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**Disaster Management Support System “Sentinel Asia”**

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## 1. Introduction

According to ADRC-Natural Disasters Data Book-2006, the Asia region has the largest proportion of natural disasters in the world. Nearly 89% of the total affected people and 59% of the human losses were reported in Asia. A noticeable 71% of the reported economic damage also came from Asia.

Based on data related to disaster types and their impact on societies and economies in 2006, the Asian region has been deeply affected by both geo-physical disasters like earthquakes and tsunamis, as well as hydro-meteorological disasters like floods and wind storms. Many of the causes and impacts of natural disasters are observable in real-time from space by earth observation satellites. When efficiently combined with modern information-distribution methods, data can be sent rapidly to affected communities and local emergency agencies as early-warning before the disaster occurs, or as post-disaster maps to assist in recovery operations.

To improve the safety of the Asian society, “Sentinel Asia” project was proposed in 2004 by the Asia-Pacific Space Agency Forum – APRSAF. This disaster management support system show the effectiveness of earth observation technologies combined with near real-time internet dissemination methods and Web-GIS mapping tools for deliver the disaster information to the users. Sentinel Asia is not designed to replace already active efforts of the other regional agencies. It rather aims to expand such efforts and make such data available to all countries and many more peoples in the region. The disaster information could 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.

## 2. Description of Sentinel Asia

Sentinel-Asia is “*voluntary and best-efforts-basis initiatives*” led by the APRSAF to share the disaster information in the Asia-Pacific region on the Digital

Asia (Web-GIS) platform and to make the best use of earth observation satellites data for disaster management in the Asia-Pacific region.

The technical concept for Sentinel Asia was approved as a project for rapid implementation by APRSAF-12 Plenary held in Kitakyushu, Japan, in October of 2005. In APRSAF-12, the “Disaster Management Support System in the Asia-Pacific Region (DMSS)” proposed by JAXA is designed to:

- Construct a ‘life-first society’ by Information and Communication Technology (ICT) & Space technology
- Improve speed and accuracy for disaster preparedness and early warning
- Minimize victims and social economic losses due to disasters.

Sentinel-Asia is initially an internet-based information distribution system to deliver relevant satellite and in-situ spatial information of multiple hazards in the Asia-Pacific region. The system will draw on satellite derived products and imagery from all available earth observing geostationary, or low-earth orbiting satellites, including meteorological

satellites that provide routine data to the region. The system is designed to be very flexible, ingesting data products (as shape-files, or text-files) produced from multiple earth observation satellites, including geostationary platforms or new satellites operated by countries on the region.

The implementation costs of Sentinel Asia are expected to be very low, since much of the necessary satellite data acquisition and processing infrastructure is already in place in many countries. This includes satellite reception facilities, satellite pre-processing computers, and Internet access. By combining forces, satellite data in all member countries will be routinely pre-processed in near real-time to produce key information which can be sent across the internet with little requirement of communication bandwidth. Capacity building is also seen as a critical element for developing this community network, and for making best use of satellite-derived disaster information across the region.

A stepwise approach for implementation of this dissemination system was proposed by the APRSAF Earth Observation Working Group, where:

- STEP 1: Implementation of the backbone ‘Sentinel Asia’ data dissemination system and associated nodes, to showcase the value and impact of the technology using standard internet dissemination systems (Feb. 2006 – Dec. 2007)
- STEP 2: Expansion of the dissemination backbone with new Satellite Communication Systems (2008 – 2009)

STEP 3: Establishment of a comprehensive DMSS (from 2010)

### 3. Main Activities

- Emergency observation by earth observation satellites in case of major disasters: Currently participating satellites are expected to be ALOS (JAXA), Terra+Aqua (NASA) and others.
- Acceptance of observation requests: ALOS accepts observation requests for major disasters in the Asia-Pacific region from Asian Disaster Reduction Center (ADRC) member organizations and representative organizations of JPT members.
- Wildfire monitoring and Flood monitoring: For wildfire monitoring, MODIS (NASA) data are utilized initially, and for flood monitoring TRMM, GPM (NASA, JAXA) and AMSR-E (NASA, JAXA) are expected to be used.
- Capacity building for utilization of satellite images for disaster management: In parallel with the above activities, capacity building for technical and emergency-response agencies users of the Sentinel Asia system will be undertaken, primarily under coordination by the Asian Institute of Technology (AIT) and UN ESCAP in Bangkok.

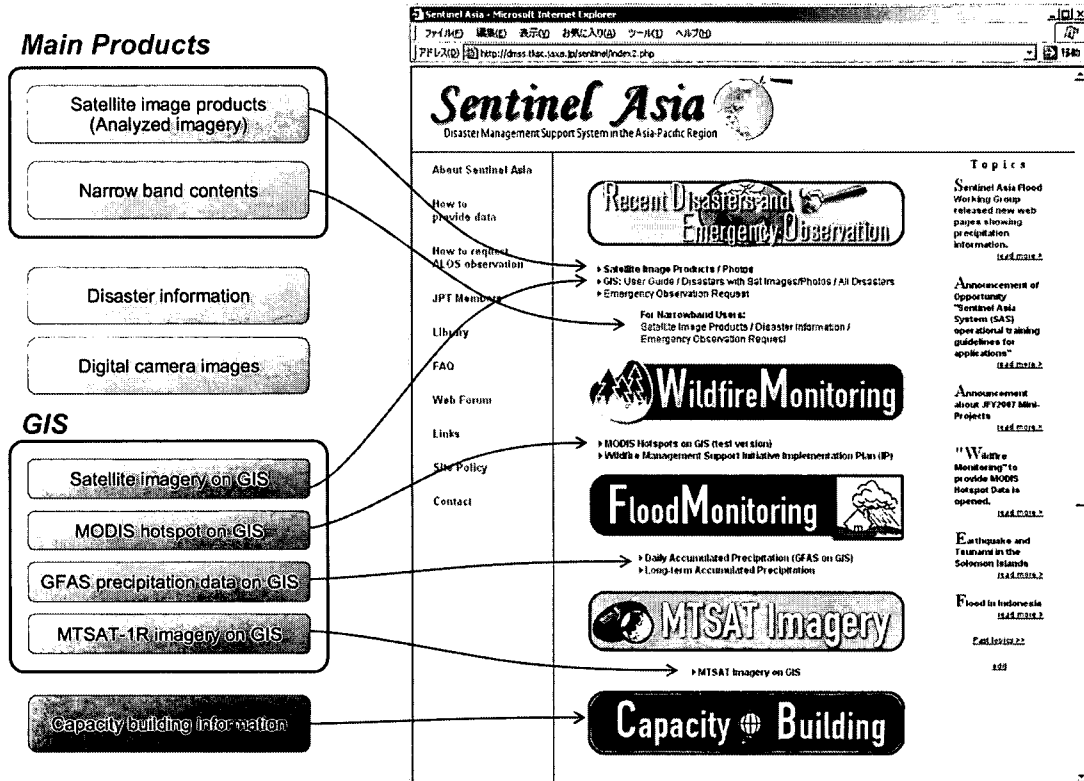


Figure 1: Main Activities (<http://dmsm.tksc.jaxa.jp/sentinel/>)

#### 4. Fast Sharing of Data

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:

True-color, best resolution, JPEGS of Satellite images provided to the network by space organizations

Wildfire hotspot and precipitation data products derived from satellite data

Basic data provided by Digital Asia. A millionth digital map provided by NGA (National Geospatial-Intelligence Agency)

and LANDSAT images, which cover the entire Asia area and so on

On-site digital camera images

Fine regional digital maps contributed to the network by national geography organizations, etc.

In addition, through its close links to the ADRC additional information will be available such as:

Detailed Disaster Information

Regional social/economic data

Main products provided by Sentinel Asia

are as follows:

Overlaid satellite images on digital maps provided by Digital Asia Web-GIS function, where satellite images are value-added images with extraction of stricken area, etc.

Original satellite images for FTP

On-site digital camera images

### 5. Framework

Sentinel Asia is promoted under cooperation among the following four communities: Space Community (APRSAF); International Community

(UN/ESCAP, UN/OOSA, ASEAN, GEO, IGOS and AIT etc.); Disaster Reduction Community (ADRC and its member countries); and Digital Asia Community (Keio University etc.) (See Figure 2.) .

To support the implementation of the Sentinel Asia project, a “Joint Project Team (JPT)” was organized. Membership of the JPT is open to all the APRSAF member countries, disaster prevention organizations and regional/international organizations prepared to contribute their experience and technical capabilities and who wish to participate in technical aspects of disaster information sharing activities..

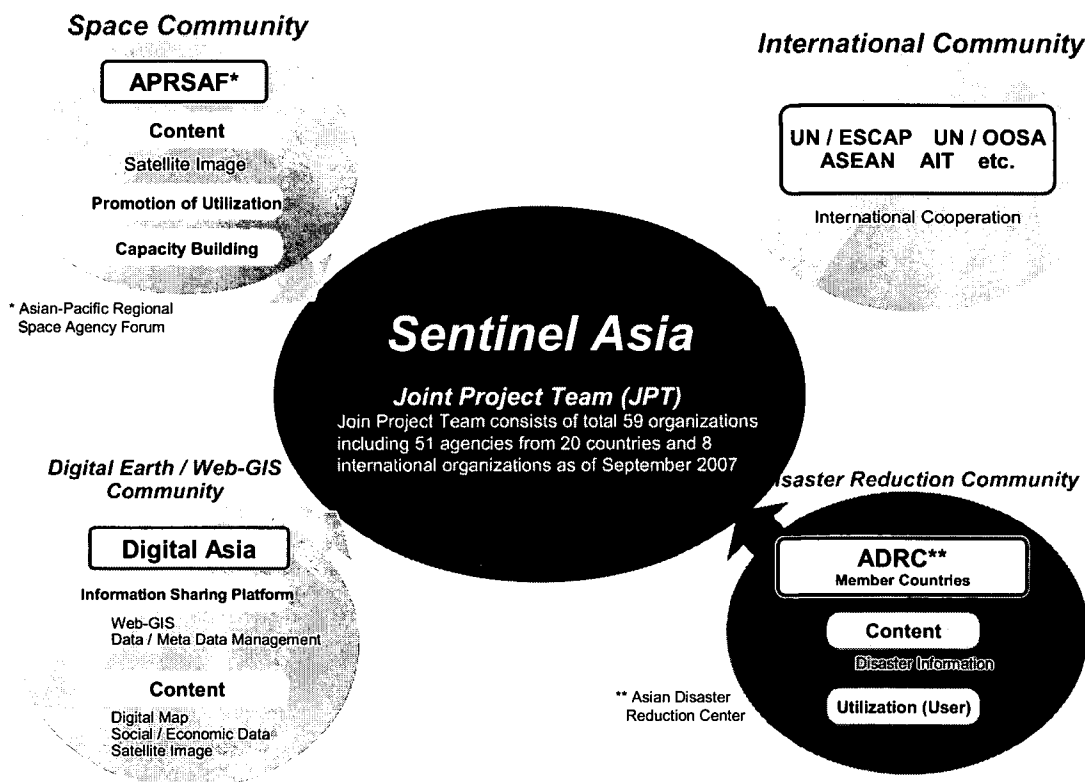


Figure 2: Framework of Sentinel-Asian

### 6. USERS of Sentinel Asia

Envisaged users of Sentinel Asia will be as

follows:

- Disaster organizations like ADRC members, which are responsible for regional policy and decision making for disaster management
- Organizations of User Nodes and

Research/Training Nodes, space agencies and so on, which have ability to analyze the data using remote sensing and GIS technologies.

- The public Internet users, who get information about disasters

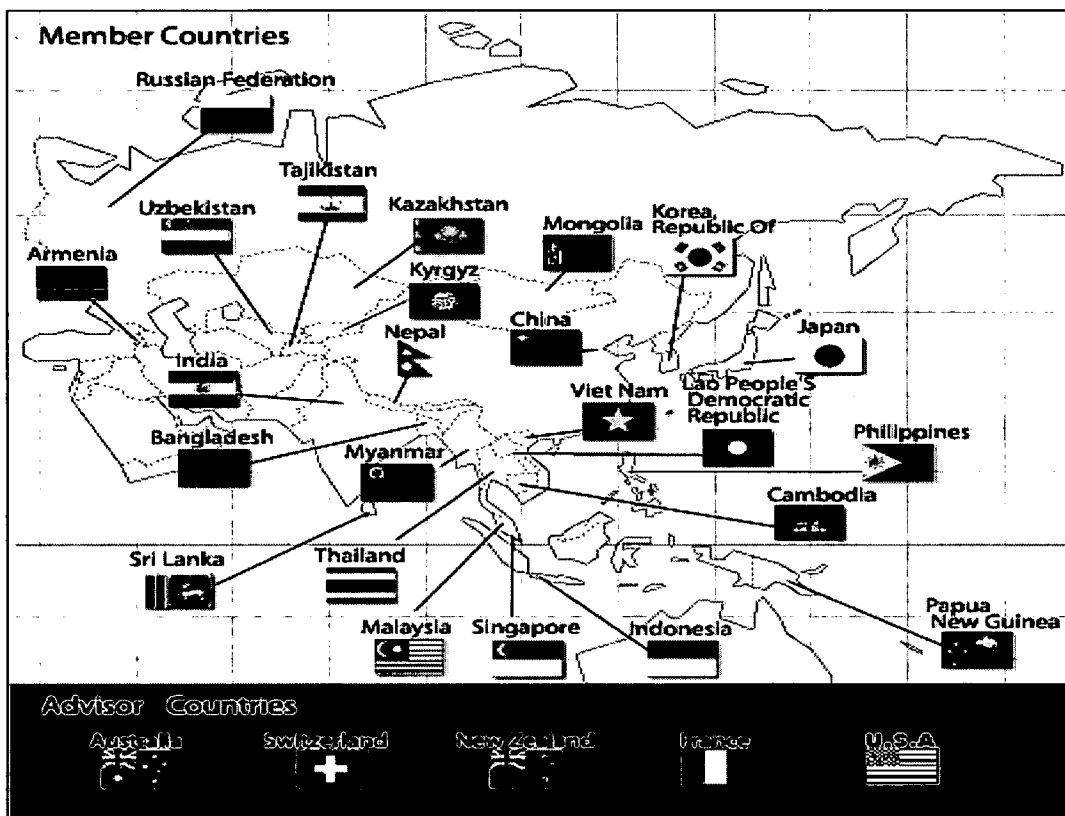


Figure 3: ADRC member countries and Advisor countries

## 7. Conclusion

Sentinel-Asia project is voluntary initiatives led by the APRSAF to share the disaster information in the Asia-Pacific region on the Web-GIS platform and to make the best use of earth observation satellites data for disaster management in the Asia-Pacific region. With this project, it give beneficial to the Asian communities

by not only improving speed and accuracy for disaster preparedness and early warning but minimizing victims and social economic losses due to disasters as well. The implementation costs of Sentinel Asia are expected to be very low, since much of the necessary satellite data acquisition and processing infrastructure is already in place in many countries. Sentinel-Asia project also provide education and

capacity building for making best use of the satellite-derived disaster information across all countries in the region.

## **8. Reference**

ADRC-Natural Disasters Data Book-2006,  
[http://www.adrc.or.jp/publications/databook/databook\\_2006\\_eng/eng.html](http://www.adrc.or.jp/publications/databook/databook_2006_eng/eng.html)

Sentinel Asia Implementation Plan,  
<http://dmss.tksc.jaxa.jp/sentinel/contents/Library.html>