

"Project Formulation Survey" under the
Governmental Commission on the Projects for
ODA Overseas Economic Cooperation
in FY2013

Summary Report

Republic of Indonesia

Project Formulation Survey for dissemination of the
Real-time Monitoring System
using a mobile communication network

March, 2014

Joint Venture of Midori Engineering Laboratory Co., Ltd. and
Kaihatsu Management Consulting Inc.

The content of this report is a summary of the project formulation survey, which was commissioned by the Ministry of Foreign Affairs of Japan in the FY 2013 and is carried out by the consortium (Joint Venture of Midori Engineering Laboratory Co., Ltd. and Kaihatsu Management Consulting Inc.). It does not represent the official view of the Ministry of Foreign Affairs.

Summary

I. Description of the current situation and development needs of the concerned development issues in the surveyed country

The government of Indonesia (GOI) has incorporated the strategy to deal with the problems related to climate change in the National Medium- and Long-term Development Plans as the most important issue since President Yudhoyono declared the following mitigation targets of the GHG emissions at G20 Pittsburg Summit in 2009.

- 26% reduction of the annual GHG emissions from the BAU level by 2020 based on its own efforts
- 41% reduction (15% addition) with the assistance of international communities

In Indonesia, deforestation particularly in the tropical rain forest has been progressing at extremely worrying speed. Although its forest area is ranked the 3rd among the tropical rain forest countries, about 20% of the area was deforested for 20 years from 1990 to 2010. The deforestation rate is 1% per annum which is ranked 1st, and the annual deforested area is ranked 2nd. The main causes of this deforestation include the development of oil palm plantation for oil production. The speed of such development does not seem to slow down because of the economic benefits gained by the landowners and the residents. The GHG emission amount from deforestation and forest degradation is estimated at 600 million tons.

Furthermore, the GHG emission amount from fires and bacterial decomposition in peat land exceeds those from deforestation -- estimated at 2 billion tons per annum. Adding these emissions from deforestation and peat land to the 410 million tons from energy consumption, the total emission amount in Indonesia exceed 3 billion tons. This emission amount ranks 3rd, only after China and USA. Thus, it can be concluded that the GHG emission reduction in Indonesia is an important development issue to be tackled globally.

The peat land in Indonesia occupies two thirds of tropical peat in the world, and is called as an “explosives warehouse for global warming”. Peat fires and decomposition never occur in the natural condition since peat land is originally wetland. However, peat fires and decomposition have been caused by dried peat due to deforestation and drainage which were accelerated through the Mega-Rice Project in Central Kalimantan in the 90’s. Furthermore, the situation has worsened by continuing development of oil palm plantation. In consequence, vast amount of carbon dioxide is continually being emitted from the peat land, and that is the state where the “explosives warehouse” caught fire. It is therefore a serious global issue to control the ground water level in peat land in order to prevent carbon dioxide from being emitted vastly from the dry peat.

GOI established “National Action Plan for Reducing GHG emissions” (RAN-GRK) and “National Action Plan for Climate Change Adaptation” (RAN-API) to cope with climate change which is regarded as the most important issue in the national development plan. They are respectively the principles of the national policy for mitigation and adaptation measures against climate change. RAN-GRK, the basis of mitigation measures, tries to achieve nearly 90% of the reduction target in the sector of forest and peat land, particularly focusing on the peat land. It also obliges the provincial governments to develop “Local

Action Plan for Reducing GHG emissions” (RAD-GRK) in reference to RAN-GRK, in order to achieve the emission reduction target. On the other hand, RAN-API, the basis of adaptation measures, focuses on the measures against floods and droughts, identifying unstable rainfall to be a major risk of climate change in Indonesia.

The Japanese ODA policy for Indonesia also emphasizes climate change as a key subject of its assistance. One of the three focus areas of the assistance mentioned in the policy refers to climate change as a global issue which requires Japanese support, and several projects are implemented in the climate change program. Climate change countermeasures are also actively supported by advanced countries such as Norway, Australia and Germany, and international organizations such as United Nations and World Bank, in addition to Japan. In respect to climate change, although it is a delicate issue for Indonesia where a balance between development and emission reduction is required, the financial assistance to establish a fund is the major approach of international communities. Concrete measures are left to Indonesia while the management capacity of GOI is enforced with the fund. In the case of Norway, however, the approach is different. Its financial aid set conditions for GOI to implement conservation policies for forest and peat land in order to encourage GOI to actively carry out the emission reduction policies.

II. Possible applicability of the SME's products and technologies, and prospects for future business development

The SESAME system is a comprehensive telemetry system which (i) collects field data with a sensor, (ii) records them on the spot, (iii) transmits them to a remote server through a mobile communication network, (iv) processes the transmitted data, (v) outputs them in a format required for an analysis, and (vi) transmits the output to a client computer. It has the following features:

- 1) Low cost: about 500 thousand yen (not including the installation) per set
- 2) High frequency of data measurement and memory capacity for a long term storage
- 3) Fully operational on a photovoltaic battery with power saving design
- 4) Variable transmission frequency with email function to send a warning message at a given condition
- 5) Easy maintenance and replacement for the instrument which consists of widely available parts
- 6) Low transmission cost using a local SIM card (about 200 yen per month) at 3,000 yen per month for the operation cost of the system
- 7) Useful particularly for wide area monitoring with its capability in real-time data processing and the display function on a graph and a map
- 8) Data is available quickly after its installation
- 9) Comprehensive system design makes imitation difficult

Despite these superior features, the SESAME system has faced entry barrier in the Japanese market. Nevertheless, being encouraged by high evaluation in Indonesia, Midori Engineering Laboratory (“MEL”) examines the shift of its market focus from Japan to foreign countries.

In comparison with two other Japanese products with similar functions, the SESAME system has advantages in such respects as measurement frequency, memory capacity, transmission capability, power consumption, and price. In Indonesia, the only competitive product is the GSM-type telemetry system produced by Tech4Water which is the consortium organized by Department of Public Works (“PU”).

However, the Tech4Water system seems to have no technological advantage over SESAME, and in fact many of the installed systems are not operating properly.

The application of the SESAME system can be expected in many ways even only for climate change countermeasures. The demand for the telemetry system is estimated at more than 14,000 measurement spots for four application cases such as (i) control of the ground water level in peat land, (ii) estimation of the immobilized carbon dioxide amount in peat forest, (iii) early warning system against floods and other natural disasters, and (iv) weather observation. Regarding market size, Indonesia is considered to have great demand for telemetry systems.

In the sales plan, BNT, a locally-established company to sell the SESAME system, plans to be the Indonesian general agent to start the SESAME business after obtaining the importing license called API-U similarly for the case of a trading company. When the business becomes stable (2 years later in the best case), MEL is going to put in the capital and acquire BNT to be its subsidiary. Through BNT, MEL plans to strengthen local partnership. For installation and maintenance, Hydrosix has been selected as a partner among several Indonesian companies handling a telemetry system since Hydrosix actively cooperates with MEL and has vast experience in related business. Specialized agents are going to be selected for knockdown production and sales in main islands except for Java and Kalimantan.

The SESAME system uses widely available parts in its structure, and therefore subject to the risk of low-quality imitation products despite its ease of maintenance. It is planned to establish the SESAME consortium in Indonesia for sharing the collected data among the related organizations, and it would result in the absolute superiority of the SESAME system.

III. Verification of adaptability of the SME's products and technologies in the surveyed country (Demonstration and pilot survey)

Pilot surveys were conducted at two locations to verify that the SESAME system has the technologies to function effectively as climate change countermeasures in the applied field, and as a result, to assess the future for MEL to expand the SESAME system business into the Indonesian market.

(1) Jatiluhur Dam Lake

In its current condition, the water level, which is one of the most important data for dam operation, is hourly read through the water gauge using human eye, as such, the planning as the multi-purpose dam to properly distribute water and immediate actions against flooding cannot be done. The pilot survey was planned and conducted to demonstrate that the SESAME system can perform the real-time measurement of water level and is resistant to hydrogen sulfide and high humidity in the field. In the survey, the measurement and transmission of the data to the server were continued with regard to the water level, rainfall, and air temperature for about two months since the system was installed in October 2013.

The water level observation by the SESAME system has proved that the system works effectively since the SESAME data reconciled with the visually observed data. No problem was found in respect to continual data collection and durability for the period of two months. In comparison with the Tech4Water system, the SESAME system demonstrated its clear superiority in aspects such as product credibility, field data collection, data transmission and processing, etc. This verification activity was introduced in one of the leading local newspapers.

(2) Peat land (Palangkaraya suburbs)

Another pilot survey was conducted at the target area of the “Indonesia Peat SATREPS project” located in Pulang Pisau County, Central Kalimantan province. This survey is to verify the SESAME’s applicability for accuracy improvement of the way how carbon balance is monitored in peat land. The survey also intends to verify the wireless communication capability of the new product -- SESAME III. Specifically, the following three subjects are verified:

- 1) Analysis on the influence of the water level to the ground movement for the purpose of accurate estimation of the carbon emissions from the peat land
- 2) Measurement of the growth of a tree trunk for the purpose to grasp the carbon fixation amount in the forest trees
- 3) Measurement of the effective transmission distance by ZigBee between the base and the extension units of the SESAME III set

The simultaneous measurement of the ground water level and the ground movement was conducted at the 5 observing locations. For the above 1), SESAME II was connected to a ground water sensor and a ground movement sensor. The measurements were conducted at one location in a forested area for the above 2) and 3) with the connecting sensor of dendrometer. The verification results and the study are described below.

- 1) No problem was found for the measurement in peat land, data analysis of which shows the linear relation of the ground movement to the ground water level with high accuracy. It also clarifies that error correction with the data of ground water level is required in addition to the remote sensing measurement for accurate estimation of the carbon emissions from the peat land.
- 2) The measurement went smoothly, which concluded that there is no problem with data transmission even in hot and humid peat forest. The measured data of aging change of tree reconciled with the general knowledge about tree growth. Also when the result observed by a satellite is to be verified, it became clear that the ground measurement using the SESAME system can enhance the accuracy much more easily than the current practice since it can narrow the measurement interval in terms of time and space with no trouble.
- 3) It was verified that the ZigBee connection used by SESAME III has sufficient transmission capability for the estimation of carbon fixation amount in forest since the effective transmission distance observed in a matured forest was 85m. However, for transmitting a still picture, it turned out that a faster modem was required.

In respect to MEL’s expansion of the SESAME business, the SESAME system is likely to be accepted in the Indonesian market for its comparative advantage since the Indonesian telemetry development concept matches SESAME’s. MEL’s business expansion to Indonesia is therefore considered to have a favorable chance.

Apart from the two pilot surveys, the adaptability verifications of the SESAME system were conducted with the soil moisture measurement in a coffee and cocoa plantation run by ICCRI and the water level measurement at two locations along Kahayan River in Central Kalimantan province. It was confirmed that SESAME’s real-time feature is highly effective for drought and flood measures.

In addition to these adaptability verifications, three meetings (a kick-off meeting and two

workshops) were held with the relevant organizations in order to draw up an ODA project plan to utilize the SESAME system and to obtain the participants' consent. Based on the situation where the questions raised in a series of the meetings were mainly related to "maintenance", "server", and "data", the outline of the pilot survey for disseminating the SESAME system was laid out and obtained the consensus among the relevant organizations in the 2nd workshop.

With regard to MEL's 10 year business plan in Indonesia, the sales will greatly depend on the three opportunities of (i) the "JICA's project for disseminating SME's technologies", (ii) the next SATREPS project undertaken by Hokkaido University, and (iii) a Japanese weather forecast company who would apply SESAME for its business in Indonesia. In the case where all the three opportunities are given, the annual pretax profit is estimated to be 8.2 million yen for the 1st year, and reaching 235 million and 475 million yens for the 5th and 10th years, respectively.

IV. Expected development impact and effect on business development of the proposing SME in the surveyed country through the proposed ODA project

The SESAME system is the proposed product in this survey which can contribute to both mitigation and adaptation measures against climate change in various ways. As for the mitigation measures, it can be applied to the monitoring for preventing peat fires and decomposition. The SESAME system can also be used for the ground monitoring to verify the accuracy and consistency of the remote sensing technologies for REDD+ and analyze the variation affected by the environmental conditions among others. As for the adaptation measures, it can be applied to the real-time water level measurement at dam and river as a flood measure and the real-time ground moisture measurement at plantation as a drought measure. The SESAME system has been used in several trials and received favorably by all users in trials.

This survey proposes the ODA project to be formulated along with the JICA's scheme of "pilot survey for disseminating SME's technologies". This proposed project will establish a structure where the participating organizations can use the SESAME system in various ways according to their roles related to climate change. It is deemed that a great development impact will result in both mitigation and adaptation measures against climate change if the SESAME system is promoted for the applications, uses and disseminations in such a manner.

In order to reduce the GHG emissions from peat land which is a highly important global issue, the introduction of the SESAME system is deemed to bring immeasurable development impact. It is also deemed to contribute to the establishment of a methodology for reducing emissions from peat land to enforce the monitoring of carbon flux with the SESAME system. If the emission reduction by preventing peat fire and decomposition is actually approved as a REDD+ activity, the actions to manage peat land will be strongly boosted in Indonesia, leading to far greater development impact.

Furthermore, this ODA project can also bring in other development impacts such as effective data sharing, which will be discussed in the SESAME Consortium to be established and enable the extended use of the SESAME system according to the local needs.

In addition, this project is expected to bring great impacts on MEL's business in Indonesia to be developed in parallel in respect to sales promotion, the SESAME's function improvement, strengthening of local partnership, creation of a new business opportunity among others.

V. Proposals for formulating an ODA project

This survey proposes a scheme to be formulated as an ODA project. The outline of the proposed project is described below.

Project name	The Project on the establishment of Real-time Telemetry System of field data related to Climate Change with the SESAME system
Goals	<ol style="list-style-type: none">1 Establish a real-time telemetry system of field data related to Climate Change by introducing the SESAME system2 Assess the future for MEL to expand the business in the Indonesian market with the SESAME system3 Transfer the development technologies of a real-time telemetry system to the Indonesian stakeholders to achieve high cost-effectiveness and easy maintenance by forming the SESAME Consortium
Target area	Whole country of Indonesia
Implementing period	2 years and 4 months (if starts in September 2014)
Counterpart organization	BPPT (Agency for the Assessment and Application of Technology)
Participating organizations	To be selected based on the “utilization plan proposal” submitted based on the selection standards determined by the survey team

The counterpart organization is to play highly important roles in this project including coordination with the participating organizations, approval of the SESAME system utilization plans to be submitted by organizations, and progress monitoring of the project. With regards to climate change, BPPT is deemed to be the most suitable counterpart organization because it is in charge of assessing technologies with no constraint to the project area.

The participating organizations will be involved in this project to utilize and verify the SESAME system under BPPT’s coordination. Among the interested organizations who have proposed a plan to utilize the system according to their specific needs related to climate change, the participating organizations shall be selected according to the standards such as relevance to climate change, intention for cooperation, intention to share costs, prospect for sustainable utilization. About 100 SESAME systems in total will be provided without charge for the participating organizations for the verifications based on their utilization plan proposal. Five organizations such as Jasa Tirta II, IAARD, ICCRI, Tanjungpura University, and PT. Indonesia Asahan Aluminium have already submitted their utilization plan proposals respectively.

The “SESAME Consortium” is the place to train the telemetry technicians and discuss the establishment and use of the consortium server in Indonesia for directly transmitting the data even without MEL’s support in future. After the establishment of the consortium server, it will discuss the extended uses of the system according to the needs of the relevant organizations. As a result, the database will be established for the collected data to be effectively and commonly used by many organizations.

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SMEs and Counterpart Organization

- Name of SME: Midori Engineering Laboratory Co., Ltd
- Location of SME: Sapporo, Hokkaido Pref., Japan
- Survey Site ▪ Counterpart Organization: Whole country of Indonesia · BPPT (Agency for the Assessment and Application of Technology)

Concerned Development Issues

Climate Change Countermeasures

- Declared the 41% emission reduction target by 2020
 - Target 41% reduction of annual GHG emissions (26% with own efforts plus 15% with international aid)
- Mitigation measures
 - Reducing emissions mainly with prevention of Deforestation and Peat Fires
- Adaptation measures
 - Taking countermeasures focusing on Floods and Droughts

Products and Technologies of SMEs

SESAME System

- Transmit the field data to a remote server via a mobile communication network, enabling Real-time measurement
- Allow connection of a variety and a number of sensors to be used for various data measurement
- Enable the stable measurement and transmission of data even in the field with the Power Saving design
- Offer crisis management functions such as automatic warning messaging on the given conditions

Proposed ODA Projects and Expected Impact

The Project on the establishment of Real-time Telemetry System of field data related to Climate Change with the SESAME system (Scheme: Pilot survey for disseminating SME's technologies)

- Establish a Real-time Telemetry System of field data related to Climate Change through introduction of the SESAME system
- Implement the activities for various needs of the Participating Organizations based on their own proposals
- Formulate the Indonesia-Japan Consortium for the Participating Organizations to effectively use the data
- Expected Impacts: Contributions to both mitigation and adaptation measures against Climate Change, such as prevention of Peat Fire and early warning of Floods and Droughts

Future Business Development of SMEs

- Establish the local corporation with local partnership to sell SESAME System inclusively of the assembly, installation and maintenance. Promote its localization in the future view to utilize the local parts.
- Enhance the multiplier effects with the ODA project to expand the business also with private companies

