GIS DATABASE ON HYDRO-GEOMORPHOLOGIC DISASTERS IN PORTUGAL (DISASTER PROJECT)

Base de datos SIG sobre desastres hidro-geomorfológicos de Portugal (Proyecto DISASTER)

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Resumen: En el siglo XX Portugal continental se vio afectado por varios desastres naturales de origen hidro-geomorfologico con altos niveles de destrucción. El proyecto DISASTER tiene como objetivo crear una base de datos hidro-geomorfológicos, consistente y validada, mediante la creación, difusión y explotación de una base de datos en SIG sobre inundaciones y deslizamientos de terreno catastróficos, cubriendo un periodo desde 1865 hasta la actualidad. Se han utilizado como fuentes, periódicos nacionales, regionales y locales. Cualquier evento hidro-geomorfológico se almacena en la base de datos si ha provocado víctimas, heridos, desaparecidos y evacuados o personas sin hogar, independientemente del número de personas afectadas y del valor de los daños y perjuicios. La base de datos se divide en dos partes: (i) las características de los hechos y (ii) los daños y perjuicios. Estos datos permitirán una mejor comprensión de las dimensiones espaciales y temporales de los desastres hidro-geomorfológicos en Portugal.

Key words: GIS database, Natural Disasters, Floods, Landslides.
Palabras clave: Base de Datos en SIG, Desastres Naturales, Inundaciones, Deslizamientos.

1. INTRODUCTION

The inventory, development and exploitation of natural disasters databases, which include characteristics of the occurrences, their impacts and value of losses, have been used worldwide in recent years for different purposes (Tschoegl *et al*., 2006).

In Europe, the European Commission identified the need to have wide monitoring capacities, where the standardization of data collection should be a priority (ECDGE, 2008). For instance, in Italy an important effort has been made to produce, exploite and disseminate disaster information (Guzzetti and Tonelli, 2004; Salvatti *et al*., 2010).

The development of natural disaster databases is absolutely decisive for risk management purposes because it highlights the relationships between the occurrence of dangerous natural phenomena and the existence of vulnerable elements (e.g., people, assets, activities) that can be quantified through human and material losses.

Recently, risk prevention became a priority in Portugal which is reflected in the National Programme on Policies for Territorial Management. The general guide for the Portuguese territorial management states that risk management and prevention must be considered in all instruments dealing with territorial planning and management.

Hydrologic (floods) and geomorphologic (landslides) events are the most common natural disasters worldwide, as well as in Portugal. Nevertheless, the basic information on past floods and landslides which occurred in Portugal is scattered and incomplete and this is a shortcoming for the implementation of effective disaster mitigation measures.

The research project named "DISASTER - GIS database on hydro-geomorphologic disasters in Portugal: a tool for environmental management and emergency planning" supported by the Science and Technology Foundation aims to develop, exploit and disseminate a GIS database on disastrous floods and landslides which occurred in the Portuguese mainland since 1865 (earliest dates for available newspaper records).

In this work, we discuss the concept of Disaster applied in the Portuguese context.

In addition, the methodological aspects related to hydro-geomorphological data collection and the multiuser online database development linked to a GIS are presented.

2. BASIC CONCEPTS OF THE DISASTER DATABASE

In the framework of the United Nations (UN) International Decade for Natural Disaster Reduction (IDNDR, 1995), Natural Disaster was defined as "a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources". Therefore, the concept of natural disaster includes the direct and indirect negative impacts to society (in social, economic and environmental terms) resulting from the occurrence of a hazardous natural phenomenon (Alexander, 2000; Wisner *et al*., 2004).

The EM-DAT (Tschoegl *et al*., 2006) is the most well known international disaster database. For a disaster to be registered into this database at least one of the following criteria must be fulfilled: (i) 10 or more people reported dead; (ii) 100 or more people reported affected; (iii) declaration of state of emergency; or (iv) call for international assistance. The EM-DAT criteria are relatively strict if applied at national level, and this is the reason why this disaster database includes only 10 hydro-geomorphologic events for the Portuguese mainland for the 1900-2008 period. In fact, many floods and landslides that have resulted in relevant social and economic losses are not included in this database and need to be considered at the national level for risk analysis purposes.

Therefore, the Disaster Project considers a hydro-geomorphological disaster any flood or landslide that, independently of the number of people, caused either casualties, injuries, or missing, evacuated or homeless people.

In the context of this work the concepts of Disaster Case and Disaster Event are also differentiated. A Disaster Case is an unique hydro-geomorphological occurrence which fulfills the Disaster database criteria, and is related to an unique space location and a specific period of time (i.e. the place where the flood or landslide harmful consequences occurred on a specific date). A Disaster Event is a set of Disaster cases sharing the same trigger which can have a widespread spatial extension and a certain magnitude.

3. ORGANIZATION OF THE DISASTER DATABASE

3.1. Data Collection

Fig. 1 represents the methodology for data collection and storage using an online multiuser database. The data collection process starts with the selection of newspapers by three research teams based in Oporto, Coimbra and Lisbon. Newspapers were selected according to two criteria: 1) the newspaper must have been published continuously for a long period of time; 2) the set of selected newspapers should guarantee the best regional spatial distribution of the news, in order to cover the whole country.

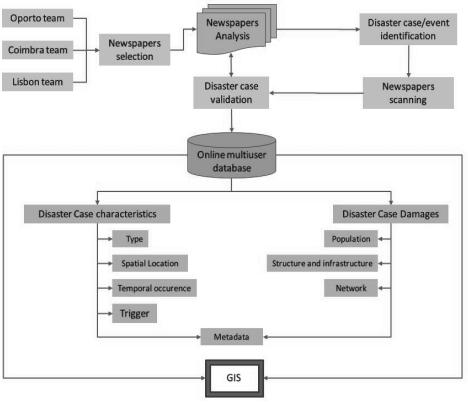

Fig. 1. Methodological scheme of data collection and storage of the Disaster database.

The complete set of newspapers used in the Disaster database is showed in Table 1, including the corresponding reference

Table 1. Newspapers used for data collection.

Newspaper	Reference period	Category	Distribution	Spatial incidence
Diário de Notícias	1865-2010	Daily	National	Portugal (mainly the metropolitan area of Lisbon and the Tagus valley region)
Jornal de Notícias	1888-2010	Daily	Regional	Northen Region (mainly the metropolitan area of Oporto)
Diário de Coimbra	1931-2010	Daily	Regional	Centre region (mainly the Coimbra area)
Soberania do Povo	1936-2010	Weekly	Local	Centre region (mainly northwest area)
Região de Leiria	1935-2010	Weekly	Regional	Centre region (west area)
Jornal do Fundão	1946-2010	Weekly	Regional	Centre region (mainly east area)
Diário do Alentejo	1933-2002	Daily until 1982 and after then weekly	Regional	Southern Region (Alentejo)
O Algarve: o semanário independente	1908-2001	Weekly	Regional	Southern Region (Algarve)

period, category, distribution and spatial incidence.

The national daily newspaper selected (*Diário de Notícias*) provides the longest time period, having been published continuously since 1865. The remaining data sources are mainly daily and weekly newspapers having a regional spatial incidence. The majority of the newspapers are in analogical support (paper or microfilm).

The next stage includes the reading and interpretation of the news (newspapers analysis). During this process the Disaster cases and events are identified according to the Disaster project criteria.

The complete set of news reporting hydro-geomorphological disaster cases/events are subsequently scanned and converted to digital support (.PDF). Next, all Disaster cases are validated using the newspaper main report and cross-checking different news sources (national, regional and local newspapers).

3.2. Database structure

In the next stage, the information about the characteristics and damages of Disaster cases are introduced in an online database which is currently available for project members only. Using an online database, on a client/server model, allowed teams based in different parts of the country to introduce data, provided there is an internet connection. For maximum portability, development was made on a LAMP platform, comprised of an Apache Webserver, a MySQL database engine and using the PHP programming language built on a Linux Server. In addition to portability, this platform also provides an efficient, secure, and cost free solution. The back office handles all data loading and exporting, as well as future data provision on a public interface.

The database comprises two major parts: (i) the characteristics of the occurrences and (ii) the damages (Fig. 2). The first part includes data on type, subtype, date (starting date and hour), location (council, parish and Portuguese military projected coordinate system), triggering factor and information source (name, source type and news trustworthiness). The size and location of the news of occurrences and events on the newspaper page were also recorded in order to, at a later stage, evaluate the change in importance that is given to disaster news over time by the mass media.

The second part of the Disaster database records damages: number of casualties, injuries, missing, evacuated or homeless people, type of damages in buildings (superficial, structural or functional), number of affected buildings, type of damage in networks (superficial, structural or functional), interruptions in road and railroad circulation and extent of interruption.

4. FUTURE DEVELOPMENTS

The Disaster Project database is expected to be concluded during 2012, and the

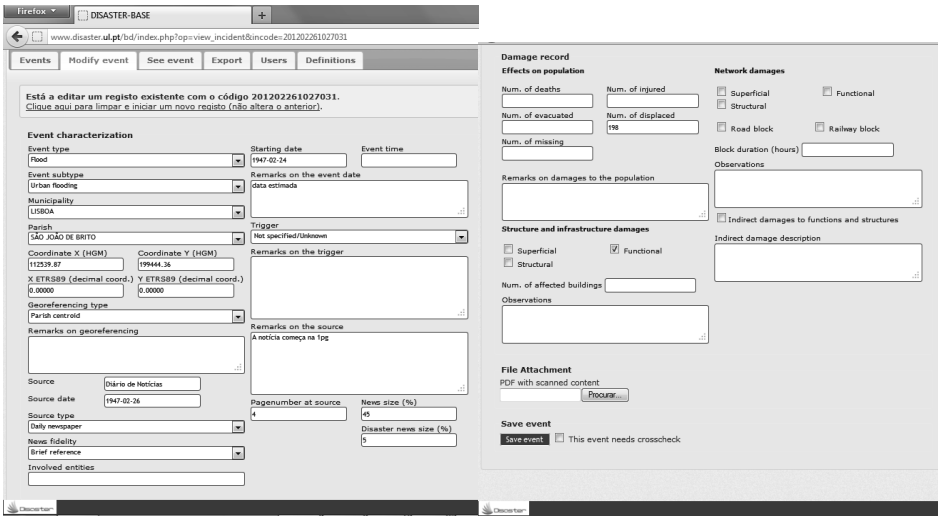

Fig. 2. Disaster database web page for data entry and validation.

following tasks will be performed until the end of the project in 2013: evaluation of the Geographic Distribution of Hydro-Geomorphological Disasters; evaluation of the Time Dimension of Hydro-Geomorphological Disasters; vulnerability Assessment of Elements subject to Hydro-Geomorphological Disasters; climatological analysis of rainfall extreme events in Portugal and relationships with Hydro-Geomorphological Disasters; implementation of the Project Web-GIS and dissemination of results.

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