

CURRENT STATUS OF THE MAPPING OF FLOOD RISK AND ITS APPLICATION IN THE LAND. THE CASE OF THE REGION OF MURCIA

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I. INTRODUCTION

The natural risk analysis required in most of its development, the spatial expression of the areas associated with a hazard (both at different severities as probabilities of occurrence) and the geographic location of the elements at risk and vulnerabilities. Therefore, the mapping has become an indispensable tool in the analysis and evaluation of natural hazards from the initial stages as a source of information, through analysis and modeling support, and ending with the publication of results as the basis of representation .

The risk map represents the delineation of areas where there is a possibility that a number of sectors or segments of society are affected by a natural occurrence of extreme type. Therefore, risk zoning involves a process of integration of two types of mapping, hazard, aimed at zoning according to the frequency and intensity of occurrence of a particular natural phenomenon, and the vulnerability and exposure , which is to express the situation and temporary stay of the elements at risk, mainly people, goods and services, as well as to the dangers inherent fragility. Finally there is also the mapping of emergency management, applied a strong character because they are designed to be used in the operational processes of intervention before the occurrence of natural disasters.

The role of cartography is really important in the case of flood risk analysis, since there are different parameters and variables of the agent that can be represented by the space component (depth, velocity, sediment load, etc.).. Furthermore, this expression mapping of risk levels for easy integration with territorial preventive measures, such as planning and management of uses and stays in risk areas (Elízaga, 1983). The article discusses each of the forms of expression of such maps.

II. FLOOD HAZARD MAPS IN SPAIN

Spanish cartographic production in flood risk is increasingly important, however, progress in its coverage of the territory is quite slow because most cases are limited to specific studies or pilot areas. One of the main explanations for this situation is the lack of specific guidelines for processing, which makes a homogeneity in the work and, more seriously, raises serious difficulties in the selection of an appropriate scale with regard to each place.

Among the organizations that have developed flood risk mapping highlights the Geological and Mining Institute of Spain (IGME-ITGE). This institution has developed over its long history many anecdotal reports and general studies focused on the characterization and analysis of natural hazards. The peak in the scientific-technical-ITGE IGME in the field of flood risk analysis occurs in the decade of 1980-1990 and the beginning of the next decade (Díez and Lain, 1998). Among the works with each cartographic expression to highlight two types of studies:

— Maps sighted risk of flooding in urban areas. Three groups of methods in an integrated way (historical-statistical, hydrologic-hydraulic and geological-geomorphological), by which floodplain obtained for different return periods (5 to 500 years) and large scales (1:2500, 1 : 5,000, 1:8000 or 1:10.000). In the Region of Murcia are conducted to the municipalities of Puerto Lumbreras, Lorca, Totana and Archena (Pernia, et al, 1987). The results obtained in the two nuclei included in the study area reveal important areas flooded on both banks of the river courses and Nogalte Guadalentín. Unfortunately all these works have been in vain, since, as discussed below, consideration of these planning policy has been nil. There is no link between these works and town planning legislation and occupation that is being done in these areas is growing flood.

— Establishment of geological criteria for flood forecasting in areas of local, provincial or regional governments. This is preventive studies on geological (geomorphological, sedimentological, hydrological, hydrogeological risks ...), and anthropogenic climate which allow a certain degree of predictability of the flood. The results are maps in the mid-scale (1:25,000 to 1:500,000) which reflects the flooded spots, exposed elements, and foreseeable risks.

On the other hand, Centre for Hydrographic Studies, part of the Experiment Station of Public Works (CEDEX, Ministry of Development), has been at the forefront methodological hydrological-hydraulic analysis of floods. However, cartographic production in the field of risk maps is limited to specific studies or pilot areas in which models have been tested.

Finally, as noted above, the Directorate General of Water Resources, initially from the Ministry of Public Works, Transport and Environment (MOPTMA) and, currently, the Ministry of Environment, Linde has embarked on the program, focusing to develop the boundary of the Public Water (DHP) of rivers as envisaged in the existing Water Act 1985. The documentation produced in the framework of Linde, DPH mainly maps and flood-prone areas is essential as hazard mapping at the risk of flooding in its probabilistic aspect. Moreover, because this definition closely linked to a legal effect, facilitates their integration into spatial planning, in particular their necessary inclusion in municipal planning.

III. THE FLOOD RISK MAPPING OF THE BASIS FOR PLANNING IN THE REGION OF MURCIA

The flood risk maps for use in regional planning in the Region of Murcia come primarily from two sources:

1. The Atlas Inventory of Natural Hazards in the Region of Murcia

The Atlas Inventory of Natural Hazards in the Region of Murcia has been until recent years, the reference document for any work on the territory since its completion in 1995. Unfortunately, what should be a thorough study on these aspects, is nothing more than a generalist approach of the main risks affecting the territory (landslides, earthquakes, extreme weather events and floods) accompanied by a mapping small-scale applicability in management issues near zero.

The chapter devoted to the Atlas of flood risks, includes a description of the hydrography and hydrology of the basin of the Segura, a simple explanation of the mechanisms of floods and a catalog of historic avenues. Risk analysis itself, in theory, the most important point of the study, is shipped in four short paragraphs. The first (5.5.1 Areas of potential danger), is a mere regional level classification of spaces according to the degree (high, medium and moderate) of its potential danger of flooding, which would be necessary a series of actions to prevent or reduce as far as possible flood damage (5.5.1 Areas of potential danger). For the location of these areas used two sources of information:

- Areas that have suffered at some point the effects of floods
- Areas with a probability of being damaged because there are causes that can cause flooding.

The results are presented in a flood zone map (vid. Fig X). As can be seen, scale, 1:500,000 is so extremely small that prevents their use for specific sectoral actions on the territory of reference. In fact, it is a simple mapping that offers only a very superficial impression of the risk of flooding in the area of Murcia. Despite the general of that document, it is understood that only has been considered a risk area outside the drainage basin of the Segura and its tributaries (Rambla de Benipila in Cartagena) when it was less than five years since the publication of this work the floods had hit hard the towns of Mazarron and Aguilas, causing even the loss of human lives. Even in the second section of that risk analysis titled, urban areas and hot spots (5.5.2), the latter two populations contained in the list of places where the authors believe that the flood could affect significantly. Including whether they are Puerto Lumbreras and Lorca, with 10% and 15% respectively, of the inner city streets affected by plants of 50-100 year return period. To determine the proportion in each of the populations studied, used as a base map drawings National Topographic Map 1:50,000 scale maps and flood hazard work "Geology and flood damage prevention" (Ayala. et al ., 1985). Unfortunately, the work does not attach any of these detailed maps, which, surely, if that could have been used in work planning and land use boundaries later.

Finally, there are two section (5.6 defense measures against floods and preventive operations) closely linked to each other, about defense measures against floods in the basin of the Segura and preventive actions should be to bring out. In this sense, the study builds on work done in the year 1982 by the Directorate General of Water Resources for the Civil

Protection National Commission on the actions needed to prevent and reduce flood damage in the Segura Basin. It recommends a series of actions fall into two groups: structural methods and management activities.

The former are well known: mill dam, correction and regulation of channels, channeling, diversion channels, etc. The latter include activities such as soil conservation and reforestation, establishment of an insurance system, installation of alarm systems and forecasting, integrated hydraulic system, a type of action that qualify as zoning and legal regulations, which could be interpreted as measures of planning. Unfortunately, among the most important findings of this study, raw technocratic approach to the problem, and planning, which is not dedicated or a paragraph, is completely neglected by structural measures.

It should be noted that much of the works and projects that are listed as necessary, and were collected previously by the General Defense Plan Avenues by the Hydrographic Confederation in 1977 and adopted in 1986 by the Directorate General of Hydraulic Works.

2. The Civil Protection Special Plan for Flood in the Region of Murcia

INUNMUR Plan (Plan Civil Protection Special Flood Region of Murcia), replaces the outdated maps of IGME and stands as the document to be consulted on any land demarcation process under Article 12 of the Act ground state of 2007 provided that the competent basin organization dictates otherwise not have a definition or replacement.

The assessment of flood risk mapping is done by the INUNMUR Plan demonstrates the shortcomings identified so far. Below is a detailed analysis of what are the weaknesses and foibles of each of the maps developed for some of the towns of Murcia Region most affected by the floods.

IV. THE NATIONAL FLOOD ZONE MAPS

On November 26, 2007 came into force a new European Directive on the assessment and management of floods (Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management flood risk) whose transposition into Spanish law should be made before November 26, 2009. With the launch of the National Flood Zone Mapping by the MARM (Ministry of Environment and Rural and Marine Affairs), Spain became one of the first European countries to apply the principles of the directive.

With the development of the National Flood Zone Mapping will be made available to citizens through the Internet, all flood hazard maps made by the Ministry of Environment and Rural and Marine Affairs and those who provide the Autonomous Communities within their competence. This system will generate and facilitate consultation of the entire floodplain mapping available in the country. It will be a basic tool:

- Protection of Public Water Basin Organizations and the defense of the flood hazard areas, serving as a basic tool for the issuance of reports on authorizations in the Public Water and their associated zones and flood management in connection with the Automatic Hydrological Information Systems.

- Proper planning of the actions of defense against floods, identifying vulnerabilities on which they must act as a priority.
- Planning and management of flood areas in the scope of its powers, the Civil Protection authorities.
- Provide this information to other governments (especially the planning authorities and planning) and promoters on the existing floodplain and the risk that exists to build on them.
- To inform citizens about the dangers existing in each area so that it will provide sufficient information to improve transparency in the management of all administrations.

Regarding the development of the National Flood Zone Mapping is being conducted in two phases: The first is the identification and collection of all floodplain studies already carried out, whether prepared by the Marmara or the Autonomous Communities.

The second phase will make the generation of new floodplain mapping from the sections at risk. This phase will start running in the watersheds of the Bay of Biscay and Júcar and, increasingly, in other watersheds that manages MARM through the Hydrographic Confederations. For the Segura basin, the Ministry of Environment and Rural and Marine has tendered for more than three million such work and it is estimated that 1,250 kilometers have to define channels, which will result in a total of 100,000 acres mapped.

To perform this last step identified the following areas:

1. Determination of DPH by criteria hydrological, geomorphological and environmental issues.
2. Preferential flow path, which may, if necessary to establish themselves as police zone
3. Avenue associated with different return periods, under natural and altered.

It thus appears that the method chosen to complete the gaps now definitely been mentioned. If you follow the steps outlined in this new project seems to have an efficient mapping and reliable enough to establish for the first time a definition of sensitive areas of flooding in line with what happens in nature. Therefore, trust is only the future municipal management plans, implement wisely directed to be made for each case, with the main objective of integrating all the security guarantees to the flood risk management process territorial.

V. FINAL REVIEWS

The flood risk maps are an irreplaceable tool for identifying areas and elements and thus subject to the same efforts to distribute proportionally to the levels of involvement. That is, knowing the potential level of impact of flooding on the various elements distributed in the territory helps to analyze, make decisions and develop measures for management and planning.

Spanish cartographic production in this area has experienced a breakthrough in the last two decades due to advances in techniques used to model natural watersheds. In this sense, the number of software dedicated to this task has been growing in number, and now there is a diverse group of private profit-driven tools such as MIKE-SHE, MIKE 11 and SOBEK or free of charge as: AVSWAT-2000, ArcHydro, TauDEM, MODFLOW-2000, HidroSIG

and, above all, the family of programs developed by the Hydrologic Engineering Center (Hydrologic Engineering Center) from the body of engineers from the U.S. Navy (U.S. Army Corps of Engineers).