

United Nations Platform for Space-based Information for Disaster Management and Emergency Response

# Importance of Space-based Information for Disaster Assessment and Prevention

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ICDO International Seminar on Application of Communication Technology in Disaster Reduction and Prevention Suzhou, 26 May 2014





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**Role of UN-SPIDER** 





# **Disaster Situation**

- Every year, 200 million people affected by droughts, cyclones, earthquakes, wildlandfires, and other hazards
- Increased population densities, environmental degradation and global warming adds to impacts



#### http://www.preventionweb.net/files/31685\_factsheet2012.pdf



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#### Annual reported economic damages from natural disasters: 1980-2012



#### http://www.preventionweb.net/files/31685\_factsheet2012.pdf



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#### Bangkok Floods (2011)



Japan Tsunami (March 2011) -28,500 died or missing -Nuclear emergency



Typhoon Bopha, Philippines(Dec 2012) -1,901 died



Typhoon Haiyan, Philippines (Nov 2013) -nearly 6,000 died -displace more than 3.6 million.

\$294 billion economic losses – representing 80 per cent of global losses due to disasters in 2011 (Source: Asia Pacific Disaster Report, 2012)



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# **Disaster Management**

## **Disaster Management**

A continuous and integrated process of planning, organizing, coordinating, and implementing measures which are necessary for

- Prevention of danger or threat of any disaster
- Mitigation or reduction of risk
- Capacity Building
- Preparedness
- Prompt Response
- Severity or Magnitude assessment
- Evacuation, Rescue, Relief
- Rehabilitation & Reconstruction



## **Disaster Management**

## **Disaster Management Cycle**



# Space Technologies for Disaster Management





Images from <u>earth observing satellites</u> help assess the damage caused by disasters and assess vulnerability to hazards.



Satellite communications help warn people who are at risk, especially in remote areas. They help connect a disaster zone to the outside world

Global navigation satellite systems enable us to obtain positional information on events that have to be mapped





# **Earth Observation from Space**



Spatially extensive mapping



Beyond 'human eye' capability



Localised event detection



Access difficult or dangerous sites





Geo-referenced and calibrated

More than 40 nations with imaging satellites -160 sensors



# **Geospatial information products** – **Increasing access and availability**



- UVAD Beta Gateway to Indian Earth Observation
- OpenStreetMap The Free Wiki World Map

- **Predictions of weather extremes**
- **Early warning**
- Monitoring of disasters and risks



# 'Space' in Disaster Management



#### **Life Saving Products**





#### Mitigation & Preparedness Planning

- Vulnerability and risk assessment
- Modelling impact
- Early warning

#### **Emergency Response**

- Specific event
- Rapid provision
- Map information
- Support crisis management

#### **Recovery & Rehabilitation**

- Situation maps
- Time series
- Monitorina



**Response maps** 



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#### **Flood Monitoring**





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#### Tsunami/flood monitoring from Space

Satellite images provide bird eye view as well as detailed information



#### Iwaki city, Fukushima

A huge earthquake of M9.0 occurred at 05:46 UTC on March 11, 2011. The epicenter was located 130 km off the east coast of the Tohoku district, Japan. This earthquake and tsunami caused tremendous damages Many missing and dead are reported in Tohoku and Kanto districts.

#### **Data Sources:**

- RapidEye (6.5 m): March 12, 2011 © RapidEye AG, 2011
- IKONOS (1 m): March 12, 2011 © GeoEye

#### Map Information:

- Map projection: geographic
- Datum: WGS84

Map produced March 16, 2011 by JAXA







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Time series of high resolution imagery in New Orleans (a) Before Hurricane Katrina; (b) Soon after the height of the storm; (c-j) Various time intervals following the recovery process; and (k) Interpreted rate of recovery



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#### House Damage Assessment in Yushu Earthquake



2010年4月25日制作



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#### Tents Monitoring in Yushu Earthquake





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#### **Drought Monitoring**



Rapid Mapping mechanism with UN-SPIDER(NDRCC)

10 Monitoring and Assessment map distribute to Africa via UN-SPIDER



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**Resource and Mechanism** 





Key Messages



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## **Spatial Data**

Effective use of space-based information is possible only if spatial data on other aspects is integrated with the space-based information

- administrative boundaries
- infrastructure details,
- settlements
- socio-economic data
- disaster related data





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#### GeoNetwork

Baseline data serve as the reference data such as administrative boundaries, human settlements, rivers, drainage, roads and basic infrastructure etc.



FIND INTERACTIVE MAPS, GIS DATASETS, SATELLITE IMAGERY AND RELA



GeoNetwork	Links
FAO GeoNetwork	http://www.fao.org/geonetwork/srv/en/main.search
WFP GeoNetwork	http://vam.wfp.org/geonetwork/srv/en/main.home
WHO GeoNetwork	http://www.who.int/geonetwork/srv/en/main.search
OCHA GeoNetwork	http://geonetwork.unocha.org/geonetwork/srv/en/main.home



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#### CrowdSourcing Data

#### The most active volunteer communities, platforms and technology providers

	Link
International Network of Crisis Mappers	http://crisismappers.net/
Crisis Commons	http://crisiscommons.org/
OpenStreetMap	http://openstreetmap.org
Ushahidi	http://ushahidi.com/
MapAction	http://mapaction.org

Google Crisis Response http://goog



http://google.org/crisisresponse/



In the field of disaster and risk management, Crowdsourcing refers to the possibility of communities and individuals to collect disaster relevant information via various communication channels and social media platforms thus fitting several small pieces of information into a larger picture.



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#### **Global Land Cover Facilities**

**Satellite imagery** ASTER Ikonos Quickbird Orbview Landsat MODIS SRTM

**Products** Landsat MODIS **AVHRR Special Collections Flevation Data** GOES



#### Reference http://glcf.umd.edu/data/

**Quick Links** 



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#### MODIS

- MODIS is an extensive program using sensors on NASA'S two satellites that each provide complete daily coverage of the earth.
- Image
  - □AM(Terra)
  - □PM(Aqua)
- Data
  - Daily scene
  - Derived products
- Data of Interest
  - □Land
  - Atmosphere
  - □Ocean
  - Calibration
- Links

#### http://modis.gsfc.nasa.gov/about/

http://edcdaac.usgs.gov/modis/dataprod.html http://ladsweb.nascom.nasa.gov/data/search.html http://reverb.echo.nasa.gov/reverb/



Please read the disclaimer about the Collection 5 MOD04\_L2 and MYD04\_L2 products.

All Soomi WID MIDE CODE are committe DETA CULLITY ONTO ENOUGH ODCOLEMES AND ADE NOT INTENDED FOR ECCENTRIC LIFE



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#### NOAA

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- Data center
- Products
- Links

http://www.nesdis.noaa.gov/

http://www.nesdis.noaa.gov/SatProduct s.html http://www.class.ncdc.noaa.gov/saa/products/welco me







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#### LANDSAT

- Software tools
- Links
- http://www.landsat.org/

https://earth.esa.int/web/guest/missions/3rdparty-missions/current-missions/landsat-tmetm



Laridisat org supports the purchasing, distribution, and sharing of Eandsat 4, 5 and 7 imagery worldwide by providing a simple, platform-independent user interface and search engine with ortine data ordering. Landsat org supports research centers, science teams, and educational organizations by providing customized search interfaces, access to data hosting services, clearinghouse services, data brokering, and imagery cooperatives.

Landsat.org\_ETM+ classic search tool press for Max users) Landsat.org\_TM\_classic search tool

#### NEWS:

- Satellite Assessment of the Impact of the Indonesia Tsunami ...more
- African scientists gain access to ortho-rectified Landsat data ...more
- · Satellites show the effects of war \_\_ more



System Notices (1), 1 Critical

UNITED MUSIAGE Upstering Galder & Representing

\$G\$ Global Visualization Viewer

Satellite Image while the upcoming weeks, at Landaut 8 data that have been acquired another WR5-2 operational acta will be reprocessed using updated cationation parameters for OLI and TR5 data. During this time, all online inventory will be re-populated. Details explaining the changes to the data are available in the Outcole 25, 2011 Calibration Notice on http://www.are.org/outcole/

Postad 10/21/2013

Collector Beaching Martayora Josh Do pop





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#### **Google Earth**



#### Links http://earth.google.com/



# Mechanisms



#### **Emergency Support Mechanisms**



# **UN-SPIDER**

#### **Space Applications Initiatives**

#### UN Affiliated Regional Centres Asia, Africa, Latin America

Regional Support Offices & Partner Organisations

Capacity Building, outreach, technical support



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#### **International Charter- Space and Major Disaster**

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#### www.disasterscharter.org

The Charter is a worldwide collaboration, through which satellite data are made available for the benefit of disaster management..

The uniqueness of the initiative lies in being able to mobilize agencies around the world and benefit from their know-how and their satellites through a single access point that operate 24 hours a day, 7 days a week and no cost to the user



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#### **Copernicus Emergency Management service**



Links: http://emergency.copernicus.eu/mapping



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#### **Sentinel Asia**

- Led by JAXA, supported by major space agencies within Asia (ISRO, KARI, GISTDA)
- Quick data delivery via the internet as easy-tointerpret disaster-related information (WINDS)
- Working Groups: Wildfire monitoring, Flood monitoring and Glacier Lake Outburst Flood monitoring

# Sentinel Asia

### **Concept of Sentinel Asia STEP2**



http://dmss.tksc.jaxa.jp/sentinel/contents/EOlogin\_web.html



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#### **SERVIR**

- SERVIR
- Regional Visualization and Monitoring System for environmental management and disaster response
- Regional SERVIR nodes are located at
  - the Water Center for the Humid Tropics of Latin America and the Caribbean (CATHALAC) in Panama
  - the Regional Center for Mapping of Resources for Development (RCMRD) based in Kenya
  - International centre for Integrated Mountain
    Development (ICIMOD) located in Kathmandu,
    Nepal.





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### **1** Space-based Information for Disaster Management

**Resource and Mechanism** 

**3** Role of UN-SPIDER





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# Context





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### Space-based Information for Disaster Management and Emergency Response

"Ensure that all countries and international and regional organizations have access to and develop the capacity to use all types of space-based information to support the full disaster management cycle."

- Especially by being a gateway to space information for disaster management support;
- serving as a bridge to connect the disaster management and space communities; and
- being a facilitator of capacity-building and institutional strengthening (A/RES/61/110).

# Activities

- Knowledge
  Management
- Technical Advisory Support



#### Capacity Building

#### • Fostering Cooperation

<u>www.un-spider.org</u> (Knowledge Portal)

#### **Technical Advisory Support**

UN-SPIDER provides support to countries in assessing national capacity and in evaluating disaster and risk reduction activities, policies and plans with regard to the use of space-based technologies.

### Knowledge Portal

The UN-SPIDER Knowledge Portal is a web-based tool for information, communication and process support. Users can find and share case studies, guides and products through the portal.

#### Fostering Cooperation

UN-SPIDER bridges the gap between the space and disaster management communities. UN-SPIDER fosters alliances and creates forums where both communities can meet.



UN-SPIDER Activities

#### Capacity Building

UN-SPIDER facilicates capacity building and institutional strengthening, including the development of curricula and an e-learning platform (e-SPIDER).







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# **Technical Advisory Missions (2008 - 2013)**





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# **UN-SPIDER Technical Advisory Missions**





# **Technical Advisory Support**



**Solomon Islands** 



#### ASIA

- Afghanistan
- Bangladesh
- India
- Maldives
- Sri Lanka
- Philippines
- Myanmar
- Vietnam

#### Pacific

- Fiji
- Samoa
- Solomon Islands

#### Africa

- Burkina Faso
- Cameroon
- Ghana
- Kenya
- Madagascar
- Malawi
- Mozambique
- Namibia
- Nigeria
- Sudan
- Togo
- Zambia

#### Latin America and Caribbean

- Chile
- Colombia
- Dominican Republic
- Ecuador
- El Salvador
- Guatemala
- Haiti



#### Myanmar

Bangladesh





# **Mission team**

- UN-SPIDER
- UN OCHA
- CANEUS, Canada
- NDRCC, China
- ITC, Netherlands
- CNES-CNRS University, France
- Pacific Disaster Center, USA
- Chinese Academy of Sciences
- Delta State University, USA
- GERENDIS, Spain
- GREEN Mindanao, Philippines



### Visits to following agencies

- Disaster Management Centre (DMC)
- Department of Dike Management
- Flood Control (Standing Office of Central Committee for Flood and Storm Control - CCFSC)
- National Institute of Agricultural Planning and Projection (NIAAP)
- Spatial Technology Institute (STI), Vietnam Academy of Science and Technology (VAST)
- National Remote Sensing Center (RSC), Ministry of Natural Resources and Environment
- Hydro-Meteorological Forecasting, Ministry of Natural Resources and Environment
- UN Disaster Risk Management team
- Department of Survey and Mapping
- General Department of Land Administration

One day workshop: Attended by over 60 officials









### **Classes of recommendations**

- Policy and Coordination
- Data access, availability and sharing
- Capacity Building and Institutional Strengthening
- Specific recommendations to address various stages of disaster management
  - risk reduction,
  - early warning,
  - emergency response etc.

UN-SPIDER TECHNICAL ADVISORY MISSION TO VIETNAM Bringing the Benefits of Space to Humanity

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## **Follow up actions**

- Wide dissemination of the TAM report and recommendations
- UNDP and UNRC offices in Vietnam to consider the recommendations
- High level intervention (at ministerial level) to encourage data sharing and Data Policy.
- Short term training programmes
- Institutional capacity building of DMC
- Familiarisation study tours to overseas operational "centres of excellence".
- Act as the bridge during emergencies to supply EO products
- Effective utilization of VinAWARE, a tool provided by PDC to facilitate the integration of geospatial and early warning information



After debriefing presentation to the <u>Vice Minister</u> of Agriculture & Rural Development



# Opportunities

# **Capacity building**

- 7 UN affiliated centres space science technology education
- Regional Support Offices (ADRC, Iran, Pakistan)
- NDRCC





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Disaster Manageme



UN Affiliated Regional Centres for Space Science Technology Education







# **UN-SPIDER Capacity Building Efforts**







### National training programmes in 2013

Sri LankaChinaMyanmarCameroon, Mozambique, SudanBangladesh

# International training programmes in 2013

<u>China-</u> with NDRCC and APSCO UN Affiliated Regional Centre in <u>India</u> (With ESCAP and IWMI)





# Opportunities

# **Outreach and Awareness**

- UN-SPIDER workshops and conferences
- Regional meetings
- News letters and updates





# Activities in 2014

#### **Technical Advisory Missions**

Asia: Bhutan & Mongolia

Africa: Kenya & Zambia

#### **Regional Support**

ASEAN - to prepare mechanism for Emergency Response (With AHA Centre, ESCAP and LAPAN)

Latin America

#### International conference/Workshops

Side event in Asian Ministerial Conference on Disaster Risk Reduction

4<sup>th</sup> UN-SPIDER Conference in Beijing

#### **National Capacity Building programmes**

Vietnam, Sri Lanka, Bangladesh

**International Capacity Building Programme** 

China and ICIMOD (Nepal)







United Nations International Conference on Space-based Technologies for Disaster Management – "Multi-hazard Disaster Risk Assessment" in Beijing. Conference dates: 15-17 September 2014 Training dates: 18-19 September 2014

http://www.un-spider.org/BeijingConference2014



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# Key Messages

- Space-based technologies can improve predictions and monitoring of potential hazards.
- Space technology needs consideration as mainstream tool in the national development and disaster management.
- Importance of raising awareness and strength capacity.
- collaborations between the disaster management community and geospatial community.



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# Thank you UN-SPIDER/UNOOSA

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### Bringing the benefits of space to humanity

