UTILIZATION OF ALOS SATELLITE DATA TO SUPPORT MAPPING AND MONITORING DEFORESTATION AND DEGRADATION IN INDONESIA

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ABSTRACT: This research and capacity building project was proposed to the Group on Earth Observation (GEO) in 2009. The Remote Sensing Technology Center of Japan (RESTEC), together with the Agency for Assessment and Application of Technology (BPPT) and The Ministry of Forestry Republic of Indonesia (MoF), submitted a proposal to GEO and it was accepted in October 2010. RESTEC, BPPT and MoF also proposed a part of the project to the Asia-Pacific Network for Global Change Research (APN) and the proposal was accepted. The first workshop of this project was held in Jakarta in July 2011.

The project aims at integration of Earth observations into decision assessments and other strategic and operation decision making processes in mapping and monitoring forest and peat land deforestation and degradation in Indonesia. This overall objective will be completed by the accomplishment of the following objectives: to develop new hierarchical change detection mapping and monitoring methods for forest and peat land in Indonesia using ALOS/PALSAR satellite data, to assess the applicability of the new methods, in terms of reliability, credibility, and consistency to improve capacity, capability, and quality of mapping and monitoring system for deforestation and degradation on forest and peat land, and to incorporate the newly developed hierarchical methodology start to operate within both national and local level of decision making process. Works of this project includes assessment of methods for forest monitoring by ALOS/PALSAR, trainings of trainers, practical trainings and technical assistance.

1. GROUP ON EARTH OBSERVATION (GEO)

The Group on Earth Observation or GEO is a voluntary partnership of 87 governments including the European Commission and 61 international organizations. GEO started its activities in order to response to calls for action by the 2002 World Summit on Sustainable Development and by the 29th G8 summit in Evian. The main purpose of GEO is to coordinate efforts of the members to build a Global Earth Observation System of Systems (GEOSS).

To construct GEOSS, a 10-Year Implementation Plan for the period 2005 to 2015 was endorsed at the third Earth Observation Summit, held in Brussels in February 2005. The Plan defines a vision statement for GEOSS, its purpose and scope, expected benefits, and the nine "Societal Benefit Areas" of disasters, health, energy, climate, water, weather, ecosystems, agriculture and biodiversity. Therefore, activities of GEO are very wide and cover almost all areas in which earth observations can contribute to improving decision making. The followings are activities of GEO related to forest monitoring.

1.1 GEO Forest Carbon Tracking Task

In GEOSS, activities of forest monitoring were coordinated and defined as the Forest Carbon Tracking Task (FCT) to contribute to "Climate" of the nine Societal Benefit Areas in "GEO Work Plan 2009-2011". The one of main objectives of FCT is to demonstrate the coordinated satellite observation and combination of optical and SAR sensor data for forest monitoring. Led by Australia, Canada, Japan, Norway and the other international organizations, FCT has selected 11 National Demonstrators (ND) to conduct coordinated observation. Several earth observation satellites with both optical and SAR sensors have voluntarily observed 11 NDs which are Borneo (Indonesia), Brazil, Cameroon, Colombia, Democratic Republic of the Congo (DRC), Guyana, Mexico, Peru, Sumatra (Indonesia), Tanzania and Tasmania (Australia) at least once a year. The limited amount of observation data has been shared with task members to develop forest monitoring products (e.g. forest/non-forest map) in combination of different sensors data.

Based on the achievements of FCT, GEO-VII Plenary Session in Beijing in November 2010 endorsed the establishment of the Global Forest Observation Initiative (GFOI) in order to sustain and strengthen the provision of data and support services to national governments.

1.2 GEO Call For Proposals

GEO released the Call For Proposals (CFP) in February 2009, in order to identify and promote practical applications of earth observations to improve decision making and to call attention to specific examples in which earth observations provide societal benefit. CFP also has a particular objective to increase the capabilities and capacity of end users in developing countries to use and apply earth observations. The unique aspect of CFP is that GEO will not directly provide funding for the accepted projects. The main effort of GEO for obtaining project budget is to assign a "donor coordinator" and engage relevant resource providing organizations with the accepted projects.

CFP is not directly related to forest monitoring. However, on the other hand, FCT has needed capacity building in NDs because the most of NDs are developing countries and they have difficulties to use satellite data for their decision making.

2. GEO-CFP FOREST MONITORING PROJECT

2.1 Background

The Remote Sensing Technology Center of Japan (RESTEC), together with the Agency for Assessment and Application of Technology (BPPT) and The Ministry of Forestry Republic of Indonesia (MoF), submitted a proposal to GEO-CFP program, having taken it into consideration that GEO-FCT needs capacity building particularly of SAR data and RESTEC has the expertise of SAR and abundant experience of capacity building. RESTEC, BPPT and MoF have had a close relationship through the other projects related to the Advanced Land Observing Satellite (ALOS). Particularly, BPPT and MoF have been interested in the Phased Array type L-band Synthetic Aperture Radar (PALSAR) because L-band SAR data is suitable to forest monitoring.

After the review by GEO expert panel, this project was accepted by GEO in October 2010.

2.2 Project Overview

The title of accepted project is "Utilization of ALOS satellite data to support mapping and monitoring deforestation and degradation in Indonesia". This project aims at integration of earth observations into decision assessments and other strategic and operation decision making processes in mapping and monitoring forest and peat land deforestation and degradation in Indonesia. This overall objective will be completed by the accomplishment of the following objectives: (1) to develop new hierarchical change detection mapping and monitoring methods for forest and peat land in Indonesia using ALOS/PALSAR satellite data, (2) to assess the applicability of the new methods, in terms of reliability, credibility, and consistency to improve capacity, capability, and quality of mapping and monitoring system for deforestation and degradation on forest and peat land, and (3) to incorporate the newly developed hierarchical methodology start to operate within both national and local level of decision making process.

BPPT and MoF are interested in both forest and peat land which are very important in the view of biomass or carbon emission. Their final target is to estimate forest and peat land biomass for their REDD+ activities.

Works of this project includes assessment of methods for forest monitoring by ALOS/PALSAR, trainings of trainers, practical trainings and technical assistance. The project will open doors of trainings to the other key organizations in Indonesia. Estimated total project budget is around USD1.3M and project period is 3 years. Cooperation with GEO-FCT and the other forest monitoring projects in Indonesia has been considered as well.

2.3 Expertise of RESTEC

RESTEC has conducted researches and analysis with ALOS/PALSAR data in the various fields including forest and forest biomass since its launch in 2006. One example is that RESTEC has researched the methods of estimating forest biomass from PALSAR data since 2009. RESTEC has been developing three different methods in different regions. Three methods are (1) to estimate above ground biomass (AGB) directly from the intensity of radar reflection (Normalized Radar Cross Section, or NRCS), (2) to calculate and estimate AGB from the results of tree

height analyzed by Interferometric SAR (InSAR) techniques, (3) to calculate and estimate AGB from the classification map made from SAR data. RESTEC will evaluate these methods in the study areas which include boreal forest, tropical forest and temperate forest so that we can propose adequate methods for different countries.

In addition, a capacity building activity is one of the most important roles of RESTEC in particular for developing countries. RESTEC conducts satellite data trainings in both Japan and overseas every year. Over 3,000 trainees visited RESTEC and attended the past trainings since its foundation in 1975 and more trainees attended RESTEC trainings held in overseas. There is no doubt that RESTEC has texts, expertise, tools (software) and experiences for satellite data trainings.

2.4 First Workshop in Indonesia

After GEO accepted the proposed project, RESTEC, BPPT and MoF also proposed a part of the project to the Asia-Pacific Network for Global Change Research (APN) to obtain a small budget because GEO will not provide funding directly and it will take time to coordinate donor organizations. The project was accepted by APN in November 2010 and RESTEC, BPPT and MoF started the project with the fund from APN.

The first workshop of this project was held in Jakarta in July 2011. At this workshop, the participants discussed the current techniques of PALSAR in Indonesia in order to avoid duplications and agreed that Indonesia still needs basic training for forest and forest biomass monitoring.

2.5 Way Forward

RESTEC will hold the first PALSAR data training for BPPT, MoF and the other related partners in Indonesia in May or June 2012. RESTEC, BPPT and MoF will seek more funding in cooperation with GEO to complete this project.

Due to the termination of ALOS operation in May 2011, the project can only use ALOS archive data for a while. However, the Japan Aerospace Exploration Agency (JAXA) has a plan to launch ALOS-2 in 2013. RESTEC will develop and transfer methods to monitor forest and peat land in Indonesia so that they can soon use the data from ALOS-2 when it is launched.

3. CONCLUSIONS

RESTEC, BPPT and MoF have been conducting the research and capacity building project for forest monitoring by PALSAR under the framework of GEO. RESTEC has expertise and experience for this project and this project framework or methods can be transferred to the other countries which have issues on forest or forest biomass monitoring in their countries.

Reference:
GEO website, http://www.earthobservations.org