DATA ANALYSIS NODE (DAN) NETWORK FOR SENTINEL ASIA

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ABSTRACT: Sentinel Asia aims to promote international cooperation to monitor natural disasters by providing earth observation satellites data. At the same time, the provided satellite data are analyzed by Data Analysis Node (DAN) of Sentinel Asia. DAN is operated by various agencies, international organizations, and universities of the Asia-Pacific region to analyze satellite data and make value-added products. Those products are disclosed to local users through the Sentinel Asia System within limited time. In addition, DAN is functioning for not only Sentinel Asia but also International Disaster Charter in case of massive disaster.

1. INTRODUCTION

According to UN statistics, the Asia and Oceania region has the largest proportion of natural disasters in the world (UNEP, 2004). While droughts are still considered world-wide the cause of fatalities associated with disasters, other calamities such as flooding, earthquakes, wildfires, high winds and landslides are high on the list of sources of deaths, destruction and economic losses in the region. Many of the causes and impacts of natural disasters, including droughts, are observable in real-time from space by earth observing systems. When efficiently combined with modern information-distribution methods, such data can be sent rapidly to the affected communities and local emergency agencies as early-warning before the disaster occurs, or as post-disaster maps to assist in recovery operations. A new project called "Sentinel Asia" was proposed in 2004 by the Asia-Pacific Space Agency Forum - APRSAF, to showcase the value and impact of earth observation technologies, combined with near real-time internet dissemination methods and Web-GIS mapping tools.
"Sentinel Asia" was originally proposed in November 2004 when it was realized that maximum benefit from rapid technological advances in the region would occur, and this data could be delivered more quickly via the internet as easy-to-interpret disaster-related information. "Sentinel Asia" is not designed to replace already active efforts by many of our regional agencies in delivery of information to emergency services. Rather, it aims to expand such efforts and make such data available to all countries and many more people in the region, particularly in countries that do now their own satellite reception facilities. Through such a backbone, information about disasters could begin to be delivered more efficiently through the 'world-wide-web', even outside national borders, in 'real-time' or 'near real-time', and used as early-warning, or as post-disaster information by various countries and relevant end-user agencies (Sentinel Asia, 2011).

2. MAIN ACTIVITIES OF SENTINEL ASIA

Sentinel Asia is conducting emergency observation by earth observation satellites in case of major disasters. Currently participating satellites are expected to be ALOS (JAXA), IRS (ISRO), THEOS (GISTDA), KOMPSAT (KARI) and FORMOSAT (NARL), which are called DPN (Data Provider Node). Those agencies accept observation requests for major disasters in the Asia-Pacific region from ADRC member organizations and representative organizations of JPT (Joint Project Team) members. On the other hand, DAN (Data Analysis Node) analyzes the satellite data provided by DPN, makes value added product and discloses the result through the Sentinel Asia System within the domestic legislation of each DAN permits. AIT (Asian Institute of Technology) coordinates data analysis as a P-DAN (Principal Data Analysis Node).
There are three working group, wildfire monitoring, flood monitoring, and Glacier Lake Outburst Flood monitoring. Besides emergency observation of disasters, based on the requirements of emergency-agency and other key users, it was identified that as a top priority the Sentinel Asia Project emphasize implementation of satellite-data production systems for wildfire, flooding and glacier lake outburst flood information, while other application fields should be developed offline by relevant research bodies and implemented subsequently.
In parallel with the activities above, capacity building for technical and emergency-response agencies users of the Sentinel Asia system are undertaken by JPT.

3. VISION FOR SENTINEL ASIA

The vision for Sentinel Asia is that it will be a fundamental service distributing, (in near real-time where possible,) only disaster-related data products/images in the Asia-Pacific region as follows:

- Satellite imagery (and data permitted by data provider) provided by space organizations
- Value-added images with extraction of stricken area, etc created from satellite data
- On-site digital camera images
- Wildfire hotspot and rainfall information derived from satellite data
- Meteorological satellite information
- Basic map data
- A millionth digital map provided by NGA (National Geospatial-Intelligence Agency) and LANDSAT images, which cover the entire Asia area and so on
- Fine regional digital maps contributed to the network by national geography organizations, etc.

Main products provided by Sentinel Asia are as follows:

- Satellite imagery (and data permitted by data provider) and value-added images with extraction of stricken area, etc.
- On-site digital camera images
- Wildfire hotspot information and data
- Rainfall (short-term and long-term) information and data
- Meteorological satellite imagery and data

4. DAN

DAN (Data Analysis Node) is the Node for the data analysis. DPN provide its own satellite data to the DAN and data policy of each DPN is decided by each DPN. DAN member implements the following tasks; to analyze the satellite data provided by DPN, to make value added product, and to disclose the result through the Sentinel Asia System within the domestic legislation of each DAN permits.
For creating value added products, data should be aware of various DPN satellite data. It is very important to have analysis experience in handling DPN satellite data and DAN needs to prepare resources to analyze satellite data. Information integration is key for making value-added products to have various other data helpful for the given disaster. Validation of products is needed to carryout ground verification as soon as possible before product distribution. Reliability has to be produced within limited time.
These are the samples of products. One is flash flood in Indonesia, which was occurred on 6 May, 2011 (Figure 1). Four people have been found dead while ten others are still went missing on Saturday following flash floods after heavy rains in Garut, West Java. Three villages namely Cigadog, Cijambe and Cikelett were the hardest hit by the flood. Thousand houses had been submerged while 25 others had been swept away by the flood. Another example is earthquake in Kyrgyzstan, which was occurred on 20 July, 2011 (Figure 2). According to the repot of the Ministry of Emergencies, there was an earthquake of 7-8 points at the epicenter at 1.35 p.m. in Batken province in Kyrgyzstan.

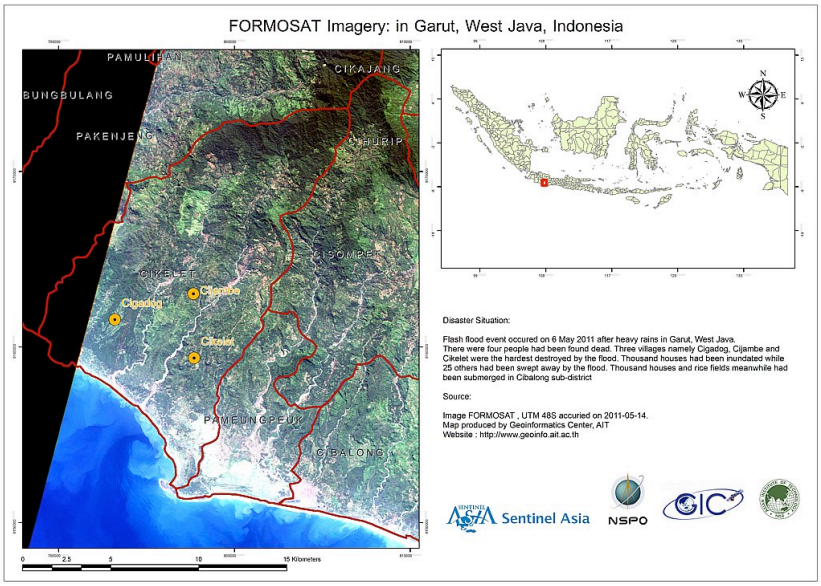

Figure 1. Flash flood in Indonesia on 6 May, 2011

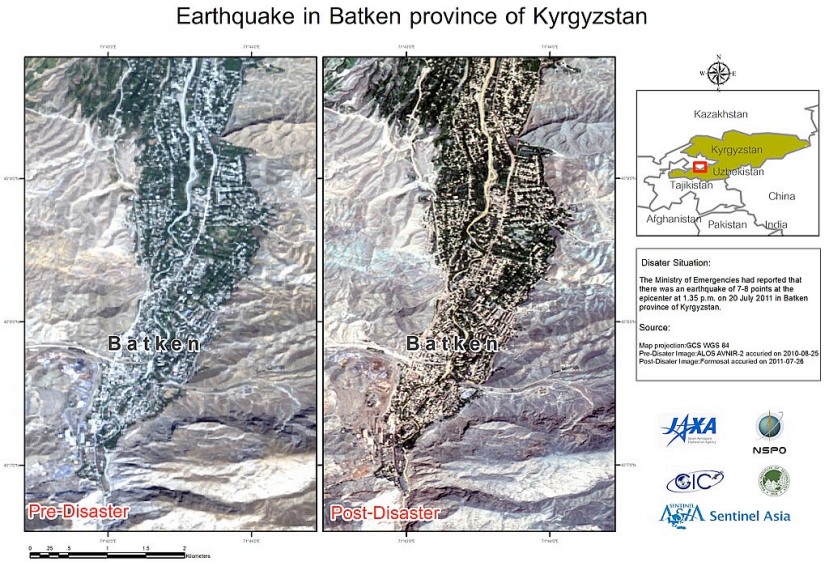

Figure 2. Earthquake in Kyrgyzstan on 20 July, 2011

5. CONCLUSION

Sentinel Asia aims to promote international cooperation to monitor natural disasters by providing earth observation satellites data. At the same time, the provided satellite data are analyzed by Data Analysis Node (DAN) of Sentinel Asia. DAN analyzes the satellite data provided by DPN, makes value added product, and discloses the result through the Sentinel Asia System within the domestic legislation of each DAN permits.

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