# Myanmar (Burma) Project: an Article

URISA GISCorps Volunteers Assist UNOSAT in Post Cyclone Nargis Relief Efforts

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Cyclone Nargis made landfall in Myanmar (Burma) on May 2, 2008. This cyclone was the deadliest natural disaster in the recorded history of Burma. On May 9th, Einar Bjorgo, the Head of Rapid Mapping, Applications and User Relations of UNOSAT, the UN Institute for Training and Research (UNITAR) Operational Satellite Applications Programme, contacted GISCorps and shortly after that, submitted a request for 20 volunteers. GISCorps was being brought in to assist UNOSAT and the UNJLC (United Nations Joint Logistics Center) in their support to the international humanitarian relief effort and local government agencies.

Based on the request, a job description was developed and an email broadcast was sent to GISCorps volunteers and many other list serves around the globe. Shortly after that, emails started pouring in and GISCorps Core Committee selected 20 volunteers for the project in less than 48 hours. Out of 20 volunteers, 11 of them with remote sensing expertise began working immediately, under the direction of Tom Ponte, a GISCorps volunteer from Oregon.

After GISCorps volunteers came on board, a decision was made to have them assist by performing change detection analysis on pre and post-cyclone image overlays made available by Google Earth and converted from data furnished by the US Government through the Pacific Disaster Centre. Every effort was made on the part of Google and UN connected personnel with expertise in remote sensing, to acquire the best possible imagery available from the major vendors.

Unfortunately, there was not a lot of good post-cyclone high-resolution imagery that was free of cloud cover. Even as late as three weeks after the event, the amount of detailed post-cyclone imagery that was available without cloud cover represented approximately only a tenth of the Ayeyarwady Delta region affected by the storm. Further, more, seventy kilometers southwest of Yangon (Rangoon); an area roughly 4000 square kilometers had neither good pre nor post-cyclone imagery. This was a heavily populated area directly in the path of the cyclone.

That said, there were a number of areas in the path of the cyclone where good imagery was available both before and after, and the change detection for those areas for the most part, showed total destruction. Perhaps, if enough data points had been gathered for a more significant portion of the disaster area, it may have been possible to extrapolate the level of destruction further. Given the shortage of post-event coverage, however, at the time, statistically reliable interpolations could not be made. It is important to note however that UNOSAT is using GISCorps data as part of an ongoing Fuzzy Logic modeling to indeed try to extrapolate to areas not covered by imagery. This is work in progress and it is too early to evaluate results yet. UNOSAT will keep GISCorps informed regarding the results.

Additionally, there was remote sensing analysis done to derive the extent of the flooding that covered most of the region. This flood analysis seemed to agree closely with the visual appearance of available high-resolution imagery. Change detection for destroyed roads and buildings on land was not easily accomplished using these more automated remote sensing techniques and required visual human interpretation. The average remote sensing experience level for GISCorps volunteers involved was quite high, with a few volunteers having more than ten years of experience.

In the weeks following the storm a fair amount of high-resolution pre-cyclone imagery overlays did become available. This allowed the GISCorps volunteers to go in and digitize pre-existing roads and buildings using Google Earth tools. The road layer derived in this fashion, although not topologically perfect, was considerably better than the best available road maps both spatially and in terms of completeness. Quite a few requests were made of the GISCorps for this layer.

As of May 21st, the first group of GISCorps volunteers (11) wrapped up their work and on May 22nd, UNOSAT requested another twenty volunteers to collect additional data in the delta region. As in phase one, 20 more volunteers were selected once again within 48 hours and 18 of them started collecting additional features from pre-disaster imageries. They came from US, Canada, various European countries and Karl Tiller from Germany was selected as the Project Manager for the second phase.

The main task for the second group was identified as digitizing as many additional structures from pre-cyclone imagery as possible. During the second phase, Karl Tiller assigned the volunteers to pre-designated regions. In some cases two to three volunteers were assigned to one region. They organized the areas to digitize among themselves and sent emails to the project manager to keep him informed of their progress. In general, communication via emails worked fine when providing instructions to a small group. However, for general communications the use of a wiki proved more effective. Every volunteer was easily able to add text or correct text in wiki environment.

Both phases highly benefited from the assistance provided by a Burmese born GISCorps volunteer, U Win, of California who not only digitized hundreds of features himself but also led a group of four other volunteers who worked independently on this project and digitized locations of thousands of buildings and places of worship. His knowledge of the area, culture, and geography was an immense asset to this mission.

Figure 8: Various Features Collected by GISCorps Volunteers

Lessons Learned (Challenges):

Any project of this magnitude has its challenges. Those challenges could be related to lack of data (particularly imagery in this case), procedures and work flows, documentation, communication, software, work flow, among others. The following are some of the challenges that GISCorps volunteers faced.

Lack of Data: The GISCorps effort was entirely predicated on the availability of good pre and post disaster high resolution imagery. Assessing the availability of this data at the outset of any disaster response using this response model is absolutely critical in determining the quality and quantity of GIS work that can be done remotely.

Communication: From the communication standpoint email seemed to work fine with the caveat that the project manager needed to have a very organized inbox. Trying to coordinate conference calls or web meetings given the disparity in time zones was a challenge. Therefore, various tasks became available on a first come first serve basis (whom ever answered the email first, got the task). Many of the volunteers had some limited day job commitments or were in bed in Europe when the requests went out from the west coast (USA). That meant, some perfectly capable volunteers may not have been available at the right time to get assigned work though eventually most of volunteers were assigned tasks. It is important to note however, that installation of wiki as a central documentation and communication tool proved extremely beneficial.

Inconsistent Quality: Another challenge was different quality of the digitized product generated by the volunteers. To avoid different interpretations it is absolutely necessary to produce understandable (especially in a Multilanguage team) guidelines with object descriptions. Even for experienced volunteers conducting a training session on the first day is critical and will assist in harmonizing the results. Also guidance on a one to one basis may be required for some volunteers. Further, background material about the region can improve the identification of various features.

Software related: One of the challenges for digitizing inside Google Earth with image overlays is that digitized features do not appear on top of the overlays. Unlike most GIS programs, GIS layers inside Google Earth cannot be stacked one on top of another in terms of visual priority. This meant that although the feature being digitized was at the top of the list in the "places" pane it would not appear on top of the overlay but rather underneath it on top of the default base imagery. Volunteers struggled with this limitation and did the best they could.

Another limitation of creating features inside Google Earth was that capturing attribute information had to be kept at a very basic level. In order to overcome this limitation, KMZ files were imported into ArcMap via an enterprise Arc2Earth license donated to the GISCorps by Brian Flood. Data was then further processed inside ArcMap for such things as cleaning attributes, removing duplicates, etc. The features were then organized and symbolized in ArcMap and exported to KML again using Arc2Earth.

On the plus side, Google Earth is free, easy to install and learn, more so than some of the competing virtual globe products. Polished, pre-prepared instructional documentation and video demos were helpful especially for volunteers with limited English or GIS skills. Google Earth can also be commended for making a big effort to acquire relevant imagery in a timely fashion.

Other Notable Points and Recommendations:

- 1. In a remote project, high speed internet is a must for every volunteer.

- 2. There needs to be one person, in addition to the project manager, keeping on top of activities of other agencies and the latest available data and imagery.

- 3. For some tasks, being available all day is more important than experience level.

- 4. Rules must be established upfront and be as simple and understandable as possible.

- 5. Clarify project's objective and final product definition from the start.

- 6. Preparation of digitizing instructions is critical.

- 7. Well documented processes and workflows is a must.

- 8. Encourage use of VoIP- communication tools such as Skype to motivate volunteers.

- 9. Installation of wiki as a central documentation and communication tool is essential.

- 10. Develop procedure for exporting data from GE and further populating in other applications such as ArcGIS.

- 11. Provide secondary data to help in understanding cultural background.

Comments on Quality Control:

At the end of each phase all collected information was delivered to UNOSAT and they conducted Quality Control on all those features. The following provides a few comments on delivered products.

UNOSAT reviewed the damage assessment and pre-disaster shelter data submitted. Damage assessments of bridges were found to be fairly consistent and well performed. Damage assessments of buildings were found to be quite heterogeneous. While some volunteers had done a very good job, a few did not seem to have the experience required for detailed damage assessments or too little time to perform the analysis. Therefore, some areas were well assessed, while other areas missed information on damages to buildings. For those cases, UNOSAT reviewed and adjusted the assessment.

Pre-disaster building identification was for the most part very well carried out. The volume of data produced was impressive, which was also recently noted in an Emergency Shelter Cluster Information Management training.

Maps and data were shared with the relevant coordination entities, such as the established Humanitarian Information Centre in Bangkok and the Myanmar Information Management Unit in Yangon. GIS data were used for individual map production locally, but also to calculate statistics in support to the Village Track Assessment (surveyors were equipped with UNOSAT/GISCorps maps).

Conclusion:

Overall 31 GISCorps volunteers participated in this project and collectively they contributed over 1,300 hours and digitizing over 60,000 features in the delta region. Though this mission was one of its first kind for GISCorps; an emergency response mission conducted fully on remote basis, the outcome helped many humanitarian organizations in a variety of applications. Perhaps a quote from Einar Bjorgo describes their organization's appreciation for GISCorps

volunteers services the best:"GISCorps is really helping towards making a difference here."

"....what I can say is that the work done by GISCorps is very highly appreciated by the actors in the field, both as input to our maps, but also as standalone databases which they include in their various local GIS assessments. Every single volunteer should be proud of the work done and rest assured that the data are being used - and will continue to be used as we move into the reconstruction phase of this disaster."

Figure 9: A Map Created by UNOSAT From Data Collected by GISCorps Volunteers