the factors for direct anthropogenic influence (i.e. the expansion of slash-and-burn shifting cultivation) that act as the driving factors behind deforestation and forest degradation and decided to use the process outlined below.

1. From historical trends in forest acreage and socio-economic indicators, we analyzed the correlation between the two and created an equation for the model

2. We established predictive estimates for socio-economic indicators under the scenario that the project does not take place (the "reference scenario").
3. By inputting the estimates obtained in above 2 into the model in above 1, we calculated predictive estimates for forest acreage.
4. We calculated the reference emissions by applying the estimates obtained in above 2 and above 3 to the equation shown in the reference materials.

Note that we used conservative methods to study the establishment of reference levels. Furthermore, when calculating the model we made a technical examination of any instances where logically the land area was incorrect, or where there was a significant deviation from real-life conditions (such as negative values etc.) When promoting an REDD+ project in the Mekong River basin, an area that includes the Luang Prabang Province, the emission sources considered when calculating GHG emission reductions are "changes in biomass carbon stock quantities associated with tree growth and felling" and "the quantity of CH_4/N_2O emissions associated with forest fires and the burning of fields". The largest amount of GHG emissions is expected to be from "changes in biomass carbon stock quantities associated with tree growth and felling" and for this we decided to use the "stock change method" as per the IPCC guidelines issued in 2006.

The REDD+ project envisaged in this study aims to curtail the expansion (into naturally generated forests) of shifting cultivation, which is the cause of deforestation and forest degradation, and calculate the amount of CO_2 emissions avoided by applying the econometric model in the Box below.

Box: Econometric model to calculate emissions caused by the expansion of slash-and burn agriculture - a factor behind deforestation and forest degradation

$$ForArea_t = 0.0207 \times ForArea_{t-1} - 0.937 \times FA_t - 0.930 \times SBA_t + 223{,}371$$

$$FA = 0.982 \times FA_{t-1} + 0.661 \times SBA_{t-1} - 2{,}390 \quad \text{..... Econometric Model}$$

$$SBA = 0.235 \times FA_{t-1} - 235 \times PF_t + 0.337 \times POP_t + 0.434 \times others_t - 10{,}494$$

where;

ForAreat	Total forest area of Mixed forest, Dry dipterocarp forest and Teak plantation within the reference region at year t; ha
FA_t	Area of fallow at time t within the reference region; ha
SBA_t	Area of slash-and-burn at time t within the reference region; ha
PF_t	Area of paddy field at time t within the reference region; ha
POP_t	Population of within the reference region at time t
$Others_t$	Number of cow as livestock at time t within the reference region or other income from non-forestry sector (e.g. Non-timber forests products)
t	1, 2, 3 … T, a year of the proposed crediting period; dimensionless

(2-3) Data and parameters fixed ex ante

The main parameters to be set in advance are as below. The first field study already carried out a survey of carbon stock per unit of area, and this study examined how frequently data will be updated in the future etc. Note that the outcomes of the previous JICA technical cooperation project (PAREDD) can be applied to the target area as coefficients (parameters) and are gathered below (in Table 8)

Table 1 Coefficients from Relative Growth Formula by Forest Type – Used as Parameters (only includes the main items)

Forest Type	Organs	Relative Growth Formula & Coefficients Developed		Source	Location where equations developed
Mixed forest	Trunk with bark	Biomass = $0.03566*D^{2.618}$, $R^2 = 0.771$	146.9 t ha^{-1} in living biomass (below-ground biomass (root) is 41.4 t ha^{-1})	JICA PAREDD	Phonsay District
	Branch	Biomass = $3.162*D^{1.197}$, $R^2 = 0.485$		JICA PAREDD	Phonsay District
	Leaf	Biomass = $0.2497*D^{1.281}$, $R^2 = 0.633$		JICA PAREDD	Phonsay District
	Root	Biomass = $0.4908*D^{1.652}$, $R^2 = 0.855$		JICA PAREDD	Phonsay District

(2-4) Elaboration of the JCM methodology based on applying the draft to measure GHG emission reductions

(2-4-1) Actual Measurements such as the Amount of CO_2 Emissions Avoided; measured using the proposed JCM methodology

The effects of the activities (i.e. the Project Activities) to curtail deforestation/forest degradation in the Houaikhing village cluster, which constitutes the REDD+ target area, were calculated using the method below. By implementing the REDD+ project envisaged in this study, we estimate a reduction in GHG emissions/removal quantities of 1,825.4 Gg-CO_2 over a 15 year period from 2011-2025 (i.e. 121.7 Gg-CO_2/year) (see Figure 4).

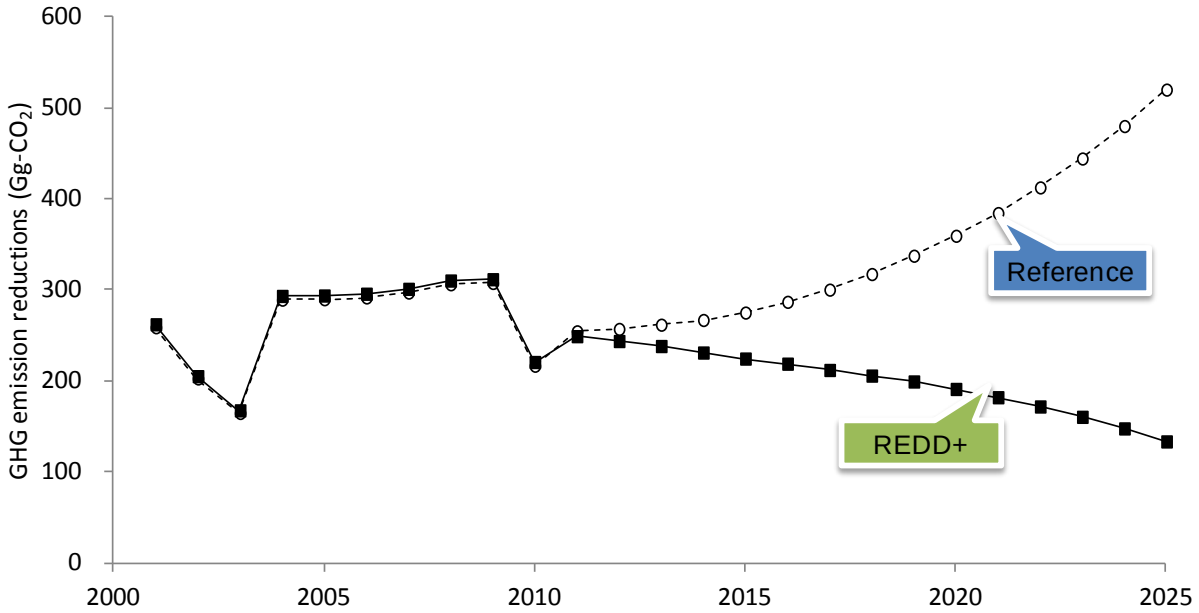

Figure 4 Reductions in GHG emissions/removals quantities predicted in the Houaikhing village cluster

(2-4-2) In Case of a Sub-National REDD+ Project for Luang Prabang Province

This study promoted initiatives in the Houaikhing village cluster, which is located in Luang Prabang Province. As of 2011, Luang Prabang Province had forest acreage that totalled 1,966 thousands ha, which is approximately 70 times that of the Houaikhing village cluster. Furthermore, the whole of Luang Prabang Province employs the same type of land use method as the Houaikhing village cluster; i.e. shifting cultivation etc. Using the conditions mentioned above to perform a simple calculation, we estimate that if, in future, a REDD+ project were conducted in Luang Prabang Province (on a sub-national basis), then reductions in GHG emissions and absorption amounts of over some millions ton-CO_2 could be obtained during the 15 year period from 2011 to 2025.

(3) Activities for acquiring international understanding of REDD+ under the JCM

(3-1) Ensuring Conformity with UNFCCC (under preparation)

The REDD+ project envisage in this study is to be rolled out from a project-based initiative to a quasi-national based initiative (i.e. to cover Luang Prabang Province). This type of concept is fully consistent with REDD+ negotiations under UNFCCC. Consequently, we expect the outcomes of this study to be useful not only in Lao PDR and the Mekong River basin, but also to prove helpful as materials for use in future UNFCC negotiations.

(3-2) Safeguard Considerations

The key safeguards to be taken into consideration when implementing REDD+ include environmental safeguards (i.e. the conservation of biodiversity while promoting REDD+) and socio-economic safeguards (i.e. promoting an increase in the standard of living for local residents (especially the poor) while developing REDD+). In addition, it helps the REDD+ project to proceed in a stable manner when such safe guards are taken into consideration; and this fact allows the following issues to be tackled effectively; namely, (i) "non-permanence" and (ii) the possibility of the project's implementation causing "activities displacement."

To date not even UNFCCC has produced any clear guidelines on how to implement environmental

safeguards (i.e. conserve biodiversity); and as a result a method has yet to be developed to quantitatively prove whether or not environmental safeguards (the conservation of biodiversity) are properly functioning. Nonetheless, the majority of REDD+ host countries have signed the Convention on Biological Diversity (including the target-country of this study, Lao PDR) and are constructing plans (strategies) to ensure the conservation of biodiversity on the basis of the convention. In the development of environmental safeguards (conservation of biodiversity), this study determined that, the adequacy of conservation methods, as well as national strategies on biodiversity in the host country of Laos (which was established at the time the Convention on Biological Diversity was ratified) were strategies that fell under the sovereignty of the Government of Lao PDR; and planned the implementation of REDD+ on the basis of these strategies.