



# WHEN DISASTER STRIKES...

PARTICIPATORY GIS COMBINED WITH SATELLITE IMAGERY IS REAPING DIVIDENDS IN COMMUNITY EFFORTS TO MITIGATE NATURAL DISASTERS. STEFAN KIENBERGER, ALEXANDRE CASTELLANO, PETER ZEIL, ARNAUD RAULIN AND JÖRG SZARZYNSKI REPORT ON ONE SUCH PROJECT IN EAST AFRICA

Involving actors at local level is fundamental when addressing the issue of disaster risk reduction. This approach is enshrined in the Hyogo Framework for Action, the internationally-accepted framework for disaster risk reduction established through the UN. Currently, development programs and national policies empower community-level disaster risk reduction planning and implementation measures. However, the availability and use of suitable maps at local scale, as well as a clear, common understanding of the interaction between ecosystems, the stability of livelihoods and natural hazards in a spatial context, remains a challenge in many regions.

Under the European DIPECHO program (Disaster Preparedness European Commission Humanitarian Aid Office), the Italian Foundation Cooperazione Internazionale (COOPI) and the Centre for Geoinformatics (Z\_GIS) at the University of Salzburg, Austria, have initiated the GI4DRR project to address this challenge (<http://www.gi4dr.org/>). Its central objective is to support DIPECHO partners and NGO beneficiaries in practically applying geoinformation and Earth Observation imagery for disaster preparedness and response planning by local institutions, authorities and communities. For this purpose, it aims to facilitate the integration of local knowledge and perceptions into geoinformation analysis and enhanced spatial decision support tools.

## EU initiative

The European Commission's Humanitarian Aid Office (ECHO) offers rapid and effective support to the victims of disasters beyond the European Union's borders. On average, approximately 16% of its assistance is in response to sudden-onset natural disasters. In 1996, ECHO launched the DIPECHO programme dedicated to disaster preparedness ([http://ec.europa.eu/echo/aid/dipecho\\_en.htm](http://ec.europa.eu/echo/aid/dipecho_en.htm)). It targets highly vulnerable communities in some of the most disaster-prone countries of the world. In the South-East African and Indian Ocean region, these include Malawi, Mozambique, Madagascar and the Comoros.

The GI4DRR project is coordinated by COOPI (<http://www.cooi.org/>), originally established in 1964 in Italy as an NGO. COOPI implements developing and emergency interventions in 39 countries in four continents including other DIPECHO programs in three countries of South America. The current project is led by the COOPI office in Malawi. Z\_GIS (<http://www.uni-salzburg.at/zgis>) is supporting the project through training activities on community-based hazard and vulnerability mapping, providing technical and GIS expertise for the implementation of pilot studies. The Centre for Geoinformatics at the University of Salzburg is a well-established centre of

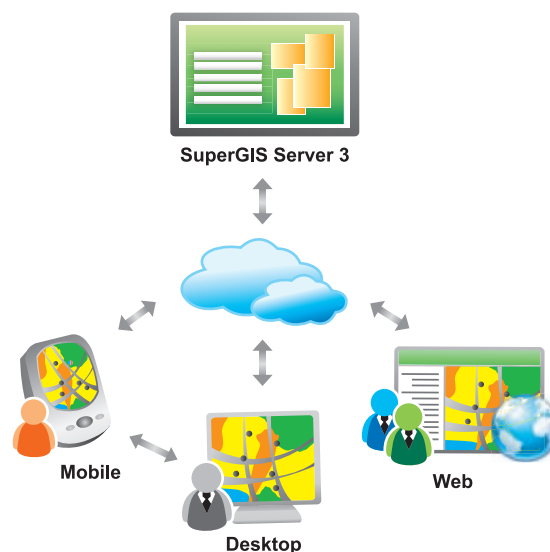


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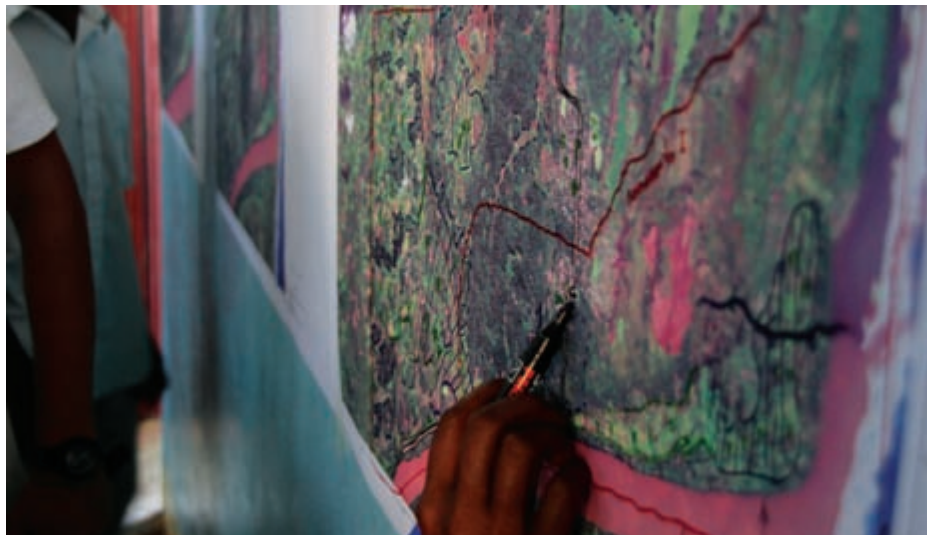


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competence in GIScience, active in research, continuing education and industry cooperation. With competence in basic and applied research funded through international programmes, Z\_GIS engages in educational and capacity-building activities, outreach initiatives and international collaboration projects.

### Universal access

On the implementation level, GI4DRR is supported by the United Nations Platform for Space-based Information for Disaster Management and Emergency Response – UN-SPIDER (<http://www.un-spider.org>). This programme within the UN Office for Outer Space Affairs (UNOOSA) fosters access for all countries and relevant international/regional organisations to all types of relevant space-based information and services. In Africa, UN-SPIDER currently has three active Regional Support Offices:

In Algeria, the Agence Spatiale Algérienne (Algerian Space Agency – ASAL)

In Nigeria, the National Space Research and Development Agency (NASRDA) and, In Kenya, the Regional Centre for Mapping of Resources for Development (RCMRD).

A series of workshops with regional partners has, to date, been conducted in Malawi, Mozambique, and Madagascar. Co-

facilitated by UN-SPIDER, these comprised presentations on relevant international space application programs in Africa and their potential benefit for national institutions.

### Participatory GIS

During the training sessions, different NGOs working in the DIPECHO program in Malawi, Mozambique and Madagascar were exposed to methodologies of GIS/Remote Sensing (Geoinformation) in the domain of Disaster Risk Reduction; on concepts of vulnerability, hazard and risk; an introduction to GPS and GIS software, and a participatory community mapping (PGIS) approach.

Such exercises teach and sensitise communities to the potential for disaster risk reduction and support their planning for such events. Additionally, brainstorming sessions are conducted to identify appropriate indicators for vulnerability mapping. In total, 14 NGOs have so far been trained in this method and are currently implementing its findings in local pilot studies.

COOPI has technically supported eight NGOs in the region to organise PGIS sessions within their partner communities. Different approaches have been tested to assess the reproducibility of the method on a larger scale. In most cases, COOPI and Z\_GIS have

been involved in the whole PGIS process: high resolution image acquisition (SPOT/GeoEye/Quickbird/Ikonos), participatory mapping sessions, digitizing and layout design. In addition to PGIS, eight pilot-studies have been conducted with partner NGOs in Mozambique and Madagascar

### Rapid results

In reflecting on the above experiences, it can be noted that using satellite images at community level proved extremely helpful in identifying features and integrating local knowledge. It is always surprising how fast local members, without any mapping experience, are able to orientate themselves on the map.

A further advantage is that the results are easier and faster to process compared with classical participatory mapping. PGIS can easily be applied at scales to support communities, districts or provinces with little loss of accuracy. Additionally, the method grabs community attention and is regarded as different and fun.

### Remaining challenges

A challenge is, of course, the cost of high resolution imagery. However, suppliers are keen to develop their market to NGOs and/or have programs to support local initiatives. For example, this project drew support from SPOT Image via its Planet Action initiative (<http://www.planet-action.org/>).

A particular focus is needed on the resources available to provide technical support and personnel who can deal with satellite data processing, digitising and GIS analysis, as well as printing and plotting. In the context of this project, technical support was supplied by COOPI/Z\_GIS together with national GIS experts or local universities. Some of the NGOs already have experienced GIS personnel but more are needed in the area of DRR both on a national and regional level. It is also important to have a clear, shared expectation of geoinformation products among the different partners involved.

However, this project strongly contributes to the need for sustainable partnerships with and between existing organisations ... partnerships that provide a bridge between the the GIS/Earth Observation and disaster management communities.

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### 3D LASER MAPPING ENSURES MINE SAFETY

A state of the art laser scanning system supplied by 3D Laser Mapping of Nottingham, England, has been used to improve safety of iron ore extraction in South Africa. The laser scanner manufactured by **Riegl** ([www.riegl.com](http://www.riegl.com)) forms an integral part of a Waste Spreader Positioning System (WSPS) developed by Stone Three Venture Technology in partnership with Reutech Mining. The WSPS is designed to ensure the safety of machine operators by calculating a safe zone of operation on the mine heap and monitoring the activities of the Waste Spreader within this defined zone.

[www.3dlasermapping.com](http://www.3dlasermapping.com)



*With a range of up to 650m and accuracies of 10mm, the scanner is mounted on a self-sufficient semi mobile platform from where it is used to monitor the expanding waste heap.*

### UN-SPIDER MISSION TO CAMEROON

Following a request by the Government of Cameroon, a UN-SPIDER Technical Advisory Mission visited the country to assess its use of and access to space-based technology and information for disaster management and emergency response. The team of eleven international experts visited a number of ministries in Yaounde and convened a formal stakeholders workshop with representatives from more than 30 Government organisations, agencies, and universities involved in disaster management activities.

Preliminary results of the visit were outlined in a debriefing session with the Director of the Civil Protection Department of Cameroon and workshop stakeholders. A technical report is now being prepared to support the Government's planned review of disaster management plans and its development of new policies and guidelines.

[www.un-spider.org/about-us/news/2011-06-27t120000/technical-advisory-mission-cameroon](http://www.un-spider.org/about-us/news/2011-06-27t120000/technical-advisory-mission-cameroon)

### 3DT AUGMENTS NIGERIAN DATASETS

**Third Dimension Technologies** of Lagos, Nigeria, has released a new address database that augments Lagos and Abuja with 25 further cities across the nation. A score of additional cities are expected to be added by the end of 2011. Simultaneously, the company has extended its street-level mapping to cover 300 cities across the nation, including Kaduna (pictured below); added a demographic layer based on population data, and refined road data class to include both tarred and untarred roads.

[www.3dtechnologies.org](http://www.3dtechnologies.org)



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