3-3. Transmitting Image of Disaster Area and Offering Image Analysis Technique

3-3-1. Sentinel Asia

(1) Objective

ADRC continues to participate in the Sentinel Asia project. The project was launched in 2006 with an objective of establishing a disaster risk management system by making the use of satellite images in Asia. ADRC functions as the focal point to receive emergency observation request in the framework of the Sentinel Asia. Upon receiving a request, ADRC decides whether the request is appropriate and whether the emergency observation should be implemented mainly for the assessment of damages and casualties. Based on its own judgment, ADRC will forward the request to five space agencies, namely, the ISRO (India), the JAXA (Japan), the GISTDA (Thailand), the KARI (Korea), NARL (Taiwan), CRISP (Singapore) participating in the Sentinel Asia Project.

In accordance with the Cooperation Agreement between the United Nations Office for Outer Space Affairs (UNOOSA) and ADRC signed on 4 June 2009 on the establishment of ADRC UN-SPIDER Regional Support Office, ADRC UN-SPIDER Regional Support Office has been established within ADRC premises and operated by ADRC staff members as coordinators of ADRC UN-SPIDER RSO.

Against this backdrop, ADRC, as a UN-SPIDER RSO, should work toward ensuring the successful completion of the UN-SPIDER Work Plan thereby facilitating countries in Asia to have access to and develop the capacity to use space-based information to support the full disaster management cycle.

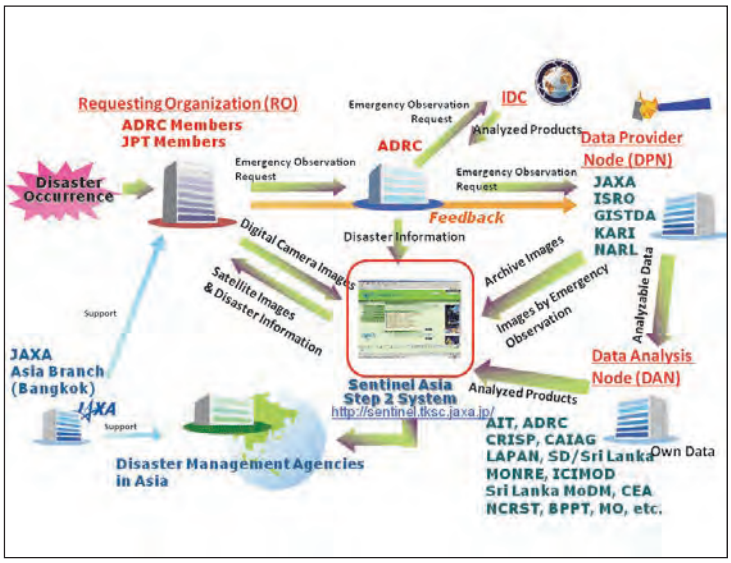

Fig. 3-3-1-1. Flow of emergency observation

(2) Implementation of Sentinel Asia Step3

A step-by-step approach for the implementation of Sentinel Asia was adopted as follows:

Step1: Implementation of the backbone Sentinel Asia data dissemination system

Step2: Expansion of the dissemination backbone with new satellite communication systems

Step3: Establishment of a comprehensive disaster management support system

At APRSAF-19 (Asia-Pacific Regional Space Agency Forum, APRSAF) held in Kuala Lumpur in December 2012, Successful completion of Sentinel Asia Step2 was declared. Sentinel Asia Step3 is based on the experiences and users' demands during the Step2 as well as the following concepts.

-Continuation of Step2 activities as the basis idea

-Expansion to cover not only phase of response (as in Step1 and Step2) but also mitigation/preparedness and recovery phases in the disaster management cycle (Fig. 3-3-1-2)

-Participation of various satellites: earth observation satellites, communication satellites, and navigation satellites

-Further collaboration for operation

-Further utilization of human networks through capacity building and outreach

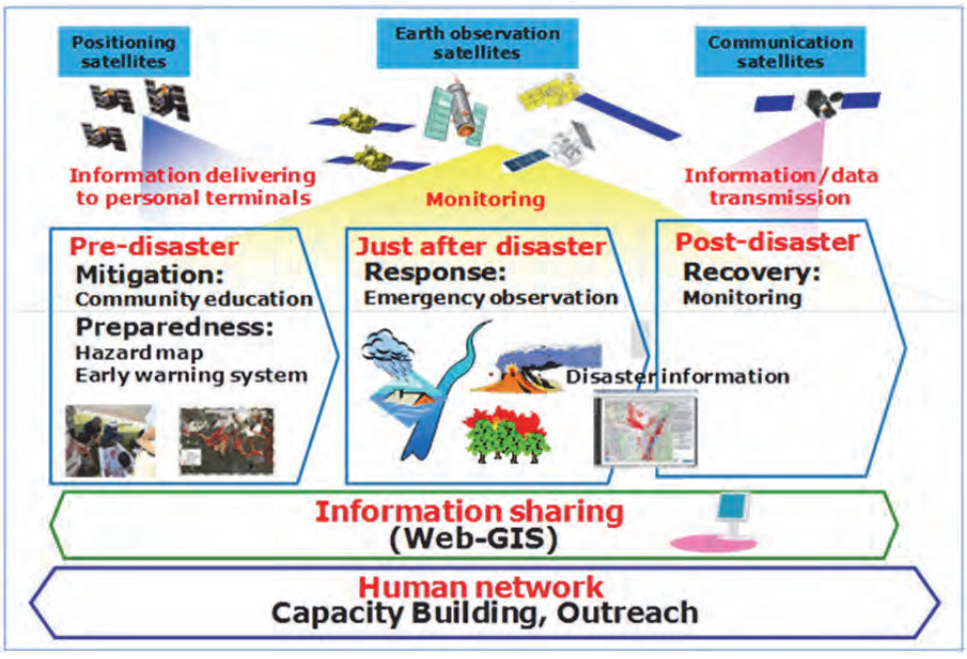

Fig.3-3-1-2. Concept of Sentinel Asia Step3

(3) Emergency Observation Activities for this year

Despite the year to year changes in the number of requests, the ratio of activated numbers of times remains stable at around 80%. After a peak of 2010-2011, however, the number of requests reduced after ALOS, a laser sensor had stopped in May 2011, which might had affected the number of requests. From January to December 2015, twenty-five emergency observations were requested, twenty-four of which were undertaken, after the operation of ALOS-2, satellite replacing ALOS had started from November, 2014.

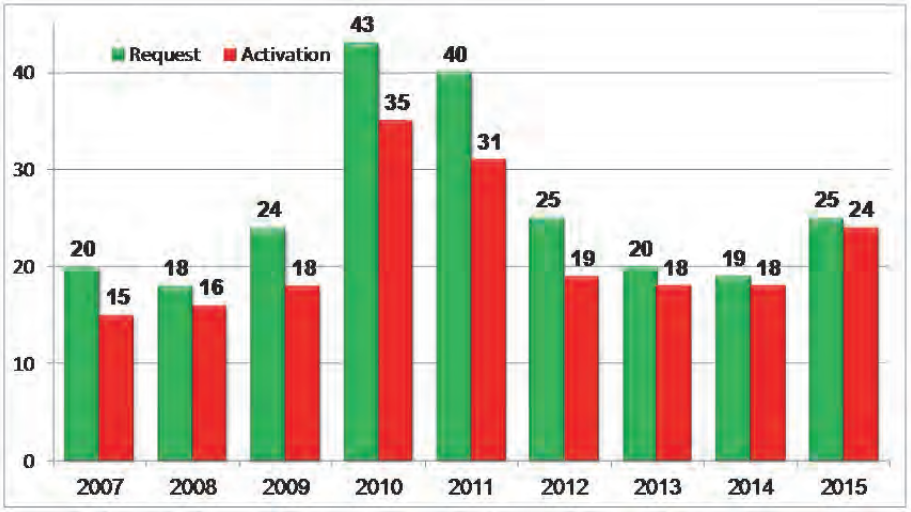

Fig.3-3-1-3. Changes in the number of emergency observation 2007-2015

Looking at the breakdown by the types of disaster in 2015, the ratio of flood occupies for more than one third of the total (Fig. 3-3-1-4).

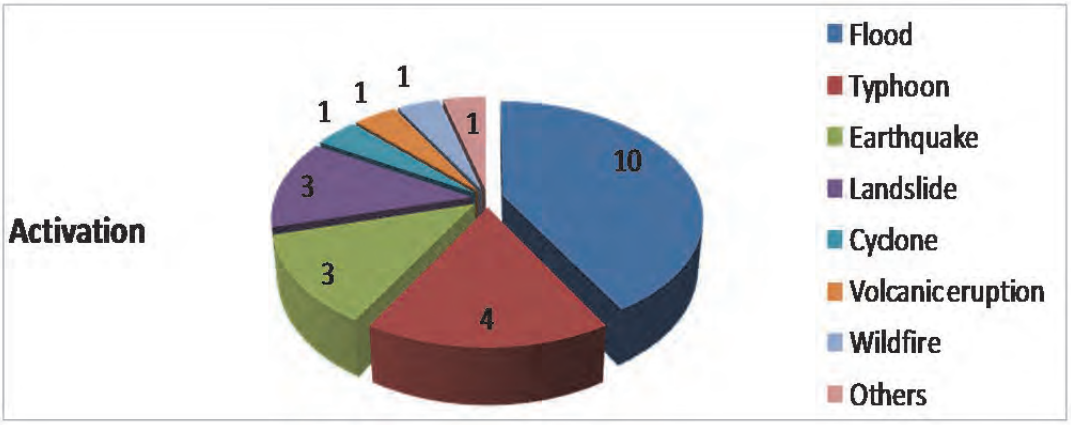

Fig. 3-3-1-4. Breakdown by type of disaster (2014)

Regarding the number of activation after June, 2015, many countries in Southeast Asia and Southern Asia saw floods including Nepal, Bhutan, Myanmar, Pakistan, Vietnam, Bangladesh, Japan, Sri Lanka, India. Concerning typhoon disaster, emergency observation was carried out twice in Philippines and Taiwan, individually. Those for earthquakes were carried out in Nepal for an earthquake of 7.8 magnitude including the later aftershock on April 25, 2015 and in Pakistan for another, of 7.5-magnitude in the northern part of the country on October 25, 2015. Pakistan was the seismic center, while damages occurred in the neighboring country, Afghanistan.

During 2007-2015, flood occupies half or more, followed by earthquake, and landslide. In regard to the status of implementation of emergency observation by country in, top five countries (Indonesia, Philippines, Japan, India, and Nepal) occupied more than half of the total. Indonesia saw many kinds of disasters with significant damage, except typhoon, including volcanic eruptions, earthquakes, tsunamis, landslides, and forest fires. Philippines was hit by typhoon almost every year bringing about damages. Vietnam is characterized by the damages caused by floods and typhoons.

In 2015 due to the earthquake of 7.8-magnitude happened on April 25, Nepal was the top in the number of activations, four times including those for the later aftershocks, and landslides. The activation was twice in Indonesia, Vietnam, Myanmar, Japan, Pakistan, Taiwan and Philippines.

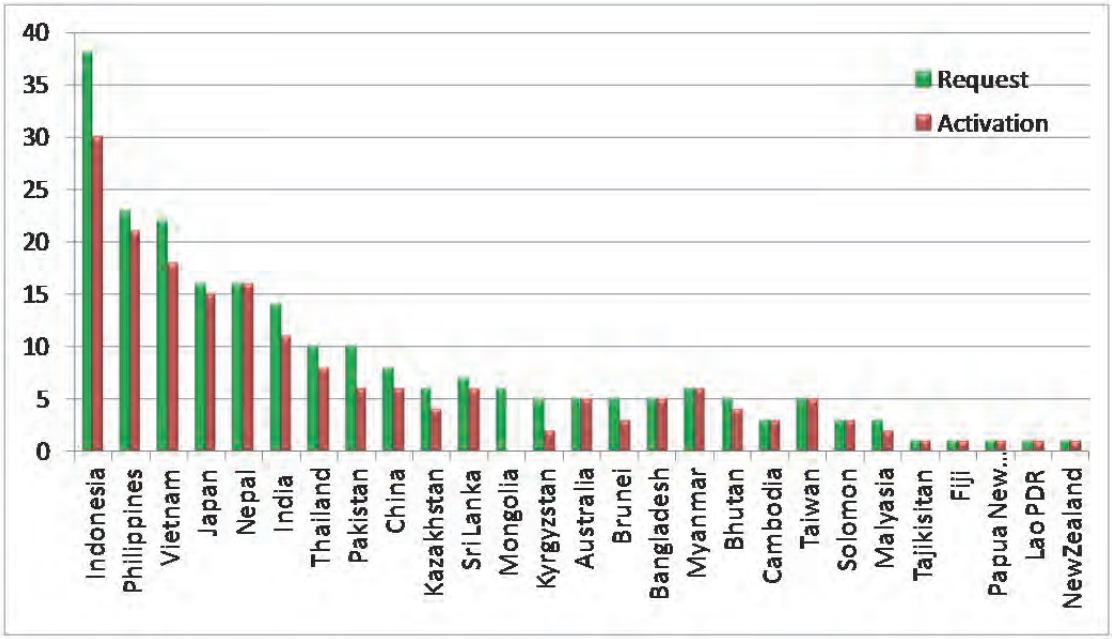

Fig.3-3-1-5. Breakdown by the country of the request and the activation of the Emergency observation

3-3-2. Utilization and Action of Disaster Management about Sentinel Asia STEP3

(1) Objective of the report

Sentinel Asia STEP3 began in 2013, based on expanding human network and joint operation coordinated by Joint Project Team of SA, employing a wide variety of satellites including earth observation satellites, communication satellites and navigation satellites. It has covered all phases in disaster management cycle; this means not just the emergency response but pre-disaster prevention and preparedness phases as well as post-disaster recovery and reconstruction phases.

ADRC, supported by JAXA, carried out the following missions to lead SA STEP3 evolution, supporting of establishment and management of steering committee and working groups, emphasizing utilization of satellite images for the disaster management organizations participating in SA.

(2) Contents

The following activities have been carried out.

1. Supporting establishment of a steering committee for SA
   - 1.1 Supporting systematization for SC
   - 1.2 Supporting administration of SC
   - 1.3 Supporting the document preparation for relevant meetings
2. Supporting promotion of SA step3
   - 2.1 Coordination for strengthening cooperation with disaster management organizations
   - 2.2 Organisation of WGs by disaster types
3. Report in the meetings
4. Drafting the outcome report

(3) Progress

ADRC has supported steering committee and WG meetings for SA, which were mainly held by JAXA, and made the minutes of other related meetings. Regarding the support for promotion of SA STEP3, ADRC has been undertaken questionnaire surveys and hearing survey on the following items, targeting at disaster management organizations as follows.

- ✓ Organizational chart of disaster management organizations
- ✓ Disaster management organisations using satellite images(Name of Organization, Contact Person, Position, E-mail address, Phone number)
- ✓ Working Groups of interest
- ✓ Contact address when a disaster happens and whether they have local offices or not

The results of the research was compiled in a table by country.

3-3-3. Promotion for 10 years Anniversary of Sentinel Asia

(1) Objective

A decade passed by March 2016 after the operation of Sentinel Asia, as an international cooperation project had started in 2007 to provide satellite image data in the event of a disaster in the Asia-Pacific region. By the end of March, 2016, in total 241 requests of operation were made by the participating disaster management/satellite agencies.

In the Sendai framework adopted as a post-2015 framework on Disaster Risk Reduction (DRR) at the third UN World Conference on Disaster Risk Reduction (WCDRR) in Sendai, Japan, it is expected that promotion of space technology in DRR filed will be strengthened which requires further activities of Sentinel Asia. ADRC proactively participated in a series of international conferences related to space technology including the steering committee established in 2015.

(2) Participation for International Conferences

① UN-SPIDER Regional Support Offices (RSO) Meeting

In accordance with the cooperation agreement between the United Nations Office for Outer Space Affairs (UNOOSA) and ADRC signed on June 2009 on the establishment of ADRC UN-SPIDER Regional Support Office, UN-SPIDER Regional Support Office (RSO) has been established in ADRC and has been operated by ADRC staff members as coordinators of ADRC UN-SPIDER RSO In the world,so far, 20 regional support offices have been established. .As a part of the activities of RSO, ADRC participated in the 6th UN Platform for Space-based Information for Disaster Management and Emergency Response UN-SPIDER RSO Meeting, which was held in conjunction with the 52nd Session of the Scientific and Technical Subcommittee on Peaceful Uses of Outer Space (UN-COPUOS). the meeting held on 5 and 6 February, was attended by more than 30 RSOs from around the world. ADRC made a presentation on the recent trends of emergency observation requests in Sentinel Asia.

② The First Steering Committee (FSC) Meeting of the Sentinel Asia Step 3

As the secretariat of Sentinel Asia, ADRC participated in a meeting jointly organized by the Japan Aerospace Exploration Agency (JAXA), the Asian Institute of Technology (AIT), and ADRC. It was held from 13 to 15 October 2015 in Bangkok, Thailand and was attended by representative of satellite agencies, academic institutions, and disaster management organizations across Asia. The meeting primarily covered the following topics.

ADRC gave three presentations at this conference on the following topics: (1) EOR and Emergency Observation Procedures Using Sentinel Asia, (2) The Role of ADRC in Sentinel Asia, and (3) Sentinel Asia Emergency Observation Trends.

③ Sentinel Asia Initiative Tsunami Working Session and the 22nd Session of the Asia-Pacific Regional Space Agency Forum (APRSAF-22)

ADRC participated in this meeting which was co-organized by the Indonesian Ministry of Research, Technology and Higher Education (RISTEK-DIKTI), the Indonesian National Institute of Aeronautics Space (LAPAN), the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT), and JAXA. It was held from November 30 to December 4 2015 in Bali, Indonesia and was attended by 453 participants and 10 international organizations, mainly Asia-Pacific regional space agencies, from 30 countries and regions.

ADRC gave two presentations at this conference: (1) The Role of ADRC in Sentinel Asia at the Space Applications Working Group on Day 2 and (2) an introduction to ADRC and cooperation with disaster management organizations in the Special Session on Synergies in Space on Day 4.

3-3-4. Application of Space-Based Technology and Information and Communication Technology to Strengthen Disaster Resilience

(1) Background and Objectives

Asian Development Bank (ADB) has initiated a regional capacity development technical assistance on Applying SBT and ICT to Strengthen Disaster Resilience. The project aims to assist Armenia, Bangladesh, Fiji and the Philippines to improve local capacity to collect and share reliable and timely disaster-related data using SBT and ICT at a local government and community level in a more cost-effective manner to strengthen their disaster resilience and support timely post-disaster response, recovery and reconstruction efforts.

(2) Overall methodology

Local information is shared by digitizing the community-based hazard map that has been created in paper form. In addition, micro-level disaster information in the event of a disaster is also rapidly shared by digitization. Furthermore, by overlaying the satellite information, disaster history in the area and overall disaster images, relevant information can be easily shared with. As a result, this application can be contribute to rapid and effective disaster response.

The overall approach and methodology outlined in the proposal fundamentally remains the same as shown in Figure 3-3-4-1 and includes: i) community-based OSM base map development; ii) Community Based Hazard/Risk and Evacuation Routes Mapping; iii) Crisis Mapping; iv) Utilization of Satellite-based Damage Assessment; v) Data Management Using GIS at Local Governments; and vi) Utilization of Data at the Community Level for Disaster Risk Reduction, Response And Recovery.

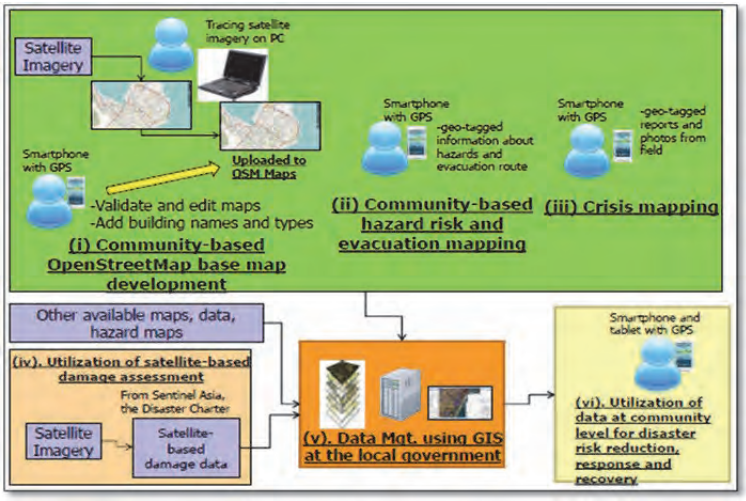

Fig.3-3-4-1. Overall methodology

(3) Duration

Project duration is 18 months from October 2015 to March 2017.

The regional kick-off meeting with the government officials of pilot project for the four countries was held at AIT, Thailand, in December 2015. Throughout 2016, data imputing and training by using the application under development will be carried out. By March 2017,the application will be completed, and made available for the relevant local authorities so that they will be able to get prepared to face future disasters.

(4) The ultimate goal upon completion of the project

ADRC would like to support wider application of this mechanism to the other regions in the pilot countries and also provide the outcome information of this project to other member countries. The spread of this application is expected to contribute to strengthening of DRR at the community level in each member country.