Launch of GIS/HM/VA activities in the Caribbean OCTs

Workshop summary

Aruba
4-6 May 2011

NOTE: Presentations and other documentation may be found at: http://www.bb.undp.org/regional-risk-reduction-initiative

Opening ceremony

The Hon Mike Eman, Prime Minister of Aruba, addressed an audience of over 80 persons representing many of the key partners involved in disaster management in Aruba, including the Crisis Management Office, Police, Fire and Health Departments, the Marines, the water and electrical utilities, the Public Works, Infrastructure and Planning departments and the Central Bureau of Statistics, as well as representatives from 8 of the other 10 R3I territories and challenged the group to go beyond technical solutions to community capacity building.

He lauded the much-appreciated contributions of the international community to assisting small islands address the mutually reinforcing issues of limited national resources and high vulnerabilities in mitigating hazard risk. He further emphasised the need to not only give attention to building the technical skills of the various agencies which contribute to disaster risk management, but simultaneously to be cognisant of the importance of working directly with communities to enable them to address their own needs as they are the first line of preparation and response.

He noted that in Japan it was the local populations that distributed food and petrol supplies in the hours before emergency services arrived. In Seattle, the local government took the decision to train a million persons to administer cardio-pulmonary resuscitation (CPR) as a measure for reducing the high incidence of death due to heart attacks. This was the most cost and resource effective option when compared to increasing ambulance fleets to be within 4 minutes of every resident, or providing private sector services.

The Prime Minister's sentiments were supported by the UNDP Deputy Resident Representative, Mr Stein Hansen. Mr. Hansen confirmed that the foundation of the Regional Risk Reduction Initiative (R3I) consists of developing local capacities to be able to use tools that will allow better modelling of hazard impact, improved warning systems, more effective response mechanisms, and strengthening recovery plans. Sharing experiences among overseas countries and territories (OCTs) and developing key partnerships are also critical for securing strong technical support and linking to regional and international initiatives and best practices.

Mr Hansen also acknowledged the Eurpoean Union's support to the OCTs through funding this initiative, and also thanked the Aruba Crisis Management Office for their remarkable contribution in the organisation of the event.

Overview of GIS/HM/VA activity launch and discussions

The majority of the three days focused on familiarising the beneficiaries with the instrumental work to be conducted in the coming months by the joint venture (JV) of GESP/UWI CGS EI/GIS4C in Aruba, Bonaire, Cayman Islands, Curacao, Montserrat, Saba, Sint Eustatius, and Turks and Caicos Islands. Each phase would see a high level of interaction with the key counterparts in each island responsible for managing geospatial (GIS) data, risk identification and management, development planning, etc. Specifically the contractors will:

- Assess each island's capacities for hazard mapping (HM) and vulnerability assessment (VA)
- Support the acquisition of data and equipment
- Conduct VA and quantitative risk assessments (QRA)
- Develop specific HM/VA applications, including multi-hazard risk maps and inputs for early warning systems, logistical planning, and emergency operations

The importance of this work was viewed within the context of the data showing increasing frequency and intensity of hurricanes in the last two decades and the vulnerability to a range of other hazards including flooding, tsunamis, and in some cases landslide and volcanic hazards.

It is critical for each country to have historical records of the hazards which have occurred in order for models to be built. Hazard maps, vulnerability assessments and consequence analysis would be based on the impact scenarios developed in order to achieve a variety of applications, using additional inputs such as demographics and ecosystem maps depending on the intended purpose. These may include contingency plans, water management strategies, infrastructure and land use development, early warning systems (EWS), and environmental protection policies.

GESP/UWI CGS EI/GIS4C described the elements of each Phase of its methodology, including the capacity needs analysis questionnaire to be completed collaboratively stakeholders with the assistance of the JV. While it is very detailed, it is important for identifying gaps for this project and those which can be useful for other initiatives. The JV indicated that team members will be in each OCT for two days when all stakeholders can gather to complete the questionnaire. Specially noted was the need flooding data/information, since global data only captures statistics when deaths occur.

Generally, the same methodology is being used in each country, with some variations e.g. based on different geological forms and data. Weighting of factors will be different based on the priority of each country e.g. by history, seasonality. Land use and rainfall should be noted as variables that are always changing. Countries need to be able to run the models themselves because the results are not static.

Countries should also be able to interpret the hazard and risk maps produced and know to which extend they can be adequately used. For instance, the landslide model allows characteristics/texture of soils to be taken into account, effects of rainfall, land use (e.g. vegetation cover), etc. The application of these tools is wide e.g. BVI uses landslide hazard maps in determining planning permission; Martinique has an EWS connected to the amount of rainfall and slope failure in the particularly high risk area of Fond St Denis.

Privacy issues can be of concern when completing data sets and the VA e.g. some countries only permit details on the total number of persons and persons with disabilities in district in aggregate not per household. Whatever level of detail the country is able to provide will be used. The JV will start with non-sensitive method and can zoom in based on authority levels.

With each country already having ongoing emergency plans, GIS applications, etc, the work that will be done must actively build on existing capacities. National long term strategies for the development of GIS and HM/VA capacities will be developed in the first phase of the project. Various departments can use this as an opportunity to develop a holistic vision so that plans can be harmonised into one system.

The JV suggested that the EU INSPIRE guidelines be applied for the formatting of the GIS data. This would allow easier exchange of information between national departments, and also between countries applying these standards.

The server for data repository will be initially and temporarily located in Italy due to uncertainty about country conditions. Different options for final achitecture have been presented – individual country, sub-regional or regional. The web server should also be managed, which may not be possible on smaller islands.

Early warning systems (EWS)

Sharing information about shared hazards is rooted within social interactions, which is one of the reasons why interaction at the community level must be inherent to so many activities. Social behaviour and the characteristics of a population are key "human" elements that must be taken into consideration.

Presentation of the warning varies based on language, literacy, sensory ability, age, etc. "Normalcy bias" creates the need for corroboration of a single message from multiple sources to increase acceptance. Too many specialised methods for each hazard create confusion, reduce credibility and efficiency. Attracting attention and motivating to action is universal. It has been shown that the "cry wolf syndrome" where false alarms will decrease people paying attention, does not hold true as long as the warnings are relevant.

R3I will seek to increase the capability of each OCT to deliver warnings about multiple hazards to specific groups and the entire population through a mechanism which simplifies and quickens the method of delivery and allows persons to be reached through various media. The Common Alerting Protocol (CAP) is that mechanism, and represents an extraction layer where the pertinent information is entered into a form to disseminate to all technologies with a single activation procedure. When integrated into a system where risk and hazard information are received and the public is well-educated and responsive to warning messages, the population can be effectively alerted and informed about possible threats.

Tsunami and storm surge modelling and mapping in the Virgin Islands

This work will also commence, on the ground in the Virgin Islands, immediately after the workshop. It will be led by the joint venture of Smith Warner International/Deltares. This will include development of multiple model scenarios and mapping of hazard prone areas.

This JV, similar to the GESP JV, will have as a priority to define specifications for data collection and equipment acquisition. The cooperation of multiple stakeholders in each country will be essential for the sustainable integration of the tools and skills into national systems, and for various departments to agree on coordination mechanisms for utilising common data platforms and information sharing systems.

Inland and coastal flood hazard modelling in Sint Maarten

UNESCO IHE (Institute for Water Education) presented its advancement in the inland and coastal flood modelling work and the successful bathymetric survey results acquired using the innovative technique of sonar correlated with satellite imagery provided by the National Aeronautics and Space Administration (NASA) from the EO1 (Earth Observer 1) satellite.

Three data sources were used in order to develop numerical models to conduct flood, tsunami and storm surge modelling. NASA gave permission to use EO1 to target imagery. The jet ski operated at different resolutions therefore calculations will determine how to interpolate to fill in unmeasured areas. No modifications are necessary for the jet ski; and sonar equipment was re-mounted daily. The maximum water depth was 20m for the images; deeper water bathymetry has been provided by the Royal Dutch Navy.

A 10m resolution MIKE model was developed and modelling will be done in compartments as opposed to a single larger model. Work is being done on a framework to estimate vulnerability and risk (coastal, pluvial, intersection, expansion hazards). VA will analyse the following aspects: physical (critical buildings and infrastructure), economic (commercial services, tourism, etc), environoment (waste treatment plant, national reservation, etc), and social (age, poverty, education, etc). These will contribute to the overall flood risk assessment. Environmental and social vulnerability assessments are still in the preliminary stages, based on literature review. Discussions are needed with stakeholders to agree on indices and weighting to refine the methodology.

No tidal measurements/data have been found yet therefore it is difficult to develop scenarios for tsunami and storm surge. Houses on the digital elevation model (DEM) would only be used in the inland flooding model.

An error on vertical measurement of about 5% on sand class and 15% for vegetation (seagrass) class has been observed for correlation between sonar and satellite imagery, corrected for tides and waves. Horizontal higher resolution (spacing between jet ski lines of 50m) was used for more sensitive areas e.g. Philipsburg, as compared to 100m in other areas. This is necessary for more refined data, and depends on the sensitivity of the area and purpose of the work. A reef class could be included, but there are not many in the area.

Lessons from the Japan earthquake and tsunami

The events in March 2011 demonstrated the efficiencies and failures in the warning systems and the preparedness of the population, with Japan being acknowledged as the best-prepared country for tsunamis. Hazardous material spills were also a secondary hazard, along with impacts on the utilities.

It also illustrates the importance of strengthening the end-to-end warning systems in the Caribbean. The Caribbean is very prone to local/regional tsunamis, giving little time to react. Ensuring that the population knows what to do can significantly reduce the number of lives lost. The goal is to achieve a detection time of less than 1 minute for earthquakes.

Knowledge of natural warning signs, not returning before an all clear is issued, and learning lessons from past experiences are critical. Enforcing building codes and good land use planning, development of hazard maps and periodic testing of evacuation routes are also important.

In Japan people did not evacuate until after the 6m dyke gave way because it had worked before. Vertical evacuation was not high enough – persons climbed to the second floor, but waves reached the fourth floor. Hazard maps, dykes and simulations were based on a magnitude 8.0 event – the earthquake was 9.0; it started at 7.9 and was upgraded for 10 hours. This represents an appox 1:1000 year event. Significant crustal movement which occurred will necessitate redrawing of bathymetric and topographical maps.

Experience of Anguilla during the UNESCO IOC ICG CARIBE WAVE exercise

During the full scale tsunami exercise on 23 March, Anguilla conducted full warning simulation and live evacuations. Of particular note was the active involvement of the local community and school through their newly-developing community-based disaster management programme. Preparations included the following:

- With no hazard risk vulnerability analysis (HRVA) data, Anguilla moved to a low-cost model for community-driven data collection.
- EMWIN (Emergency Managers' Weather Information System) training was provided for IT personnel and warning managers, to be able to understand and use the incoming notification information. This option is preferred as the Global Telecommunication System (GTS) is a subscription service and is expensive.
- The community received DANA training and a cache of equipment.
- Fishermen used their VHF radios and determined whether to come in or move out to the deep.
- The school is located by the sea with a single access route in and out. There was an education programme targeting both teachers and children. There was good interaction and pariticpation, using materials developed by kids.

Total cost of the exercise was approx $150-200. The Dept of Disaster Management (DDM) is working with two communities to capture best practices, and which have also committed to help roll out the programme

across the island. Now they are moving into a third community. Rapid implementation will not necessarily have sustainability since limited capacities of the DDM are used to work with the communities every month. Funding is needed for redundant equipment. Also a written plan and map are needed showing evacuation locations for different hazards. The public and media are now aware of the risk; therefore it is incumbent on the DDM and other stakeholders to work to reduce risks.

Notable decisions from the recently concluded UNESCO IOC ICG (International Ocenographic Commission Intergovernmental Coordinating Group) CARIBE meeting included:

- Reporting after exercises must be completed in 1 hour to familiarise the national tsunami warning focal points (TWFP) with the process, train them to effectively execute their functions
- Tests tentatively to begin 1 Sept to allow time for notifications to be disseminated and EMWINs to be installed
- WAVE exercises will be conducted every 2 years to give time to make changes and implement programmes and for the ICG to develop the exercise

Oil spill management and Environmental Sensitivity Index (ESI) maps

The Regional Marine Pollution Emergency Information and Training Centre (REMPEITC) exists to strengthen national regional capacities, provide technical assistance and facilitate cooperation in the areas of oil spill preparedness and response and marine pollution prevention. They can organise national and regional activities, training courses, assist with development of national response plans, conduct exercises, and provide technical assistance and consultancy services.

ESI mapping involves identification of coastal resources at risk during an oil spill. Much of the necessary data exists in country, but is scattered across many departments. The first step is to centralise it and ensure that it will be maintained. Aruba developed its map in 2006 with REMPEITC but it was not digitised in a GIS. This is an activity that could be integrated into the work of GESP/UWI CGS EI/GIS4C.

EMWIN training

Concurrently, a training session was held on the use of the Emergency Managers' Weather Information System (EMWIN). Facilitated by NOAA NWS/UCAR JOSS, this system will allow notification messages about tsunamis and other natural hazards to be received via satellite.

These systems are promoted by UNESCO ICG particularly for receiving tsunami notifications as part of national early warning systems, and are a very useful tool, particularly as redundant support to the GTS. They will be installed either at the national TWFP, typically the meteorological office, or at the disaster management office or other designated agency for redundancy.

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