



GOBIERNO  
DE ESPAÑA

MINISTERIO  
DE MEDIO AMBIENTE  
Y MEDIO RURAL Y MARINO

CONFEDERACIÓN HIDROGRÁFICA  
DEL JÚCAR

# WORKS FOR THE IMPLANTATION OF THE DIRECTIVE 2007/60/CE IN THE JUCAR BASIN

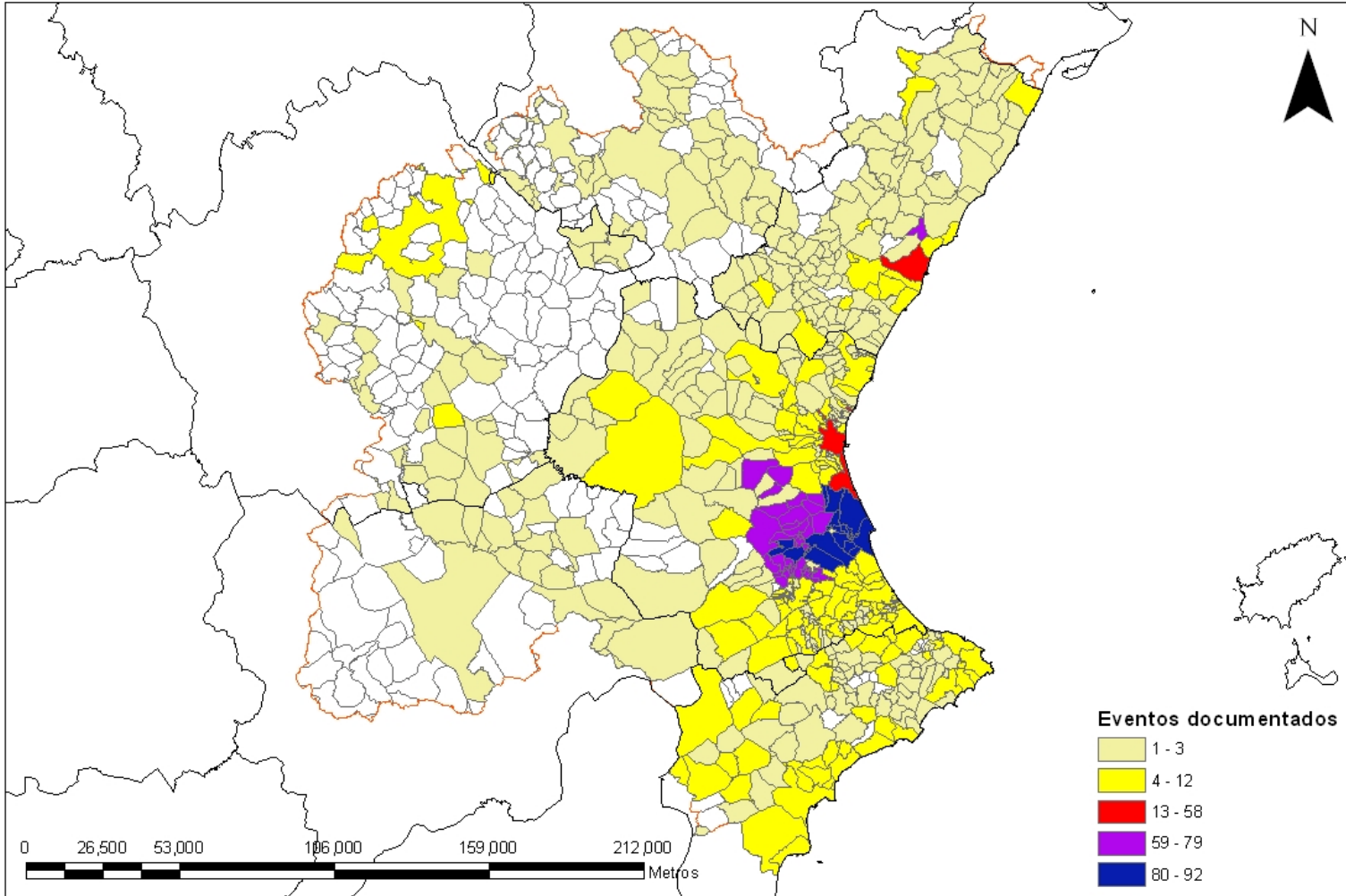
Onofre Gabaldó  
Confederación Hidrográfica del Júcar

# JÚCAR RIVER BASIN




# HISTORICAL DATA

Eventos documentados por municipios



# PREVIOUS MEASURES

- Early warning systems (1989)
  - Civil protection plans (1994)
  - Land use planning (2003)
  - Dam operating rules
  - Several hydrological studies and defence infrastructures
- 
- A close-up photograph of a single water droplet falling into a pool of water. The droplet is captured mid-fall, creating a vertical column of water that is still attached to the droplet above. The impact has created several concentric ripples on the surface of the water. The entire scene is illuminated with a strong blue light, giving the water a deep, vibrant blue color. The background is dark, making the water and the droplet stand out prominently.



# MARCO NORMATIVO DE APLICACIÓN



• **DIRECTIVE 2007/60/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL ON THE ASSESSMENT AND MANAGEMENT OF FLOOD RISKS.**



• **RD 903/2010 DE 9 DE JULIO DE EVALUACIÓN Y GESTIÓN DE RIESGOS DE INUNDACIÓN.**

• **REGLAMENTO DEL DOMINIO PÚBLICO HIDRÁULICO (RD 849/1986, DE 11 DE ABRIL, MODIFIED BY RD 9/2008, DE 11 DE ENERO).**

**This modification incorporates elements from the directive**



# DIRECTIVE STEPS



- **PRELIMINARY FLOOD RISK ASSESSMENT**

By December 2011

Jucar River Basin

Art. 13 → By December 2010

- **FLOOD HAZARD MAPS AND FLOOD RISK MAPS**

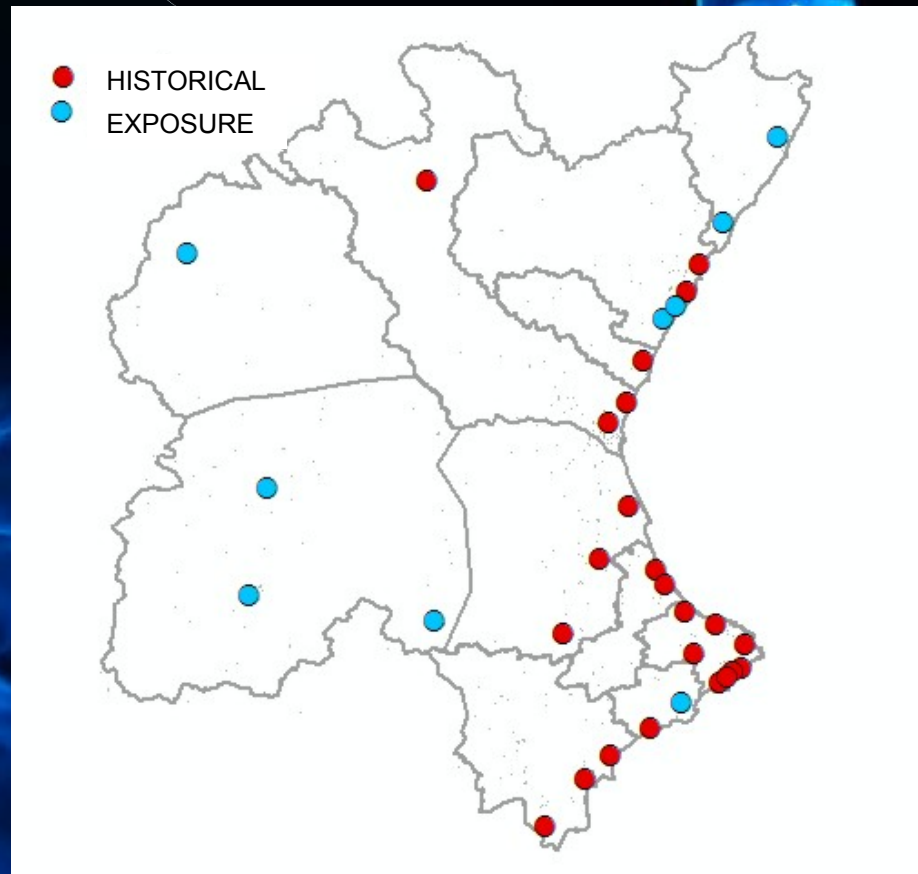
By December 2013

- **FLOOD RISK MANAGEMENT MAPS**

By December 2015

# SIGNIFICANT POTENTIAL RISK AREAS

- 23 AREAS BASED ON HISTORICAL DATA
- 9 AREAS BASED ON HAZARD - EXPOSURE





# FLOOD HAZARD MAP METODOLOGY

- ◉ Field works
- ◉ Cartography (LIDAR)
- ◉ Geomorphological works
- ◉ Hydrological studies
- ◉ Hydraulic modelization
- ◉ Map generation



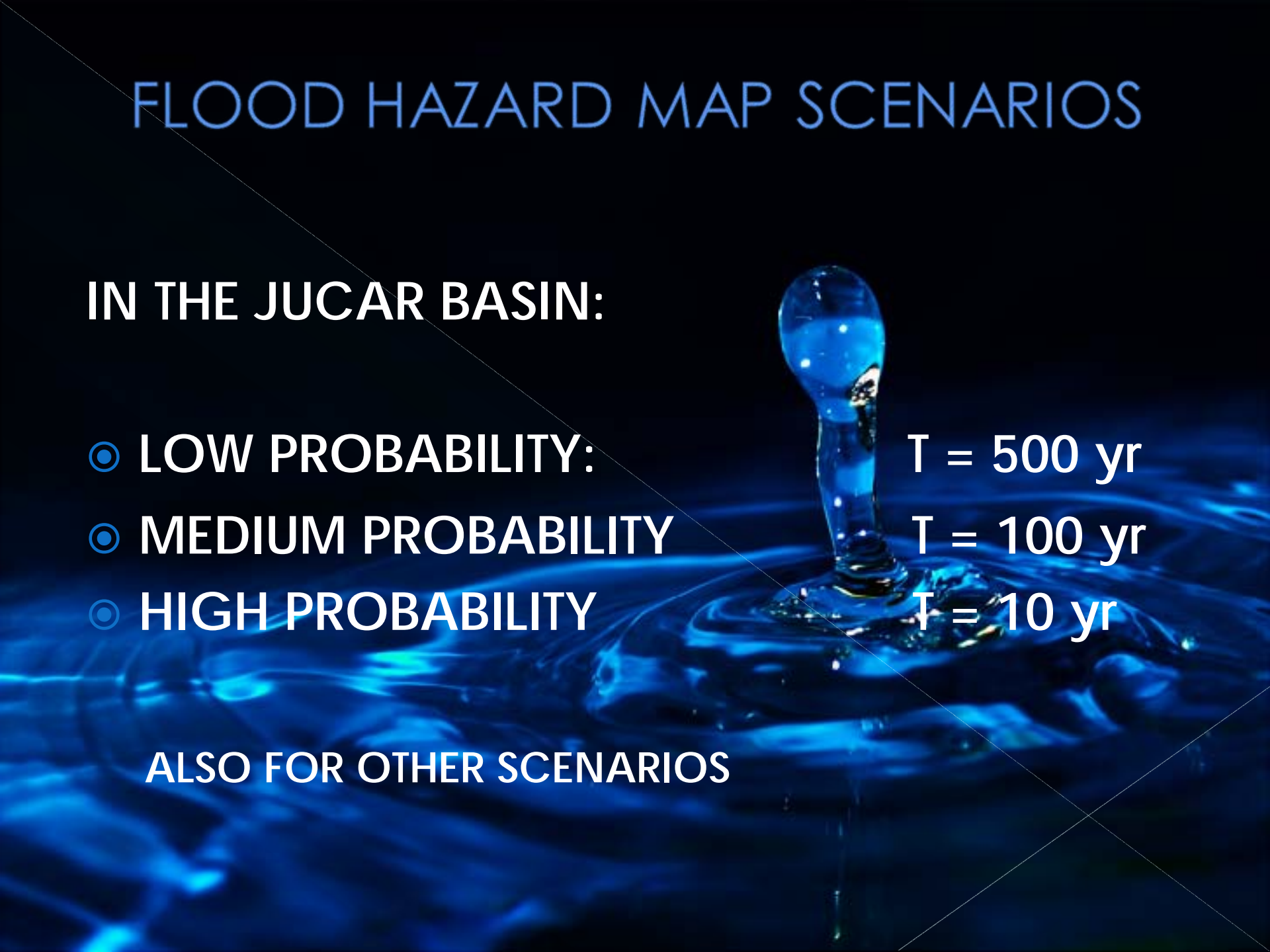


# FLOOD HAZARD MAP SCENARIOS

## IN THE JUCAR BASIN:

- LOW PROBABILITY:  $T = 500 \text{ yr}$
- MEDIUM PROBABILITY  $T = 100 \text{ yr}$
- HIGH PROBABILITY  $T = 10 \text{ yr}$

ALSO FOR OTHER SCENARIOS



# OTHER SCENARIOS

- ◎ SPANISH LEGAL AREAS (DPH)

  - + T = 25

  - T = 50

- ◎ PREFERENTIAL FLOW AREA:

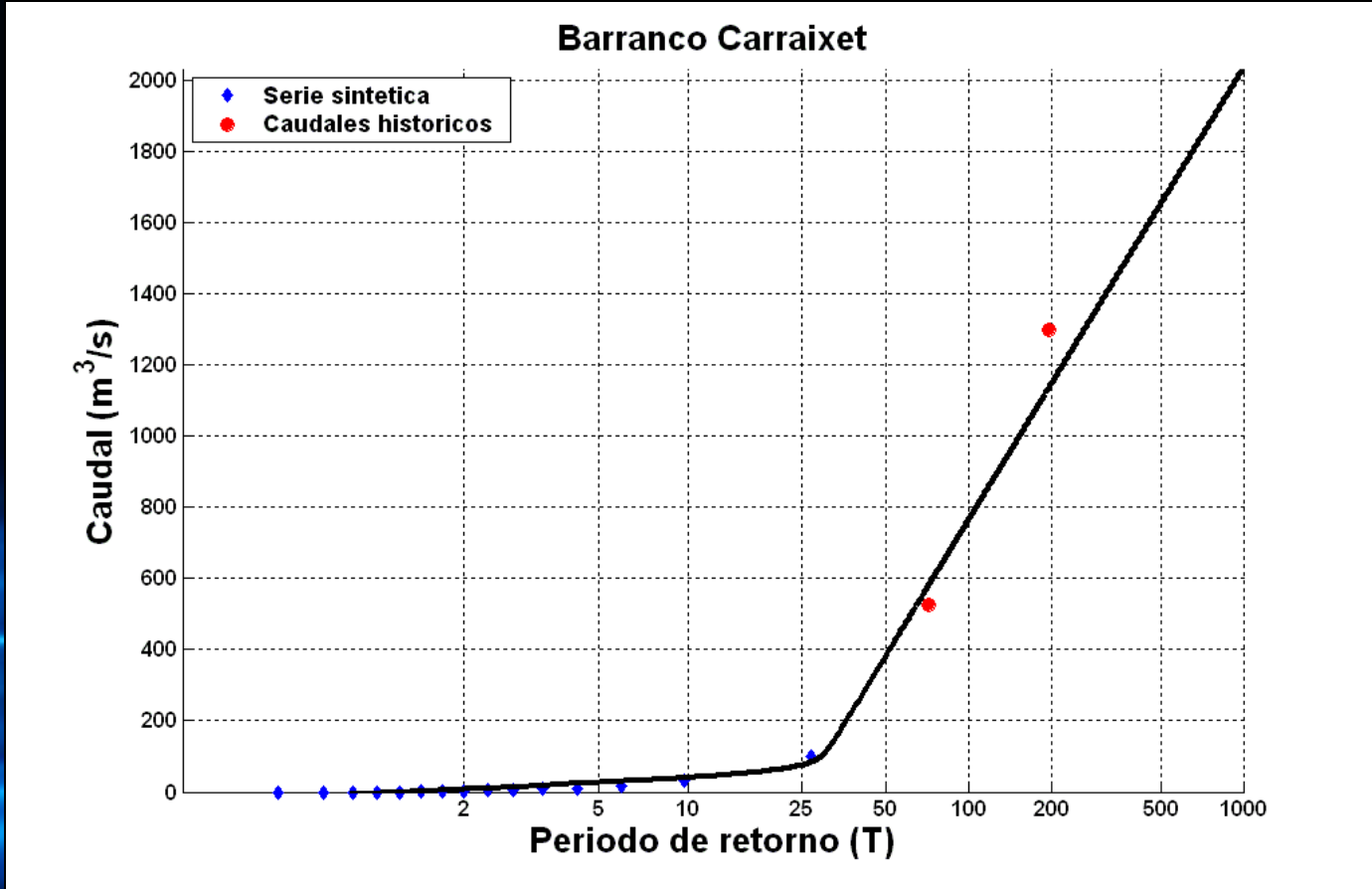
  - > FLOOD HAZARD ZONE

    - +

  - > FLOODWAY

# HYDROLOGICAL STUDIES

Hydrological behaviour



From Antonio Jiménez (Centro de Estudios Hidrográficos del CEDEX)

**CÁLCULO DE CAUDALES** TRAMO: 10.11

Río: RIO DEL PALACIO  
 Municipio: SANT MATEU  
 Origen del tramo: AGUAS ARRIBA DE SANT MATEU  
 Fin del tramo: RIO BENIFARGUELL

Area(Km2)	Z max(m)	Z min(m)	Long (Km)	Po correg	I/10d
5,29	493	290	4,51	25,57	11,5

T=2	Pmm	J(M/M)	Pendiente
73,08	0,02		
T=5	Tc (h)	Coef. Simultaneidad	Coef. Uniformidad
103,15	1,93	1,00	1,14
T=10	125,24		
T=50	182,27		
T=100	210,23		
T=500	278,34		

T	Pd	ITC	Pd/Pd*	C	Q (m3/s)
2	73,08	23,09	2,75	0,24	9,17
5	103,15	32,49	3,85	0,35	19,00
10	125,24	39,45	4,71	0,42	27,49
50	182,27	57,42	6,86	0,55	52,85
100	210,23	66,23	7,91	0,60	66,13
500	278,34	87,68	10,48	0,69	100,80

**CÁLCULO DE HIETOGRAMAS - HIETOGRAMAS**

Cuenca: Barranco Carraixet y Carraixet Longitud Km: 10,2

Area Total Km2: 145,55 Islote: Tramo 40,41(B. Podrivilla)

Composici	Area (Km2)	Lava (Km)	Cota min (M)	Cota max (M)	Longitud (Km)	Coef. de concentración	Transform. Hietogr. K
Subbasin 1	10,40	21,16	141	497	44,74	52,78	7,82
Subbasin 2	30,40	16,40	578	169	48,76	52,21	4,44
Subbasin 3	78,40	6,40	447	474	47,20	2,49	0,82

Routing Method: Muskingum Coeffs

Composici	ReschT	Coef. H	Coef. X	ReschT	Coef. H	Coef. X
ReschT	6400	0,8	0,40	0,035	2	19,4

Downstream

Time (h)	Subbasin 1	Subbasin 2	Subbasin 3
T2	85,30	87,69	81,20
T5	82,46	81,35	89,61
T10	81,1	80,80	92,29
T25	80,22	80,49	101,89
T50	80,29	80,21	104,33
T100	80,27	80,23	105,40
T500	81,04	80,85	109,55
T1000	84,21	83,06	112,87

HIETOGRAMA

Results for different return periods:

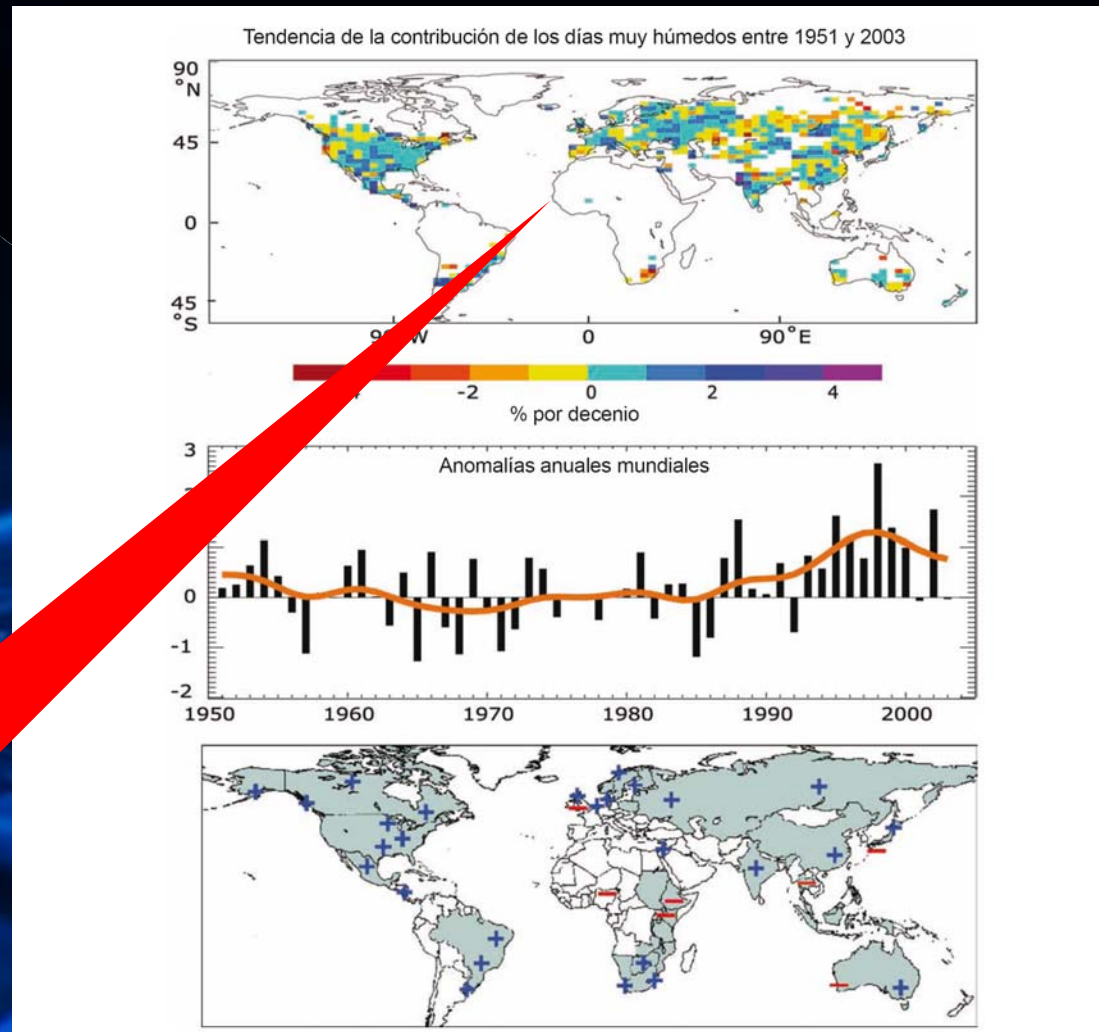
Return Period (T)	Peak (mm/h)	Duration (h)
2	21,1	15
5	23,5	15
10	27,4	15
25	31,1	15
50	34,2	15
100	36,1	15
500	42,2	15
1000	46,2	15



# CONSIDERATIONS ON CLIMATE CHANGE I

Based on available information, there is no clear and specific enough knowledgement to determine a parameterization of the effects of climate change on the hydrological behavior of the basins of the rivers in the Demarcación Hidrográfica del Júcar, BUT...

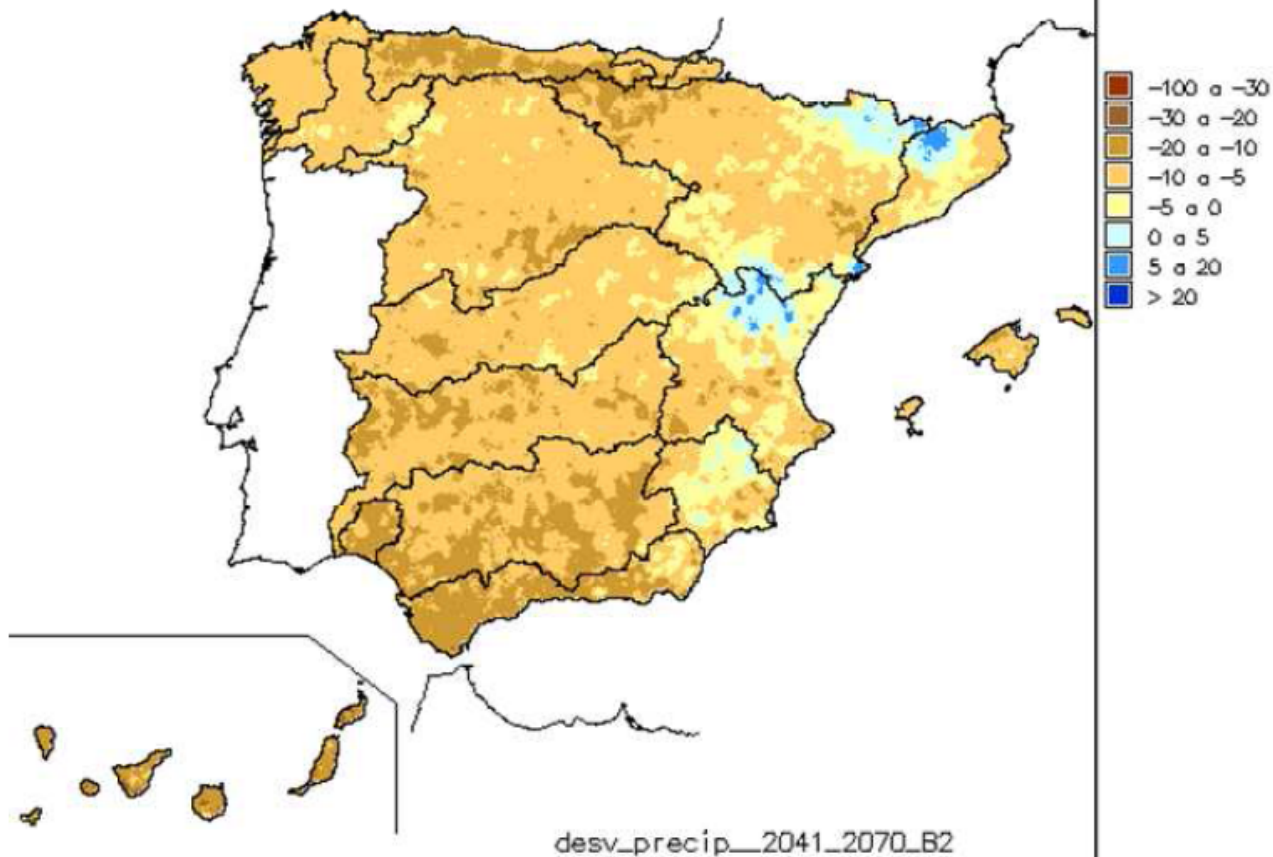
IPCC TECHNICAL PAPER VI



# CONSIDERATIONS ON CLIMATE CHANGE II

## INCREASE IN MAXIMUM PRECIPITATION (%)

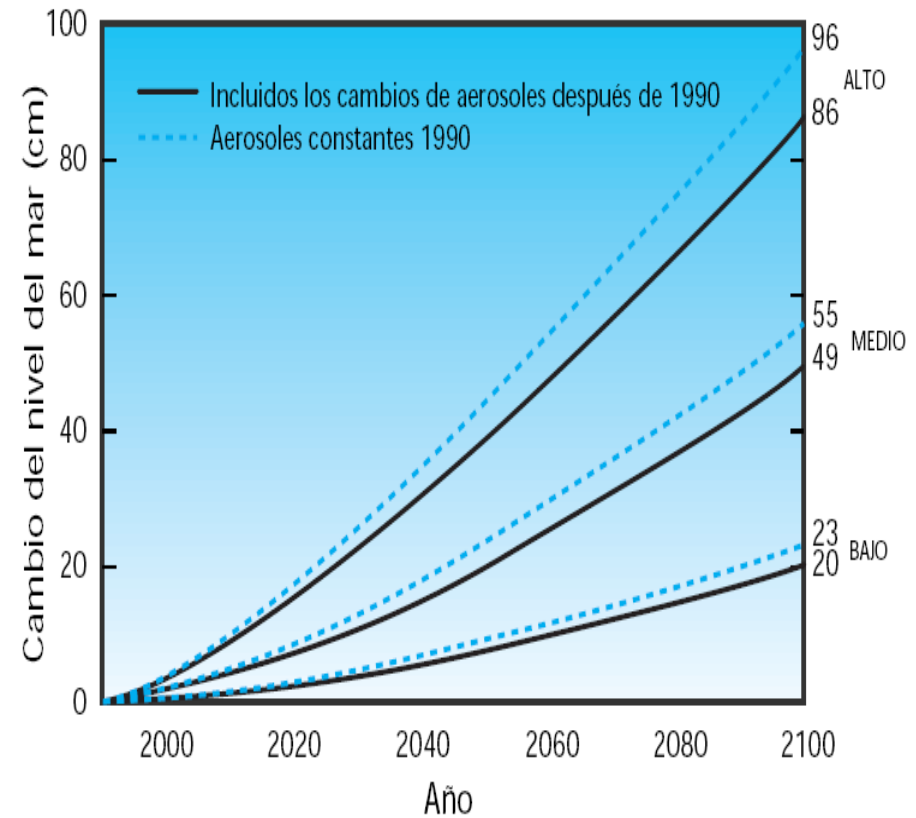
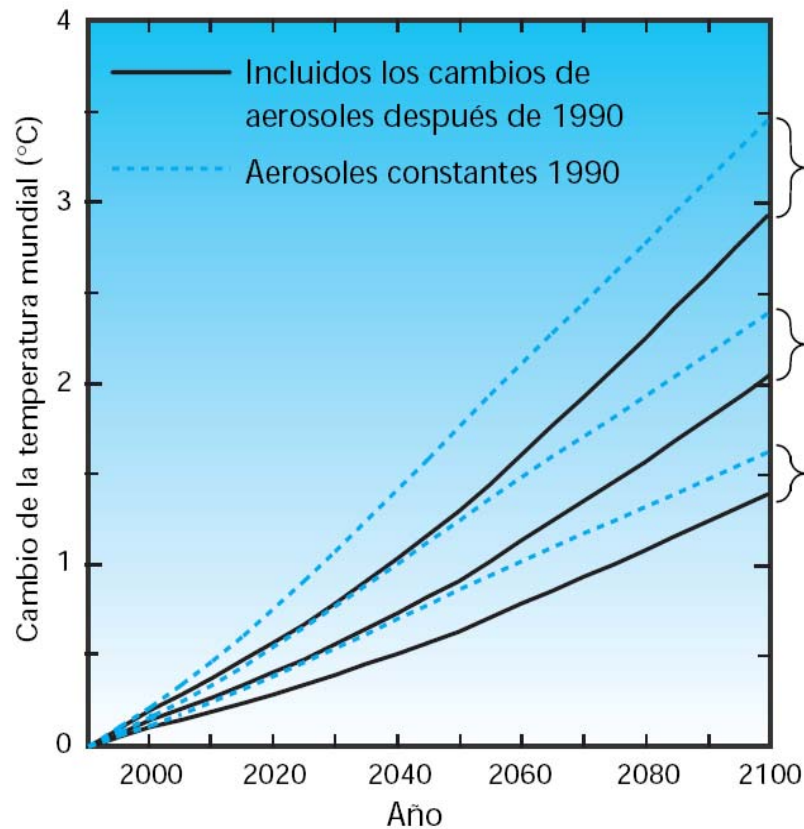
2041-2070



CENTRO DE ESTUDIOS HIDROGRÁFICOS CEDEX

# CONSIDERATIONS ON CLIMATE CHANGE III

## ABOUT SEA LEVEL IN HYDRAULIC MODELING





# HYDRAULIC MODELING

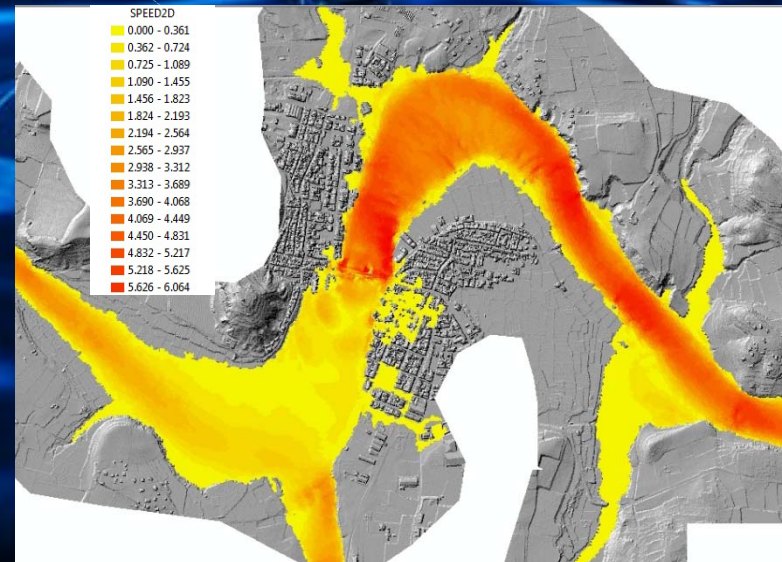
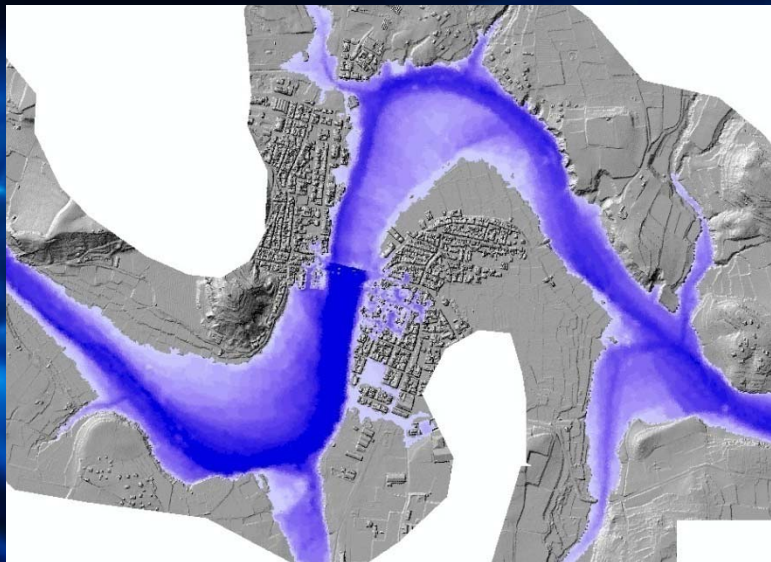
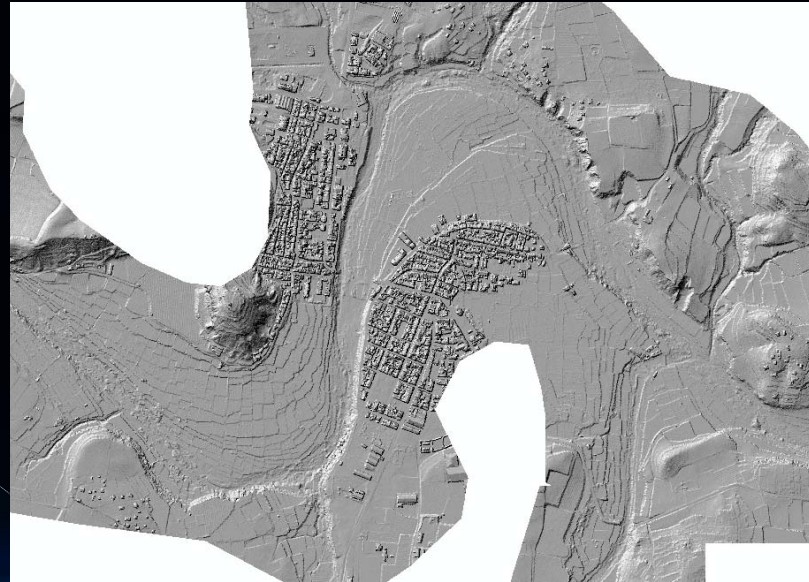
LIDAR (0,5 points/m<sup>2</sup>)



HYDRAULIC MODELING 2D

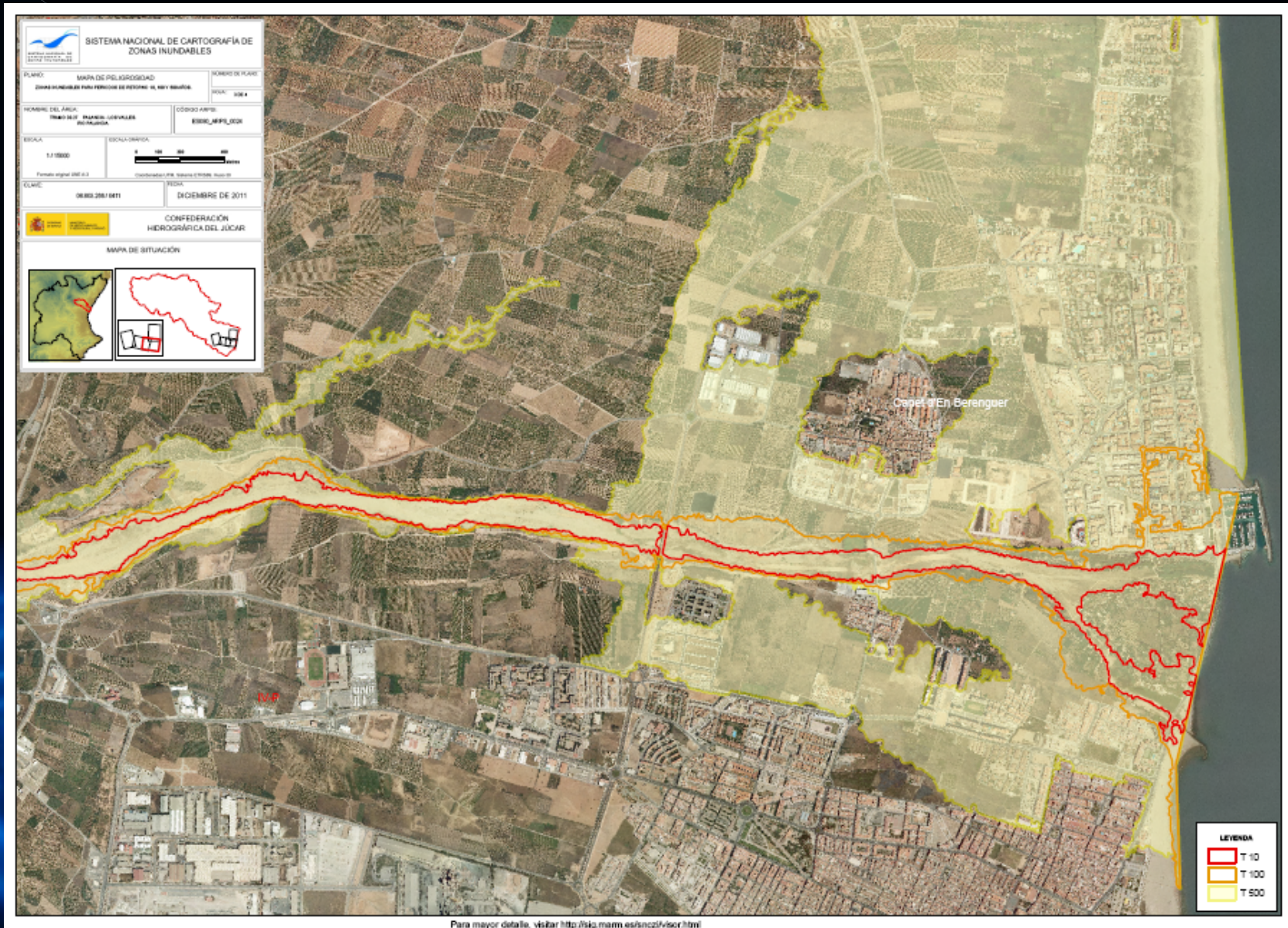


DEPTH AND VELOCITY FIELDS



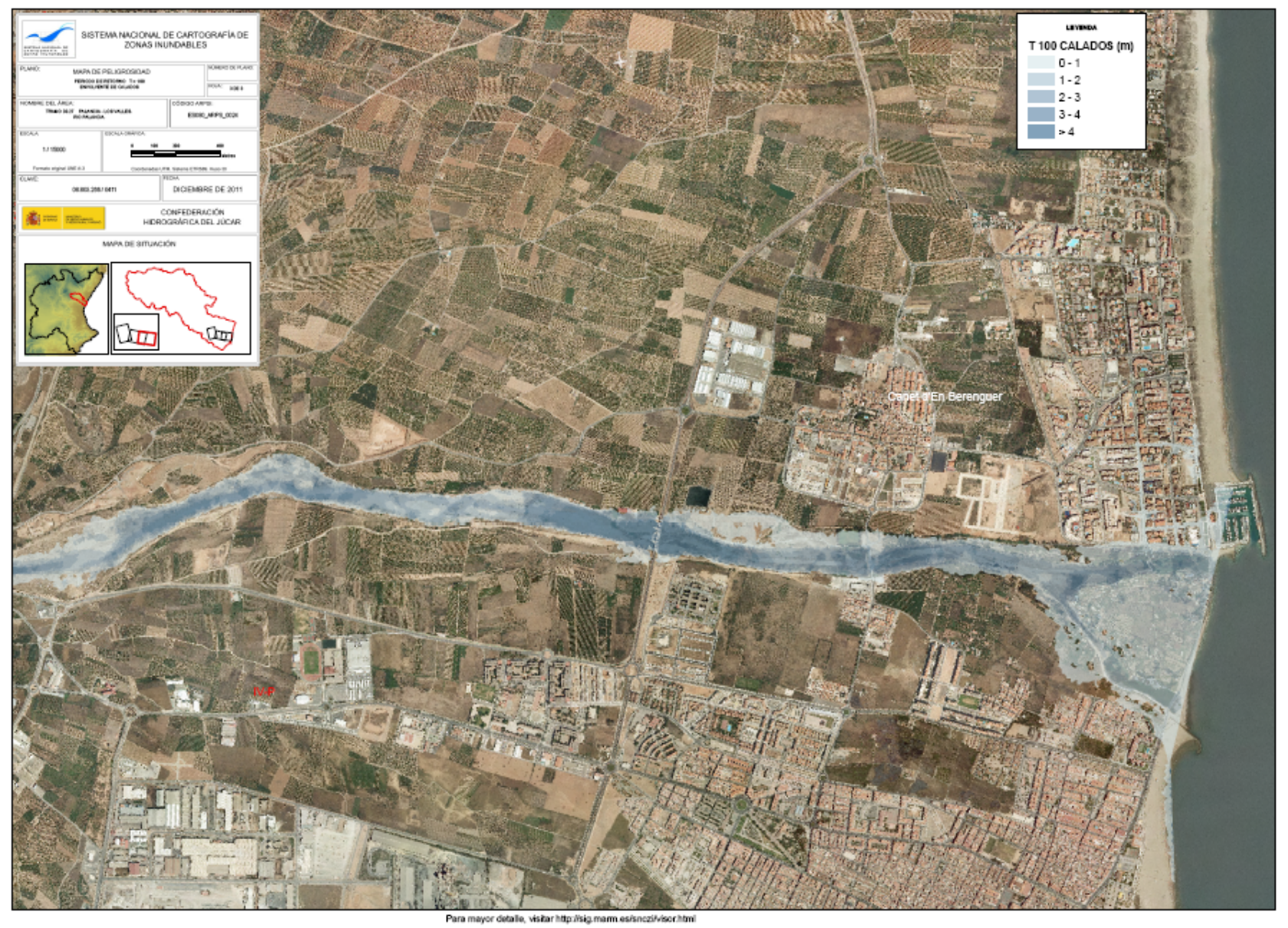


# FLOOD HAZARD MAPS. LOW, MEDIUM, HIGH PROBABILITY



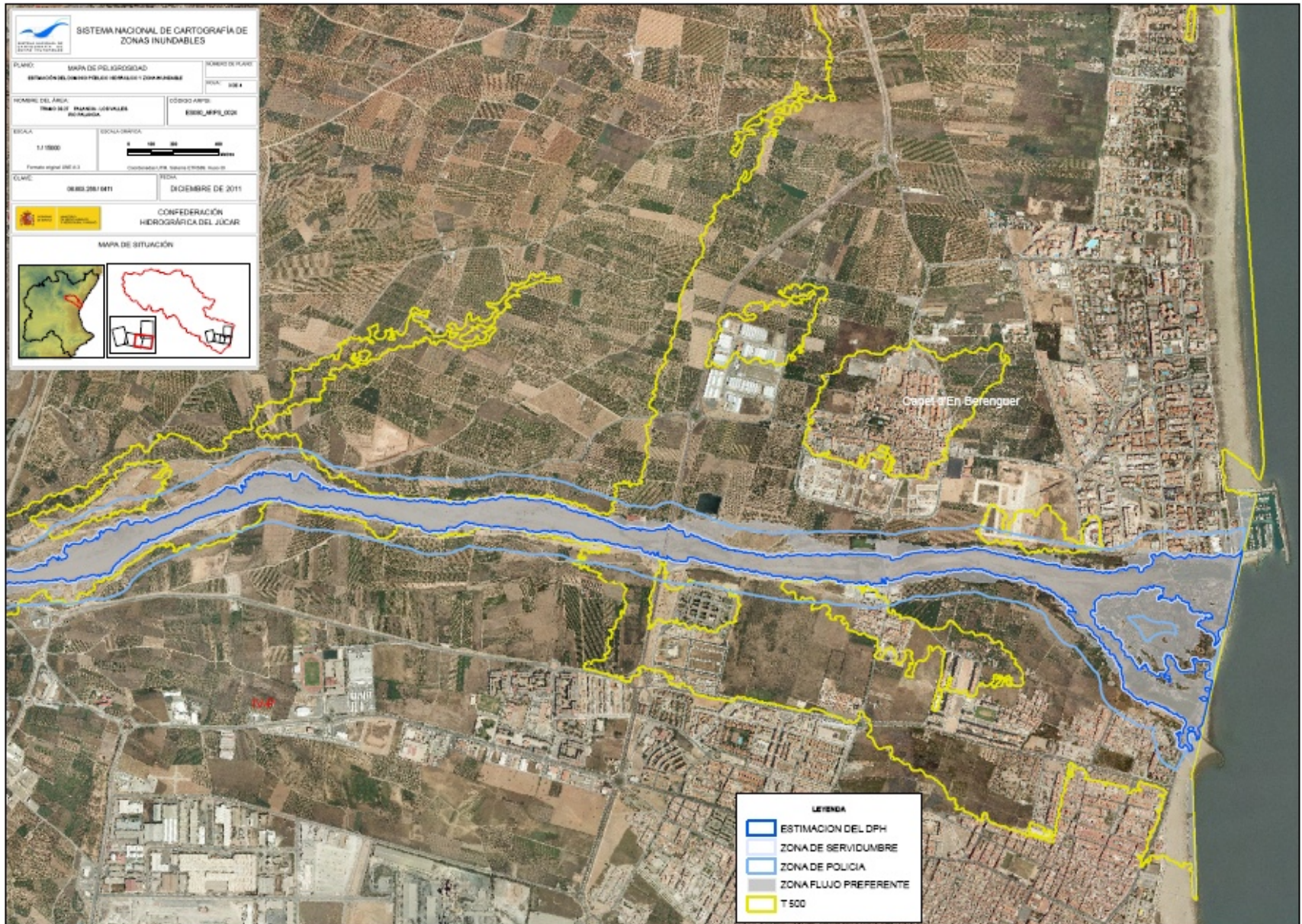


# FLOOD HAZARD MAPS. DEPTH MAPS



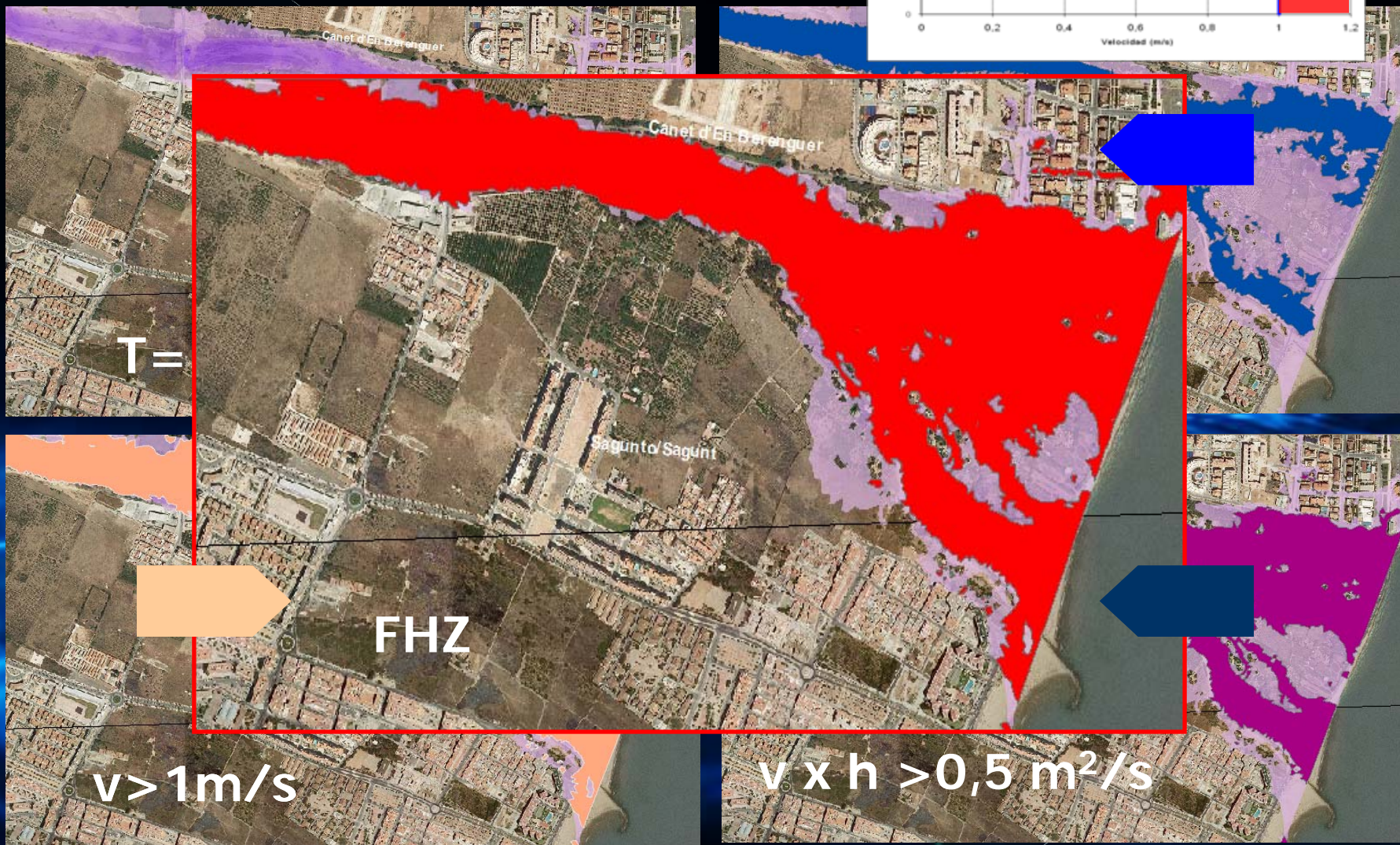
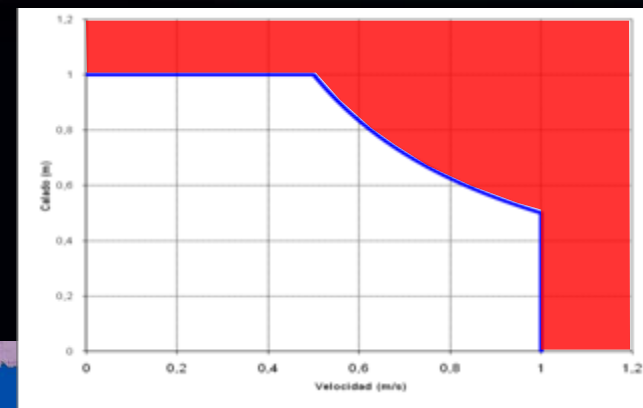


# FLOOD HAZARD MAPS. LEGAL SCENARIOS

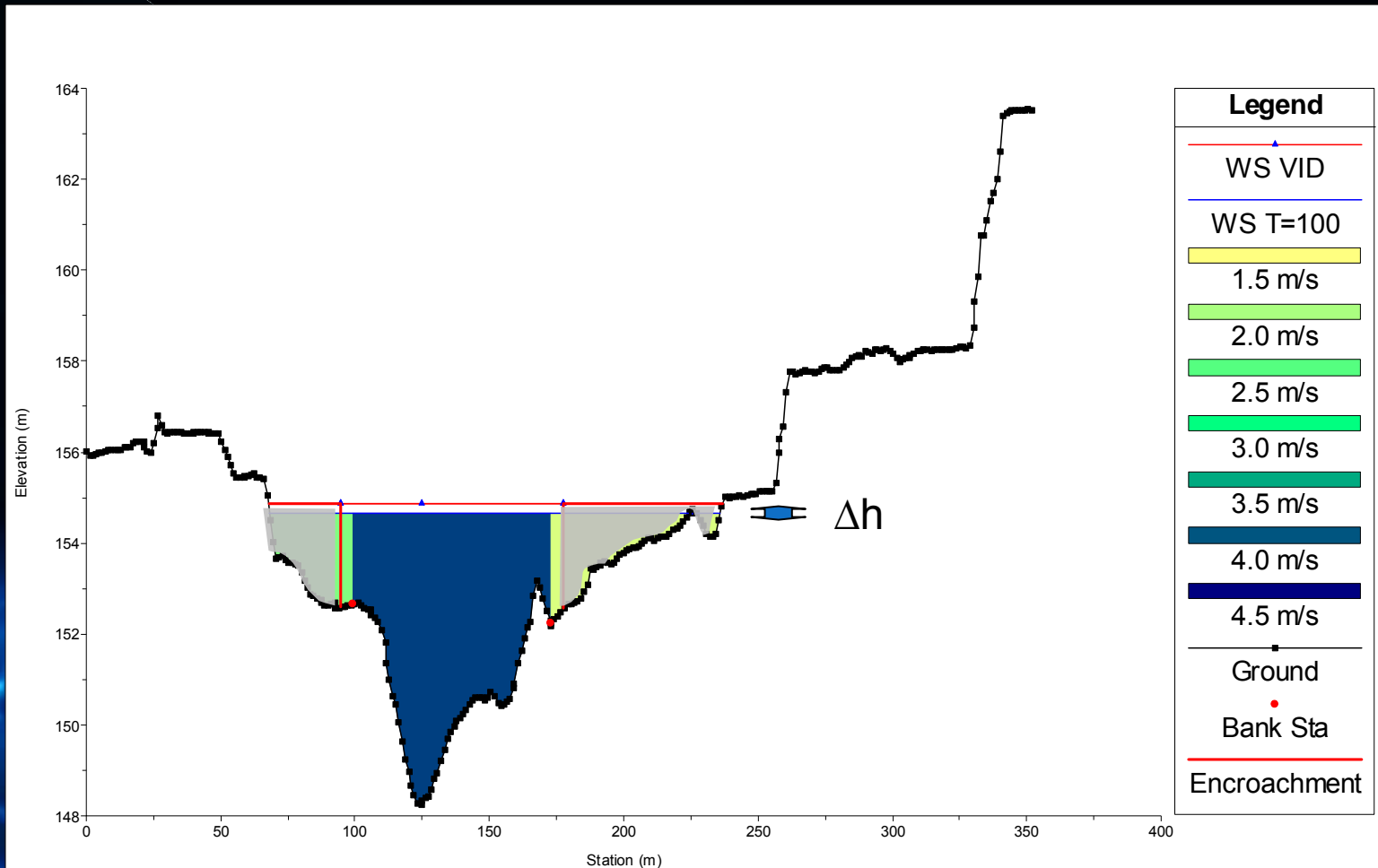




# FLOOD HAZARD ZONE

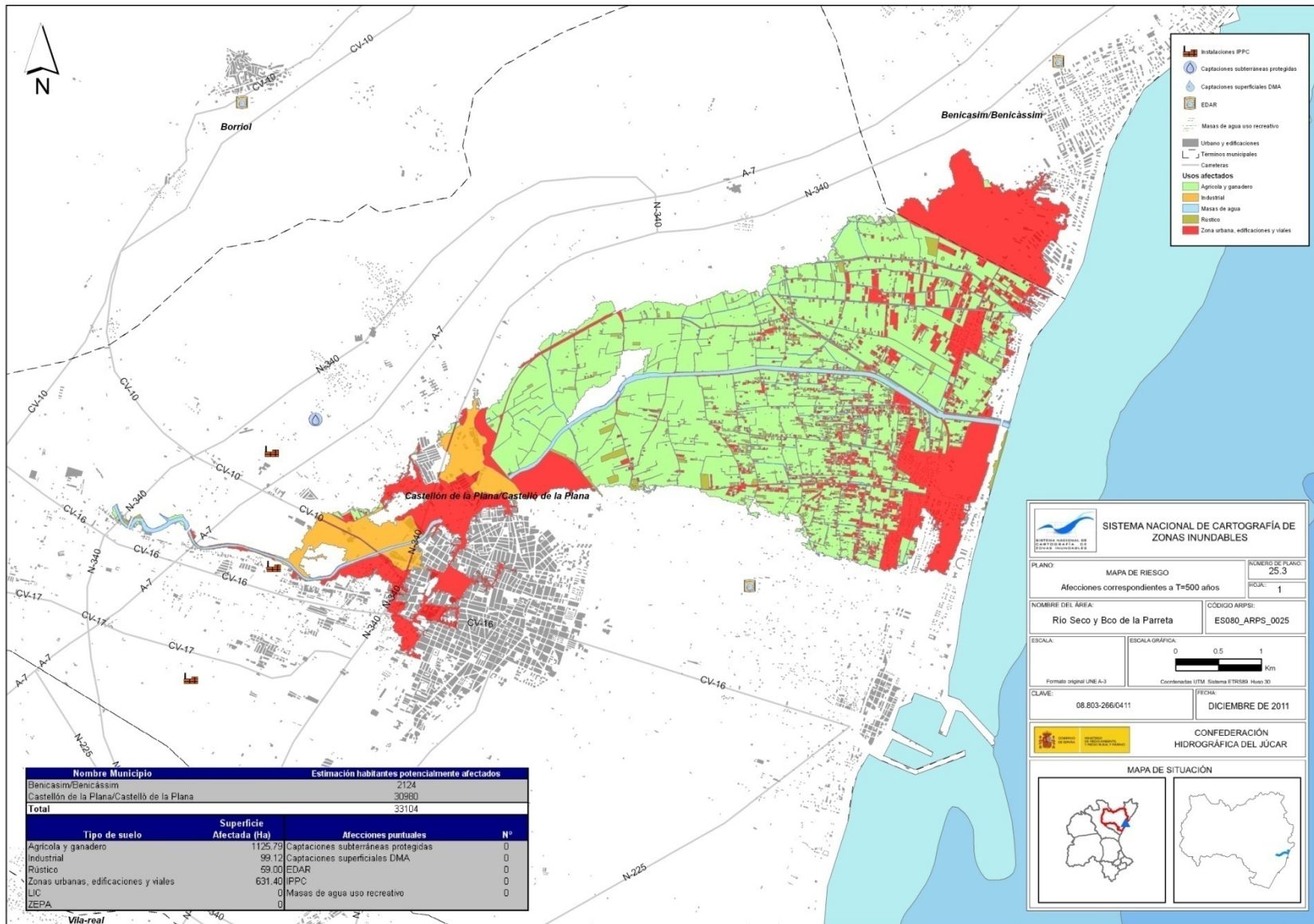


# FLOODWAY





# RISK MAPS



Nombre Municipio	Estimación habitantes potencialmente afectados		
Benicasim/Benicàssim	2124		
Castellón de la Plana/Castelló de la Plana	30980		
<b>Total</b>	<b>33104</b>		

Tipo de suelo	Superficie Afectada (Ha)	Afecciones puntuales	Nº
Agrícola y ganadero	1125,79	Captaciones subterráneas protegidas	0
Industrial	99,12	Captaciones superficiales DMA	0
Rústico	59,00	EDAR	0
Zonas urbanas, edificaciones y viales	631,40	IPFC	0
LIC	0	Masas de agua uso recreativo	0
ZEPA	0		

**SISTEMA NACIONAL DE CARTOGRAFÍA DE ZONAS INUNDABLES**

PLANO: MAPA DE RIESGO NÚMERO DE PLANO: 25.3

Afecciones correspondientes a T=500 años FOCAL: 1

NOMBRE DEL ÁREA: Río Seco y Bco de la Parreta CÓDIGO ARPS: ES080\_ARPS\_0025

ESCALA: ESCALA GRÁFICA: 0 0.5 1 Km

Formato original LINE A-3 Coordenadas UTM Sistema ETR2011 Huso 30

CLAVE: 08.803-266/0411 FECHA: DICIEMBRE DE 2011

**CONFEDERACIÓN HIDROGRÁFICA DEL JÚCAR**

**MAPA DE SITUACIÓN**



# SISTEMA NACIONAL DE CARTOGRAFÍA DE ZONAS INUNDABLES

<http://sig.marm.es/snczi/>

The screenshot displays the SNCZI web application interface within a Windows Internet Explorer browser window. The browser address bar shows the URL <http://sig.marm.es/snczi/>. The application header includes the logo of the Sistema Nacional de Cartografía de Zonas Inundables and the Ministerio de Medio Ambiente y Medio Rural y Marino. A metadata box in the top right corner provides projection details: **Proyección UTM** (X: 660.418,89; Y: 4.469.209,36), **HUSO: 30**, and **ESCALA: 1/15.625**. A navigation menu below the header includes options for **Servicio de Mapa**, **Serv. WMS**, **Consultas**, **Localizar**, and **Situación**. A legend panel on the left side of the map is open, showing a list of layers with their respective visibility and activity status:

Nombre	Opacidad	Visible	Activo
Z.I. con alta probabilidad ...	<input type="range"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Zona de flujo preferente	<input type="range"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Z.I. con probabilidad med...	<input type="range"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Z.I. con probabilidad baja...	<input type="range"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Cauces con DPH cartogr...	<input type="range"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Cauces con DPH deslindado	<input type="range"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Plan Nacional de Ortofoto...	<input type="range"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Below the legend, there is a button labeled **Ocultar panel**. The main map area shows an aerial photograph of a river valley with a yellow shaded area representing the flood risk zone. A scale bar in the bottom right corner indicates 1 km and 0,5 mi. The browser status bar at the bottom shows "Listo" and "Internet | Modo protegido: activado".



**THANK YOU FOR YOUR ATTENTION**

