
GROUNDWATER IN JÚCAR RIVER BASIN

APLICACION OF WATER FRAMEWORK DIRECTIVE

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The Implementation Strategy of European WFD

THE PILOT RIVER BASIN NETWORK

B, F, N (Scheldt)
D, F, Lux (Moselle-Sarre)
Denmark (Odense)
Finland (Oulujoki)
Norway(Suldalsvassdraget)
France (Marne)
Ireland (Shannon)
Greece (Pinios)
Portugal (Guadiana)
Spain (Júcar)
Italy (Cecina, Tevere)
Romania Hungary (Somos)
CZ, D, PL (Neisse)
UK (Ribble)





Delineation and initial characterisation of groundwater bodies

Delineation of groundwater bodies at Júcar RBD

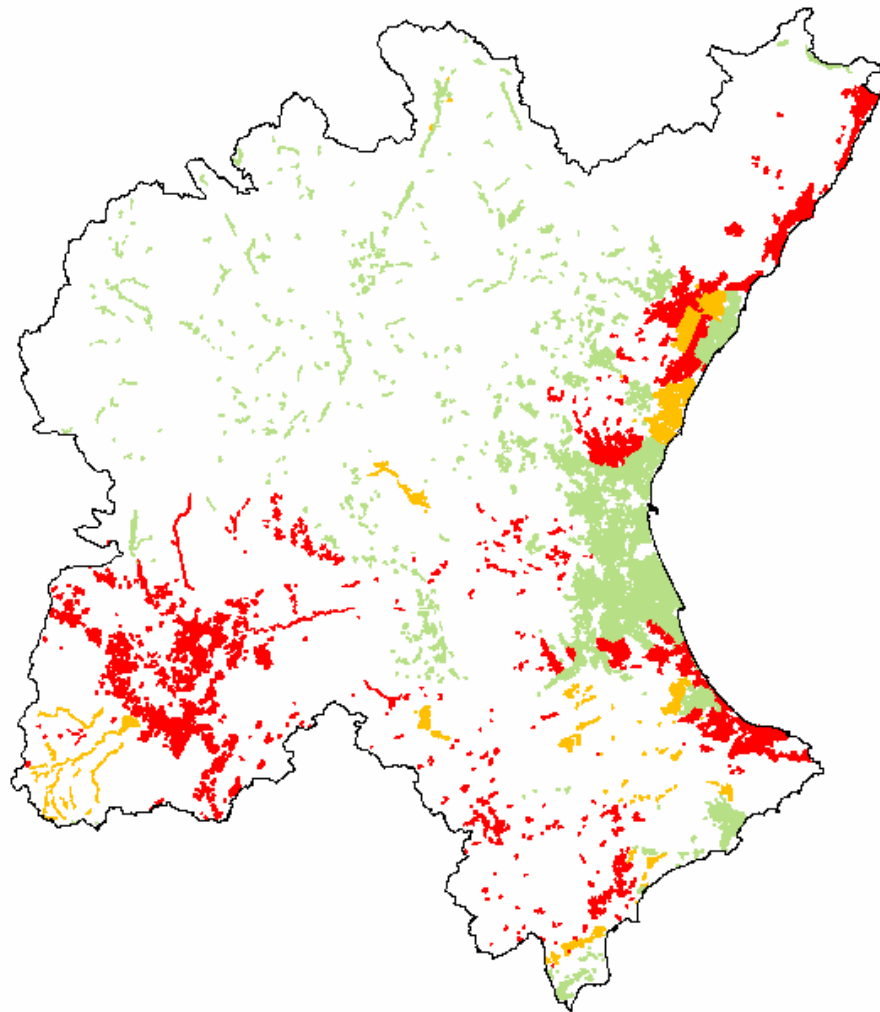


Area (km²)	43 000
Population (inhabitants)	4 360 000
Equivalent population due to tourism (inhabitants)	1 400 000
Irrigated land (ha)	370 000
Water demand (hm³/year)	3 600
Water resources (hm³/year)	3 300
Origin of water resources	Surface water(25%) Groundwater(75%)

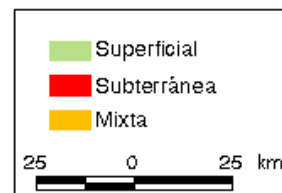


- Delineation criteria established on national scale
- 79 groundwater bodies
- Size ranges from 10 km² to 6.289 km² (mean value 513 km²)

Origin of water for irrigation



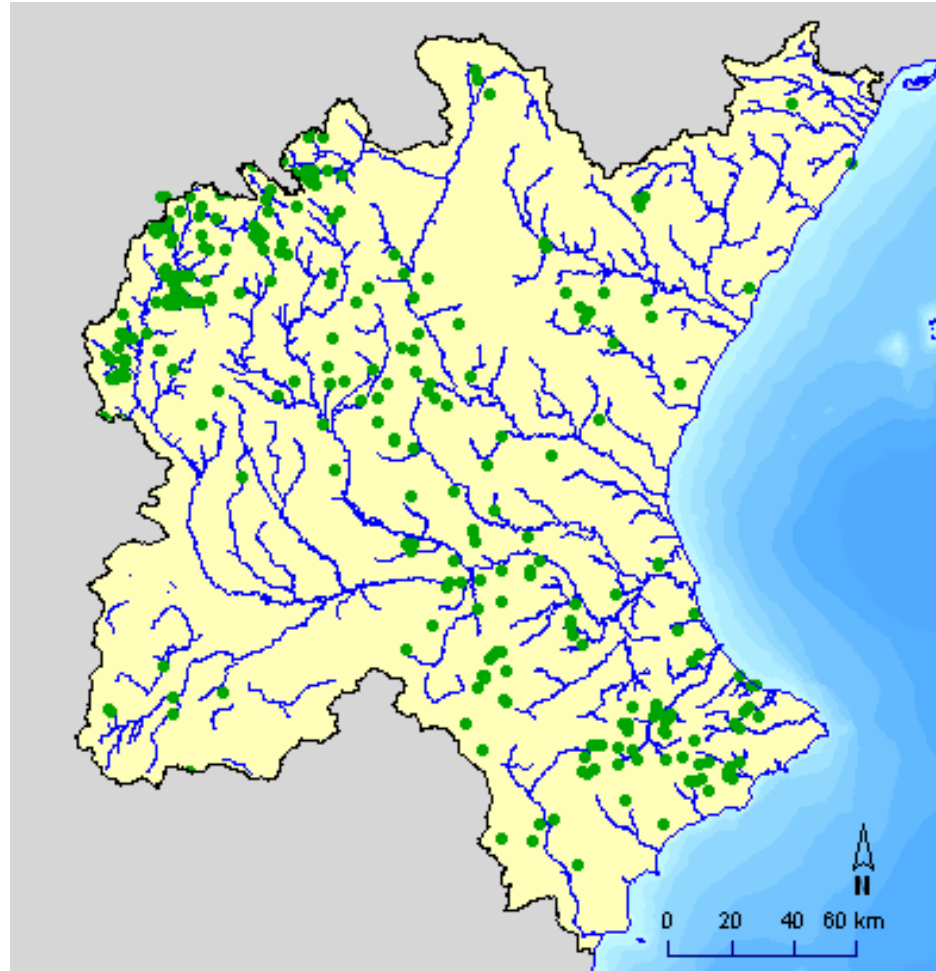
Well for groundwater abstraction in aquifers



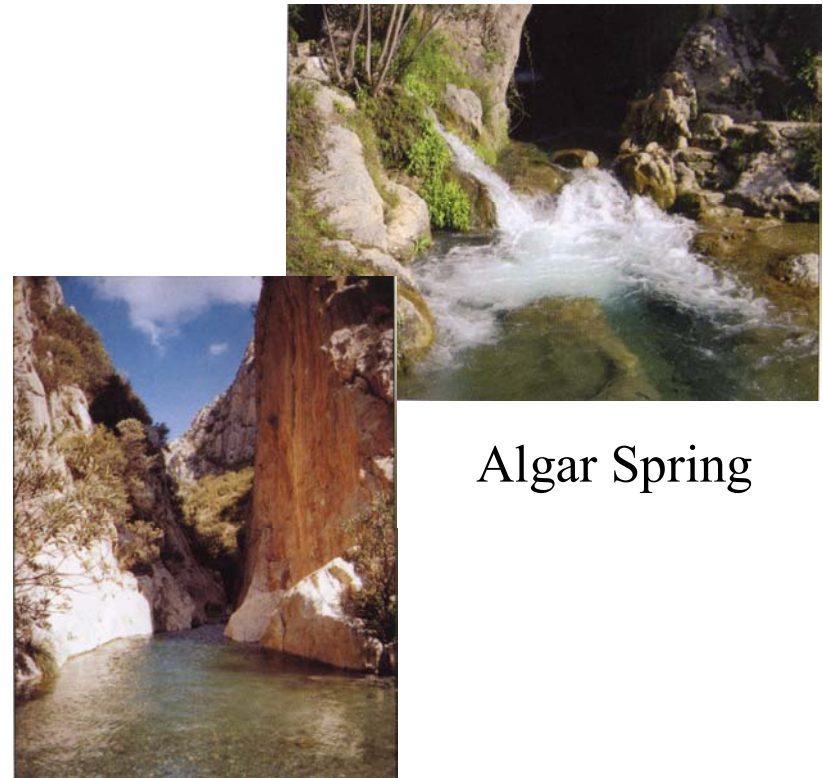
Initial characterisation of groundwater bodies

Código	Nombre	Superficie (km ²)	Tipo	Litología	Dependencia con ecosistema acuático	Ecosistemas acuáticos dependientes (ríos y zonas húmedas)
080.001	HOYA DE ALFAMBRA	745.69	Libre	Detrítico	No	
080.002	JAVALAMBRE OCCIDENTAL	608.70	Mixto	Carbonatado	No	
080.003	JAVALAMBRE ORIENTAL	807.83	Mixto	Carbonatado	Sí	Río Mijares
080.004	MAESTRAZGO OCCIDENTAL	865.53	Mixto	Carbonatado	No	
080.005	PUERTOS DE BECEITE	376.75	Libre	Carbonatado	Sí	Río Cenia
080.006	PLANA DE CENIA	246.50	Mixto	Mixto	No	
080.007	PLANA DE VINAROS	101.86	Libre	Detrítico	No	
080.008	MAESTRAZGO ORIENTAL	2285.30	Mixto	Carbonatado	Sí	Ramblas del Maestrazgo
080.009	PLANA DE OROPESA-TORREBLANCA	69.87	Libre	Detrítico	Sí	Prat de Cabanes - Torreblanca
080.010	LUCENA-ALCORA	1105.46	Mixto	Carbonatado	Sí	Río Villahermosa
080.011	HOYA DE TERUEL	607.26	Mixto	Carbonatado	No	
080.012	ARQUILLO	180.29	Mixto	Carbonatado	Sí	Río Guadalaviar
080.013	GEA DE ALBARRACÍN	152.77	Libre	Carbonatado	Sí	Río Turia o Guadalaviar

Dependence with aquatic ecosystems (springs)



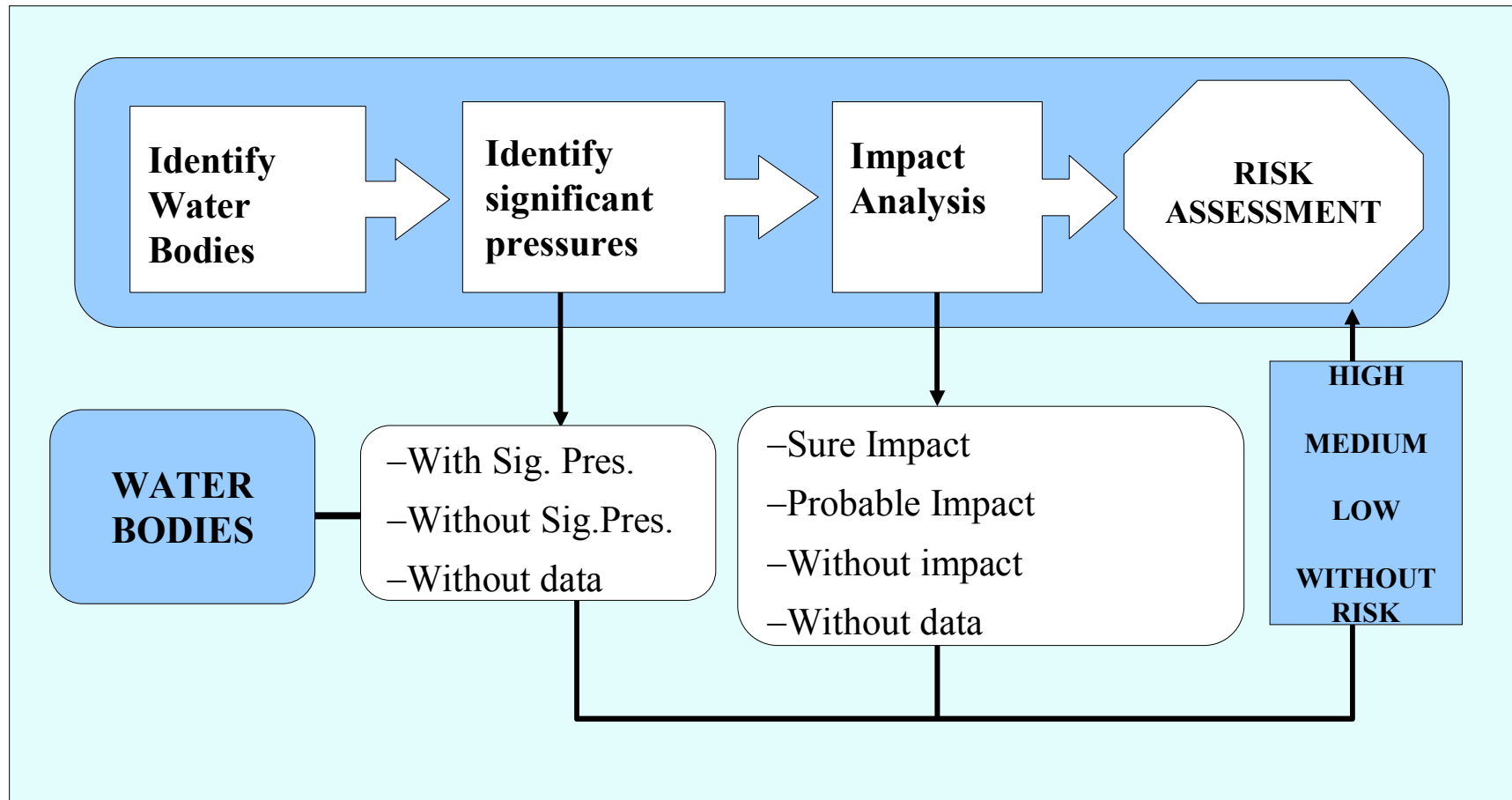
Inventory of springs



Algar Spring

Effect of human activity on groundwater bodies

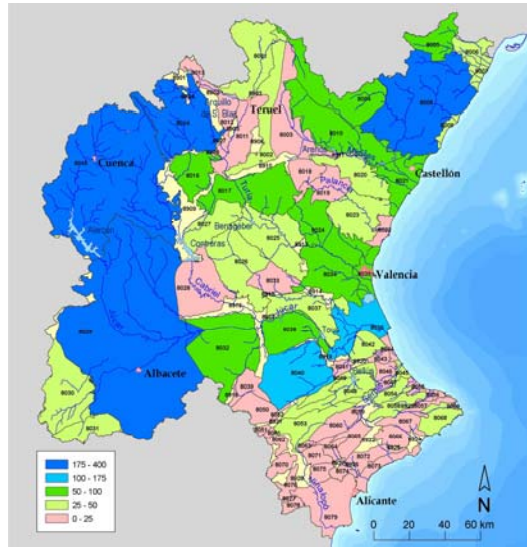
Pressure-impact analysis



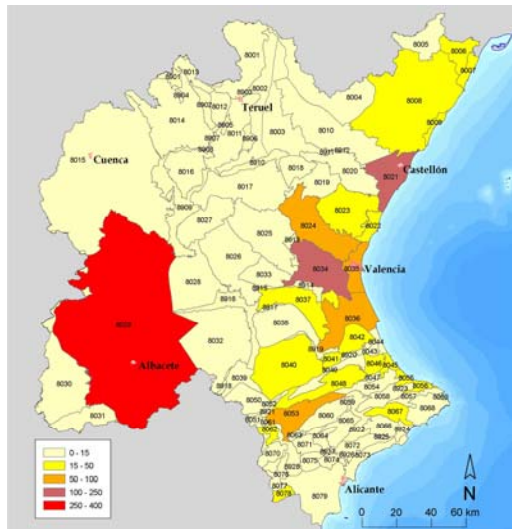
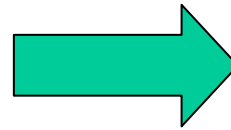
Main pressures on groundwater bodies

Abstractions	Diffuse pollution	Marine intrusion
Urban and industrial use	Use of fertilisers	Groundwater abstractions near the coast
Agricultural use	Use of pesticides	

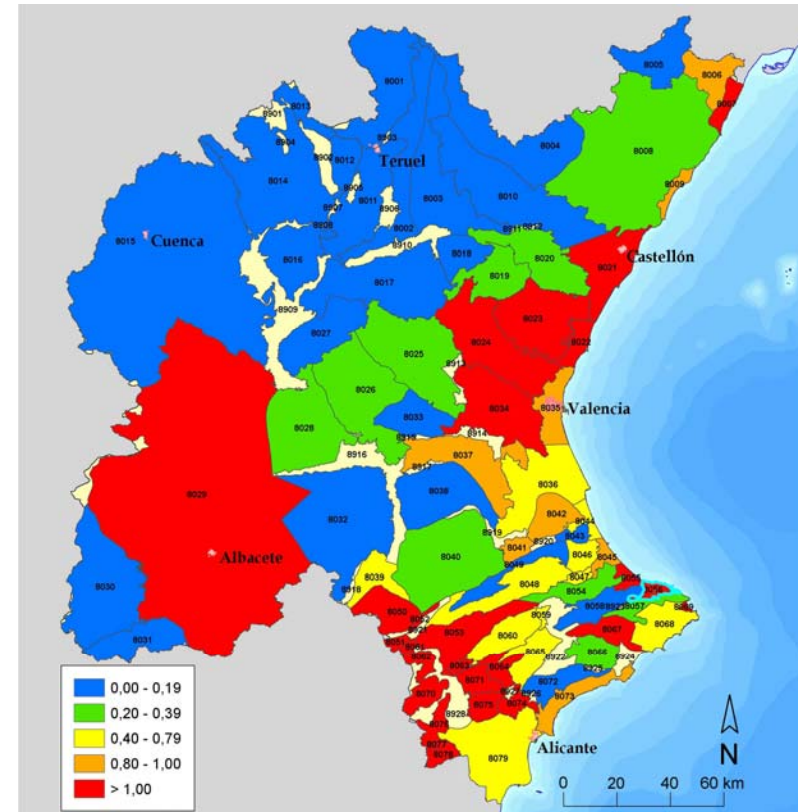
Assessment of pressures due to abstractions



Available resource (hm³/year)

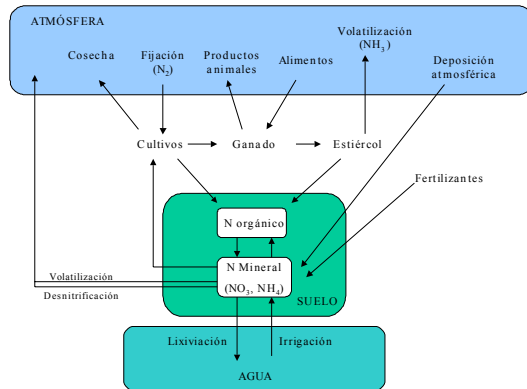


Abstraction (hm³/year)

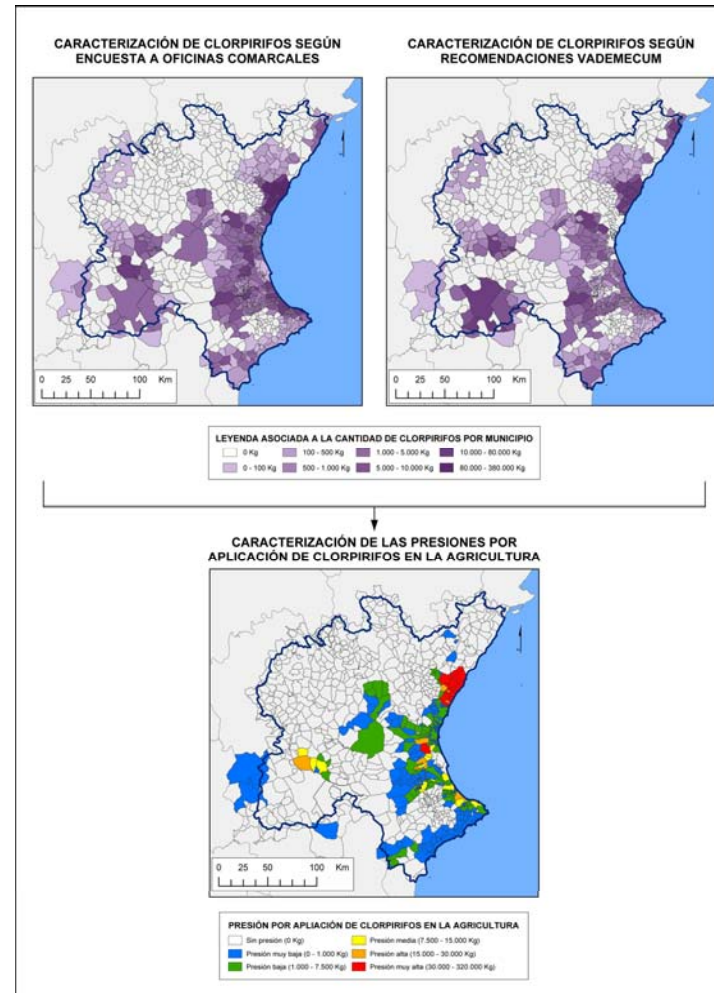
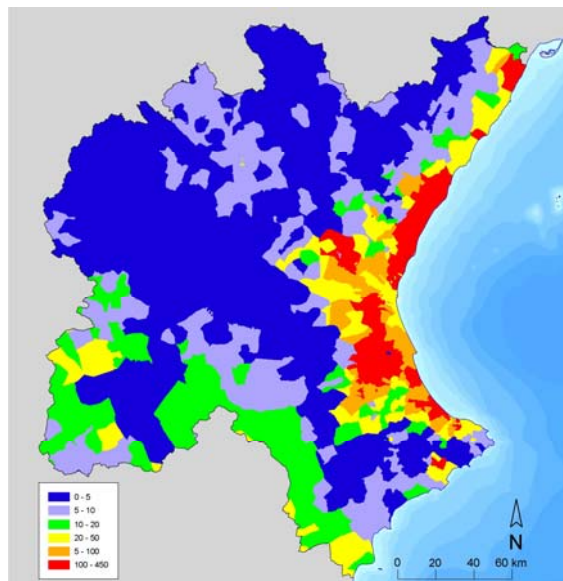


Exploitation index =
abstraction / available
resource

Pressure: diffuse pollution (excess of agricultural nitrogen and pesticides)

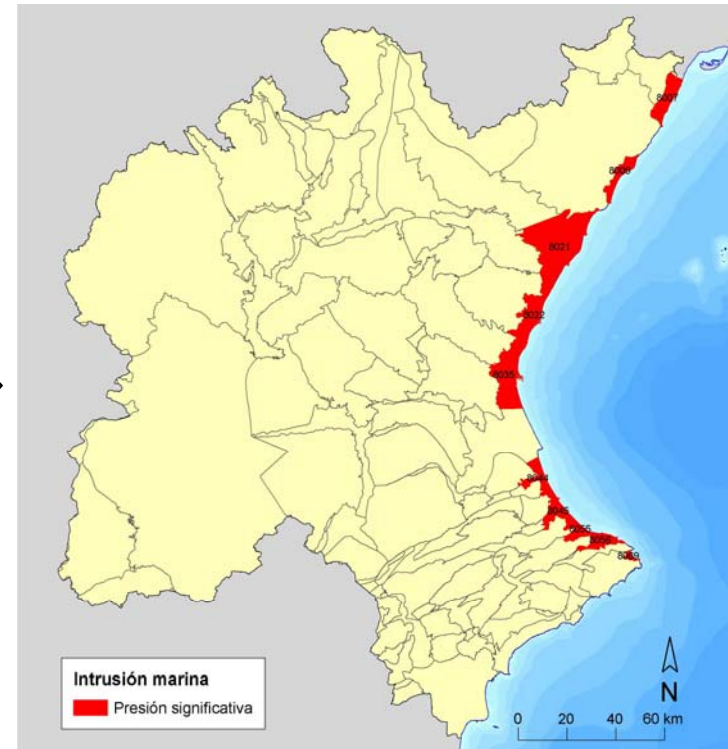


Modelling excess of agricultural nitrogen in the soil



Pesticides

Analysis of pressures due marine intrusion

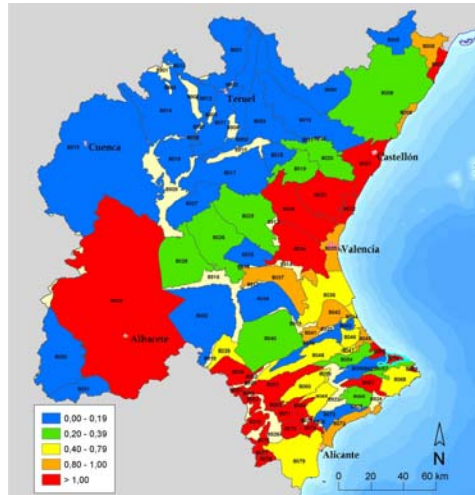


Abstractions near the coast (hm^3/year)

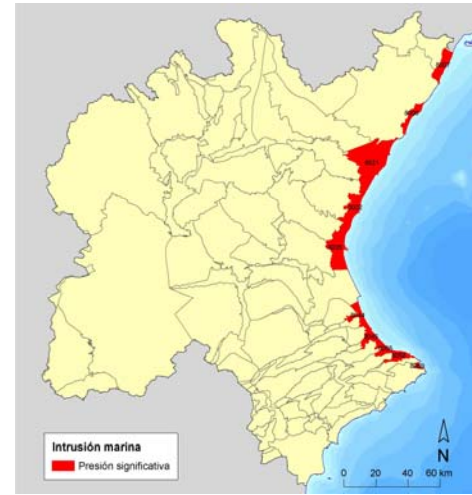
Significant pressure due to marine intrusion

Pressures on groundwater

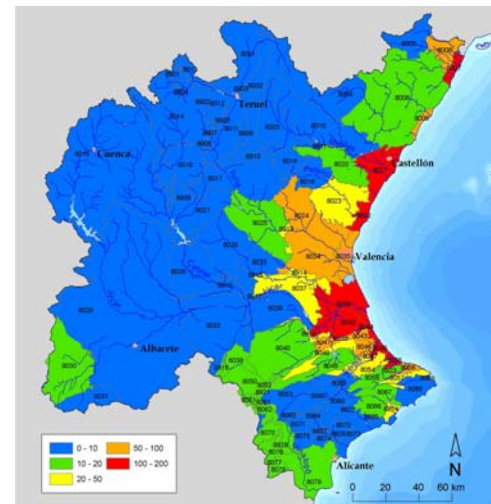
Exploitation index



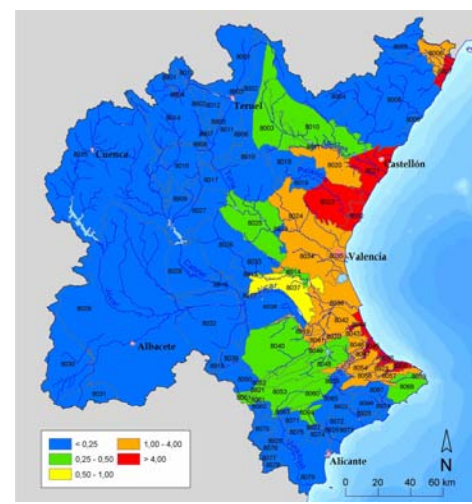
Saline intrusion of seawater



Excess of nitrogen in the soil (kg/ha/year)

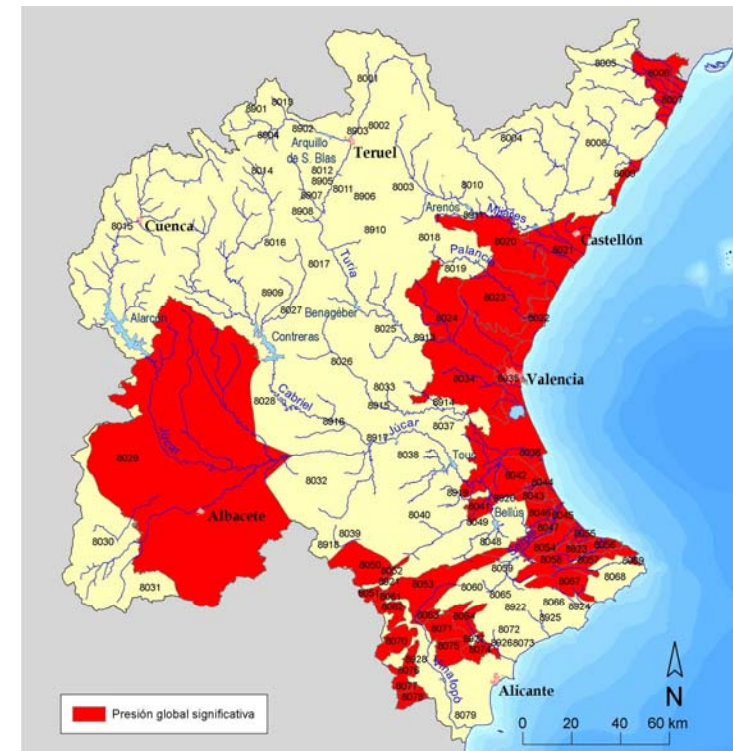


Pesticides applied on the soil (kg/ha/year)



Groundwater bodies with significant global pressure

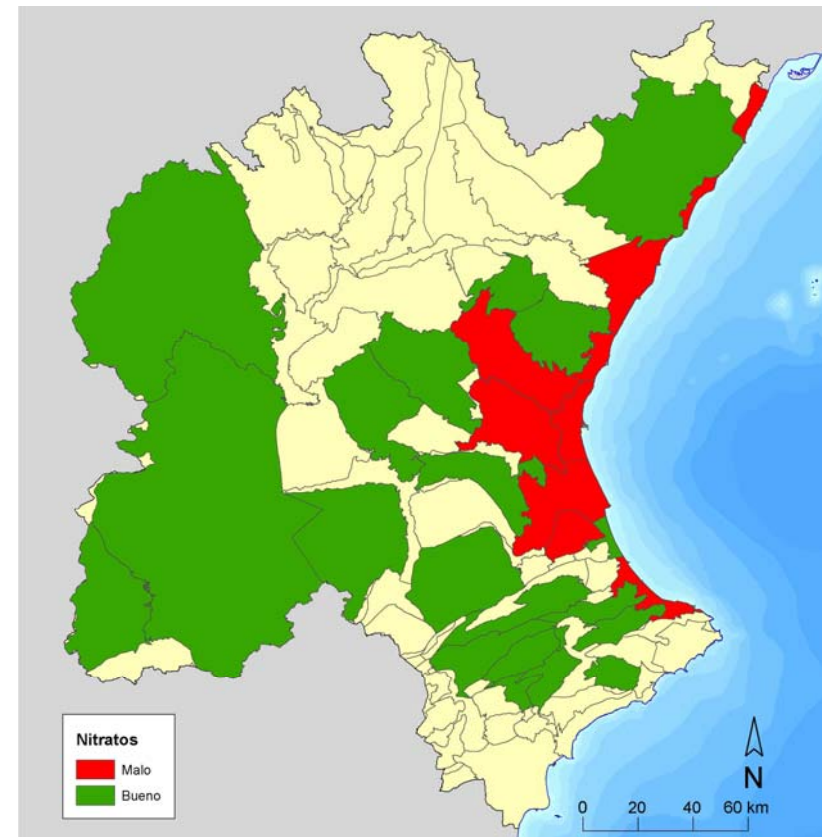
Código	Nombre	Índice de explotación K>1	Fuentes de contaminación puntual	Fuentes de contaminación difusa		Intrusión marina	Presión global significativa
				Exceso nitrógeno	Pesticidas		
080.001	HOYA DE ALFAMBRA	No	No	No	No	No	No
080.002	JAVALAMBRE OCCIDENTAL	No	No	No	No	No	No
080.003	JAVALAMBRE ORIENTAL	No	No	No	No	No	No
080.004	MAESTRAZGO OCCIDENTAL	No	No	No	No	No	No
080.005	PUERTOS DE BECEITE	No	No	No	No	No	No
080.006	PLANA DE CENIA	No	No	Sí	Sí	No	Sí
080.007	PLANA DE VINARÓZ	Sí	No	Sí	Sí	Sí	Sí
080.008	MAESTRAZGO ORIENTAL	No	No	No	No	No	No
080.009	PLANA DE OROPESA-TORREBLANCA	No	No	Sí	No	Sí	Sí
080.010	LUCENA-ALCORA	No	No	No	No	No	No
080.011	HOYA DE TERUEL	No	No	No	No	No	No
080.012	ARQUILLO	No	No	No	No	No	No



Sure impact



Groundwater bodies with provisional overexploitation declaration



Groundwater bodies with chemical sure impact: nitrate > 50 mg/l

Improvements on the monitoring network



Water level monitoring network (year 2005)

130 control points

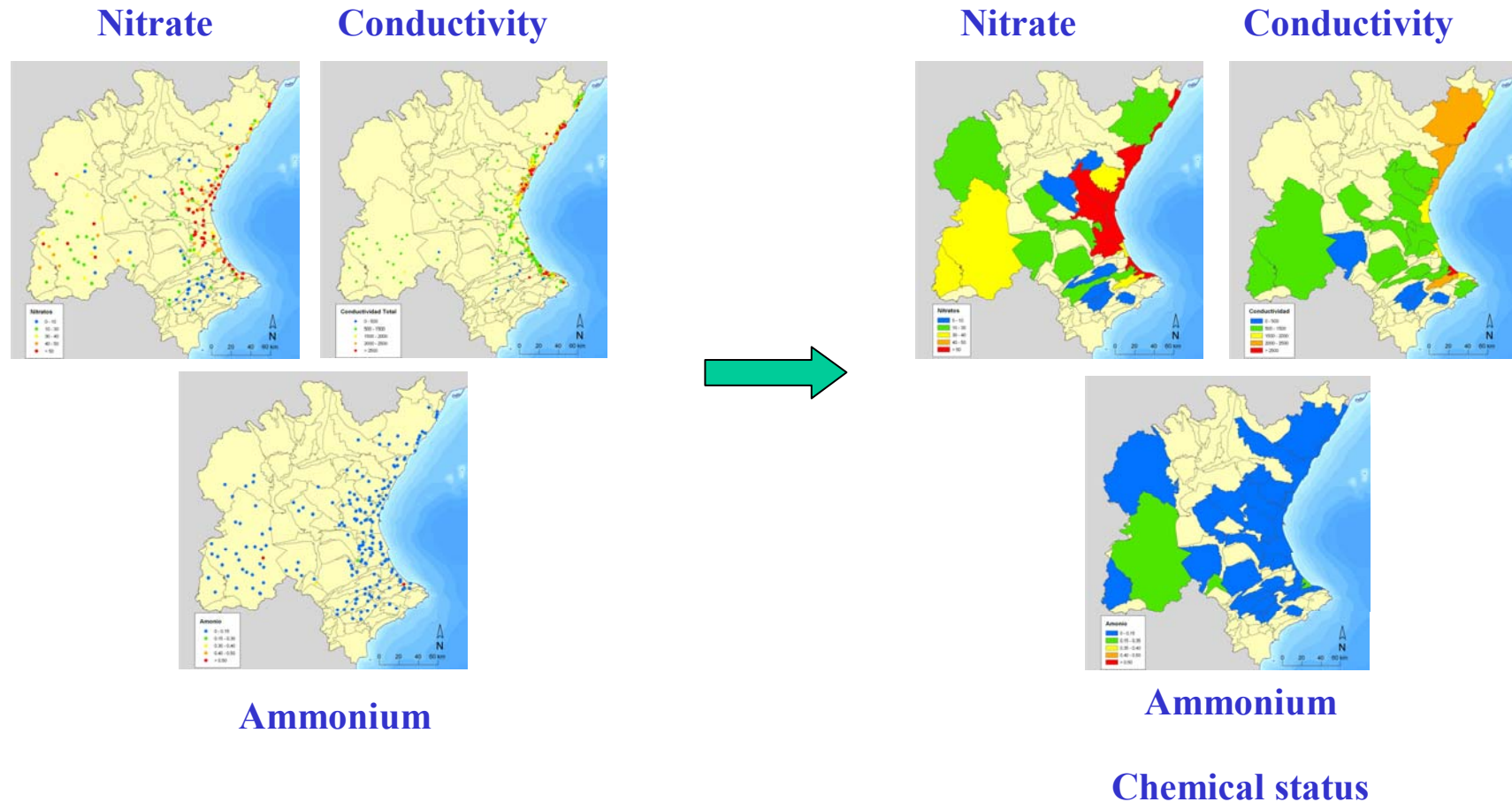


Improved water level monitoring network (under construction)

287 control points

Probable impact:

Characterisation of chemical status



Water quality monitoring networks (150 control points) are used to define chemical status of groundwater bodies

Probable impact: map of chemical status

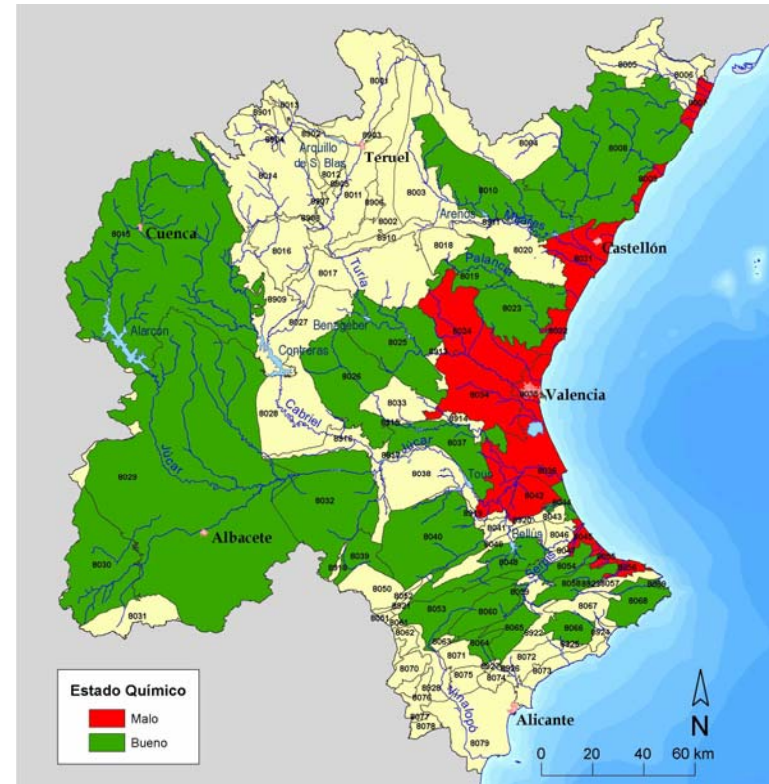
Nitrate



Conductivity



Ammonium

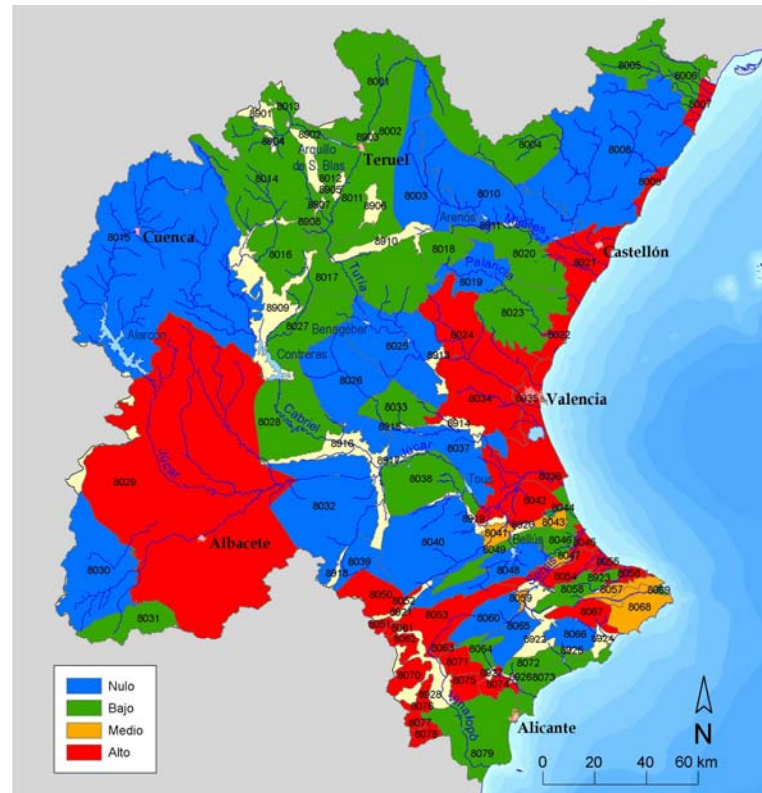


Chemical Status

Combination of pressures and impacts to define risk not to reach EO

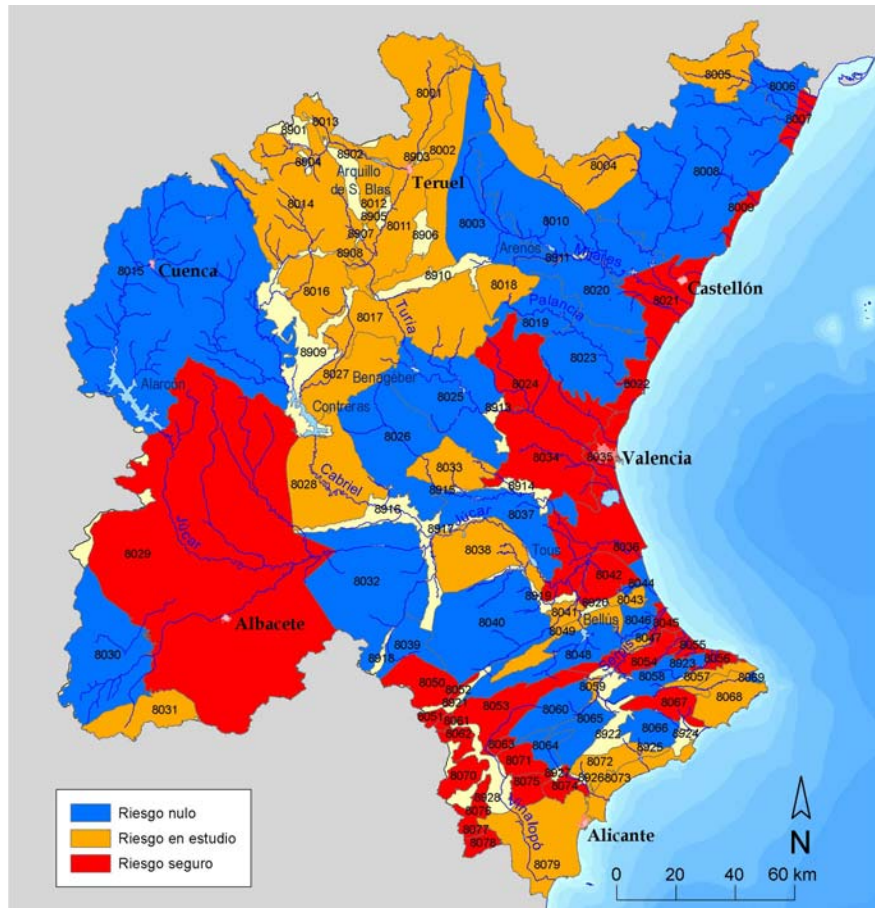
RISK		IMPACT			
		SURE	PROBABLE	NO IMPACT	NO DATA
PRESSURE	SIGNIFICATIVE	HIGH	HIGH	LOW	MEDIUM
	NO SIGNIFICATIVE		MEDIUM	NULL	LOW
	NO DATA		LOW	NOT ALLOWED	

GW at risk of not to reach environmental objectives



Risk	Number og GW	Percentage
High	29	36,7%
Medium	6	7,6%
Low	28	35,4%
Null	16	20,3%

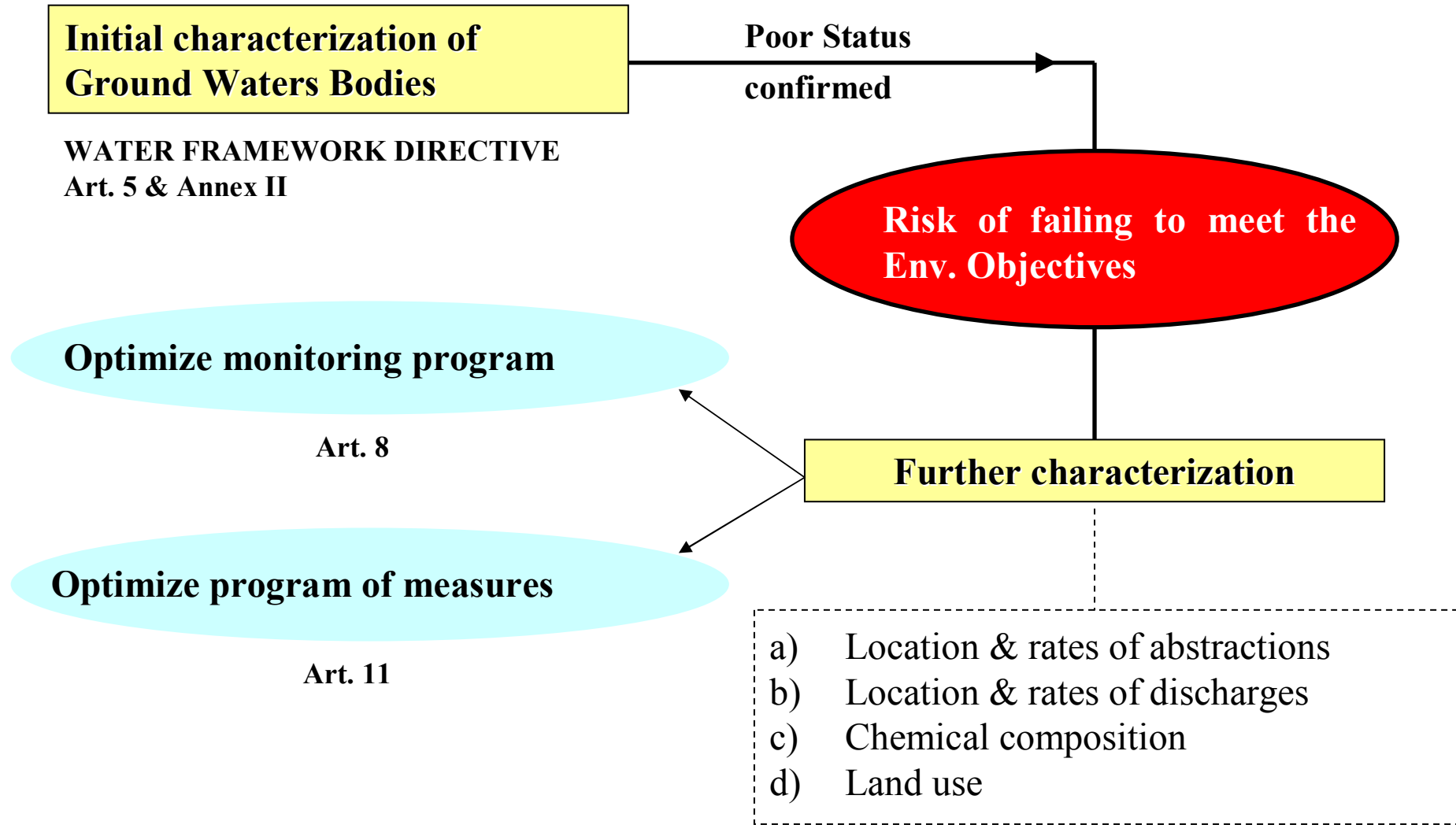
GW at risk of not to reach environmental objectives



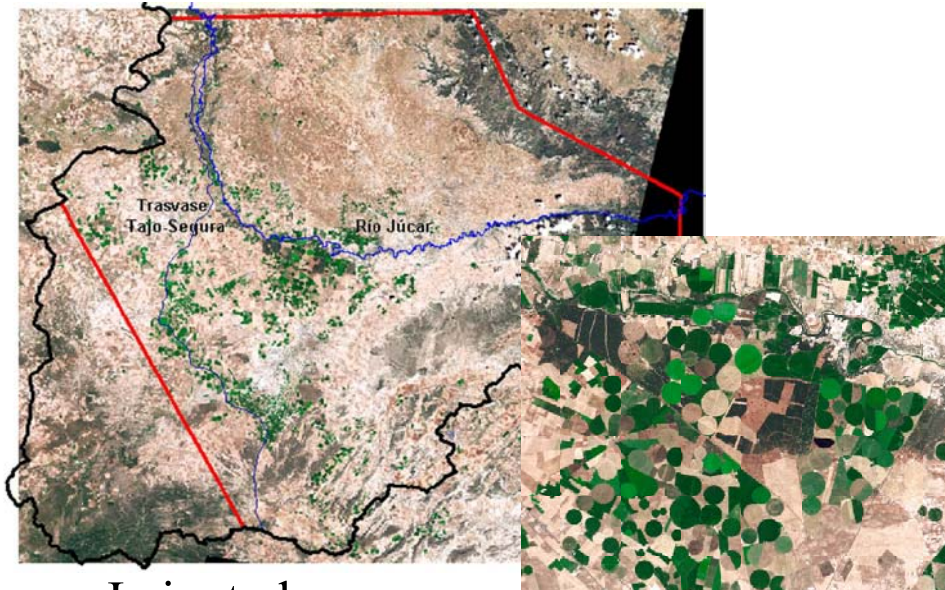
Groundwater body at risk as consequences of pressures due to:		%	
		Sure Risk (SR)	Risk on Study (ROS)
1	Diffuse pollution: fertilizers	15,19% (12)	2,53% (2)
2	Diffuse pollution: pesticides	15,19% (12)	5,06% (4)
3	Abstractions	29,11% (23)	0% (0)
4	Marine intrusion	10,13% (8)	0% (0)

Further characterisation of groundwater bodies

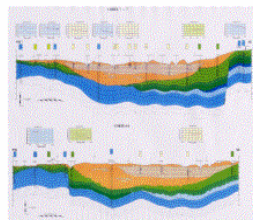
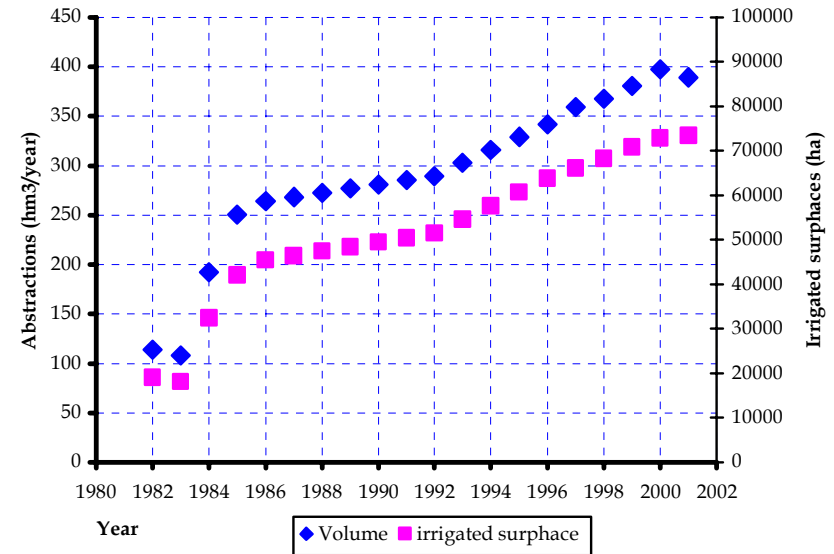
Further Groundwater Body characterization



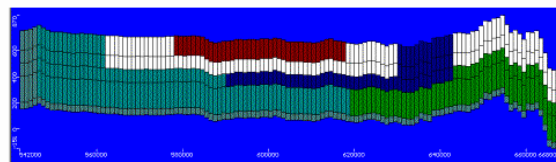
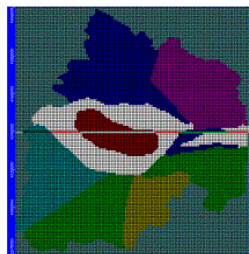
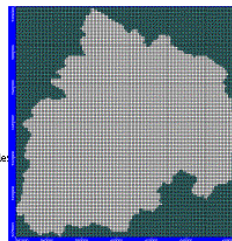
Further characterisation: Case study of Mancha Oriental Aquifer



Irrigated area

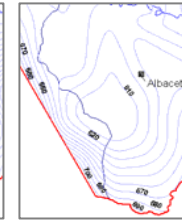
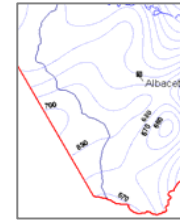
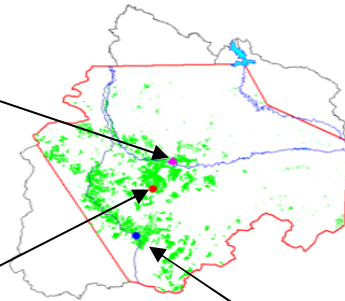
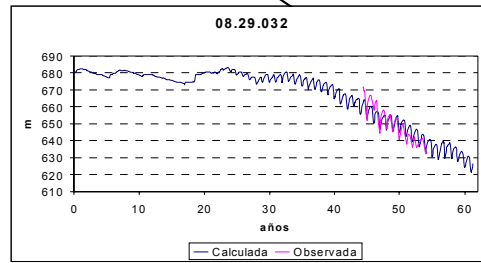
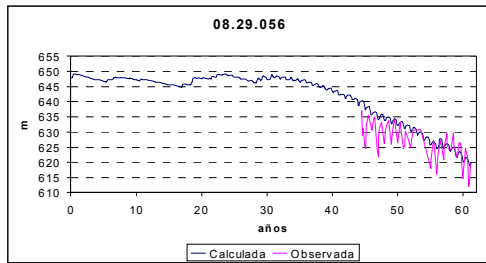
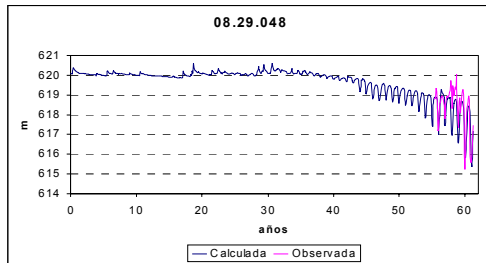


- 150 m. Intercalaciones calcáreas permeables
- 100 m. Acuífero Mioeno.
- 100 m. Acuífero Cretácico
- 200 m. Acuífero Jurásico N
- 200 m. Acuífero Jurásico S

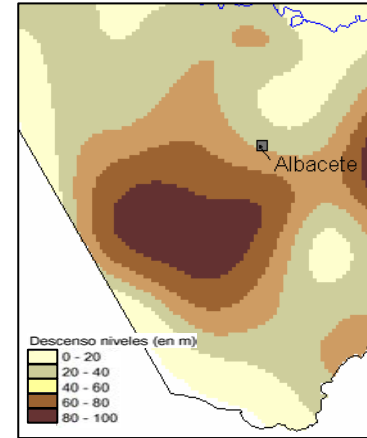


Development of mathematical models

Modelling Mancha Oriental aquifer



1974 - 2001



Júcar river near "Los Frailes"

