Tentative collection of Best Practices on the use of geospatial information for disaster risk reduction

UN-GGIM-AP WG2

December 2016

Regional Committee of United Nations Global Geospatial Information Management for Asia and the Pacific (UN-GGIM-AP)

Contents

1. Overview of the Best Practice survey

1) A Best Practice survey was conducted as a part of UN-GGIM-AP（United Nations Global Geospatial Information Management for Asia and the Pacific）WG2 （Disaster Risk Management, hereinafter WG2) activity plan.
2) NGIAs(National Geospatial Information Authorities)Member States of UN-GGIM-AP were requested to submit at least one best practice, in conjunction with the questionnaire survey which was s simultaneously conducted by WG2.
3) As of October 2016, Best Practices of 14 cases from 10 member states were collected on the use of geospatial information for disaster risk reduction.

2. Overview of the of Best Practice cases and a brief analysis

1) NGIAs have already committed to disaster risk reduction through implementing various kinds of activities.
2) Kinds of disasters addressed reflect each Member States circumstances.
3) Best practices mainly focus on responses during the occurrence of disaster. On the other hand, a few practices focus on before the occurrence of disaster and after the occurrence of disaster.
4) Geospatial information produced and provided according to each disaster phase is:

- Before the occurrence of disaster: hazard maps provided to citizens to enlighten disaster risk of a particular area;
- During the occurrence of disaster: aerial photo, satellite imagery, UAV images, topographic maps showing damage situation and geodetic data,
- After the occurrence of disaster: DEM data to consider relocation of victimised people.

5) NGIAs' data were used as a material for decision-making by government organizations and decision makers. Some cases indicated that data were provided to citizens and residents via the internet to facilitate evacuation activities. Promotion of geospatial information application, enlightenment and capacity building of local governments were also reported.
6) As future efforts, use of UAV which enables flexible and quick provision of information during disaster was pointed out by a few cases.
More efficient data provision in coordination with other organizations, provision of disaster risk information before the disaster and accompanying awareness raising activities, development of geospatial information about the people vulnerable to disasters, and development of geospatial information infrastructure (CORS network, topographic map, databases, DEM) were also reported in Asia and the Pacific region as future efforts.
7) Conclusion
A variety of examples of Best Practices suggests that the collection would be a valuable material for NGIAs to learn how to take an action for DRR effectively.
Because there should be cases which are not yet known, it is recommended that NGIAs are requested to add and share the Best Practices.

3. Summary list of Best Practices introduced

No.	Memberstate	Disaster classification	Information and Service	Title	Activity Contents	Page
1	Australia:Geoscience Australia	Overall disaster	Location data	Real Time Crisis Response Mapping for Government Officials	Provided by Geoscience Australia to Government Emergency Crisis Coordination Centre and used by the government as a material for decision-making during disasters .	3
2	Bangladesh:Survey of Bangladesh	Typhoon, Cyclone, Earthquake, etc.	Thematic map	Use of Geospatial information for DRR in Asia and the Pacific region	Provided by Survey of Bangladesh to government organizations, and by integrating and sharing geospatial information in the government, contributed to mitigating disaster risks and saving of resources.	4
3	China:sasmac	Earthquake	Geospatial information		Used for emergency response during disasters.	5
4	Fiji:National Disaster Management Office	Typhoon, Flood	Geospatial information		Used for emergency response during disasters.	6
5	Hong Kong Special Administrative Region (HKSAR):Lands Department	Landslide	Location data	Contingency Plan for Natural Disasters	Provided by the system of the website and used to identify the location at the occurrence of landslides and for recovery activities after the occurrence.	7
6	Indonesia:Geospatial Information Agency	Volcano	Topographic map	Rapid Mapping of Kelud Mountain	By releasing evacuation routes and distribution of volcanic ash on the topographic map on the Internet, provided the people living around the volcano with a material to make decision for evacuation.	8
7	Japan:Geospatial Information Authority of Japan	Flood	Aerial photo, Inundated area map	Floods as a result of heavy rain	Swiftly disclosing the disaster situation that specifies the inundation range on the Internet, contributed to initial restoration operations (placement of police, the numbers of pumper trucks and workers, placement positions and determining work hours). Government and media used the data provided by GSI as trustworthy official information for disaster response and for news coverage.	9
8	Japan:Geospatial Information Authority of Japan	Tsunami	Aerial photo, Inundated area map	Floods as a result of heavy rain	Immediately after the disaster, GSI created figures to provide related organizations with the general situation of the inundation range, conducted emergency shoots of aerial photograph, and these resources were utilized in a wide range of fields, such as making the base map for disaster recovery planning. All of them are released on the Internet.	11
9	Malaysia:Department of Survey and Mapping Malaysia (DSMM)	Flood	Video by UAV	The Use Of Unmanned Aerial Vehicle (UAV) To Monitor The Flood And Its Impact in Malaysia	Used to identify flooded areas and evacuation sites with video and aerial photo captured by UAVs. After the disaster, used to identify facilities for recovery of various infrastructures.	13
10	Malaysia:Department of Survey and Mapping Malaysia (DSMM)	Earthquake	GNSS data	Earthquake Struck Ranau In Sabah, Malaysia	By analyzing GNSS data before and after earthquakes and releasing them on the early warning system of earthquake, contributed to the citizen for an early planning.	14
11	Republic of the Philippines:National Mapping and Resource Information Authority	Hydromet* and seismic*	Hazard map	Multi-Hazard Mapping of 28 Priority Provinces and the Greater Metro Manila Area	By providing local government organizations with hazard maps on the Internet, used as a material for decision-making of the area at the time of disasters.	15
12	Republic of the Philippines:National Mapping and Resource Information Authority	Hydromet and seismic	Hazard map	The Philippine Geoportal	By providing hazard maps on the Internet, contributed to the citizen in visually identifying risk areas.	16
13	Republic of the Philippines:National Mapping and Resource Information Authority	Typhoon	Digital topographic map data Ortho image	Recovery and Rehabilitation After Typhoon Haiyan	Used by the government to determine the status of disaster-affected areas and to identify safe and risk zones.	17
14	Sri Lanka:Survey Department	Tsunami	Digital topographic map data		Expressing disaster-prone areas on the topographic map can make swift relief operations.	18

*Hydromet – flood, storm surge, rain-induced landslide
*Seismic- ground rupture, ground shaking, tsunami, earthquake-induced landslide, liquefaction

4. Best Practice cases

No.1

Country	**Australia**
Organization	Geoscience Australia
Title	Real Time Crisis Response Mapping for Government Officials
Outline of the subject natural disaster	Spatially enabling federal government to enhance decision making.
Response	Geoscience Australia is supporting the Attorney-General's Department's - Australian Government Crisis Coordination Centre - establish a spatial mapping capability as part of its crisis centre. Geoscience Australia also integrates fundamental and synthesised spatial data with statistical information for a given area of interest to estimate exposure. This information is provided in report form on request to the Australian Government Crisis Coordination Centre.
Effect	The collaboration between GA and AGD is supporting the ability of executive decision makers in government to make informed decisions on the coordination of the Australian Government's response to domestic disaster events, using location based data.
Future	Continuous development and improvement of the capability supporting a joint mission across agencies.

No.2

Country	**Bangladesh**
Organization	Survey of Bangladesh
Title	Use of Geospatial information for DRR in Asia and the Pacific region
Outline of the subject natural disaster	Floods, Storm surge, Drought, Tornedo, Landslide and Cyclone are the main disaster. Beside these, country is in the risk of Earthquake and Sea Level Rise.
Response	Survey of Bangladesh is preparing thematic maps for the whole Bangladesh. Thematic maps will help the country to prepare an integrated, comprehensive and coordinated plan which is already underway.
Effect	By supplying geospatial information to the relevant agencies, the Government will be able to mitigate the natural disaster and can save our valuable resources.
Future	Our organization is planning to use UAV for capturing aerial photographs and making available live high resolution satellite images just after the disaster to prepare an integrated, comprehensive and coordinated post disaster plan.

No.3

Country	**China**
Organization	sasmac
Title	earthquake
Outline of the subject natural disaster	In China, earthquakes happen quite often, In almost all earthquakes, SBSM provides the mps after earthquakes including previous, in situ, and after maps
Response	The response of emergency mechanism of government
Effect	good
Future	Accelerate the speed of response including all kinds of disasters such as storm, flooding. etc

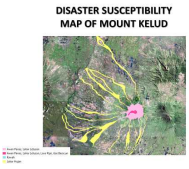
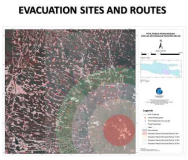
No.4

Country	Fiji
Organization	National Disaster Management Office
Title	
Outline of the subject natural disaster	Tropical Cyclone, Flooding
Response	The information provided by geospatial information assists in the coordination our response.
Effect	It really assists in the effectiveness and efficiency of response efforts.
Future	• Improve geospatial information • Mapping of people with disability

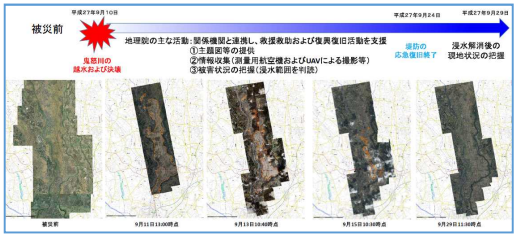
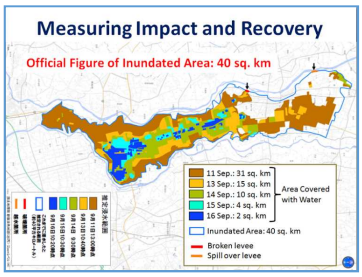
No.5

Country	**Hong Kong Special Administrative Region (HKSAR)**
Organization	Lands Department
Title	Contingency Plan for Natural Disasters
Outline of the subject natural disaster	A landslip is occurred affecting life and property.
Response	Lands Department (LandsD) is responsible for emergency and urgent repair works to landslips occurring on registered man-made slopes maintained by LandsD and to landslips that occur on man-made slopes on unleased and unallocated Government land not maintained by other departments and affecting life and property. LandsD works in conjunction with the Civil Engineering and Development Department (CEDD) in determining maintenance responsibilities of registered man-made slopes. The maintenance responsibilities of slopes having been determined are contained in the Slope Maintenance Responsibility Information System (SMRIS) and publicized on the LandsD's website (http://www.slope.landsd.gov.hk/smris/) and on CEDD's Slope Information System (SIS) accessible from http://hkss.cedd.gov.hk. LandsD will assist as necessary in emergency situations. The Survey and Mapping Office (SMO) of LandsD is responsible for providing existing maps, plans and aerial photos of the scene in conjunction with Government Flying Services (GFS) in an emergency situation. The SMO will also conduct topographical surveys after the disaster if necessary.
Effect	Location and maintenance responsibility of the landslip are identified in the first instance. Geospatial information of the disaster scene is captured for investigation and restoration purposes.
Future	UAV will be deployed as a part of the emergency survey operation in future disaster incidents.

No.6

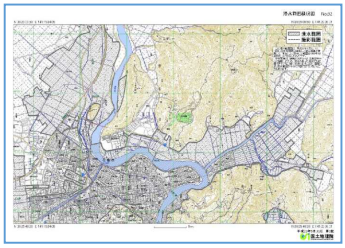
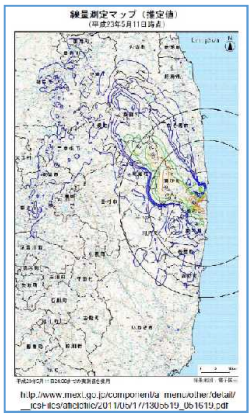
Country	**Indonesia**
Organization	Geospatial Information Agency
Title	Rapid Mapping of Kelud Mountain
Outline of the subject natural disaster	On February 13, 2014 mount Kelud erupted. The Centre of Thematic Mapping and Integration of Geospatial Information Agency (BIG) has conducted rapid mapping and analysis of Mount Kelud.
Response	   BIG, together with some institutions and local governments, have provided the Disaster Susceptibility Map of Mount Kelud, Evacuation Sites and Routes, and Ash Distribution of Mount Kelud.
Effect	The above products have been published on internet so that many people in Blitar and Kediri Regencies could be saved.
Future	Many additional important information from ministries, local governments, and private sectors could be enriched the above maps.

No.7

Country	**Japan**
Organization	Geospatial Information Authority of Japan (GSI)
Title	Floods
Outline of the subject natural disaster	Due to the heavy rainfall from September 9 to 11 in 2015, the collapsing of levees, overtopping and leakage, inundation and the fracturing/breaking of levee slopes occurred in over 80 rivers. Immense damage was brought about as a result of this, including the loss of lives, injuries, and many incidents of houses being swept away and above the floor level inundation.
Response	Relief work and restoration activities were enforced in cooperation with related organizations after overtopping and damage occurred at the rivers. Specifically, aerial photos after the disaster were photographed, and photos before and after the disaster were provided to the government and disaster-stricken municipalities, while information was provided extensively to the nation on our homepage. By measuring the inundated area using photographic interpretations, the disaster effects and restoration situation after the disaster were monitored. Measurements of the inundated areas were updated daily and reported to the government until the inundated areas became small enough that drainage pump cars were no longer required.  
Effect	Swiftly disclosing the disaster situation that specifies the inundation range, contributed to initial restoration operations (placement of police, the numbers of pumper trucks and workers, placement positions and determining work hours). As well, the government and media utilized the data provided by GSI as trustworthy official information in their disaster response and news coverage, reaffirming the significance of GSI.

Future	It was possible to provide timely information to the government, as the government's needs were understood through frequent interactions with various government posts on a regular basis. In other words, it is important that the required needs for policy making are grasped. Furthermore, disaster simulations (hazard maps) of these rivers where levees broke had been released to the public until now. However, because a sense of danger was not clearly communicated to residents, it may also be believed that it didn't lead to their swift evacuations. It is important to also raise the awareness of residents towards disaster prevention.

No.8

Country	**Japan**
Organization	Geospatial Information Authority of Japan (GSI)
Title	2011 Great East Japan Earthquake
Outline of the subject natural disaster	The Great East Japan Earthquake that occurred at 14:46 on March 11 2011 with the largest Mw (moment magnitude) of 9.0 ever recorded in Japan, caused strong earthquake motions with an intensity over lower 6 on the Japanese scale of 7 in a wide area spanning eight prefectures from Iwate Prefecture to Chiba Prefecture, and triggered a powerful tsunami over 10-meters in height that hit the Pacific side of Japan's Tohoku region, destroying an area of 561km2 with its massive force, followed by an accident at the Tokyo Electric Power Company Fukushima Daiichi Nuclear Power Plant and resulting massive evacuation efforts, making it the most massive and multiple catastrophe our nation has ever experienced.
Response	Immediately after the disaster, Geospatial Information Authority of Japan created figures of the general situation of the inundation range, conducted emergency shoots of aerial photograph to provide to related organizations, and these resources were utilized in a wide range of fields. Specifically, figures of the general situation of the tsunami inundation and aerial photos were used for the creation of radiation dosimetry maps, the issuing duties of disaster victim certificates, and explanatory manuals for volunteer activities etc. Apart from these, the disaster recovery plan base map, provided by Geospatial Information Authority of Japan, was also utilized.  [Figure of the general situation of the inundation range]  [Radiation dosimetry map (estimate)]

Effect	Various resources to serve restoration/recovery were created and provided using the map provided by Geospatial Information Authority of Japan as its base. For example, in areas where massive emigration was conducted, the time and cost spent on the move was significantly reduced using the results of the cadastral survey results.
Future	Though most of the three months after the disaster was spent for grasping the damage situation, because the information gets complicated, the swift disclosure of “trustworthy maps” issued by the nation is indispensable for grasping damage situations towards their recovery. In the future, Geospatial Information Authority of Japan will continue to seriously maintain and provide geospatial information for restoration/recovery, and promote the utilization of information, while understanding the needs of each field.

No.9

Country	Malaysia
Organization	Department of Survey and Mapping Malaysia (DSMM)
Title	The Use Of Unmanned Aerial Vehicle (UAV) To Monitor The Flood And Its Impact in Malaysia
Outline of the subject natural disaster	Floods are the major natural disaster threat facing Malaysia. The 2014-year end downpour and floods has been the worst ever in the country's history, affecting more than half a million people. Damage to infrastructure alone was estimated RM2.851 billion. Areas that have never experienced floods before were also inundated and floodwater rose at an unprecedented level.
Response	The video and aerial photo captured using UAV have been used to provide information about the areas that were susceptible to the floods and locations where people can be evacuated to. The data have been used for making post flood damage assessments and identifying the facilities need to be repaired urgently such as roads, bridges, water treatment plant, etc.
Effect	The process to search and rescue flood victims were expedited by using the UAV data. Besides that the refurbishment and reconstruction of damaged facilities were expedited to ease the transportation links in moving people and goods to the affected area. The use of UAV also has saved the operational cost due to its flexibility and cheap flying operation with less constraint on time and human resources.
Future	To provide UAV data during and after disaster for relief and recovery purposes particularly on the remote area. Efficient dissemination of information

No.10

Country	Malaysia
Organization	Department of Survey and Mapping Malaysia (DSMM)
Title	Earthquake Struck Ranau In Sabah, Malaysia
Outline of the subject natural disaster	A magnitude 5.9 earthquake struck near Mount Kinabalu killing 18 and stranding more than a hundred people on the peak. The quake damaged roads and buildings, including schools and a hospital on Sabah's west coast. Geospatial information also plays a big role to monitor the crustal and surface motion by using Continuously Operating Reference Station (CORS) data.
Response	The earthquake that occurred in Ranau on 5th June 2015 which is near to Mount Kinabalu had caused massive landslides around the mountain and nearby area as well. The data before and after earthquake from CORS stations (MyRTKnet) and 11 GNSS monuments were analysed and has indicated the surface motion on the area is between 36 to 53 cm. The output reflected the benefit to monitor the progress of motion so that the early warning for earthquake can be disseminated to alert the surrounding people.
Effect	The data from CORS stations (MyRTKnet) and 11 GNSS monuments has contributed significant information for an early warning system for earthquake in order to expedite the necessary evacuation of people from the hazard area. Also important in the following cases: • Overall picture and extent of damage caused • Indication of ground displacement • Planning and distribution of aids
Future	To densify the CORS stations (MyRTKnet) throughout the country

No.11

Country	Republic of the Philippines
Organization	National Mapping and Resource Information Authority (NAMRIA)
Title	Multi-Hazard Mapping of 28 Priority Provinces and the Greater Metro Manila Area
Outline of the subject natural disaster	The Philippines is consistently visited by tropical disturbances exposing communities to hydrometeorological hazards such as strong winds, storm surge floods/flashfloods, and rain-induced landslides. The country, being located in the Pacific ring of fire, is likewise exposed to seismological hazards such as ground shaking, ground rupture, earthquake-induced landslide, and liquefaction. Aiming to have a safer and disaster resilient communities, multi-hazard mapping of the 28 high risk provinces was implemented to map out areas exposed to natural hazards. The output of this activity will facilitate evidence-based decision-making by local and national authorities.
Response	The Agency provided base maps, capacitated LGUs on the use of GIS technology, engaged technical staff in the integration of hazard maps for use by the local government units and national government agencies, and participated in the conduct of information and education campaign (IEC) in the communities primarily exposed to hazards.
Effect	1. Raised awareness on the impending hazards confronting the exposed communities in the provinces. 2. Hazard maps are increasingly used in the formulation of land use and physical development plans. 3. Hazard maps used in the formulation of local DRRM plans. 4. Increasing number of LGUs expressing interest in the use of GIS for DRRM
Future	

No.12

Country	Republic of the Philippines
Organization	National Mapping and Resource Information Authority (NAMRIA)
Title	The Philippine Geoportal
Outline of the subject natural disaster	The Philippine Geoportal is envisioned to provide a comprehensive and consistent geospatial information of the country. It aims to support the geospatial information needs of users in various disciplines by providing access to such information. In the aftermath of Tropical Storm Ketsana (Ondoy) which left Metro Manila and 30% of the provinces in the Philippines under state of calamity, geohazard maps were prepared for the 28 high risk areas in the country. These maps were made accessible to the public through the Philippine Geoportal.
Response	Developed in the Philippine Geoportal is a DRRM application which provides a visual appreciation of the hydrometeorological and seismological hazards in the high risk areas of the country.
Effect	1. Increased awareness of the public on the hazards faced by the community. 2. Hazard maps are increasingly used in the formulation of land use and physical development plans. 3. Hazard maps used in the formulation of local DRRM plans.
Future	

No.13

Country	Republic of the Philippines
Organization	National Mapping and Resource Information Authority (NAMRIA)
Title	Recovery and Rehabilitation After Typhoon Haiyan
Outline of the subject natural disaster	The harrowing impact of typhoon Haiyan left about 4 million people homeless. This prompted the Philippine government to ensure the safety of the affected communities, moving them away from the seashore to more suitable relocation sites. In focusing on the recovery and rehabilitation phase, the immediate objective is to identify areas suitable for relocation of those left homeless by the typhoon.
Response	NAMRIA provided technical assistance with the provision of IfSAR data which includes digital terrain models (DTM), digital surface models (DSM), and orthorectified images used in the identification of suitable relocation sites for the affected communities.
Effect	The government was able to advance and fast track the identification of safe and unsafe zones in the Haiyan-affected areas.
Future	

No.14

Country	**Sri Lanka**
Organization	Survey Department
Title	Surveyor General
Outline of the subject natural disaster	Tsunami – 2004 December 26
Response	Providing available digital data / maps and technical support to map the disaster prone areas / damages Identify available resources for relief activities
Effect	Help quick dispatch of support Relief providing activites Locations for relief camps Medical support availability information
Future	Fully pledged database on topographic information / resources available which is shared with stakeholders / allowing them to add / update information Quick mapping with UAV when required Provide accurate digital elevation model