



MINISTERIO
DE MEDIO AMBIENTE

CONFEDERACIÓN
HIDROGRÁFICA
DEL JÚCAR

Sustainable Management of Drought: Experience in the Júcar basin

Megève September 2006

Javier Ferrer

Head of the Hydrological Planning Department

Júcar River Basin Authority

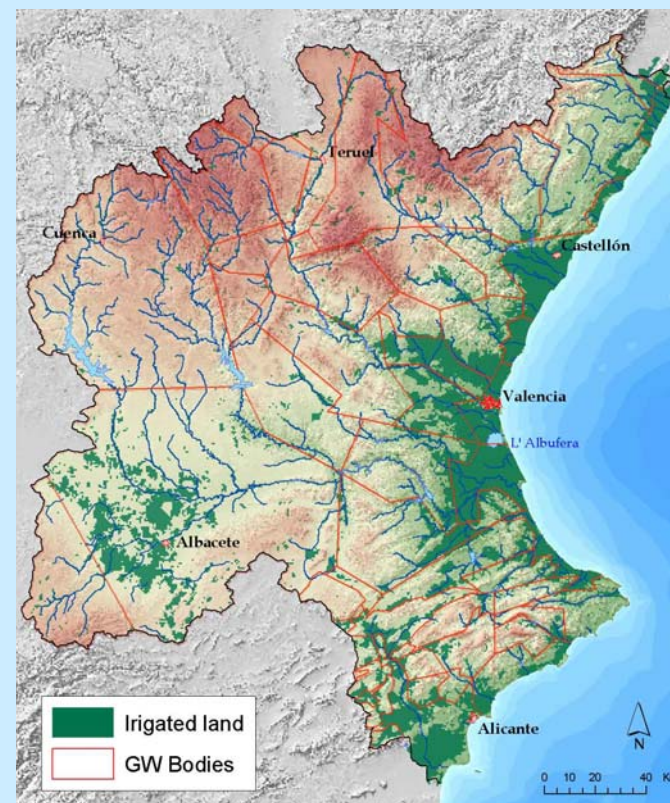
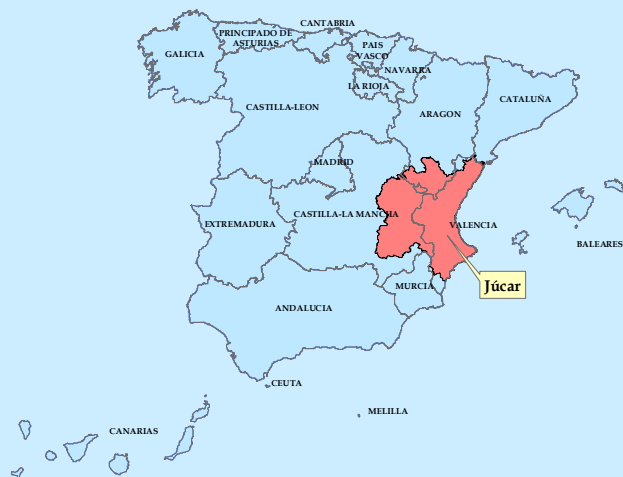


Index

- Territorial area of the Júcar River Basin Authority (JRBA)
- Drought protocol in the JRBA
- Drought 2004- ¿? in the JRBA
 - Hydrological Characterisation
 - Specific legislation
 - Adopted measures
- Conclusions



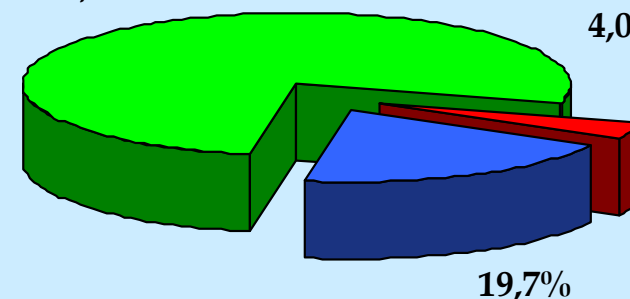
Territorial area: JRBA



Area (km ²)	43 000
Population (inhabitants)	4 360 000
Equivalent population due to tourism (inhabitants)	1 400 000
Irrigated surface (ha)	370 000
Water demand (hm ³ /year)	3 600
Water resources (hm ³ /year)	3 300
Water resources origin	Superficial runoff 25% Groundwater Recharge 75%

76,3%

4,0%



19,7%

■ Agrícola ■ Industrial ■ Urbana



Drought Protocol in the JRBA

Approved by the Governing Board (representatives of basin organisations, users, central and regional administration and experts) in December 2005

Character

Provisional and Partial Action Protocol as long as the Special Plan does not exist, with prevision of December 2006

Protocol bases

- a) Indicators showing the drought situation with enough notice to act accordingly
- b) Knowledge of the resources system and its elements capacity of reinforcement in scarcity conditions
- c) Knowledge of the environmental restrictions and the demand system, as well as its vulnerability towards drought
- d) Alternatives to reduce drought impact, structural and non-structural and adequacy depending on the indicators status

Confederación Hidrográfica del Júcar - Microsoft Internet Explorer

Archivo Edición Ver Favoritos Herramientas Ayuda

Dirección <http://www.chj.es/index2.HTM>





[Inicio](#)
[Organismo](#)
[Cuenca](#)
[Comisaría de Aguas](#)
[Dirección Técnica](#)
[Secretaría General](#)
[Oficina Planificación Hidrológica](#)

Documento de referencia

Descripción	Fecha	Formato	Tamaño en bytes
<ul style="list-style-type: none"> Protocolo de actuación en situación de alerta y eventual sequía. Protocolo de actuación en situación de alerta y eventual sequía de la Confederación Hidrográfica del Júcar. 	Dic/2005	PDF	4.179.838
<ul style="list-style-type: none"> Informe sobre balance del año hidrológico 2004-05 Informe sobre el estado y evolución de los recursos hídricos en el año hidrológico 2004-05 en la Confederación Hidrográfica del Júcar. El documento comprende, entre otros, la descripción de la precipitaciones, estado de los embalses y de los acuíferos así como medidas adoptadas a lo largo del año y el análisis de diferentes escenarios. 	Sep/2005	PDF	3.880.971
<ul style="list-style-type: none"> Informe sobre los artículos 5 y 6 de la Directiva Marco del Agua. Informe para la Comisión Europea sobre los artículos 5 y 6 de la Directiva Marco del Agua. Demarcación hidrográfica del Júcar. 	Abr/2005		
Acceso documento completo. Acceso documento por capítulos.		PDF	22.589.950
		PDF	Varios
<ul style="list-style-type: none"> Informe para la comisión europea sobre la conducción Júcar-Vinalopó. El objetivo del presente informe es responder, en el marco de la financiación con fondos europeos del trasvase Júcar-Vinalopó, a los requerimientos de la Comisión Europea sobre las siguientes cuestiones: <ul style="list-style-type: none"> a) Un programa de reducción de la utilización de aguas subterráneas, b) Un plan de actuación para conseguir una adecuada cobertura de los costes de acuerdo con la Directiva Marco del Agua y c) Las conclusiones del estudio actualmente en marcha sobre la Albufera y su sustentabilidad. 	Dic/2004	PDF	4.425.910

NOVEDADES

[Informe ART. 5 y DMA](#)

[Oficina virtual](#)

[Información Pública](#)

[Notas de Prensa](#)

[Bases de Datos](#)

[Documentos de referencia](#)

[Mapas](#)

[Estado Actual](#)

[Vídeos](#)

[Enlaces](#)

[Mapa Web](#)

[Software requerido](#)

[Contactar con la CHJ](#)


[Constitución Europea](#)

http://www.chj.es/WEB/PDF/Protocolo_CHJ_dic2005_JG.pdf

Internet

19:17



Main actions to carry out during drought situations in the JRBA

- Impact control in natural environment
- Exploitation rules: alternative supplies
- Emergency plans activation for drinking water: saving
- Use restrictions: irrigations
- Drought wells:
 - Joint superficial water and groundwater management
 - Temporary reserve exploitation in strategic aquifers
- Non-conventional resources: reuse of depured water in agriculture
- Transfer and Centre of Rights Exchange



MINISTERIO
DE MEDIO AMBIENTE

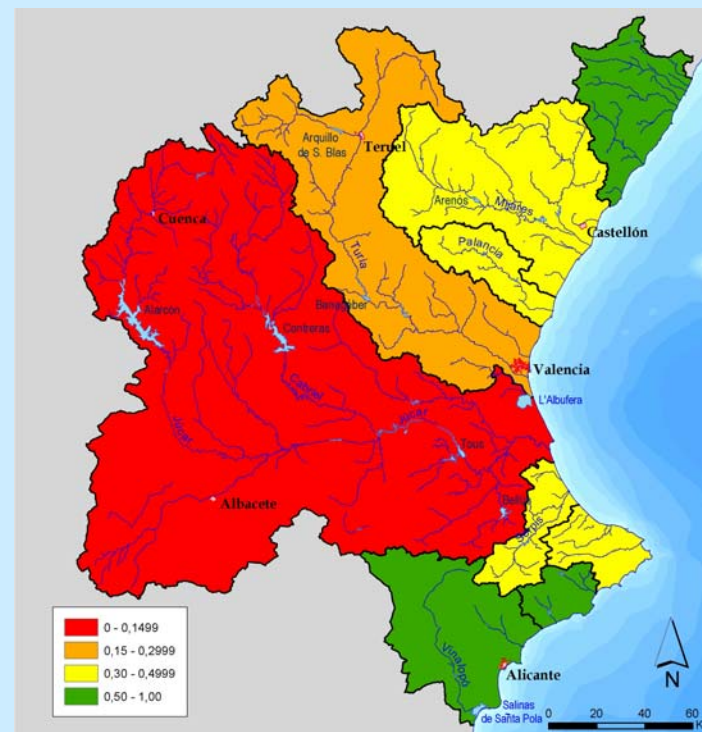
CONFEDERACIÓN
HIDROGRÁFICA
DEL JÚCAR

Drought 2004-¿? In the JRBA: focused in Jucar basin



Hydrological Characterisation

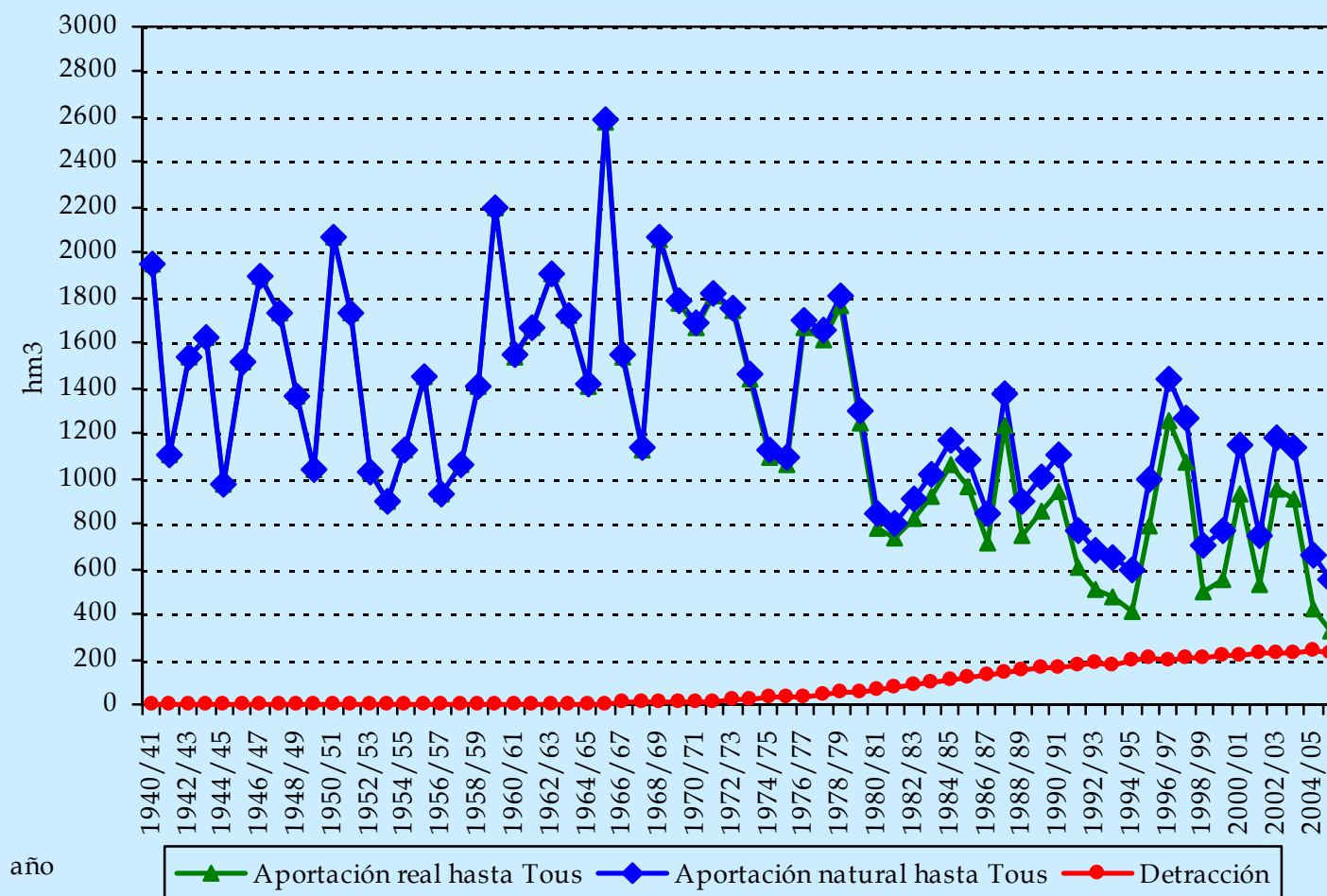
Drought indicators JRBA
(1st September 2006)
Júcar => emergency
Turia => alert



System	Risk Valuation	Status index	Status
Cenia-Maestrazgo	LOW	0,50	NORMAL
Mijares-Plana de Castellón	MEDIUM	0,32	PRE-ALERT
Palancia-Los Valles	LOW	0,35	PRE-ALERT
Turia	MEDIUM	0,29	ALERT
Júcar	VERY HIGH	0,12	EMERGENCY
Serpis	MEDIUM	0,42	PRE-ALERT
Marina Alta	MEDIUM	0,35	PRE-ALERT
Marina Baja	LOW	0,64	NORMAL
Vinalopó-Alacantí	LOW	0,50	NORMAL



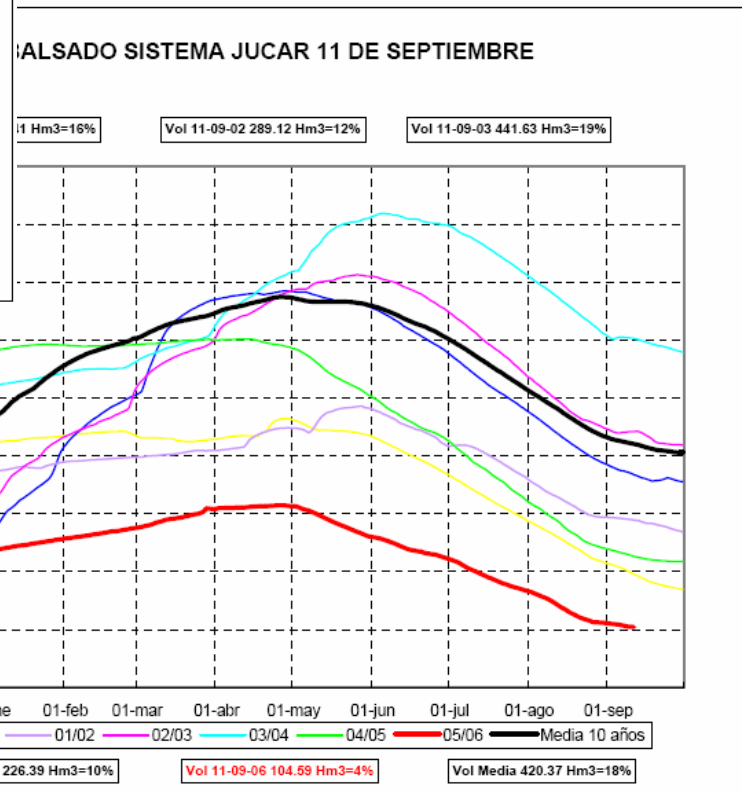
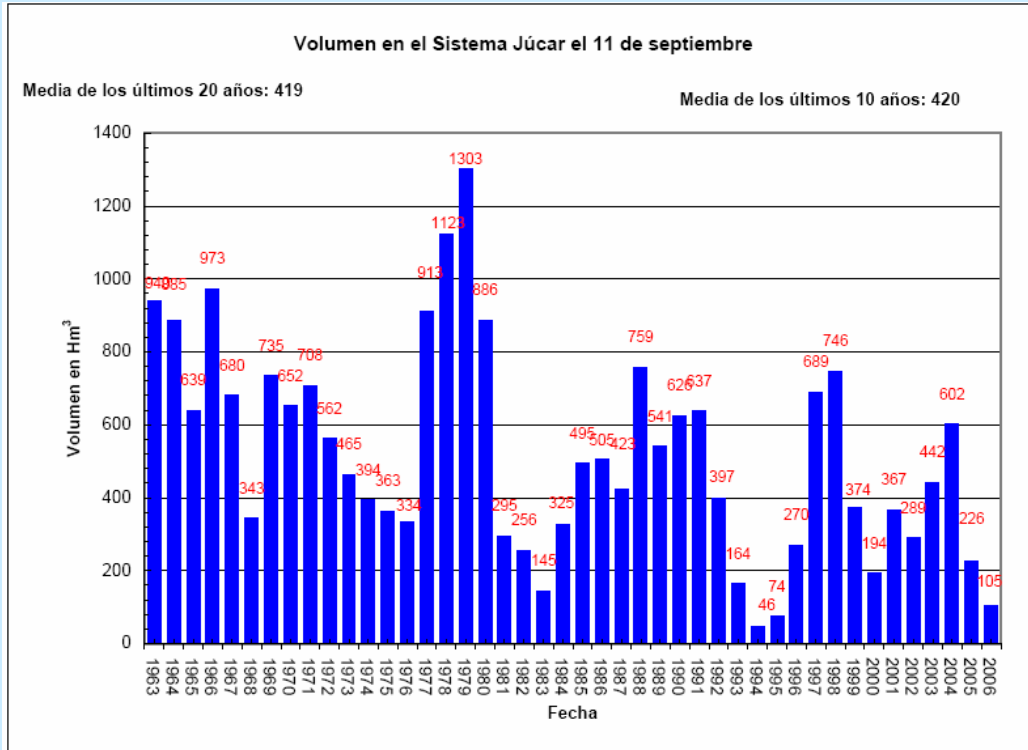
Annual series inflow to Tous reservoir: natural and altered by wells



Two last years: Minimum historic from 1940/41



Reservoir volume 11 September





Permanent Commission

- Set up by Royal Decree 1265/2005, 21st of October
- Permanent Commission: representatives from
 - JRBA (4)
 - Ministries (2)
 - Autonomous Communities (4)
 - Users (3)
 - Local entities, Syndicates and NGO (4)
- Monthly meetings
- Approved on February 13th 2006 of the *Action Plan for Droughts in the Júcar System*



Action Plan 2005/06

Adopted Measures

- 1) Environment protection
- 2) Management and control
- 3) Saving resources
- 4) Generation of additional resources



1) Environment protection measures

Aquifers Ribera
of river Júcar

Action

Extraction follow-up in drought wells

Piezometric and quality follow-up in affected aquifers: Sierra Ave, Plana de Valencia Sur and Plana de Valencia Norte

Middle reach
of river Júcar

General reduction of extraction in the aquifer of Mancha Oriental

Restrictions on superficial uses in river reach of Alarcón-Molinar and in wells considerably affecting the river

Hydrologic-environmental analysis of the Júcar river in the area of Mancha Oriental

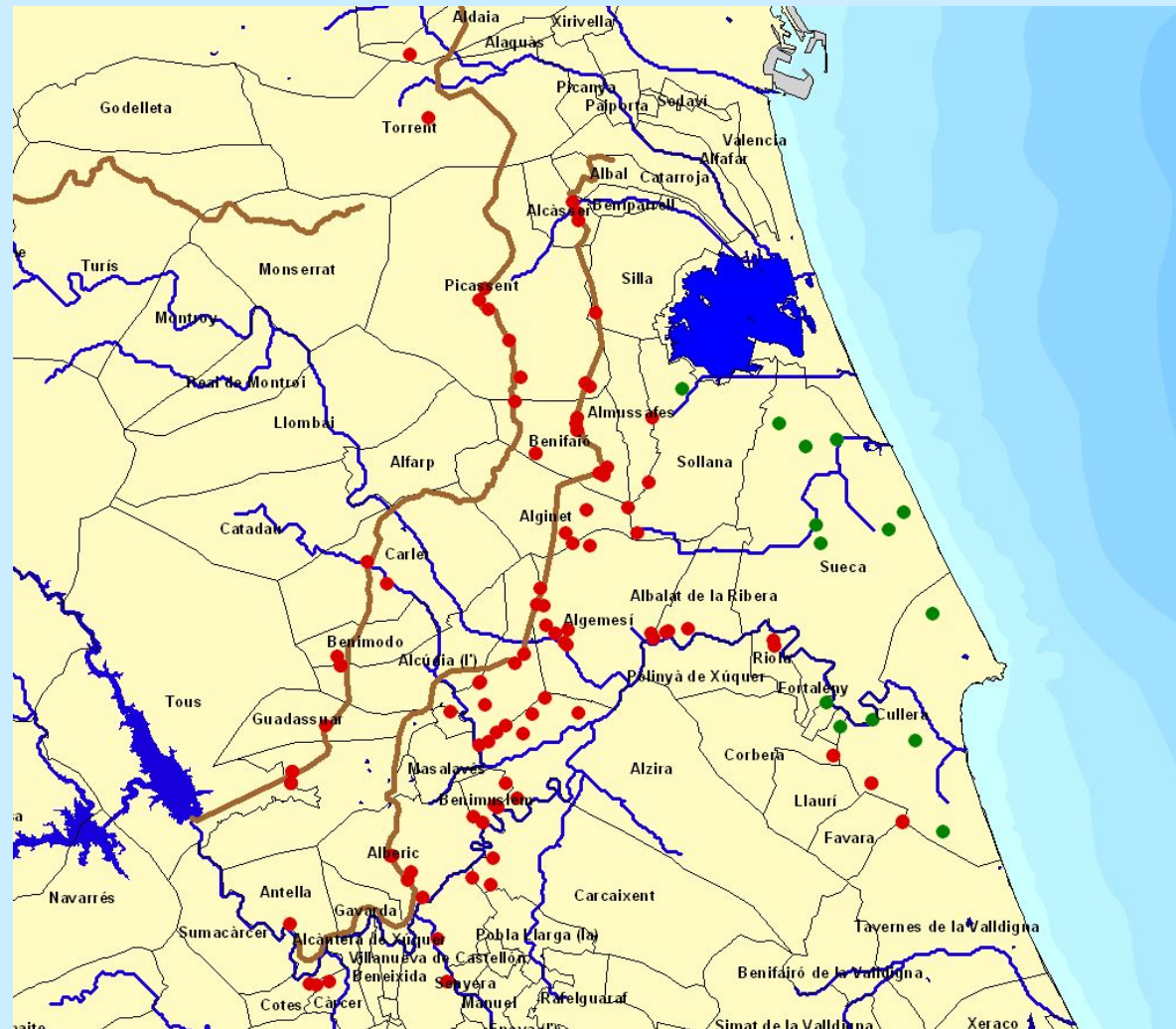
Albufera
wetland in
Valencia

Improvement in the monitoring networks, inputs, outputs and levels in the Albufera lake in Valencia

Follow-up of hydrological balance in the Albufera lake in Valencia



Follow up of aquifers with drought wells in the *Ribera del Júcar*





Follow-up programme for the utilisation of drought wells: Starting April 2006

1. Follow-up in wells:

- Monthly reading of the levels and flow in the wells
- Monthly quality analysis in wells (ions)

2. Aquifer follow-up: Plana of Valencia Norte, Sur and Sierra Ave

- Monthly reading of levels in Basic Network
- Monthly reading of levels in Specific Network
- Monthly quality analysis (μ , pH, T, Cl^- and ions) in Specific Network



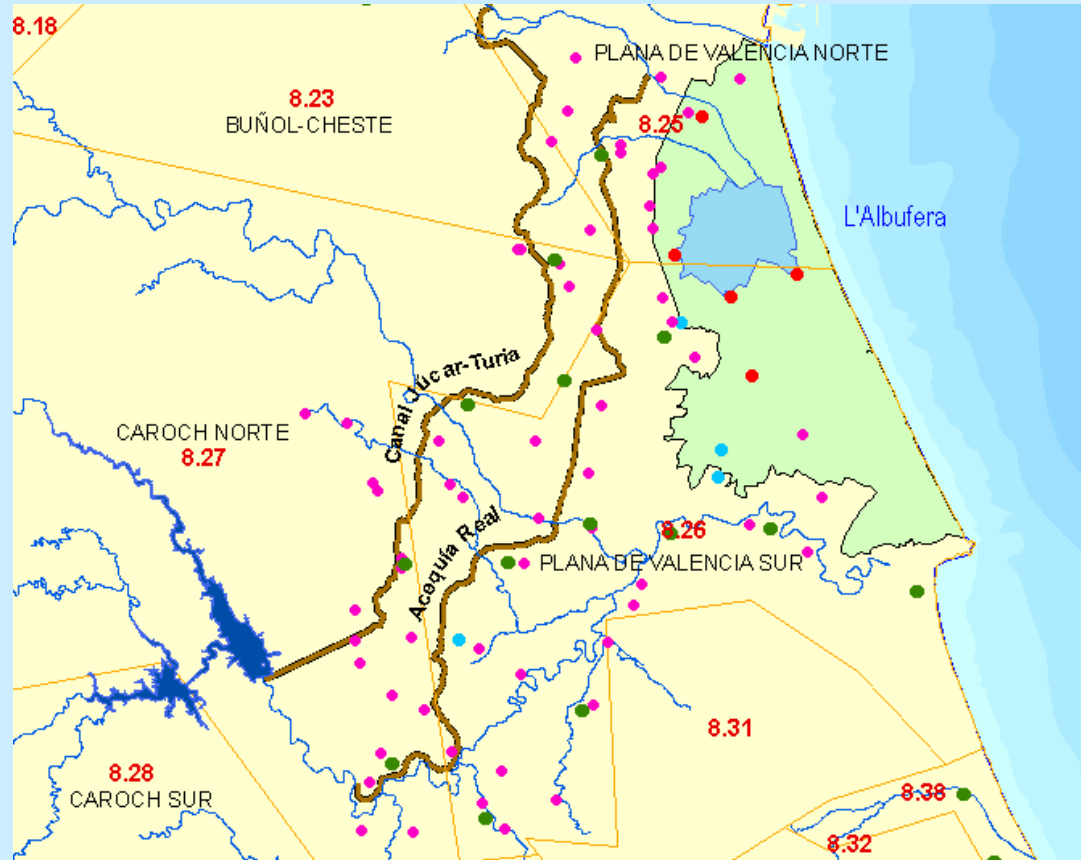
Basic Monitoring Network

General Piezometry

Albufera Piezometry

Hydrometry

● Specific drought network



Piezometry	46	Piezometry = 72	
Piezometry and Quality	26		
Quality	7		Quality = 33
Hydrometry	4		Hydrometry = 4



Detailed follow-up of extraction, piezometric levels and groundwater quality.

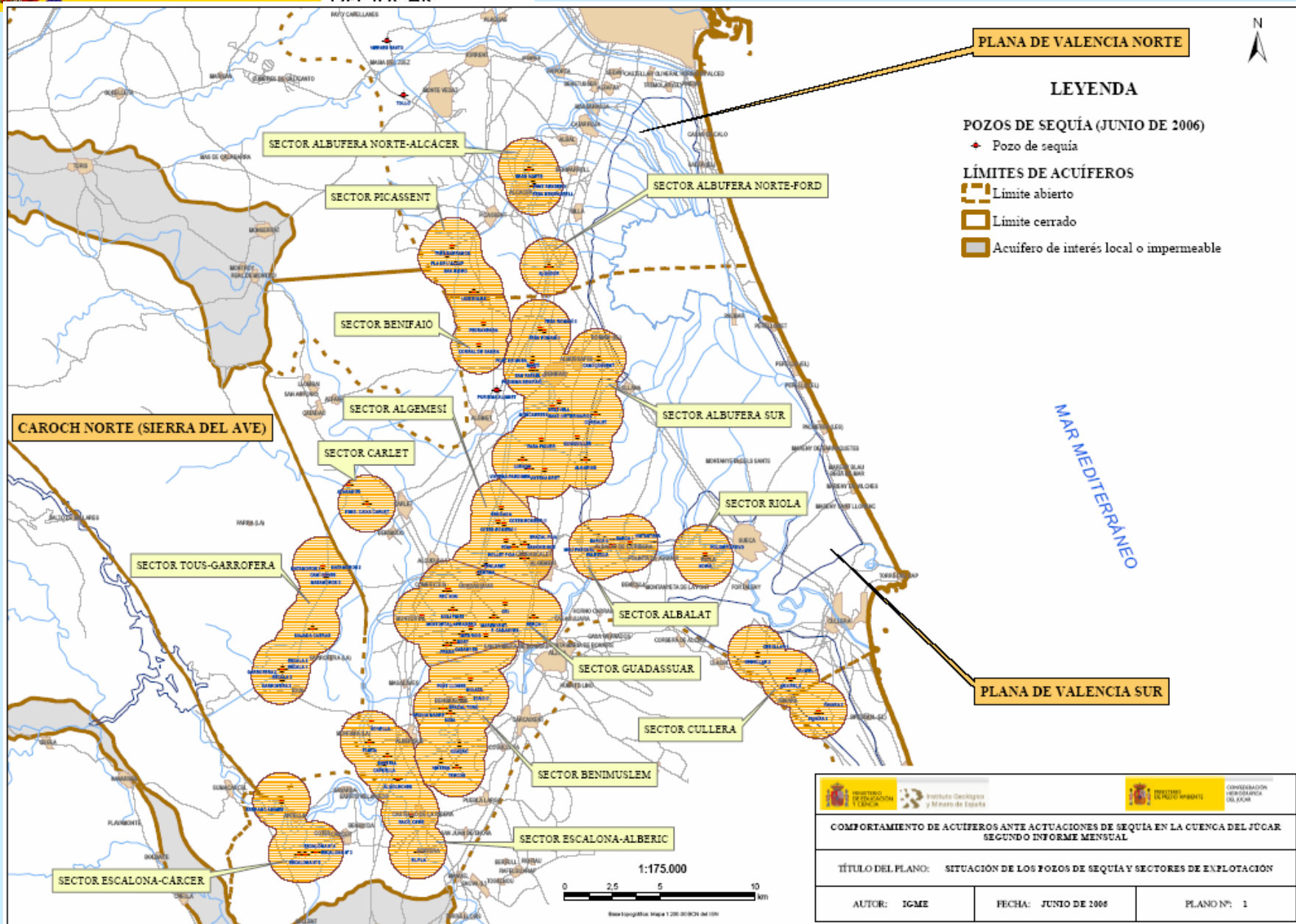
Analysis divided into sectors: areas with well water extraction, 3 aquifers and 16 sectors:

- 4 sectors Plana of Valencia Norte
- 11 sectors Plana of Valencia Sur
- 1 sector Caroch Norte – Sierra Ave

Follow-up monitoring networks within each sector and general network of the aquifer outside the sectors.



Aquifers and sectors





MINISTERIO
DE MEDIO AMBIENTE

CONFEDERACIÓN
HIDROGRÁFICA
DEL JÚCAR

Follow-up on the middle reach of river Júcar

Objective: Maintenance of a minimum flow in river Júcar, in the reach downstream the Alarcón reservoir

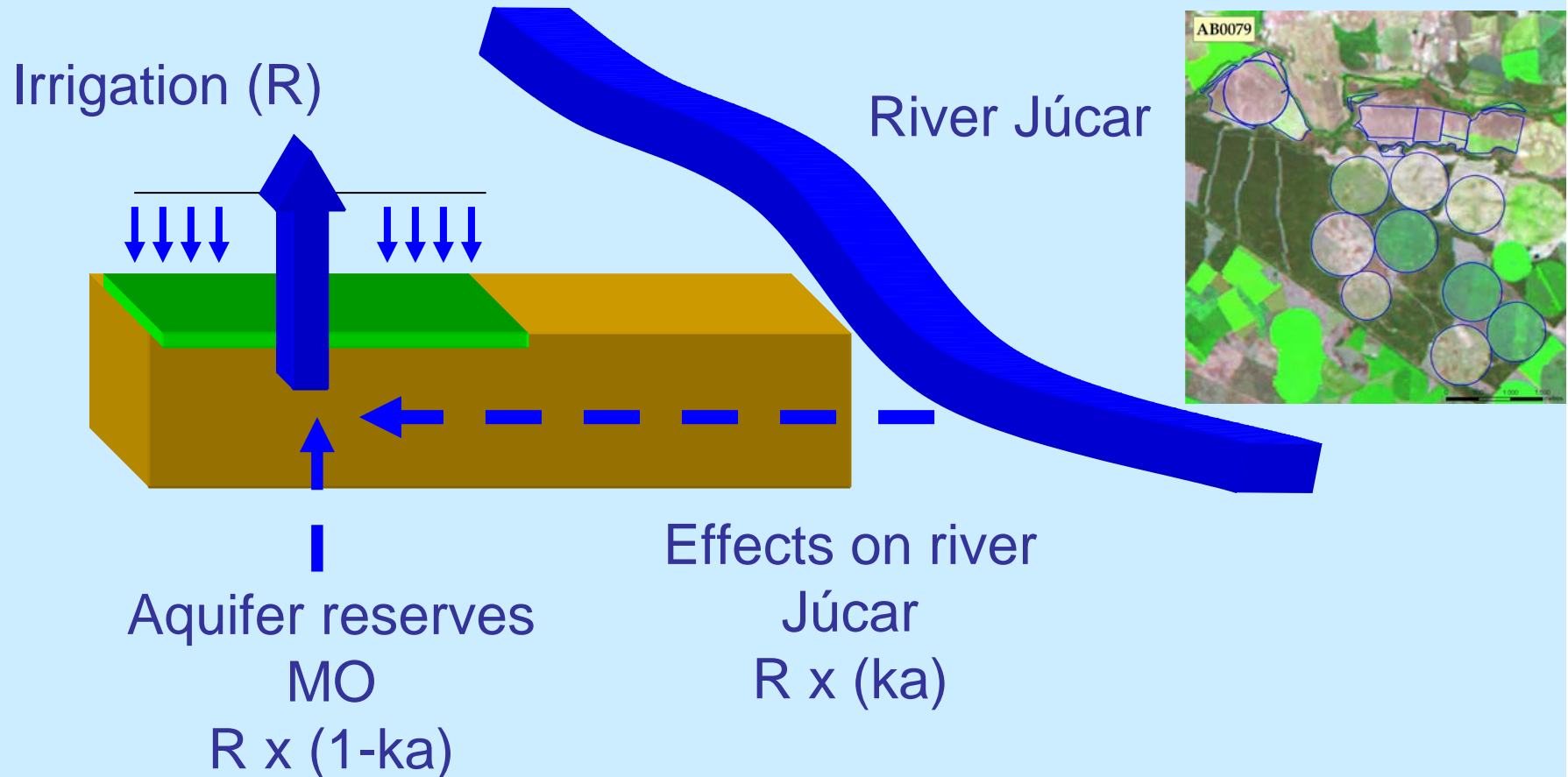


Júcar river during summer 1995



Intensive groundwater irrigation uses:

- environmental effects in the Júcar river flow
- affects other users guarantees
- does not allow to use groundwater reserves during droughts





Reduction of uses

- Communication to users of reduction 45%
 - Superficial irrigation
 - Groundwater irrigation with wells very near the river
- Economic compensation for additional reductions
 - Criteria and relation of affected users to be approved by the Permanent Commission
 - Voluntary compensation of 55%
 - Unitary compensation around 0,19 €/ m³ : economic analysis of representative crops
- Permanent Commission Agreement 22nd may and 27th June economic compensation agricultural exploitations with total reduction of water use

Users	Surface (ha)	Total Volume (m ³)	Compensated Volume (m ³)
13	508,23	3.298.185	1.797.601



MINISTERIO
DE MEDIO AMBIENTE

CONFEDERACIÓN
HIDROGRÁFICA
DEL JÚCAR

Follow-up measures in the Albufera lake in Valencia





Pilot monitoring network installed and operating:

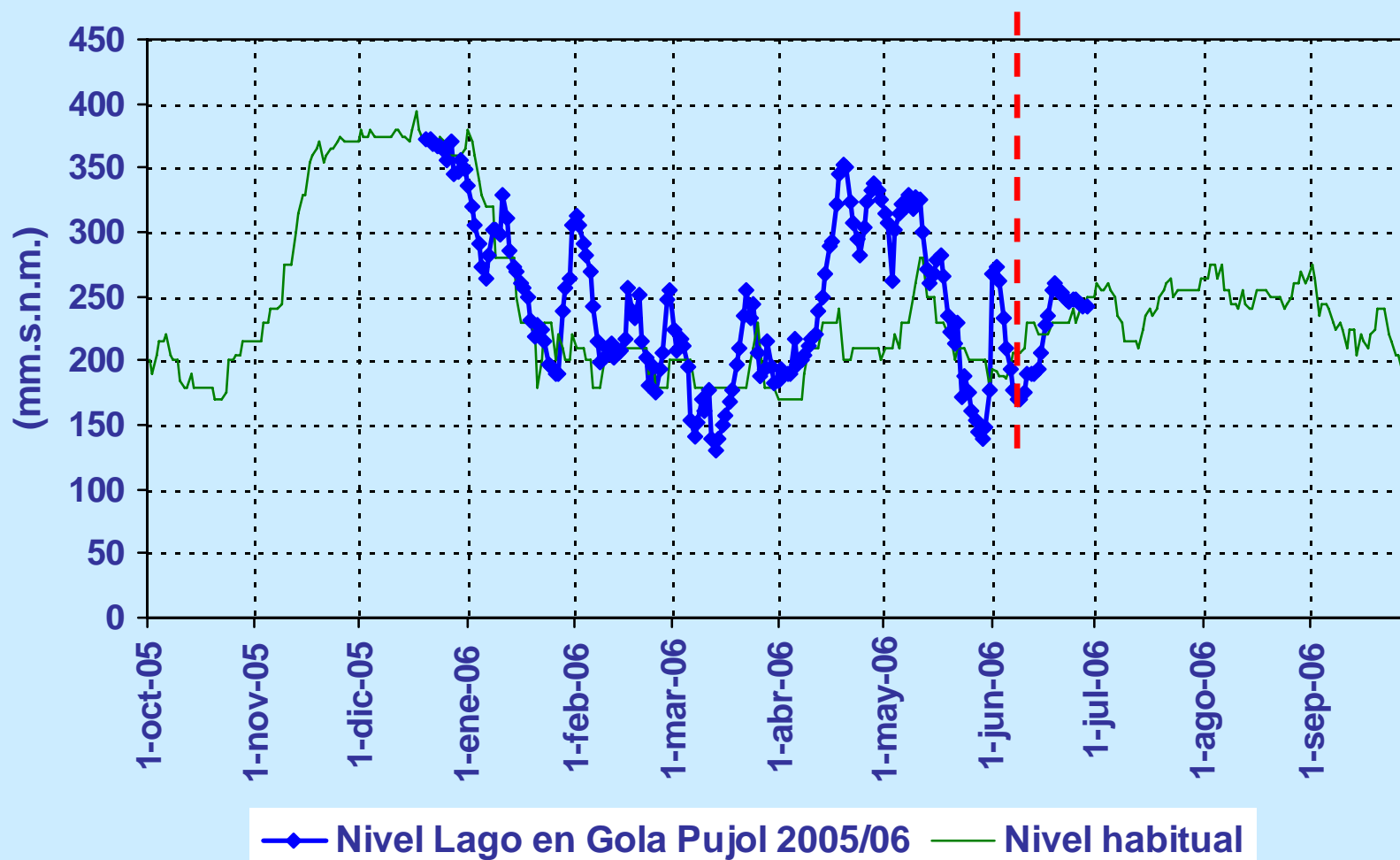
- Level gage in the lake, next to Gola (artificial channel) of Pujol
- Discharge gage in Gola of Pujol (outflow lake)
- Discharge gage in the Overa irrigation channel (inflow lake)

Pilot monitoring network extension finishing:

- Quality monitoring in the lake, next to Gola de Pujol
- Discharge gage in the rest of Golas: Perellonet, Perelló, Rei, Sant Llorenc
- Discharge gage in Clot and Dreta irrigation channels

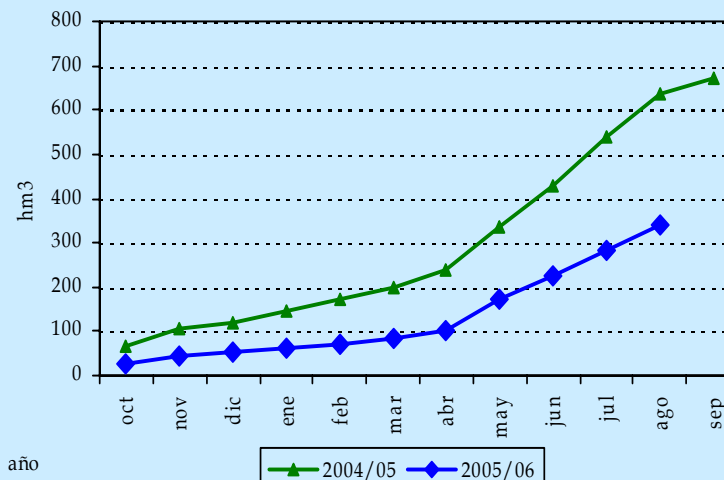


Level follow-up in the Albufera lake





3) Irrigation Saving



Superficial irrigation	Supply 1994/95	Supply 2004/05	Reduction on 2004/05 Superficial	Proposal 2005/06 Superficial (hm³)
Irrigation canal Júcar Turia	42	46	60 %	18,4
Assignment for the replacement of pumping and consolidation of MO	0	21	60 %	8,4
Traditional irrigation Júcar (Albacete) (*)	8,7	8,7	45 %	4,8
Traditional irrigation Júcar (Ribera Alta and Baixa)	383	621	43 %	354

Groundwater irrigation: General saving in extractions in the whole Mancha Oriental aquifer: 15% from 406 hm³ (61 hm³). Possibility to materialise in three years

Saving in wells affecting the river in a practically immediate way similar to superficial areas: 45%.



4) Additional resources generation

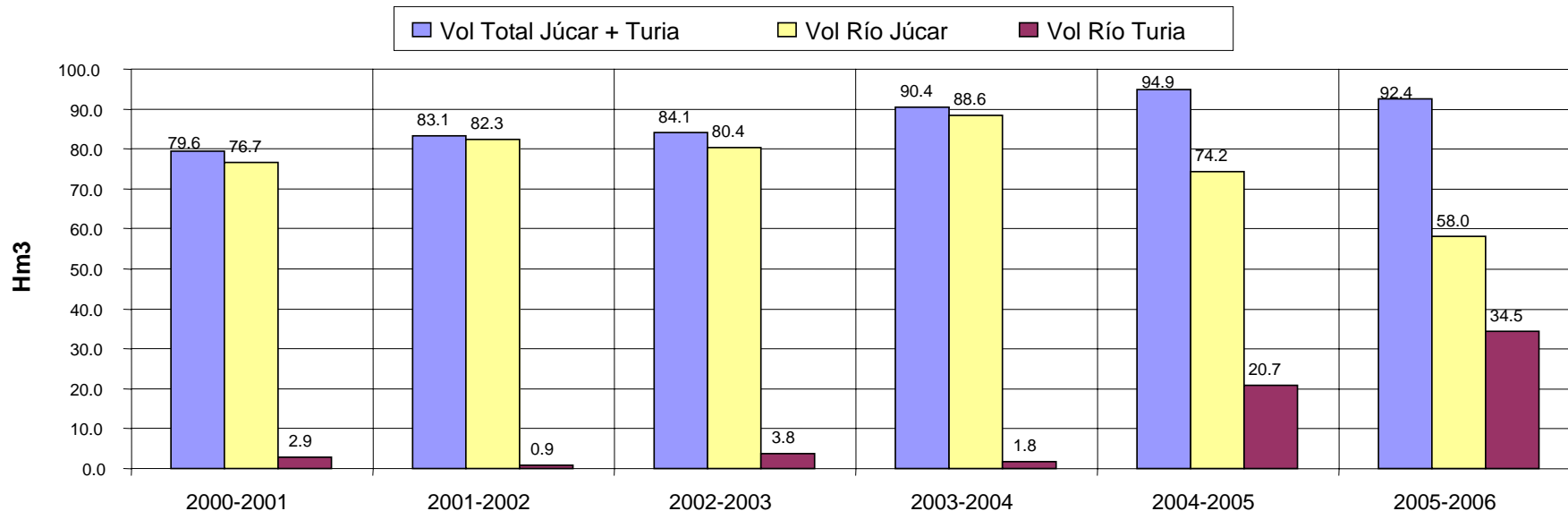
- Actions in drinking water:
 - Alternative supply from Turia in Valencia and Sagunto
 - Alternative groundwater supply in Albacete
 - Infrastructures improvement
- Actions in irrigation
 - Utilisation of drought wells in the Ribera of Júcar aquifers
 - Infrastructure improvement
 - Reutilisation of depured water from EDAR of Pinedo in the Vega del Turia (Oro and Favara irrigation areas)



Alternative supply resources for drinking

Supply		Total Supply	Proposal	Proposal 2005/06	
Alternative resources use to technical limits	Starting	2005/06	Origin Júcar	Other origins (hm ³)	Other origins (%)
Supply Albacete	Feb 2006	15	10	5	33 %
Supply Valencia	Oct 2005	126	70	56	44 %
Supply Sagunto	Abr 2006	7	4	3	43 %

VALENCIA SUPPLY VOLUME FOR HYDROLOGICAL YEAR
UNTIL 30TH OF AUGUST





Irrigation actions:

- 1) Reuse of depurated water: 24 hm³
- 2) Drought wells authorized by the Permanent Commission:
 - 3 aquifers
 - 7 irrigation areas
 - 109 wells
 - 40 hm³ :compatible with available resources

Code	Name	Urban and industrial pumping	Agricultural pumping	Total pumping	Available resource
080.035	Plana of Valencia North	57,19	1,01	58,20	68,15
080.036	Plana of Valencia South	26,84	43,87	70,72	139,89
080.037	Sierra of AVE	15,89	25,54	41,43	46,31

Resources estimation and water extraction (hm³/year) in the groundwater bodies (*from the REPORT FOR THE EUROPEAN COMMISSION on Articles 5 and 6 of the WFD*)



Conclusions

- New environmental management policy
 - Planning for emergency treatment
 - Protocol and Special Drought Plan (SDP)
 - Environmental Evaluation of measures
- Severity of the drought in the JRBA from 2004/05
- Action Plan of the Permanent Commission JRBA:
 - Environment protection measures
 - Management and control measures
 - Saving measures
 - Additional resources generating measures
- Importance of the emergency and urgency works
 - Year 2005: 19,3 M €
 - Year 2006: 35,3 M €



MINISTERIO
DE MEDIO AMBIENTE

CONFEDERACIÓN
HIDROGRÁFICA
DEL JÚCAR

Thank you for
your attention

