Introduction to SDIM

Fang Chen
CAS-TWAS Centre of Excellence on Space Technology for Disaster Mitigation (SDIM), chenfang@radi.ac.cn

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Natural Hazards in 2014

We are facing the severe disaster challenges

980 Loss events

Source: Munich RE, NatCatSERVICE, 2015

- Loss events
- Selection of catastrophes
  - Overall losses ≥ US$ 1,500m
- Geophysical events
  - (Earthquake, tsunami, volcanic activity)
- Meteorological events
  - (Tropical storm, extratropical storm, convective storm, local storm)
- Hydrological events
  - (Flood, mass movement)
- Climatological events
  - (Extreme temperature, drought, wildfire)

Source: Munich RE
Impacts of Natural Disasters (1992-2012)

**Affected**
- 4.4 Bln.
- About 64% of the Earth population

**Damage**
- $2.0 Tln.

**Killed**
- 1.3 Mil.
- Comparable to the number of victims in 1500 A380 (853 passengers each) accidents

**People Affected (millions)**
- China: 1.341
- India: 0.928
- USA: 0.636
- Japan: 0.483
- Indonesia: 0.42
- Vietnam: 0.25
- Pakistan: 0.172
- Philippines: 0.099
- Bangladesh: 0.099
- Sri Lanka: 0.06

**Damage (USD billions)**
- China: 1.729
- India: 0.636
- USA: 0.483
- Japan: 0.42
- Indonesia: 0.055
- Vietnam: 0.056
- Pakistan: 0.071
- Philippines: 0.071
- Bangladesh: 0.071
- Sri Lanka: 0.071

**People Killed**
- China: 75,970
- India: 21,768
- USA: 15,579
- Japan: 7,268
- Indonesia: 1,768
- Vietnam: 1,549
- Pakistan: 1,084
- Philippines: 1,084
- Bangladesh: 1,084
- Sri Lanka: 1,084

**TOP 10 COUNTRIES IMPACTED BY DISASTERS**

<table>
<thead>
<tr>
<th>Country</th>
<th>People Affected</th>
<th>People Killed</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>2.5 BILLION</td>
<td>23,0675</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>1.36 million</td>
<td>1,768</td>
</tr>
<tr>
<td>Philippines</td>
<td>0.92 million</td>
<td>520,000</td>
</tr>
<tr>
<td>USA</td>
<td>0.636 billion</td>
<td>21,768</td>
</tr>
<tr>
<td>Japan</td>
<td>0.42 billion</td>
<td>42,000</td>
</tr>
<tr>
<td>Indonesia</td>
<td>1.084 million</td>
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<tr>
<td>Vietnam</td>
<td>0.25 million</td>
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</tbody>
</table>

Source: UNISDR report of June 13, 2012
Disaster Mitigation for Sustainable Development

7 critical issues for sustainable development

Disasters, Oceans, Energy, Water, Jobs, Food, Cities

Source: Rio+20 Conference Website
EO for Disaster Mitigation

Earth Observation Systems

- Space Station
- Satellite
- Air Ship
- Airplane
- Air Balloon

Disasters:
- Volcano
- Typhoon
- Flood
- Earthquake
- Drought
- Tsunami
- Wildfire
- Dust storm
- Snow storm
Earth Observation Missions (1962-2012)

Data from CEOS EO HANDBOOK 2012
CAS-TWAS Centre of Excellence on Space Technology for Disaster Mitigation (SDIM), aims to enhance scientific and research capacities for disaster mitigation in developing countries through the use of the most advanced space technologies. The centre is hosted at RADI, CAS.
Host Institute
Institute of Remote Sensing and Digital Earth (RADI)
Mission & Focus Areas

Main Areas of Focus

- Earthquakes
- Droughts
- Floods

Mission

- Technology Transfer
- Education and Training
- Research Collaboration
- Advisory Services
- International Network

www.radi.cas.cn
To lead collaborative research in developing countries that seek to increase the knowledge and capacity to use Earth observation technology for disasters early warning, preparedness, management, mitigation, and recovery.

The SDIM graduate student fellowship, and the SDIM visiting scholars and postdoctoral fellowships will be provided to students and the early/mid career scientists from developing countries, enhance their academic capabilities.

Each training course stretches over a 2-week period, covering both theoretical and practical aspects on the use of space technologies for disaster mitigation.

The conference facilitates the broad discussion of capacity development for disaster risk reduction, innovative Earth observation products and tools for disaster management, and spatial technology and integrated disaster research.
Progress Summary

- **11** research projects are launched cooperating with **13** developing countries
- **4** key application systems are developed and transferred
- **4** training workshops and **1** strategy report
- **15** students and scholars study at SDIM
Food: a big issue for current and the future

1. CropWatch System

Disaster: threats to world food security

All major food producers and consumers crucially depend on timely and accurate information on food production, especially in developing countries.
1. CropWatch System

Monitoring the food security using remote sensing

CropWatch® Components
- Drought Condition
- Crop growth Condition
- Crop Production Prediction
- Grain Production Estimation
- Crop Planting Structure Inventory
- Cropping Index
- Grain Supply-Demand Balance and Early-warning

CropWatch system structure

Input
- Rainfall
- Air temperature
- PAR
- Vegetation Health Index
- Uncropped Arable Land
- Cropping Intensity
- Potential Biomass Ratio

Output
- Crop Production System Zones (CPSZ)
- Environmental Indices (EI)
- Environmental impact and crop response
- Agricultural pattern
- Biomass trend
- Cropland use intensity
- Crop condition
- Production, Area, Yield
- Cropland use intensity
- Crop condition
- Production, Area, Yield

Crop Condition analysis

Global food supply analysis
1. CropWatch System

CropWatch bulletin is published four times a year.

The bulletin provides a comprehensive overview of the global production of wheat, rice, maize, and soybean which can guide decision-making and boost food security.
2. SatSee Technology

Earth observation is a powerful technology for disaster mitigation.

Very few developing countries launched satellites.

For disaster quick response and management, developing countries are seeking to increase their level of Earth observation data sharing.

High cost of the construction of a new satellite ground station.
2. SatSee Technology

Low-cost “virtual ground station” for disaster mitigation

- 2Mbits internet connection
- Two computers and a large monitor or TV screen
- Distributing real time quick-look imagery of high resolution satellite

RADI’s three stations receive data from satellites covering 70% of Asia.

Installed in Kirghizstan, Mongolia, Belgium, and Cambodia
International Students and Scholars (2015)

15 students at SDIM:
5 from Pakistan, 4 from Thailand, 1 from Egypt, 1 from Mongolia, 1 from Nepal, 1 from Iran, 1 from Ghana, and 1 from India

- President's Fellowship Programme for PhD Candidates from Developing Countries
- SDIM Postdoctoral Fellowship
- SDIM Visiting Scholars Fellowship
## International Network

### International

- Integrated Research on Disaster Risk (IRDR)
- UN-SPIDER
- UNISDR
- International Society for Digital Earth (ISDE)
- Group on Earth Observations (GEO)
- Committee on Data for Science and Technology (CODATA)
- the Flemish Institute for Technological Research (VITO)

### Developing Countries

- GISTDA - Thailand
- NEMA - Mongolia
- DPNET - Nepal
- IRA - Tunisia
- DMCSL - Sri Lanka
- LAPAN - Indonesia
- MMUST - Kenya
- DoA - Papua New Guinea

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Current Progress in Developing Countries

Shortages and Requirements

Future Development Support

Scientific Report & Advisory Services

Reasons for the development gap of space technology for disaster mitigation in developing countries remain unclear

Scientific Report on Space Technology for Disaster Mitigation

Stage-1: Development Survey
Stage-2: Situation Analysis
Stage-3: Advisory Support

2013-2020

Drought
Earthquake
Typhoon

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Earth observations in support of national strategies for disaster-risk management

A Synergy Framework for the integration of Earth Observation technologies into Disaster Risk Reduction

Final Issue, dated 25 February 2015
Overall Objective: to make the participants aware of the potential of space technology for various phases of disaster risk management, and to enhance the capacity building for developing countries to tackle disaster issues using advanced space technologies.

Participants: early- and mid-career scientists from developing countries in Africa, Asia and Latin America.

Financial Assistance: round-trip international airfares, lodging, field tour, local transportation, etc.

More information: SDIM@radi.ac.cn
2nd Training Workshop

Beijing, China, 3rd - 13th June, 2014
Research and Practical Skills

Deepen the Understanding of Disaster Issues in Developing Countries

Enhance Friendship
From July 20 to August 5, 2014, 19 representatives from 7 Shanghai Cooperation Organization (SCO) member countries and observer countries (Kyrghyzstan, Tajikistan, Uzbekistan, Pakistan, Mongolia, Iran and China, etc.) attended the 3-week training courses. The workshop was held at RADI’s Kashi Campus in Xinjiang Province.
CAS-TWAS Centre of Excellence on Space Technology for Disaster Mitigation
Thanks!

Institute of Remote Sensing and Digital Earth
Chinese Academy of Sciences
Add: No.9 Dengzhuang South Road, Haidian District, Beijing 100094, China
Tel: 86–10–82178008 Fax: 86–10–82178009
E–mail: office@radi.ac.cn
Web: www.radi.cas.cn