

FIRST STEPS IN THE IMPLEMENTATION OF THE FLOODS DIRECTIVE IN SPAIN

Preliminary flood risk assessment and flood hazard maps

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**1. Directive
2007/60/CE.
The Spanish
point of view**

The first drafts of the Directive had as reference the floods occurred in the 80's in the larger international European rivers, and they were designed as a response to these problems.

**2. Institutions
involved in
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in Spain**

This point of view was analysed with worry from Spain, because it left out the torrential floods that usually occurs in mountain torrents and in the Mediterranean catchments.

**3. National
System for
Cartography
of Flood
Prone Areas**

Finally, these items were incorporated to the Directive.

**- Types of
existing flood
maps**



- Hazard maps



4. Work to do

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4. Work to do

- Directive. Whereas 9. [...] **different types of floods occur**, such as river floods, **flash floods**, urban floods and floods from the sea in coastal areas.

- Directive. Article 2. "flood" definition [...] shall include floods from rivers, **mountain torrents**, **Mediterranean ephemeral water courses**

The **Mediterranean ephemeral streams** are short fluvial systems that are usually dry most part of the year. The typical flood events in these currents are a combination of the basin physical characteristics of these areas (*steep slopes, sparse vegetation, thin soils and permeable rocks*), and intense, heavy and irregularly distributed rain. Runoff generation is sudden, resulting in a flash flood with sharp, narrow hydrographs with short time lags.

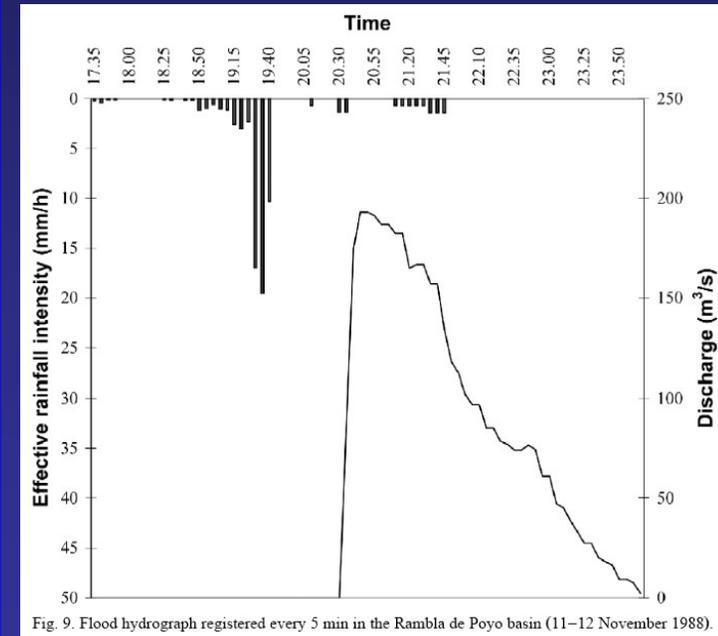


Fig. 9. Flood hydrograph registered every 5 min in the Rambla de Poyo basin (11–12 November 1988).

FIGURE'S SOURCE: *Flood events in Mediterranean ephemeral streams (ramblas) in Valencia region, Spain.* A.M. Camarasa Belmonte, F. Segura Beltrán. *Catena* 45(2001)229–249

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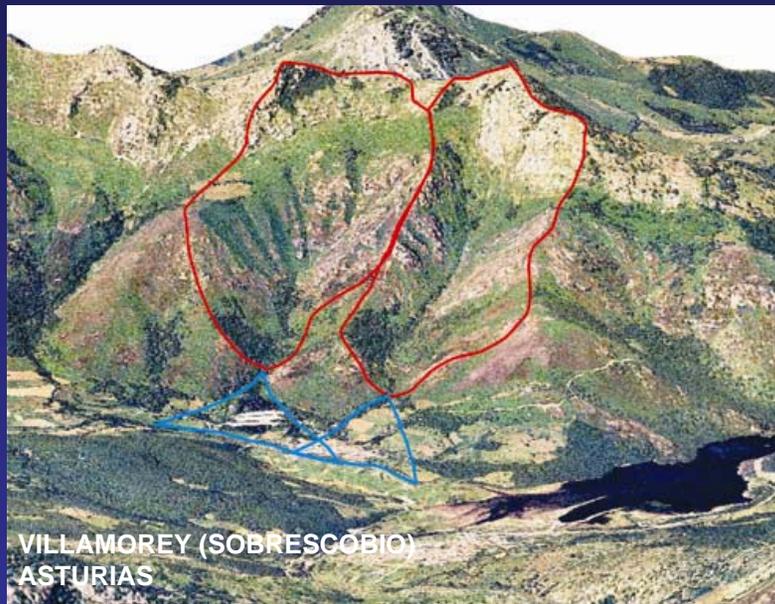
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4. Work to do

The mountain torrents refers to the debris and mud flows, landslides and floodwater that happened in mountainous area caused by heavy rainfall.



The technical analysis about Mediterranean ephemeral streams and mountain torrents floods is quite different to the typical European rivers, because the amount of sediment load is very high and the processes of erosion causes morphological and river path changes. The classic engineering approach based on water and sediment transport equations results weak without taking into account geomorphological and sedimentological studies.

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4. Work to do

Key issue for flood protection!

Removing floodplains suppose the reduction of areas with a high potential to retain flood water and sediment transported load. It contributes to aggravate flood damages.

*Directive. Article 7.3. Flood risk management plans shall take into account relevant aspects such as costs and benefits, flood extent and flood conveyance routes and areas which have the **potential to retain flood water**, the environmental objectives of Article 4 of Directive 2000/60/EC, soil and water management, **spatial planning**, **land use**, nature conservation, navigation and port infrastructure.*



ESVA RIVER.
ASTURIAS. SPAIN.
Floodplain retains
sediment

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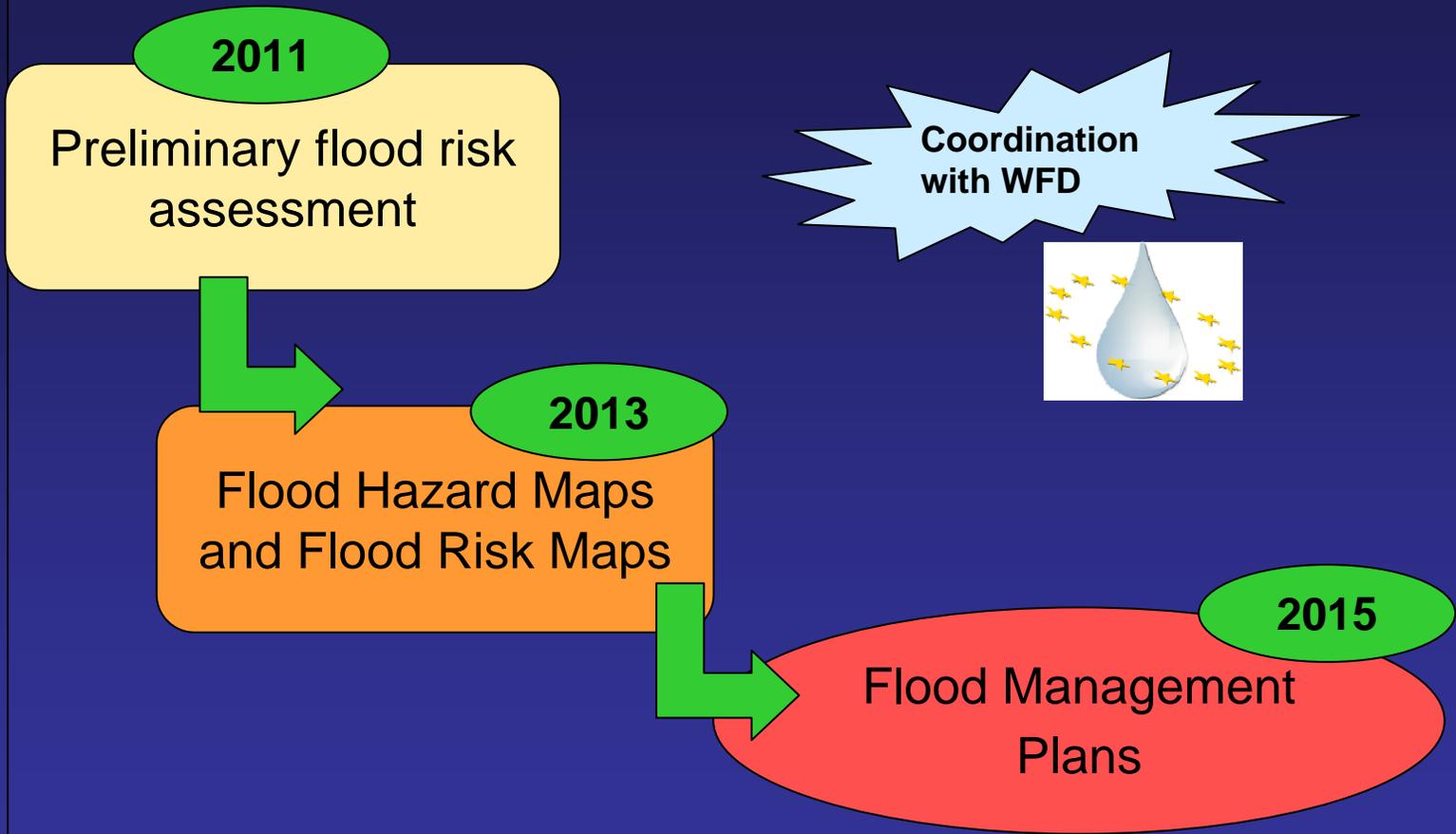
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4. Work to do



Key issue!

Participative and coordinated management between authorities is needed to design the best solutions and not to fall into contradictory initiatives.

Developing of a management directive must involve flood control, land use planning, fluvial and riparian systems restoration and water management.

The distribution of competent authorities for flood management in Spain involves mainly to:

- <i>Types of existing flood maps</i>	River basin districts	National administration	To administer and to control the HPD and regulated areas
		Regional administration	
- <i>Hazard maps</i>	Regional and local units of management	Regional and local administration	Land use management
4. Work to do	Civil protection	National administration	Emergencies management
		Regional administration	

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4. Work to do

Recent law amendments appoint that, the river basin districts must inform to the land use planning competent authority about the available studies and data related with flooding. This information must be taken into account for land use management, especially for the authorizations of non-vulnerable activities in flooding areas.



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4. Work to do

NATIONAL SYSTEM FOR CARTOGRAPHY OF FLOOD PRONE AREAS

The flood hazard maps will be developed by the Ministry of Environment and Rural and Marine affairs in coordination with the Autonomous Communities and Civil Protection.

Aims:

- Identification and analysis of existing flood (hazard and risk) maps
- Integration of these maps in the system
- Developing of new flood hazard maps when necessary

If work is finished before december 2010, article 10 will be used

Preliminary flood risk
assessment

2011

Flood Hazard Maps

2013

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4. Work to do

The preliminary flood risk assessment is being realized on the base of the existing flood maps plus the historical floods records.

Quality and suitability of the existing hazard maps is being evaluated, and the available information will be integrated into the system with the aim of avoiding duplicity of work

New hazard maps will be developed based on:

- Geomorphological and environmental analysis
- LIDAR and orthophotomaps
- The national Map of maximum flows (by CEDEX) will be used as the hydrological input
- Hydraulical modelling
- Building of digital cartography (using GIS)

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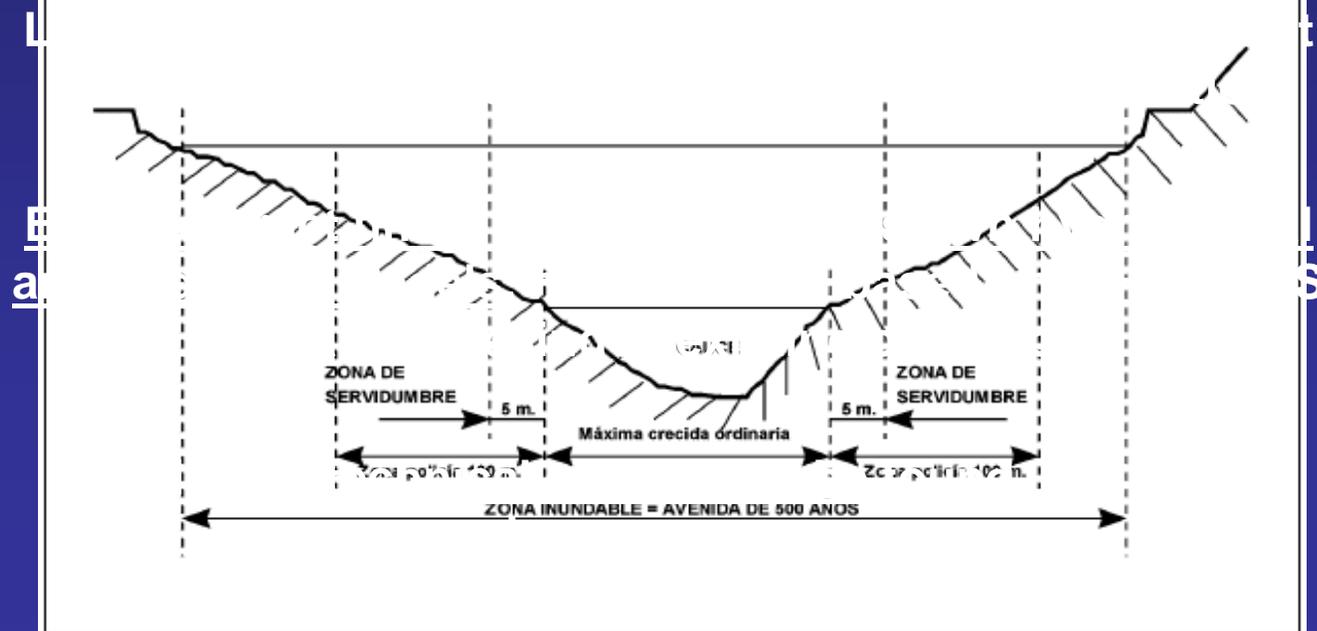
- Hazard maps

4. Work to do

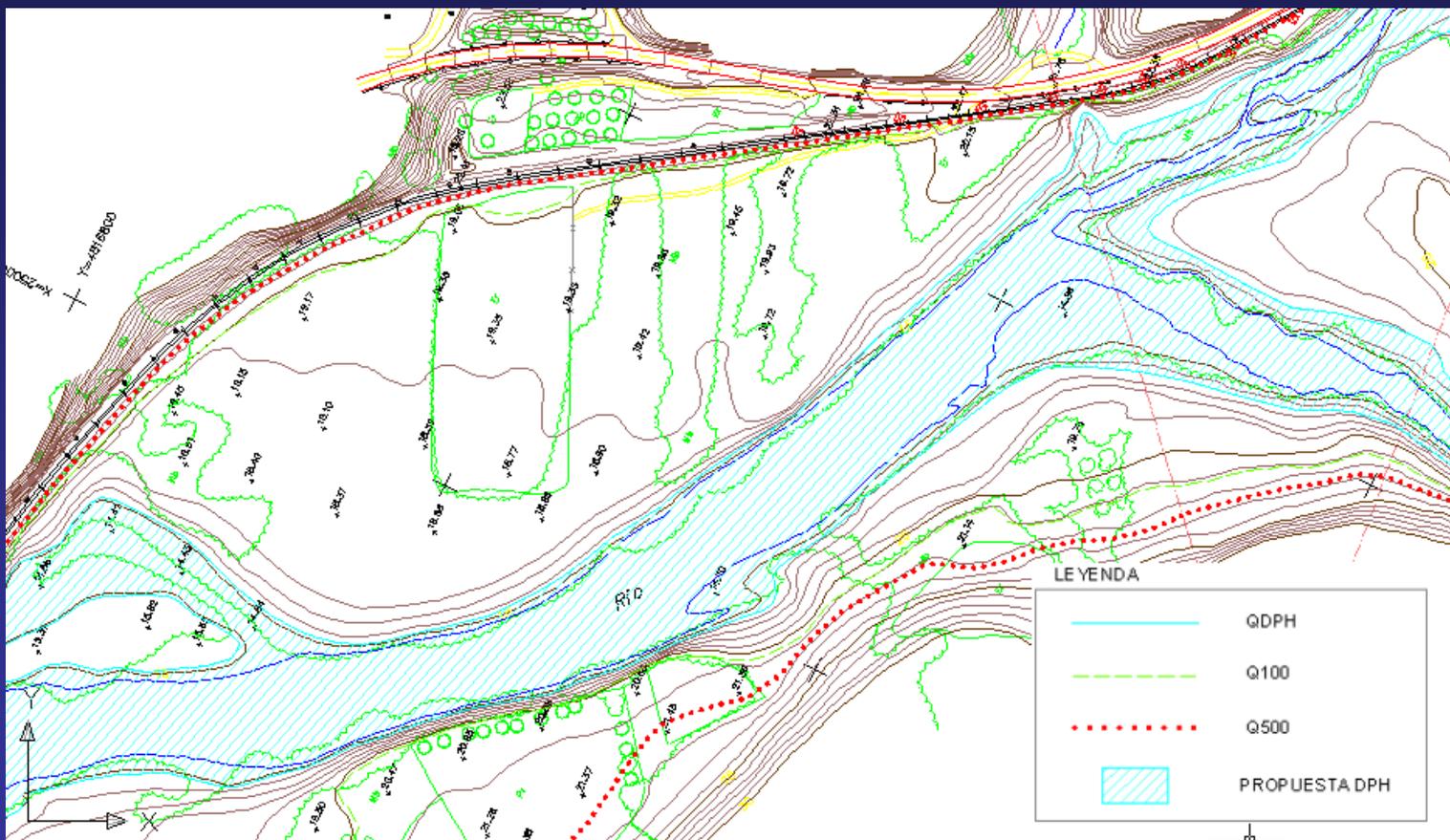
1) The Linde project maps

MoE launched back in 1993 a project called Linde as a tool for the delineation of the river channel (which is called HPD, or Hydraulic Public Domain) plus some administrative boundaries which have regulations (water law) in order to protect the river environment

These maps also include the 100- and 500-year floods



1) The Linde project maps



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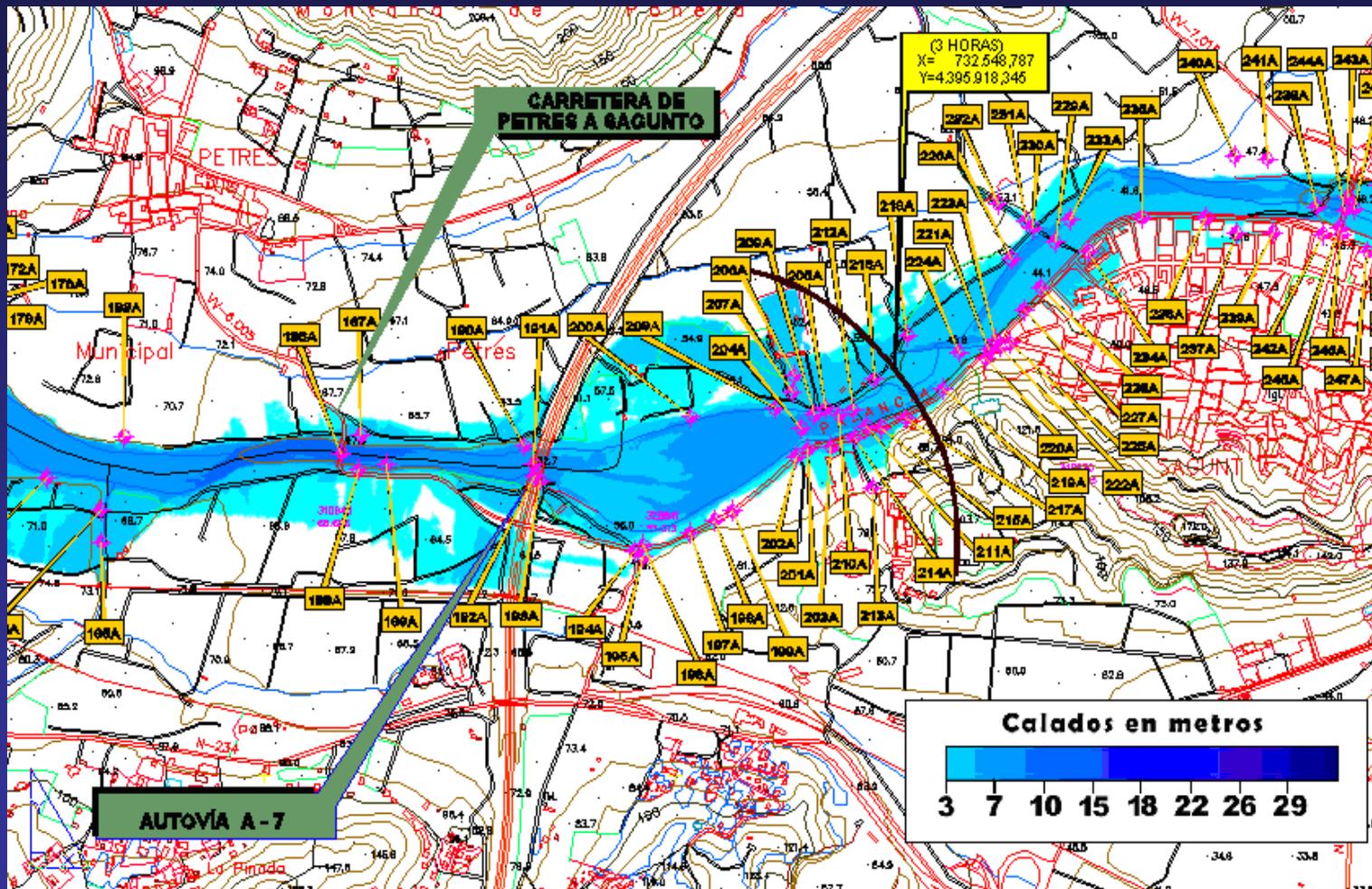
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2) The PEP maps



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4. Work to do

3) The CP's maps

Civil Protection, in compliance with the Basic Directive on Flood Risk Management (31/01/1995), develops flood risk maps in every Autonomous Community

Hazard maps are developed on the basis of frequent, occasional and exceptional floods (i.e. 50-, 100- and 500-yr floods)

CP's maps also realize a risk assessment but the hazard maps are less detailed than Lindes and PEPs.

CP's flood risk maps were elaborated according to historical flood data and damages produced, so that a matrix of impact of the flood was created in which risk was assessed

The historical flood data are collected in the 'National Record of Historical Floods', that is a base document that collects data on historical floods, based on a common guideline, which is being updated nowadays.

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4. Work to do

4) The Autonomous Community's maps (ACs)

ACs are responsible for land use management according to their laws.

Land use planning laws ban building in areas with 'risk of flooding'

Some ACs have developed flood mapping for urban planning purposes

Hazard maps identify areas exceeding certain depths and velocities in a set of probable scenarios for which a hazard matrix is done

Vulnerability analysis uses economic criteria to the goods exposed to floods

Risk assessment is based on the vulnerability of the goods exposed to hazards

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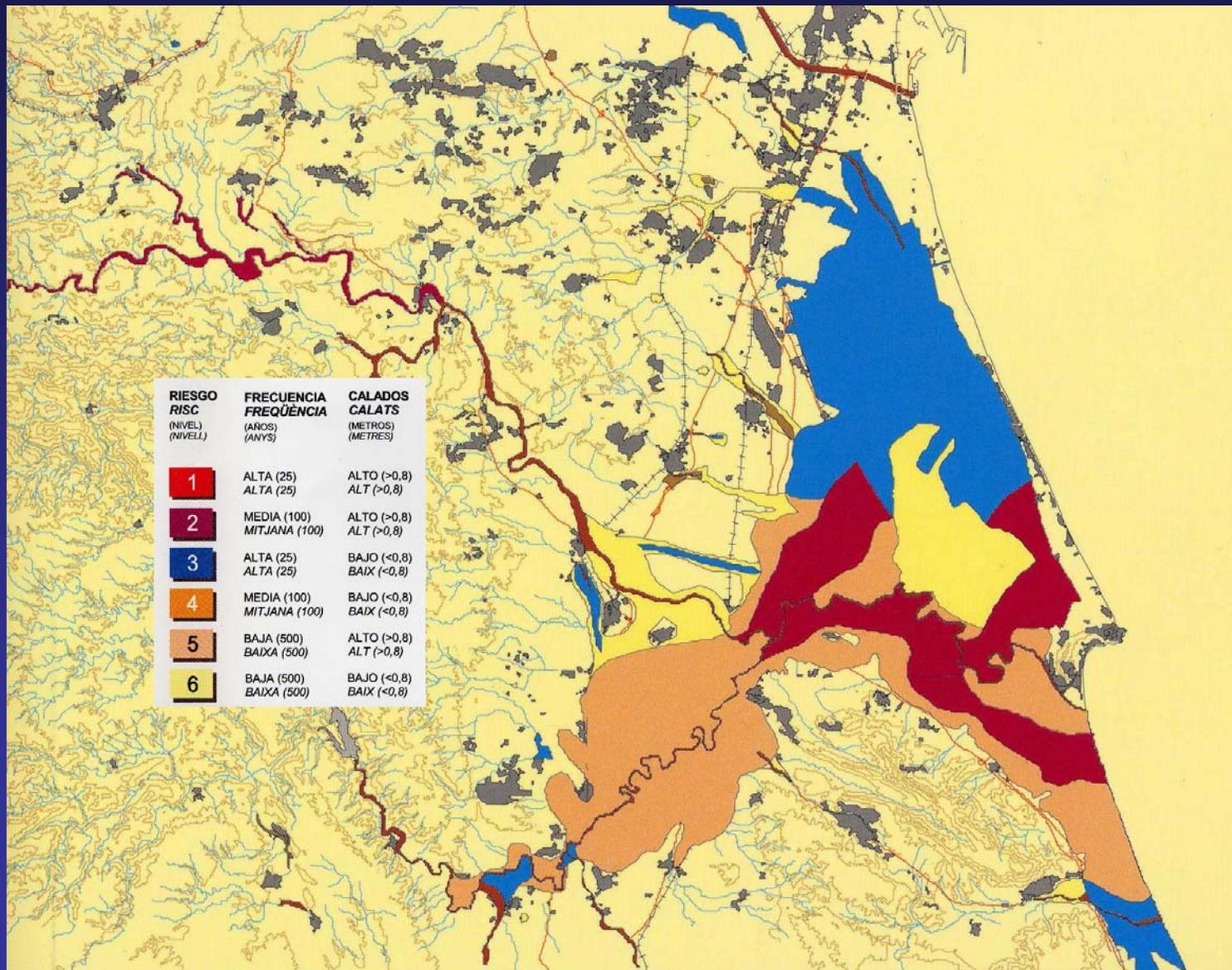
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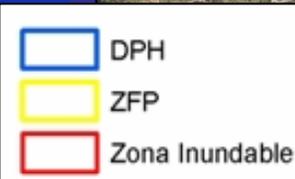
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4. Work to do

DEVELOPING OF NEW HAZARD MAPS

Elements to be delineated:

- Hydraulic Public Domain: using hydrological, geomorphological and environmental criteria
- Areas where the flow is “essentially concentrated”: activities in these zones may be regulated
- Areas flooded for different return periods: high frequency (HPD), medium frequency (100 years) and extreme events (500 years)
- Identification of areas with torrential activity.



Example of the new delimitation of de HPD

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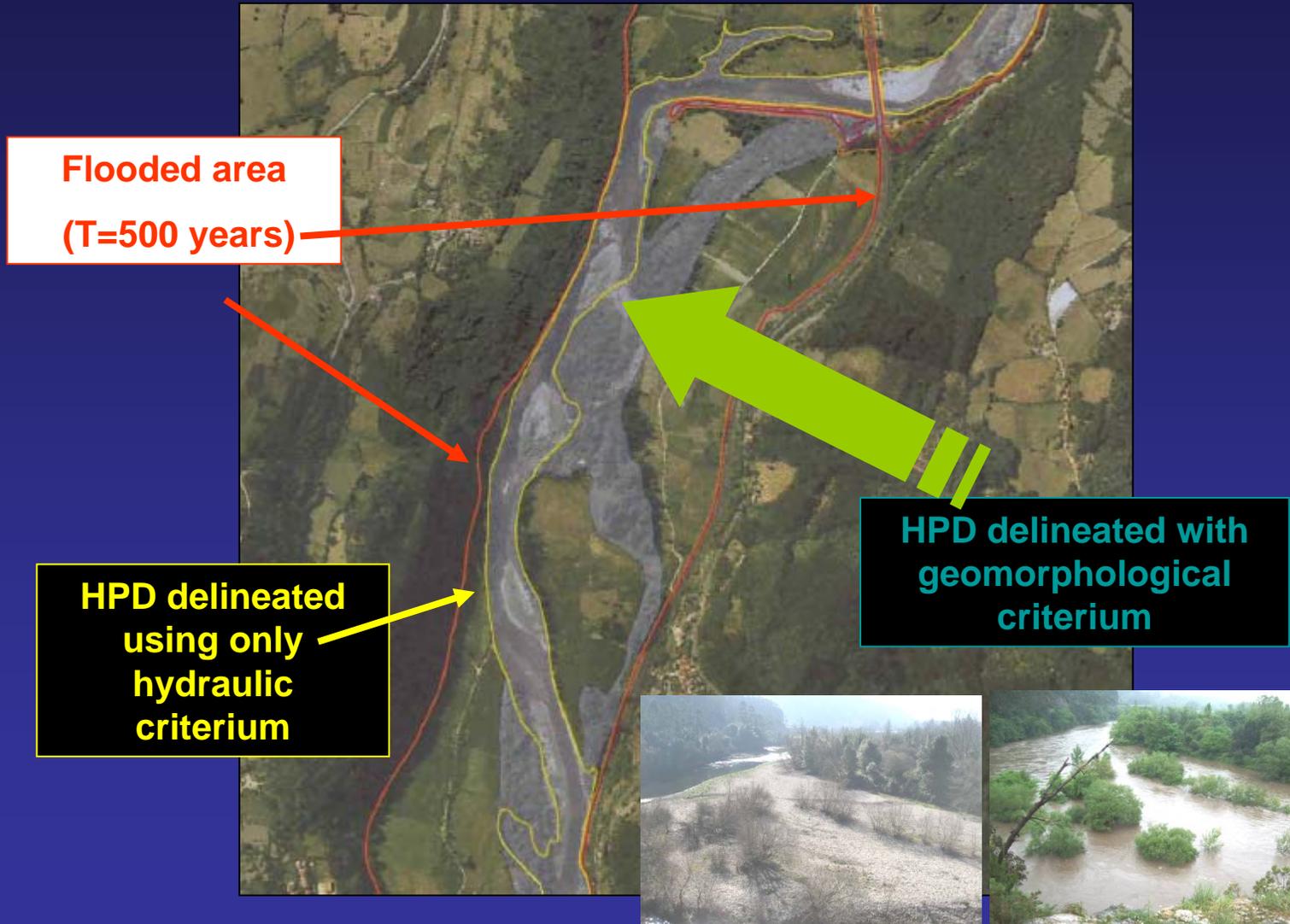
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4. Work to do



A protected space for the river

To obtain the aims of preserving the 'good state' of the water mass and preserve the role of floodplains in the lamination of water and sediments, the areas where the flow is "essentially concentrated" will be protected by the Spanish law. Only will be authorized in this area the non-vulnerable activities that will not reduce the outflow capacity.

Room for the river



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4. Work to do

The area where the flow is essentially concentrated

Area where
flow is
essentially
concentrated

Area of dangerous
flood



$$h > 1\text{ m}$$

$$V > 1\text{ m/s}$$

$$h \times v > 0,5\text{ m}^2/\text{s}$$

Areas with geomorphological and historical
evidences of high energy

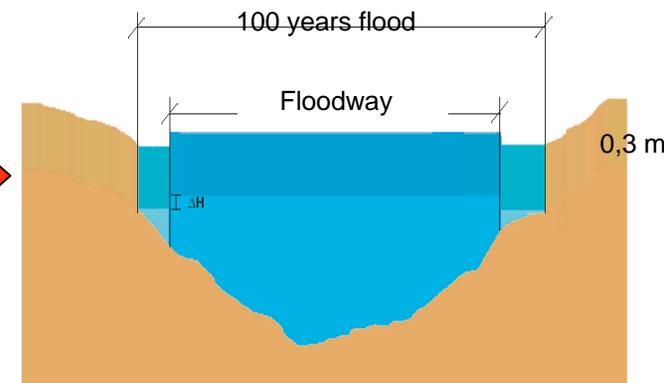
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Floodway

Encroachment



analysis



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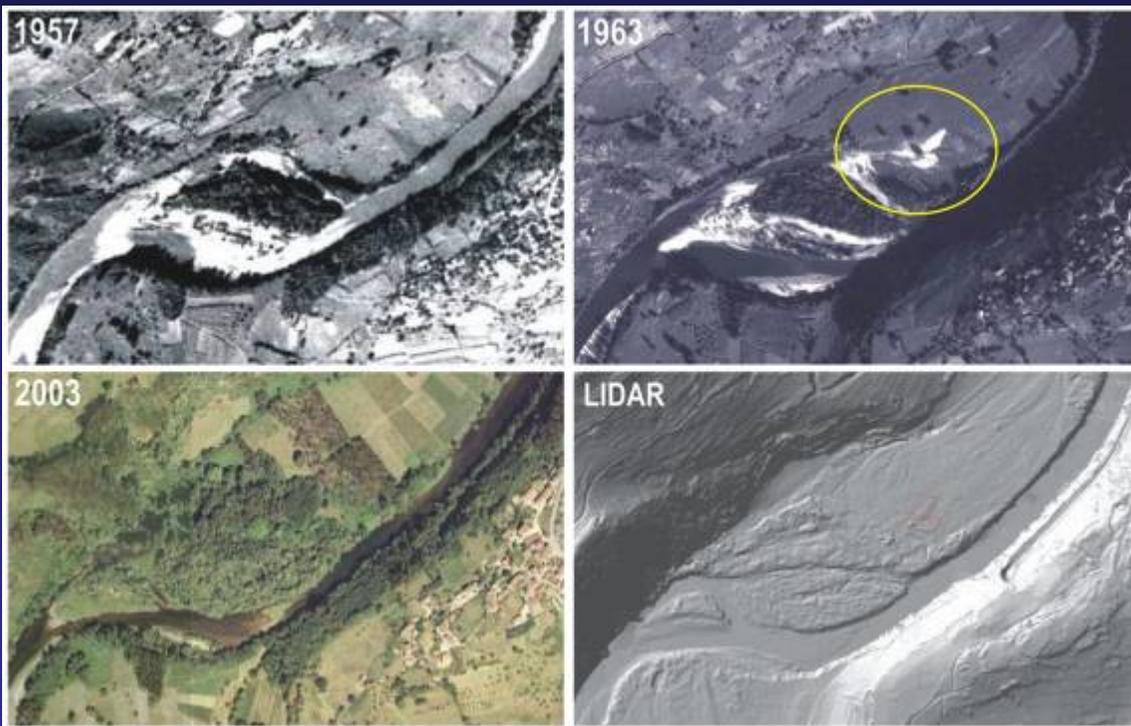
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4. Work to do



Geomorphological criteria used
for the delineation of the area
where flow is essentially
concentrated:

- Secondary flows
- Erosive and sedimentary evidences
- Fluvial system evolution

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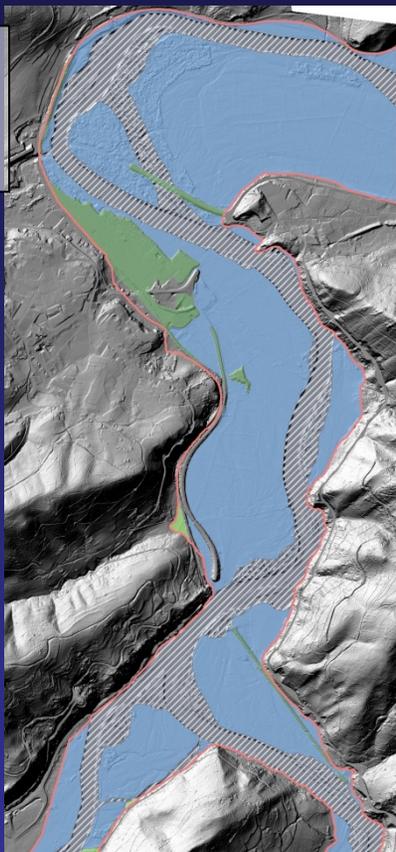
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4. Work to do

LEYENDA

	Alta
	Media
	Baja



Delimitation of flooded areas

In addition to hydrological and hydraulic methods, information regarding floods occurred in the past, and the analysis of geomorphological evidences is a key issue for an appropriate delineation of the flooded area.

High frequency: less than 50 years
return period

Medium frequency: 100 years return
period

Extreme events: 500 years return
period



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4. Work to do

Work done and work in progress...

- Digitalizing information from previous flood studies (identified 50.000 km of rivers with flood information)

- Finishing an application for the visualization and consultation of the information from internet

- Developing new hazard maps for more than 1.000 km of rivers

- Beginning to develop of new hazard maps for more than 3.000 km of rivers

- In elaboration a methodological guide for flood hazard developing (coordinated by CEDEX, IGME, INDUROT, CP and River basin authorities)

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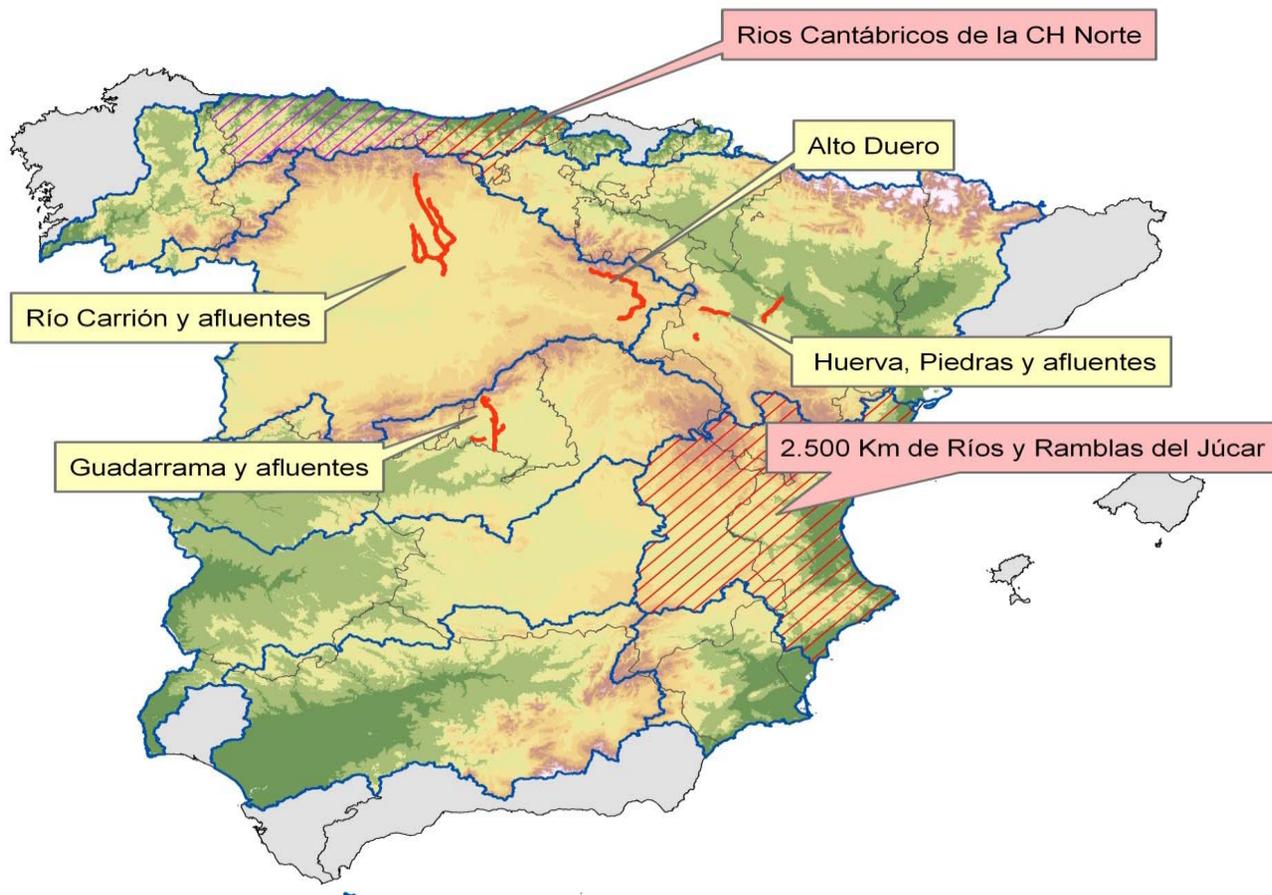
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4. Work to do

Work done and work in progress...



The rivers in red colour mean that the work is being done at present. Lined areas mean the zones where work will be done within a short period of time.

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4. Work to do

The following steps for the implementation of the floods directive will be;

- *Transposition to the Spanish law*
- *International coordination (mainly with Portugal)*
- *Vulnerability analysis in the areas of risk*
- *Developing of flood risk maps in these areas*
- *Finally, developing of flood management plans*



Thank you for your attention

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4. Work to do

The effects of this kind of floods are impressive. These are some examples occurred in Spain:

- in 1957 a 2,500 m³/s flow of the River Turia (Valencia) killed 86 people;
- in 1962 a 1,200 m³/s in the Riera de Rubí dry bed (Barcelona) killed 973 people;
- in 1982 a convective storm with 300 mm precipitation in a single day caused the collapse of the Tous Dam (Valencia) resulting in a flood peak of 15,200 m³/s killing 38 people;
- in 1995 a storm produced flash flood killing 10 people in Yebra (Tagus basin).
- in 1996 87 people dead in Biescas's campsite by a mountain torrent caused by a 160l rainfall in 1 hour that carried 13.000 tonnes of sediments in a 500 m³/s flood.