Applications of geospatial data and technology on disaster management activities in Japan

Bokuro Urabe

Geospatial Information Authority of Japan (GSI),

Ministry of Land, Infrastructure, Transport and Tourism, Japan
1. Recent output of UN-GGIM-AP for DRM
2. Latest Trends in Surveying and Mapping
3. GSI’s work on developing/providing Geographic Information for Disaster Management in Japan
   (a) Prepare geospatial information for disaster management
   (b) Monitoring & Early warning system
   (c) Quickly find the impact and damages
5. Summary
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5. Summary
UN-GGIM-AP: Introduction and Role

UN-GGIM-AP
• Regional Committee of UN-GGIM.
• Established: 1 November 2012
• Member: National Geospatial Information Authorities of 56 countries and regions in Asia and the Pacific
• Current Chair: Dr. Andy Barnicoat (Australia)
• Secretariat: UN-ESCAP (since Nov. 2018)

Vital Role in
(Relevant to geospatial information management)
• Resolves regional issues
• Facilitate regional capacity building
• Promote globally the unique needs and interests of the region
• Contribute to the discussions in UN-GGIM

(Reference)
ECOSOC Resolution entitled “Strengthening institutional arrangements on geospatial information management”, E/RES/2016/27
WG1 : Geodetic Reference Framework for Sustainable Development

WG2: Disaster Risk Management
• This WG aims to enhance the capability of NGIAs in Asia and the Pacific region for contributing to disaster risk reduction by applying geospatial information for effective implementation of Sendai Framework for Disaster Risk Reduction (SFDRR).

WG3: Regional SDI

WG4: Cadastre and Land Management
Guidelines for DRM to assist NGIAs on taking actions against natural disasters

- International trend in utilization for DRM
- Summary of SFGISD – explore strategic viewpoint of NGIAs to manage disaster risk
- Policy and measures NGIAs can take before, during and after disasters
- Collection of Best Practices and actions by NGIAs

Guidelines for Disaster Risk Management Using Geospatial Information and Services

Working Group on Disaster Risk Management (WG2), Regional Committee of the United Nations Global Geospatial Information Management for Asia and the Pacific (UN-GGIM-AP)

November 2018
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5. Summary
We are now witnessing a Revolutionary Innovation in Surveying and Positioning, empowered by the combination of Positioning Satellites and CORS networks.
Combination of GNSS and CORS enables Real-time, Accurate Positioning and Surveying.

Innovative Services and New Industry
Monitor the movement of the earth

Quick, accurate, efficient response on disasters
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Hazards in Japan

- Earthquake
- Tsunami
- Volcanic Eruption
- Tropical Storm
- Flood
- Landslide
“Geographic Information for Disaster” may have two types of information. GSI develops/provides both types.

A) Topographic Feature Information

B) Disaster History Record
Example of “Topographic Feature Information”

GSI provides topographic feature information through various thematic maps. These maps help people to understand geographic feature.
In Japan, natural disaster monuments can be found at many places.

These are also important information of past disasters.

Examples of Natural Disaster Monuments

- flood
- flood
- earthquake
- earthquake
- tsunami
- tsunami
- volcanic eruption
- landslides

Survey on Natural Disaster Monuments

◆ **Stone monuments** that are inscribed with **events concerning past natural disasters (disaster conditions, damage, etc.)** caused by tsunami, flooding, volcanic eruptions, sediment disasters, etc.

◆ Natural disaster monuments **convey the conditions of disaster at that time.** Since most of them are **located in disaster-affected areas**, by showing them on the map **disaster prevention awareness of local residents** will be promoted.

Draw the Natural Disaster Monuments on GSI Maps
MLIT Hazard Map Portal Site

Information useful for evacuation and disaster preparedness

**Overlaid hazard maps**
Various information about anywhere in Japan, which is useful for disaster risk reduction, can be overlaid and viewed as a single map.

**Local hazard maps**
Hazard maps of municipalities across Japan are available.

- Overlaid hazard maps
  - Various information about anywhere in Japan, which is useful for disaster risk reduction, can be overlaid and viewed as a single map.

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**Evacuation route**

**Measures for flooding**

**Enhancing seismic safety**

**Measures for liquefaction**

Hazard Map Portal Site: [http://disaportal.gsi.go.jp/](http://disaportal.gsi.go.jp/)
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GNSS Continuously Operating Reference Stations (CORS)

GNSS: Global Navigation Satellite System

GLONASS (Russia)  
Galileo (EU)  
QZSS (Japan)  
GPS (US)

5-m height stainless pillar

1318 stations (approx. 20 km interval)
 REGARD system workflow

Real-time CORS Network for Tsunami Warning

1. Real-time positioning
2. Calculate displacement vector
3. Estimate fault model
4. Send results

Continuously
Repeat for 5 min.
Early Warning System for Earthquake

All data from various sensors are sent to JMA (Japan Meteorological Agency) for Warning using TV/mobile devices etc.

Data from sensors

Earthquake wave 3~7 km/s

Transmission of alarm in time for hiding or guarding
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Crustal deformation detected by GNSS CORS

the deformation caused by the Great East Japan Earthquake (Mar. 2011)
Crustal Deformation Detected by GNSS CORS

The 2016 Kumamoto Earthquake (M7.3)

- Co-seismic deformation detected by GNSS CORS
  ✓ SW-ward: max. 98 cm
  ✓ Upward: max. 24 cm
- Detected deformation data was provided to the public in a few hours after the earthquake.

GNSS CORS helps find the impact and extent of potential damage caused by earthquakes.
The photos revealed the impact and extent of damage in detail.
Video images taken from a helicopter → ortho-rectified real-time
Integrated Disaster Information Mapping System

“DiMAPS”

Overlaying Live Information from Different Sources on One Map

On-site Image

Situation Center

Live Camera

On-site Vehicles

Local Government

Digital Map Table

Live Video by Aircraft

On-site Vehicles

Situation Center

On-site Vehicles

Live Video by Aircraft

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SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

SDG 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development
Summary

• Geospatial information is crucial for disaster risk management.
  • In Japan, GSI is providing various thematic maps to understand topographic features.
  • Disaster history information is also important to understand the risk.
  • Geospatial Information helps activities at all phases of disaster.

• National Geospatial Information Authorities in Asia and the Pacific annually have UN-GGIM-AP meeting to discuss technical and substantive activities in the geospatial information field at the regional level. The guideline for Disaster Risk Reduction using Geospatial Information is now available.

• Such geospatial information will contribute to achieve SDGs.
Thank you for your attention

Contact to:
Bokuro URABE urabe-b9510@mlit.go.jp
GSI Japan https://www.gsi.go.jp/ENGLISH/index.html