Spatial Data Infrastructures and Open Source GIS to help developing countries. Case of climate change problem in Ebinat (Ethiopia)

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Summary

The increasing interest in the use of the Geographic Information in our days has taken to many countries and organizations to adopt a combination of techniques, policies and mechanisms to share spatial information, known as Spatial Data Infrastructures (SDI). However, this revolution affects and benefits more developed countries, while in developing countries the change is still getting started. This article explains the first steps taken and the training given to the local staff about how SDI, combined with Open Source GIS software to access them, can optimize the understanding and interoperable utilization of geo-spatial data and therefore contribute to the development of the needy nations. A real case of use referred to the management of the climate change problem in the Ethiopian region of Ebinat is being developed at the moment.

Keywords: SDI, open source, developing countries, interoperability, gvSIG, climate change

1 Introduction and motivation

In Ethiopia, chronic food insecurity affects 44% of the population, according to the estimates for 2004-06 there were 34.6 million undernourished people (FAO, 2009). With more than 80% of the population living in rural areas (Central Statistical Agency of Ethiopia, 2008), entailing high structural food insecurity, Ethiopia has strong agricultural potential. However, the Plan for Accelerated and Sustained Development to End Poverty of the Ministry of Finance and Economic Development emphasizes that although productivity has increased in recent years, production is still well below the desired level.

After joint reflection on the development plans for the College of Agriculture and Environmental Sciences, Bahir Dar University and Universitat Jaume I have proposed a series of objectives and activities in keeping with the University Cooperation Strategy for Development.

The general objective established for the project is to contribute to improve food security and agricultural productivity in the Amhara Region by strengthening BDU's Centre for Research and Community Service in Disaster Risk Management.

This work is a collaboration of the UJI Institute of New Imaging Technologies and the UJI Local Development Institute with the Bahir Dar University, through a Inter-university Cooperation Program (PCI) which is funded by the *Agencia Española de*

Cooperación Internacional para el Desarrollo (AECID) and also assisted by the UJI International Cooperation Program.

In the Ethiopian region of Ebinat (in Amhara state), the variable atmospheric conditions and climate change are affecting the local agriculture system and the consequences might be irreversible. However, scientific and technological advances are nowadays more and more helpful in that sense. Red Cross organization is working in the affected area focusing in a farmer to farmer learning model in order to promote the adaptation to Climate Change by the farmers. The project described in this paper will be just a small part of a bigger project coordinated by Red Cross and Climate Center organizations. Our challenge will be to analyze how humanitarian organizations can use and benefit of GIS technologies for disaster management, food security and other related issues.

By using SDI, combined with Open Source GIS software to access them, we may improve the understanding and interoperable utilization of geo-spatial data, optimizing the existing geographical resources in the region and therefore contributing to the development of the needy nations.

2 Aim and objectives

As stated before, the overall goal of the collaboration between UJI and BDU is to reduce the risk of climate change-induced disasters and food insecurity. Optimizing the understanding and utilization of geospatial data in a proper way by the local community is just one of the objectives of the project and the one in which this article is focused.

To achieve this goal, the following specific objectives have been formulated:

- ✓ Contribute to increase the awareness of the available geographical and map information of the local community in the regions of Bahir Dar and Ebinat.

- ✓ Collaborate with the University of Bahir Dar supporting the establishment of a GIS Lab there.

- ✓ Help in the integration of humanitarian issues into the work of the GIS team in University of Bahir Dar.

- ✓ Define the specific conditions and needs in the region, focused on the climate change problem.

- ✓ Implement a simple Spatial Data Infrastructure with the existing data in the region in order to help them to access it easily, using Open Source technologies as a priority.

- ✓ Contribute to the development of the region of Ebinat, making geo-information work for that local development.

- ✓ Lead training courses/workshops of free open source GIS software *gvSIG* so that local team could manage in a better way the geographical information and improve their knowledge in this area.

- ✓ Analysis the gaps and constraints to effectively utilizing climate data and information within a GIS to inform decision-making.

- ✓ Share the knowledge within the Geographic Information Community.

3 Methodology and work plan

The work developed will be eventually part of a master thesis currently being implemented inside the *Master of Sciences in Geospatial Technologies* program. Literature review has been the first step, followed by the definition of needs in the area of interest (Bahir Dar and Ebinat regions in Ethiopia), which will be a crucial step in order to focus the project in a proper way since the beginning. On that purpose, a regular communication process with responsible team in Ethiopia and with the coordinator of the Red Cross project via e-mail, Skype and other is being done. This task may be extended as a continuous process and, since the work to be carried is quite practical, we may find new needs while the project goes on. Nevertheless, those tasks will be accompanied with the corresponding research and comparison with other countries that may have similar conditions, figured out from the literature review process.

Gathering of data has to be done as soon as possible in order to start establishing a geographical database that will group all the existing data (maps, layers, images, tables...) However, we know that this process may not be easy and it depends mostly on the quick feedback of the several institutions and organizations involved.

One of the objectives of the project is to increase the awareness and knowledge of local people in GIS technologies and geographical skills. On that purpose a training course will be held in the region during November 2011, and preparation of material, tutorials, user manuals, presentations, etc. will be a prerequisite before travelling there. Once in Ethiopia, we will be meeting the team in the University of Bahir Dar to train them in the use of *gvSIG* Open Source GIS software and also in the establishment of a GIS Laboratory there, making special emphasis in the tools and functionalities more related with the climate and the agricultural aspects.

In parallel of most of the tasks, the implementation of a very simple Spatial Data Infrastructure will be done, by the creation of several online resources (map services) that will improve the accessibility and interoperability of existing geographical data. Those services will follow the OGC standards (WMS, WFS, WCS, etc.). The establishment of a geographical Database, *PostGIS* or similar, will also be a prerequisite. Open Source technologies will be used as a priority within the SDI implementation process.

After that, a testing phase will be applied, as well as the general evaluation of the results in the different steps of the project.

Eventually, several maps will be designed for different purposes according to the needs of the local staff at the Bahir Dar University and Ethiopian Red Cross. User support will be given to them as well during (and afterwards) the project through forums, online platforms or mailing lists.
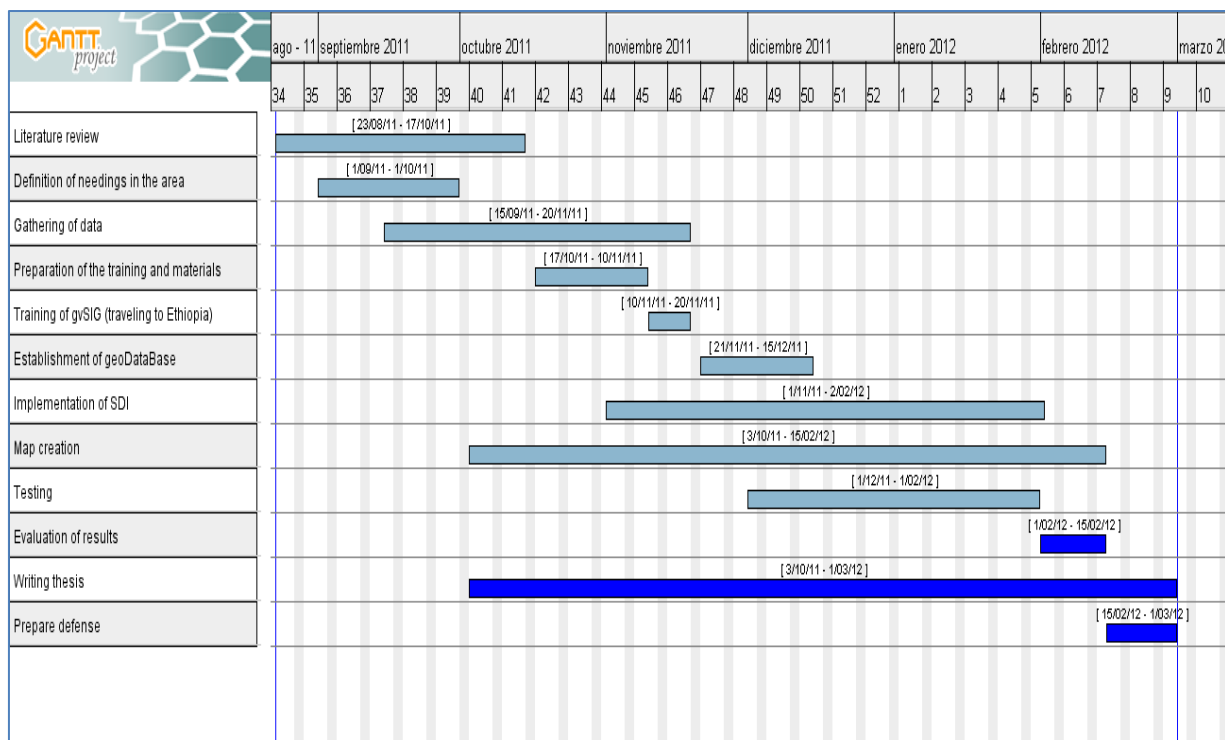
Image 1. *Work plan established for the process, including gathering data, staff training and evaluation of results.*

4 Bibliographic references

[1] Anguix A., Díaz L. (2008), "gvSIG: A GIS desktop solution for an open SDI", *Journal of Geography and Regional Planning* Vol. 1(3), pp. 041-048. http://www.academicjournals.org/JGRP/PDF/Pdf2008/May/Anguix%20and%20D%EDaz%20.pdf; Date of query: December 2010, Last update of the website: May 2008.

[2] Gavin E., *Building SDI in Africa: a South African experience*. Hatfield, Pretoria, South Africa

[3] Muhwezi B.J., *Consolidating efforts for achieving a sustainable SDI in Uganda*. Geoinformation Services, Uganda Bureau of Statistics.

[4] Qadir U., (2009). *Integrating Climate Information into Humanitarian Efforts, Final Report*.

[5] Suarez P. (2009), *Linking Climate Knowledge and Decisions: Humanitarian Challenges*

[6] *Global SDI Association*: http://www.gsdi.org/ and *"SDI Cookbook"*

[7] *gvSIG* Project website: www.gvsig.org