Summary of Terminal Evaluation

I. Outline of the Project

Country: Indonesia		Project title: The Project for the Support on Forest Resources Management through Leveraging Satellite Image Information
Issue/Sector: Forestry and Forest Conservation		Cooperation scheme: Technical Cooperation
Division in charge: Forestry and Nature Conservation Division 1, Forestry and Nature Conservation Group, Global Environment Department		Total cost: -
Period of Cooperation	(R/D): Sep. 11, 2008～Sep.10, 2011	Partner Country's Implementing Organization : Directorate general of Forestry Planning (DJP), Ministry of Forestry (MOF)
		Supporting Organization in Japan: Forest Agency
Related Cooperation: Nothing		

1. Background of the Project

Indonesia's tropical and subtropical forests and wetlands have the third largest area (over 120 million ha) after Brazil and the Democratic Republic of Congo. On the other hand, forest has been decline by 2% annually (FAO, 2005), and forest conservation and restoration has been recognized as an urgent issue. Causes of deforestation include forest fires, illegal logging, timber processing and unplanned land conversion to agriculture. Background of these causes are, ①the accuracy of monitoring forest resources, law reliability caused by non-integrated information ② lack of coordination with related government agencies on land use permits, ③a lack of legal and institutional arrangements which results from rapid decentralization.

As effective measures to deal with issues above, it is necessary to obtain forest resources information with a certain degree of accuracy and reliability, to share such information among relevant organizations (various ministries , government agencies under decentralization condition and private companies), and to develop and implement appropriate forest resource management plan based on information above. In forest resources management in Indonesia, remote sensing techniques utilizing satellite image is needed.

The Project for the Support on Forest Resources Management through Leveraging Satellite Image Information ("The Project") is transferring forest remote sensing techniques for forest resources management by using PALSAR (microwave sensor the ALOS satellite in JAXA) and MODIS (optical sensors on satellites AQUA / TERRA U.S. which can conduct wide-area survey of forest resources), and strengthen current forest resources monitoring system. Moreover, the Project was formulated for capacity development for central- and local-level staff. JICA implemented Ex-ante evaluation in October, 2007 and February, 2008, and the Project started in September, 2008.

The Project conducted technical instruction on PALSAR image interpretation and developed interpretation manual. In addition, the Project carried out activities related to REDD (reducing emissions from deforestation and forest degradation) such as provision of information and donor coordination. In March, 2010, JICA monitoring mission was dispatched to understand current situation and to discuss future perspective.

Considering the project is scheduled for completion in September 2011, terminal evaluation is made this time.

2. Summary of the Project

(1) The Project Purpose: BAPLAN's capacity to conduct more reliable forest resources monitoring and assessment is upgraded through transfer of technology and training

(2) The Overall Goal: Sustainable Forest Management (SFM) is promoted in Indonesia through the upgraded forest resources monitoring and assessment

(3) The Outputs

1) Output 1: Accuracy of forest resources monitoring and assessment data utilizing satellite image information is improved

2) Output2: Capacity of BAPLAN and its UPTs id upgraded

(4) Inputs:

1) Indonesian side

Allocation of project personnel:	Management personnel:2 persons Technical personnel:5persons	Running Expenses:	n/a

2)Japanese side

Dispatch of Experts: (as of Jun 2011)	7persons in total	Provision of Equipment:	n/a
Project personnel Trained in Japan:	18 persons in total	Local Activity Cost:	n/a

II. Evaluation Team

	Title	Name	Position
Members of Evaluation Team	Leader	Mr.Shigeki Hata	Executive Technical Advisor to the Director General, Global Environment Department
		Dr.Gen Takao	Department of Forest Management, Forestry and Forests Products Research Institute
		Mr.Kazunobu Suzuki	Advisor, Forestry and Nature Conservation Division I, Forestry and Nature Conservation Group, Global Environment Department
	Evaluation Analysis	Ms.Yasuyo Hirouchi	Permanent Expert, International Development Associates, Ltd.

Period of Evaluation	5/ 15/ 2011- 1/ 6/ 2011	Type of Evaluation : Terminal evaluation

III. Results of Evaluation

3-1 Accomplishment of the Project.

3-1-1 Accomplishment of the Outputs

(1) Output 1: The cloud cover appeared in the land cover map is eliminated by using PALSAR data. An interpretation manual for PALSAR data as well as a guideline for the use of PALSAR data for land cover mapping (as main satellite images) has been developed. Technically achievable accuracy (i.e. matching ratio between the land cover types appeared on the sample land cover maps formulated based on the above manual/guideline, using only PALSAR 50-m Resolution Ortho Mosaic data, and the land cover types identified through field surveys) based on the methods developed by the Project was more than 85%. Land cover mapping based on the developed methods, however, has not been operationalized yet: DJP has not yet reached an organizational decision on substituting PALSAR for LANDSAT because of discontinuation of free-of-charge provision of PALSAR data by JAXA from 2010 data due to change in a data provision policy of JAXA and unexpected termination of ALOS operation in April 2011. In addition, the final draft of the PALSAR data interpretation manual was not available until March 2011. At present, DJP is planning to use the PALSAR data as complement to the LANDSAT data in the land cover mapping process in 2011, but DJP is uncertain about utilization of PALSAR data in the future especially in light of uncertainties related to continuous provision of PALSAR data and JAXA's data provision policy in the future.

(2) Output 2: With regard to DJP, the officers trained by the Project are expected to have gained skills and knowledge necessary for supervision of land cover mapping using PALSAR data. As for UPTs, there is a gap in capacity building. From 9 UPTs at least one officer has participated in advanced-level training: these UPTs are presumably ready to formulate land cover maps using PALSAR data through leadership of the officers with advanced skills and knowledge. In contrast, the other 8 UPTs have the officers who were trained only in basic-level (or less-advanced) courses. Presumably, these 8 UPTs are not ready to formulate land cover maps using PALSAR data for themselves. It should also be noted that the officers trained by the Project have had little opportunities to familiarize themselves with the skills and knowledge through practical experiences. Though on-the-job training (OJT) is scheduled in the remaining period, the details, including target officers/UPTs and modality of OJT, are yet to be finalized.

3-1-2 Accomplishment of the Project Purpose

Improvement of reliability of forest resource information was not able to be confirmed

because the land cover maps, utilizing PALSAR data, from which the information would be acquired from, are yet to be formulated by DJP. As stated already, DJP has not been able to decide on the use of PALSAR in their land cover mapping especially in light of uncertainties related to continuous provision of PALSAR data and JAXA's data provision policy in the future. For reference, such information is likely to be made available for other Departments of the Ministry of Forestry or other Ministries in early-mid 2012 since DJP is planning to use PALSAR in their land cover mapping process in 2011 as complement to LANDSAT

3-2 Summary of Evaluation

3-2-1 Relevance

The Overall Goal is relevant with the needs of Indonesia. The Project Purpose is consistent with the organizational needs of DJP. The Overall Goal and the Project Purpose are relevant with the latest Mid-term Development Plan (2010-2014) of Indonesia as well as Official Development Assistance (ODA) policies of Japan. Technical advantage of Japan is confirmed.

Overall, the Project is considered to be still relevant.

3-2-2 Effectiveness

Progress has been made towards achievement of the Project Purpose but the exact degree of achievement was not able to be assessed because of unavailability of the relevant data. Judging from the overall achievement level of the Outputs, achievement level of the Project Purpose is presumed to be lower than expected due to adverse effects posed by the external condition beyond the control of the Project (i.e. discontinuation of free-of-charge provision of PALSAR data by JAXA and unexpected termination of ALOS operation in April 2011).

Taken together, the Project is considered moderately effective.

3-2-3 Efficiency

In general, the Inputs from the both Indonesian and Japanese sides have been mostly appropriate in producing the Outputs in terms of timing, quality and quantity. Output 1 has been mostly produced but is not likely to be fully produced due to external factors that are beyond control of the Project (i.e. discontinuation of free-of-charge provision of PALSAR data by JAXA and the unexpected termination of ALOS operation). Output 2 has been moderately produced. It is uncertain whether Output 2 would be fully produced by the Project end mainly because the Project is yet to come up with a clear capacity building

strategy for the remaining period.

On the whole, the Project has been mostly efficient.

3-2-4 Impacts

Impacts at the Overall Goal level: It is unclear if the Overall Goal would be achieved in three years after the termination of the Project due to adverse effects posted by the external factors that cannot be controlled by the Project (i.e. discontinuation of free-of-charge provision of PALSAR data by JAXA and the unexpected termination of ALOS operation)

Other impacts: Some positive impacts have been observed, including the increased knowledge and skills of lectures and students of IPB on PALSAR through participation in the works contracted out to Faculty of Forestry of IPB, and increased awareness on the use of PALSAR through publicity activities of the Project. Negative impacts have not been observed. They are not foreseen, either.

3-2-5 Sustainability

Institutional and organizational aspects: The legal and policy support for utilization of satellite images in forest resource monitoring is likely to continue. DJP has not been able to come up with a clear post-project strategy on the use of PALSAR data in land cover mapping and associated capacity building especially because (i) discontinuation of free-of-charge provision of PALSAR data by JAXA from 2010 data due to change in a data provision policy of JAXA; (ii) provision of the PALSAR data itself has been discontinued due to power anomaly experienced by ALOS in April 2011; and (iii) there should be a time-gap of a few years until PALSAR data becomes available again. Meanwhile, DJP would be able to manage land cover mapping process, using PALSAR, given such a decision is reached because it has managed land cover mapping, using LANDSAT, through coordination with relevant organizations.

Financial aspects: DJP has formulated land cover maps, using LANDSAT, with their own budget. Necessary budget is likely to be allocated for land cover mapping, using PALSAR, given a decision on the use of PALSAR is made by DJP.

Technical aspects: It is presumed that, the Indonesian Project Personnel will have acquired practical knowledge, skills, and experience on the use of PALSAR, which are necessary for continuation of the relevant activities in the post-project period. It is uncertain whether the knowledge and skills transferred to the officers of DJP/UPTs as well

as the project deliverables, including the PALSAR data interpretation manual, Guideline for using PALSAR data for land cover mapping, training modules and training guidelines, etc. would be actually utilized in the future, because DJP has not been able to come up with a post-project strategy on the use of PALSAR as noted above. In addition, the capacity development strategy to fill-up a gap between the UPTs with advanced skills and those only with basic skills in the remaining period is not clear, which also raises concern over utilization

Taken together, It seems possible, but is not certain whether the sustainability of the Project would be ensured because DJP has not been able to nail down a post-project strategy, especially on the use of PALSAR in its forest resource monitoring and assessment system in light of uncertainties related to continuous provision of PALSAR data and JAXA's data provision policy in the future, which are beyond the control of the Project.

3-3 Factors that promoted realization of effects

3-3-1 Factors concerning to Planning

Nothing special

3-3-2 Factors concerning to Implementation

Technical Advisory Group, consisting of experts from University of Indonesia, Indonesian National Institute of Aeronautics and Space (LAPAN), and Center for International Forestry Research (CIFOR), has been formulated in order to take most advantage of the expertise available in Indonesia, in particular in the development process of PALSAR Data Interpretation Manual. Valuable technical advice made by the Members of the Group, who were invited to internal workshops and meetings, have been duly reflected in the Manual.

3-4. Factors that impeded realization of effects

3-4-1 Factors concerning to Planning

The project design was not clear enough. For example, descriptions of some of the Activities and Outputs were vague and most of the Objectively Verifiable Indicators were not well defined. In addition, many of the Indicators lack criteria to judge their achievement level so that they were not objectively verifiable. Some Indicators were placed at a wrong level of the Narrative Summary. Furthermore, Indicators of the PDM were not sufficient to assess the achievement of the Project properly. As result, the concerned personnel had to invest the time and effort in understanding the contents of the Project described in the PDM.

3-4-2 Factors concerning to Implementation

Project staff of DJP has been occupied with routine work and other tasks so that they could

not participate in the Project Activities fully. It was often difficult to find time for meetings/discussions.

As for the PDM, during the visit of the JICA Consultation Team in March 2008, a discussion paper on interpretation on PDM, prepared by the Japanese Expert Team, was reviewed and the necessity of further elaboration of the paper was agreed. The paper, however, has not been discussed within the Project as it has been difficult to find convenient meeting time. Meanwhile, the issues other than definition of the Indicators have been left unnoticed. This has made it difficult for all those concerned to have common understanding on the expected achievement level and progress of the Outputs and the Project Purpose of the PDM.

3-5 Conclusion

The Project is still relevant and moderately effective. And the Project has been mostly efficient. It is unclear if the Overall Goal would be achieved in three years after the termination of the Project due to adverse effects posted by the external factors that cannot be controlled by the Project. In the meantime, some positive impacts have been observed. Negative impacts have not been observed. They are not foreseen, either.

It seems possible, but is not certain whether the sustainability of the Project would be ensured because DJP has not been able to nail down a post-project strategy, especially on the use of PALSAR in its forest resource monitoring and assessment system in light of uncertainties related to continuous provision of PALSAR data and JAXA's data provision policy in the future, which are beyond the control of the Project.

3-6 Recommendations

3-6-1 By the end of the Project

- The Evaluation Team recognized that implementation of OJT was approved at the JCC (April, 2011), and that the Project is in the process of planning OJT. Considering that remaining time is very limited, it is recommended that the Training contents such as place and target participants be discussed and immediately agreed by the Project. In addition, recognizing that there is a gap in capacity development to formulate land cover maps using PALSAR data, it is recommended that the Project develop a clear capacity development strategy.
- The Evaluation Team found that "Guideline for using PALSAR data for land cover mapping" which has been developed by the Project described solely the PALSAR image interpretation with no relevance to the conventional Landsat image interpretation that MoF had adopted. Therefore, it is recommended that the interpretation guideline further describe the complementary use of PALSAR

image interpretation to the Landsat image interpretation so that the developed method be integrated in the conventional land cover mapping. The Team also recommends changing the title of the guideline so as to explicitly indicate the complementary use of PALSAR to the conventional mapping scheme.

- The Evaluation Team found the method developed by the Project very innovative with high accuracy. To promote a better understanding of this achievement by the external stakeholders, the Team recommends to the Project the additional actions as follows;

  - Calibrate the accuracy table and correct the bias in area estimation of each class as recommended by Card (1982).
  - Present the aggregated accuracy tables by different levels of land cover classes so as to demonstrate the higher accuracies for simpler (or higher level) classification demands.
  - Compare the resulted accuracies with the accuracies by the conventional Ministry of Forest land cover map, which is supposed to be released for the first time as a part of the "Land Cover Map of Indonesia, 2011 " in coming June or July, as a baseline.
  - Publish the summary of the Project products in English and proactively present the Project results in international arenas.

3-6-2 After the end of the Project

- It is recommended that Ministry of Forestry utilize PALSAR images as a complementary data source for land cover mapping as suggested in the guideline and manuals by adopting those products as the materials for the training which HQ regularly conducts every year with participation of HQ staff and all UPT's staff in Indonesia. For those limited staff with excellent abilities, it is recommended to provide knowledge and skills in ALOS PALSAR pre-processing for their possible use in further application.
- The Evaluation Team found that the PALSAR image interpretation developed by the Project would be potentially superior to the conventional Landsat image interpretation adopted by MoF in terms of the temporal resolution especially when the mapping interval becomes shorter. Usually 3 to 4 or more Landsat TM/ETM+ images acquired over a period of 2 years are necessary for interpretation of an area so as to minimize the cloud cover by mosaicking cloudless parts of the images. This image acquisition period limits the updating interval of the map to 2 years or longer, otherwise wider cloud coverage in the resultant maps should be accepted in return for a shorter updating interval. Thus, MoF's plan to shorten the interval of land cover mapping from 3 years to merely 1 year would result most likely in a series of maps with lower quality if they continue the same interpretation procedure. In contrast, PALSAR and the scheduled ALOS2 SAR can provide cloudless

images with a precise temporal resolution which would allow more frequent mapping with a narrow time window. Thus the Team recommends for MoF to evaluate the feasibility of the PALSAR image interpretation applying in any given area in Indonesia in response to the shorter mapping interval requirement.

- The Evaluation Team found that the Project had accomplished development of the PALSAR image interpretation at an excellent level of accuracy, which demonstrated the modality of usability of PALSAR for land cover mapping. It was recommended that MOF further explore possible applications of PALSAR data for its policy implementation, e.g. deforestation detections and/or carbon stock estimation, in combination with other data sources and methods so as to make wider and robust options of forest monitoring in future.

3-7 Lessons learned

- It could be a good idea to have a target of technical transfer outside of the government. The Project showed that working with staff of IPB contributed to developing their skill for dealing with PALSAR data. Educational institution like national university has a potential to be a source of providing human resources to the government.

3-8 Follow-up situation

Nothing.

It is suggested that outputs/outcome of the Project be utilized in REDD+ project in future in Indonesia.