GOBIERNO DE ESPAÑA
MINISTERIO DE MEDIO AMBIENTE Y MEDIO RURAL Y MARINO
CONFEDERACIÓN HIDROGRÁFICA DEL SEGURA

Presidencia Española eu 2010.es

SEGURA RIVER BASIN

SPANISH PILOT RIVER BASIN REGARDING WATER SCARCITY AND DROUGHTS

GOBIERNO DE ESPAÑA | MINISTERIO DE MEDIO AMBIENTE Y MEDIO RURAL Y MARINO | CONFEDERACIÓN HIDROGRÁFICA DEL SEGURA

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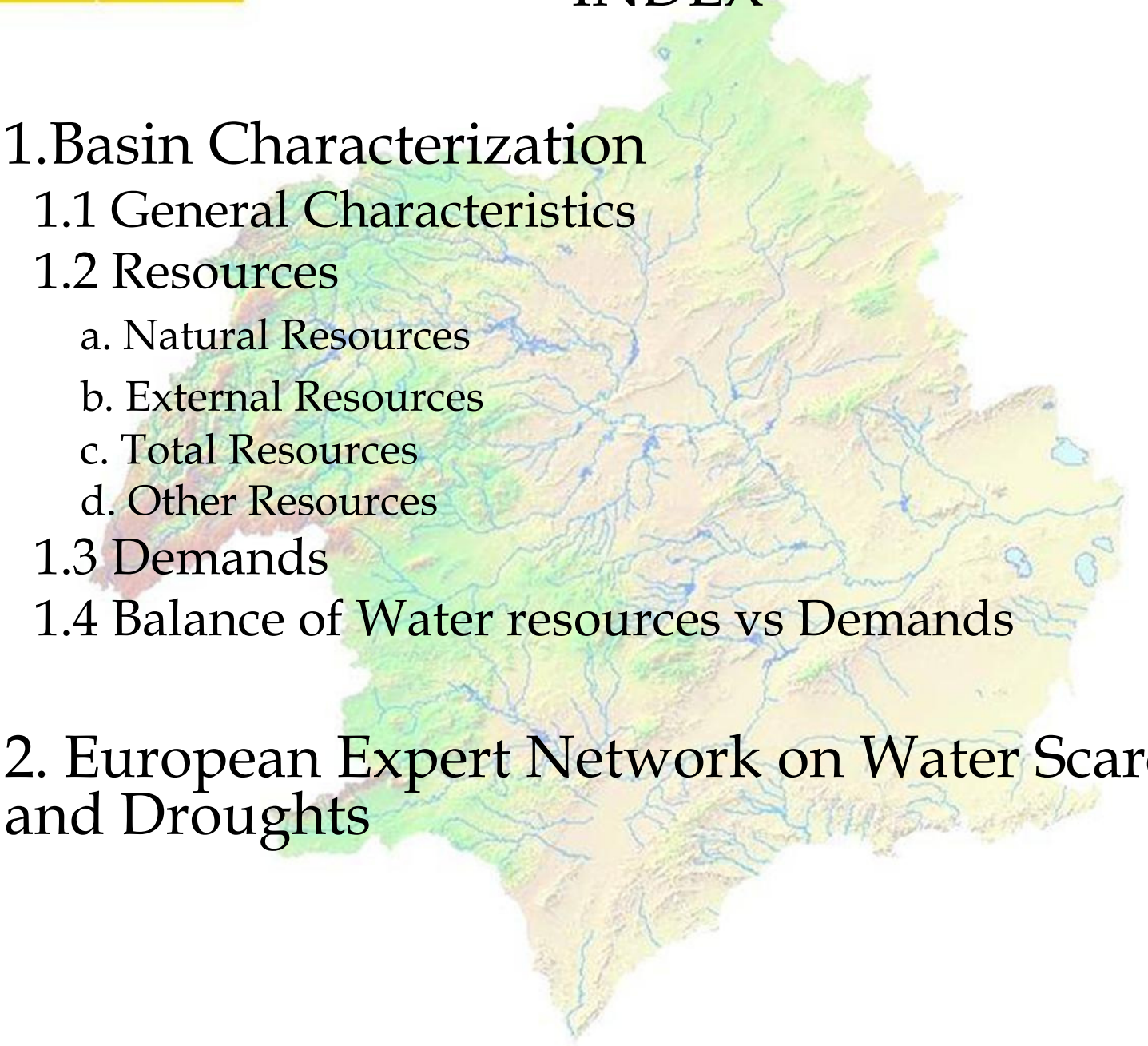

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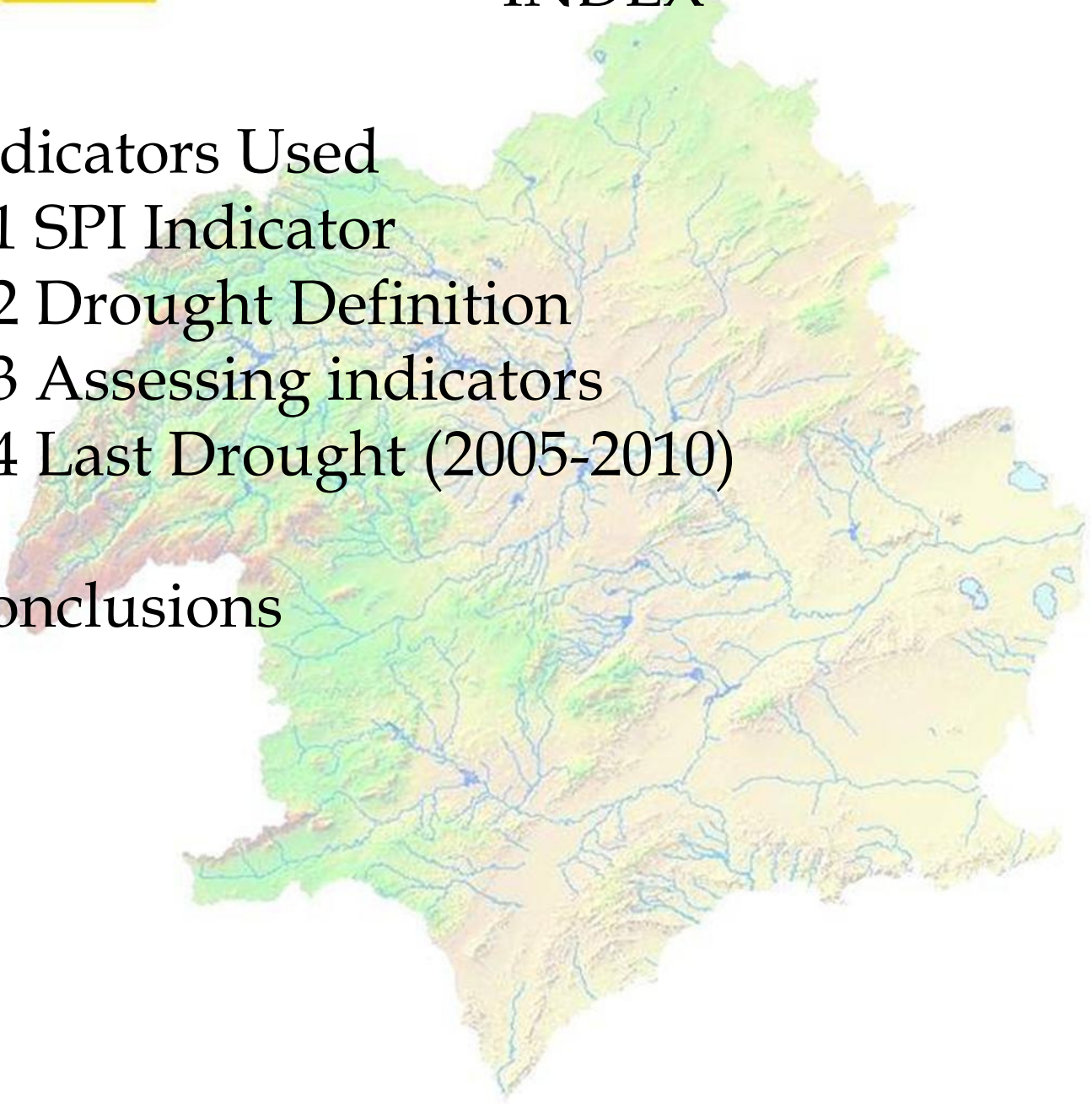
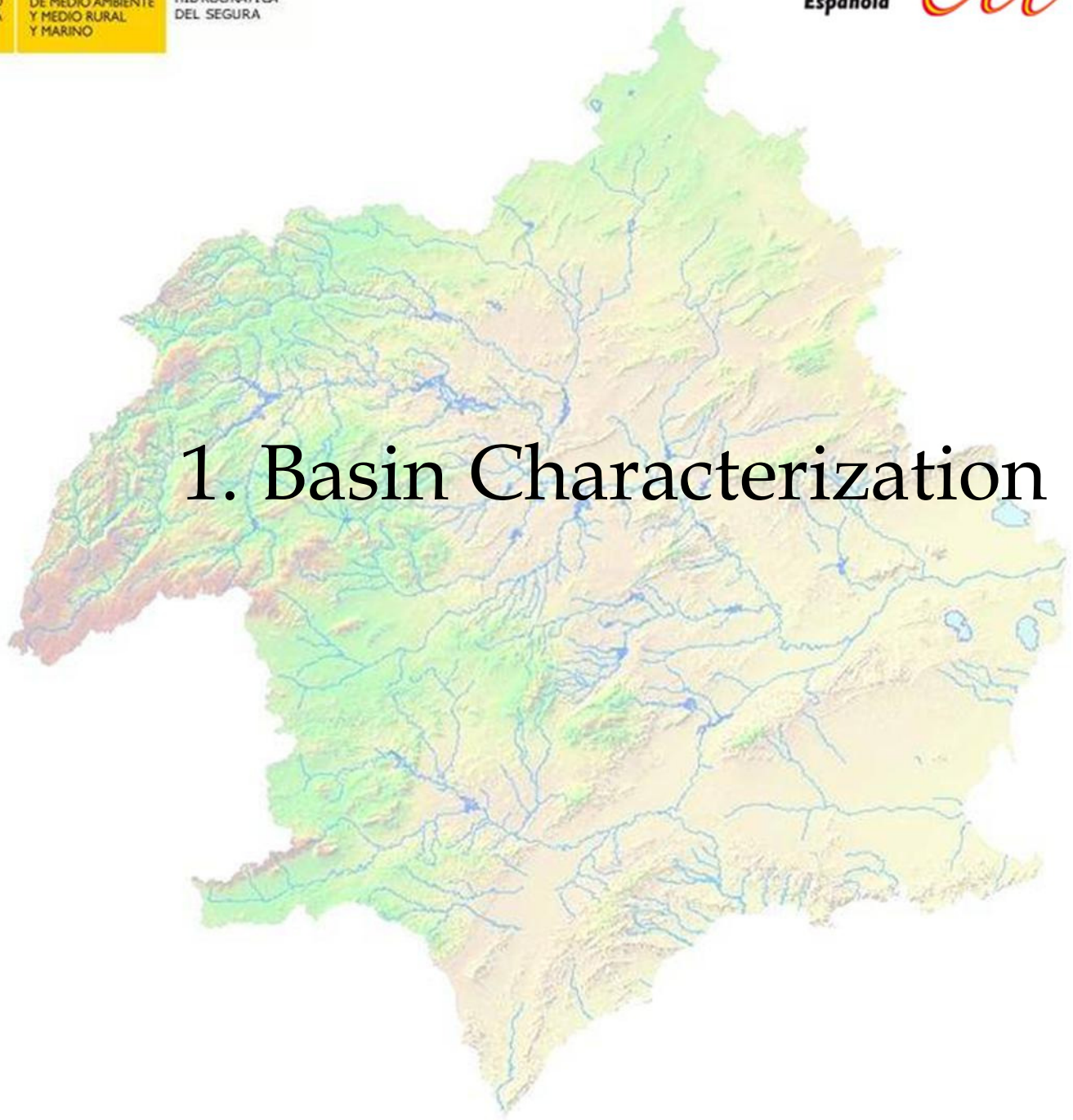




1. Basin Characterization

1. Basin Characterization: **1.1 General Characteristics**

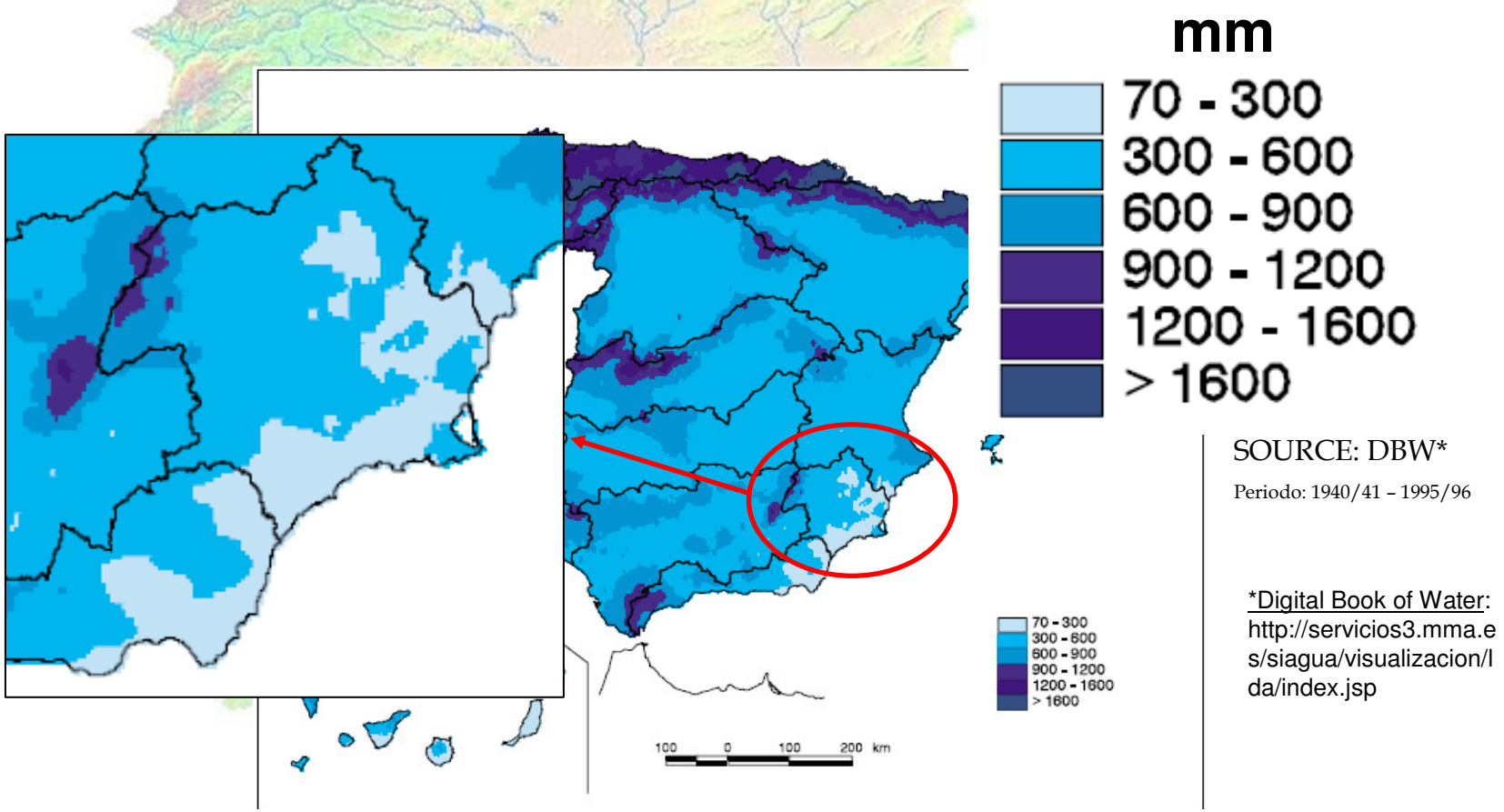
Spain

Europe

SURFACE (Km²)	18.815
POPULATION THAT DEMANDS RESOURCES FROM SEGURA RIVER BASIN (inhabitants). Year 2009	1.969.370
SUMMER POPULATION (inhabitants). Year 2009	> 2.500.000
TOTAL LENGHT OF CHANNEL NETWORK (Km)	1.470
IRRIGATION SURFACE (ha)	269.029
SOURCES OF WATER RESOURCES (Hm³)	Surface waters : 640, Groundwater: 220 Reutilization:110, TAJO-SEGURA WATER TRANSFER: 540

1. Basin Characterization: **1.1 General Characteristics**

The South East of Spain receives less RAINFALL than the rest of Iberian Peninsula, due to Foëhn effect.



SOURCE: DBW*

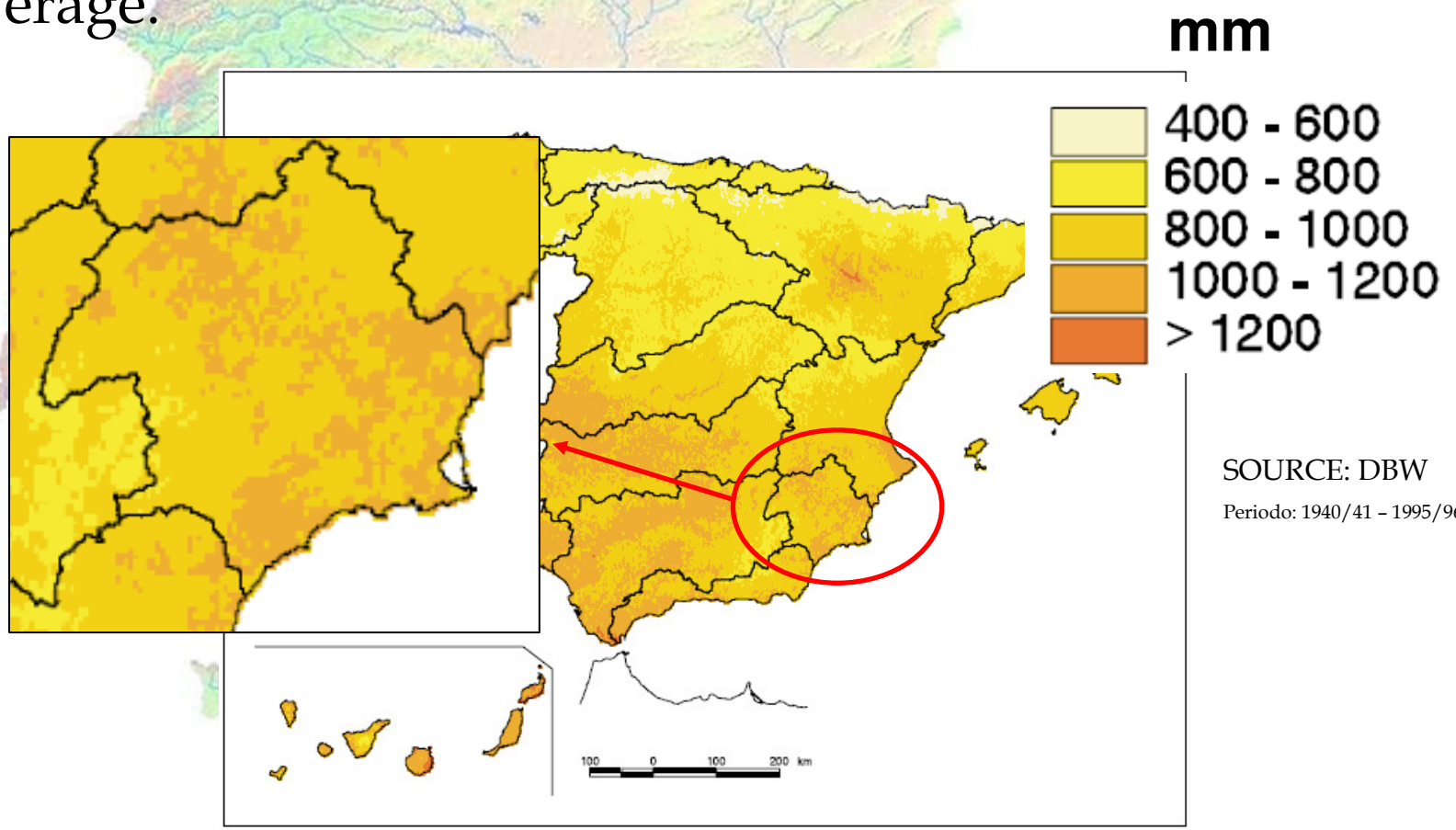
Periodo: 1940/41 – 1995/96

*Digital Book of Water: http://servicios3.mma.es/siagua/visualizacion/lda/index.jsp

Average annual rainfall: 365 mm in the Segura River Basin

1. Basin Characterization: **1.1 General Characteristics**

The high isolation generates a POTENTIAL EVAPOTRANSPIRATION (PET) similar to the Spanish average.

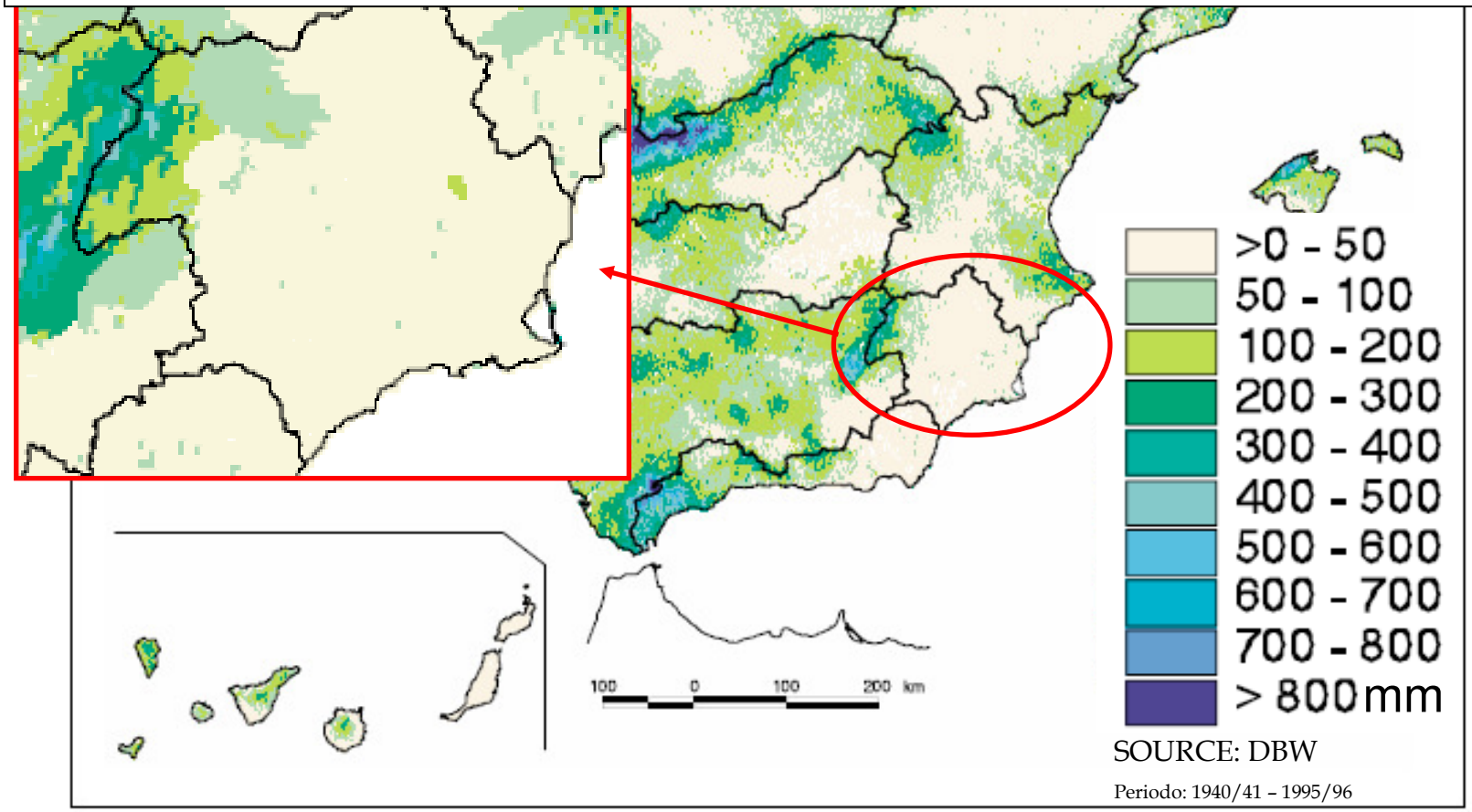


SOURCE: DBW
Periodo: 1940/41 – 1995/96

Average Annual PET: 827 mm in the Segura River Basin

1. Basin Characterization: **1.1 General Characteristics**

Only in the headwaters of the basin , the RUNOFF is significant.

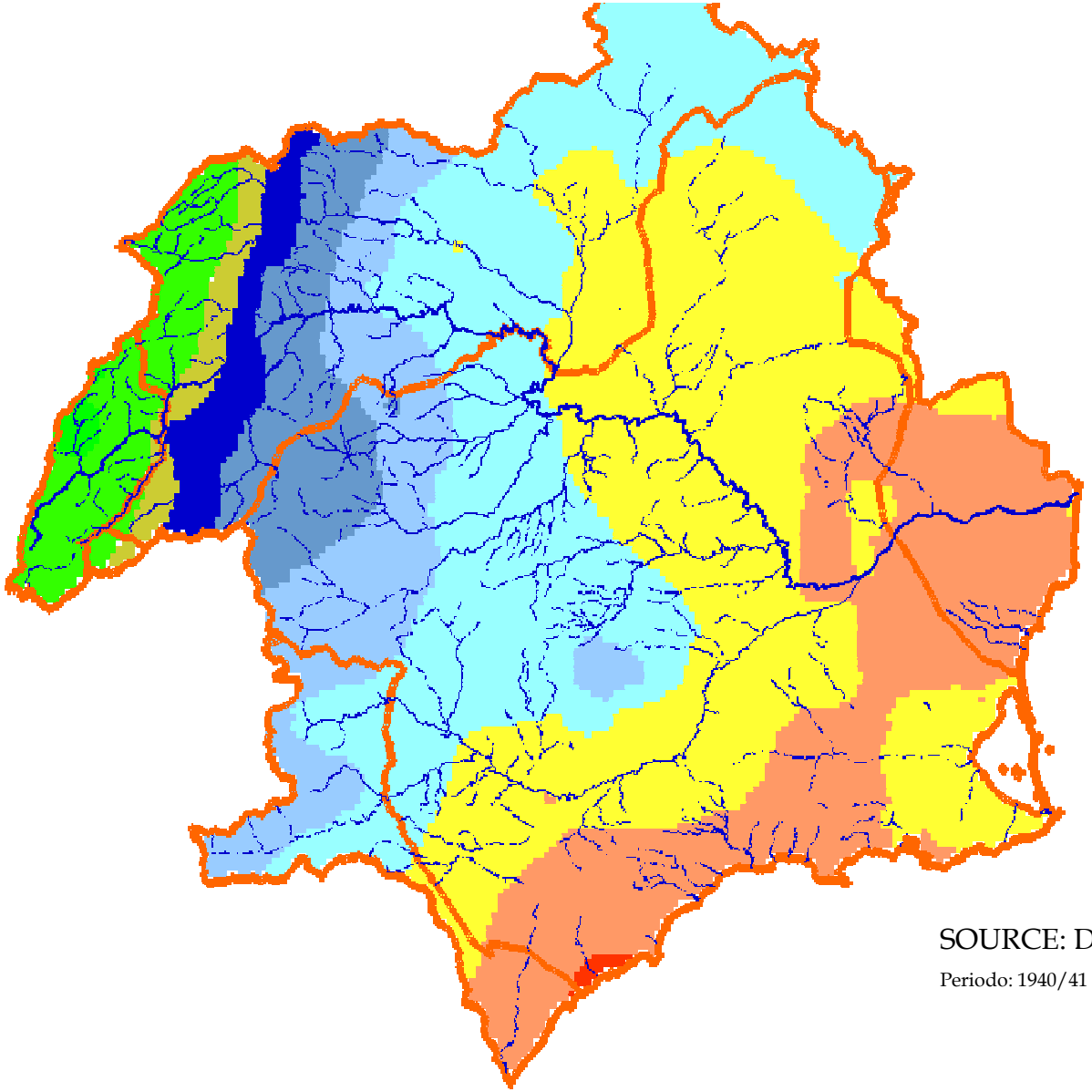


Average total runoff < 100 mm in Segura River Basin

1. Basin Characterization: **1.1 General Characteristics**

Water balance

Rainfall - ETP (mm)



SOURCE: DBW

Periodo: 1940/41 – 1995/96

1. Basin Characterization: **1.1 General Characteristics**

❖ According to international organisms (UN, WHO, etc…), the water scarcity threshold at national level is set in 1.000 m^3/inhab/year of available water resources.

❖ This threshold is estimated for food safety or sustainable economic development of the region.

Segura River Basin (S.R.B.)	442 m^3/inhab/year
SPAIN	2.460 m^3/inhab/year

1. Basin Characterization: **1.1 General Characteristics**

	Surface (km^2)	Average rainfall (mm)	PET (mm)	Natural Resources (hm^3/year)	Ratio per inhabitant
S.R.B.	18.870 (3.7%)	365	827	803 (0,7%)	442 m^3/hab/año
Spain	506.474	711	842	111.186	2.460 m^3/hab/año

Source: Digital Book of Water /SRB Report 2008

The Segura River Basin is a semiarid basin that shows the least renewable water resources of all the Spanish river basins.

1. Basin Characterization: **1.2 Resources**

a. Natural Resources: surface water

1. Basin Characterization: **1.2 Resources**

a. Natural Resources: surface water

- The headwaters of the basin (Segura and Mundo Rivers until their confluence) represent the main source of water resources of the basin.

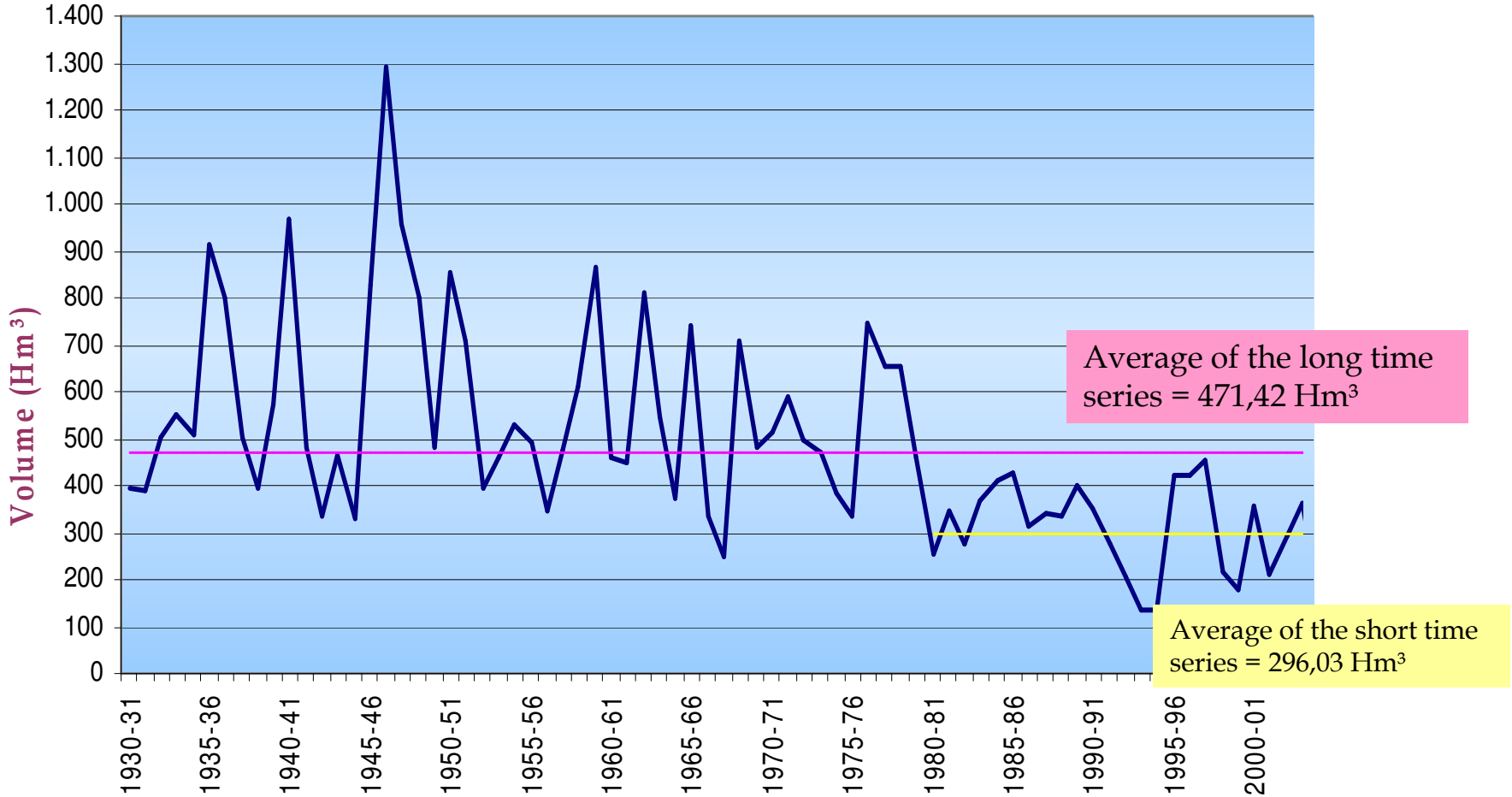
- After headwaters, the second main source of water resources are tributaries of right river bank (Moratalla, Argos, Quipar and Mula Rivers), which have permanent hydrological regime but with scarce water flow (65 hm^3 approximately). They are locally consumed and don't represent significant flow returns to Segura River.

- The torrential tributaries of left river bank correspond to semiarid basins. Therefore, they only are active after storms.

1. Basin Characterization: **1.2 Resources**

a. Natural Resources: surface water

Interannual acumulated runoff between september 1931 and september 2009



1. Basin Characterization: **1.2 Resources**

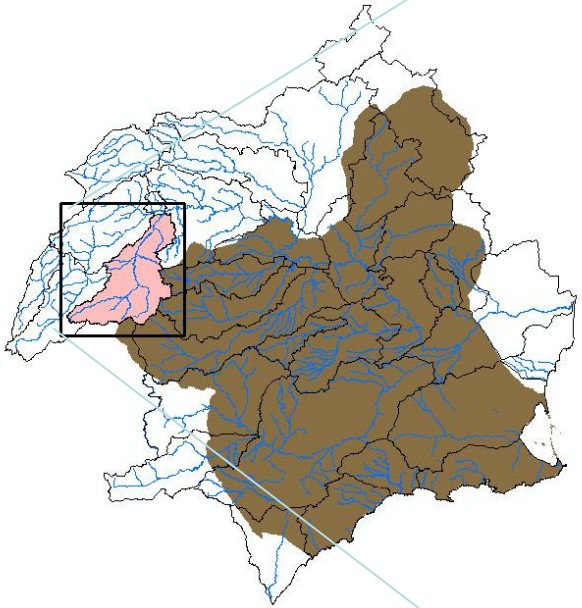
Possible causes in the runoff decrease

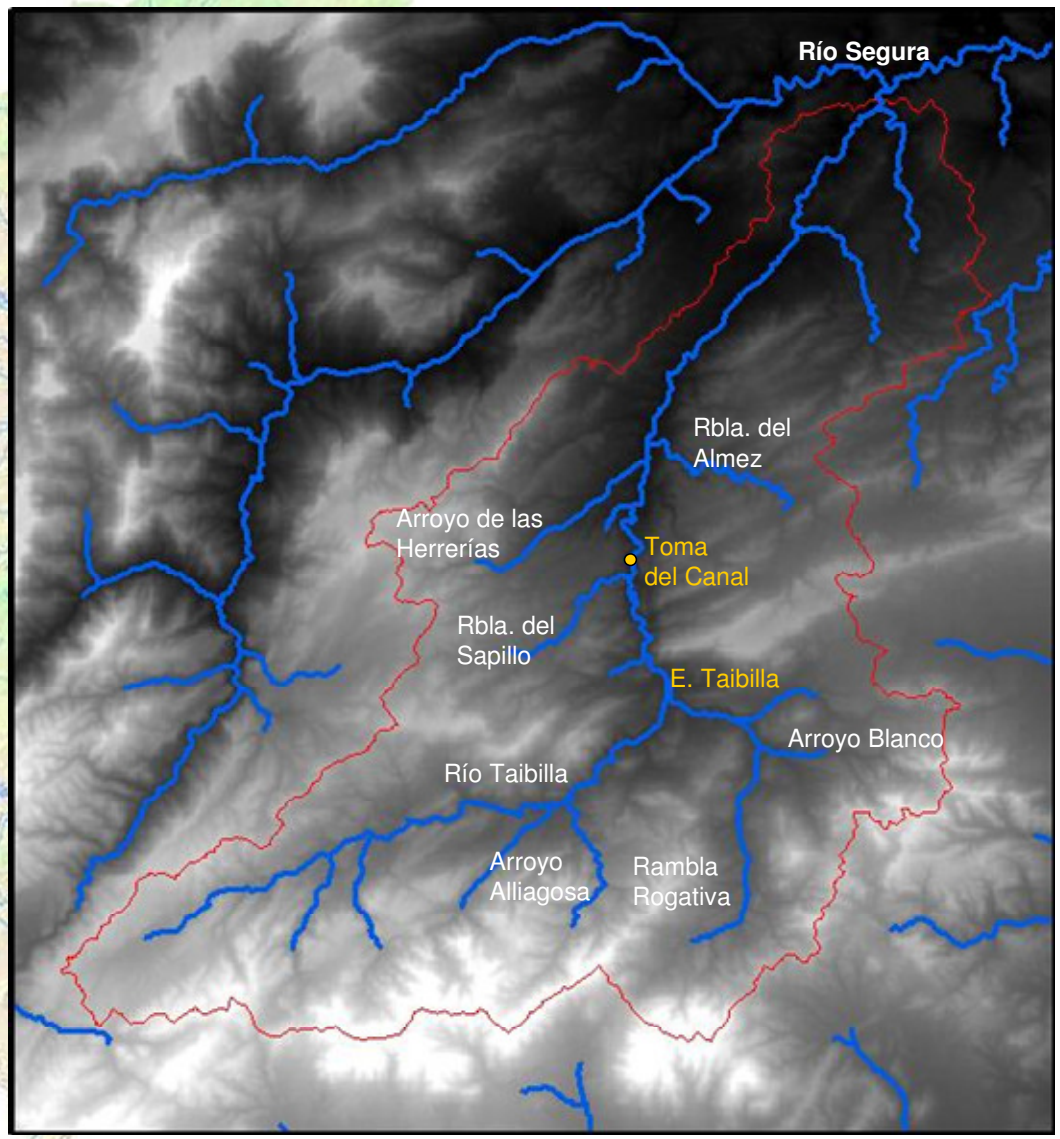
- Climate variability and change (rainfall, temperature, wind, relative humidity, radiation …) and theirs effects in the evaporation, evapotranspiration, and finally in the water balance in the basin.
- Drought events and its impacts in the water cycle (soil moisture, aquifers recharge, groundwater, and surface water).
- Changing in land use (reforestation, abandon of agricultural activities …)

In the vulnerability studies about droughts and water scarcity at regional level, the future scenarios of climate change must be considered for the basin.

1. Basin Characterization: **1.2 Resources**

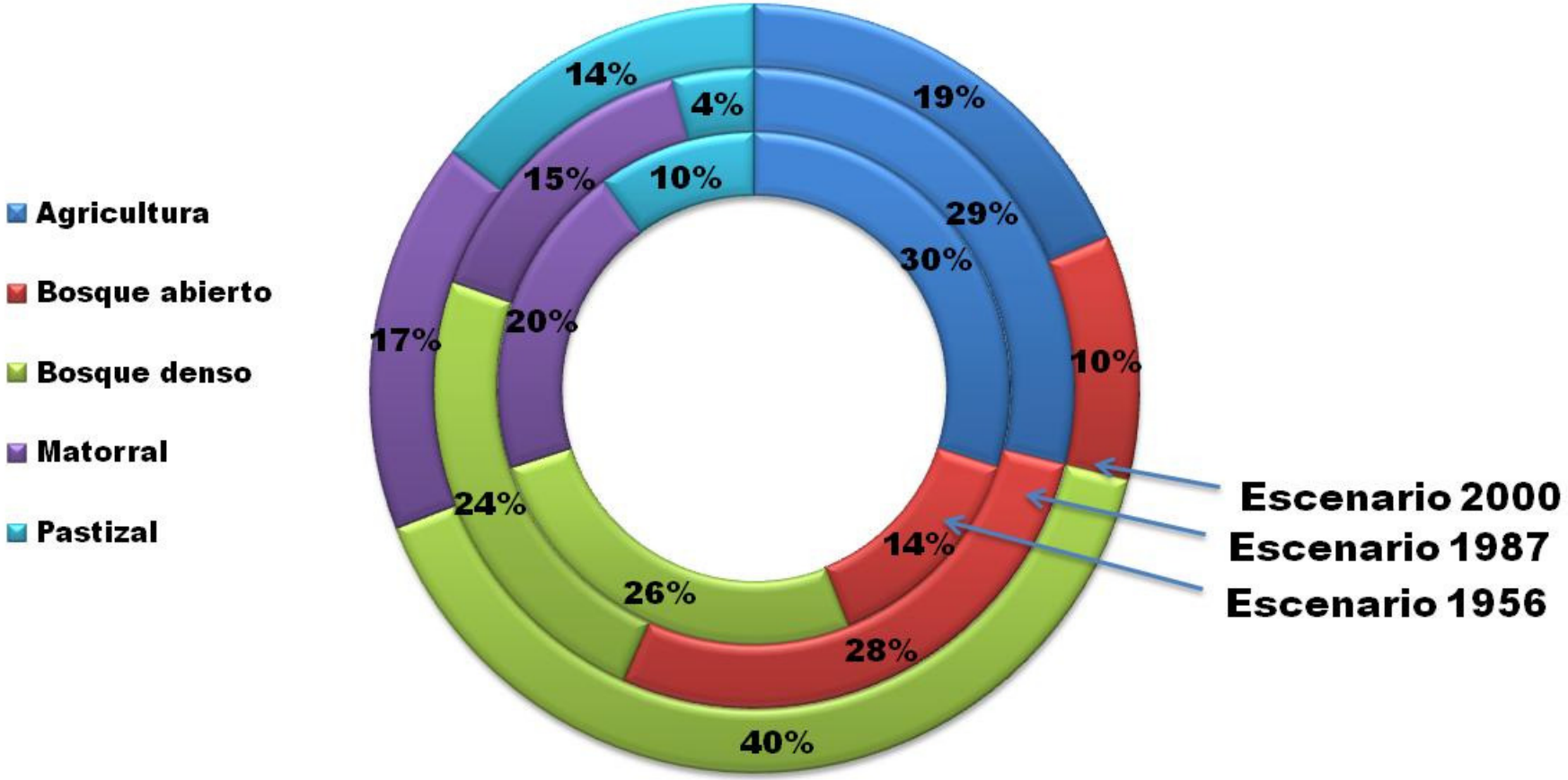
Case of study: Taibilla River basin





1. Basin Characterization: **1.2 Resources**

Land use change: Scenarios 1956, 1987 y 2000

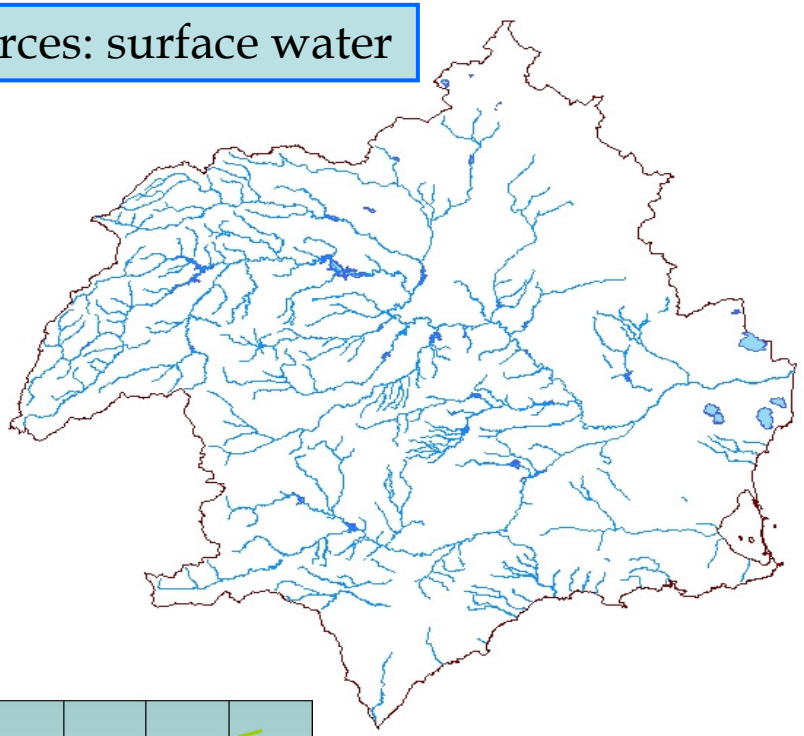


-Noticeable variations in the land uses of the basin. Possible causes: abandon of rural areas, with irrigation areas abandoned which are occupied by vegetation.

1. Basin Characterization: **1.2 Resources**

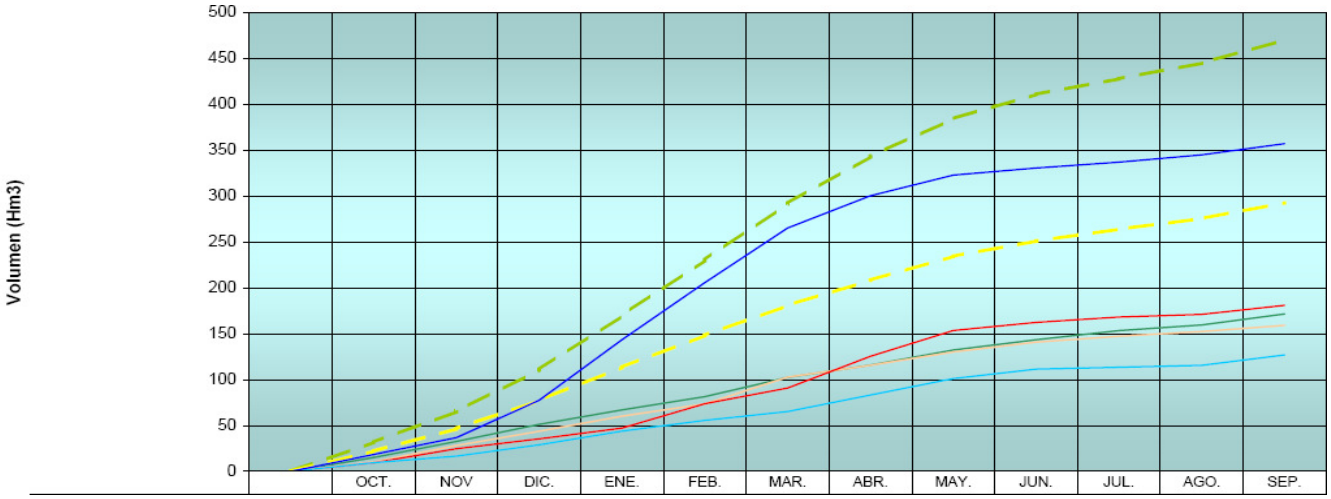
a. Natural Resources: surface water

Surface water of the Basin



Runoff contributions to the Basin in the last 5 hydrological years

Media Histórica	470,232
Media desde 1980-81	290,487
2004-05	171,628
2005-06	159,144
2006-07	181,008
2007-08	126,917
2008-09	357,124



1. Basin Characterization: **1.2 Resources**

a. Natural Resources: groundwater

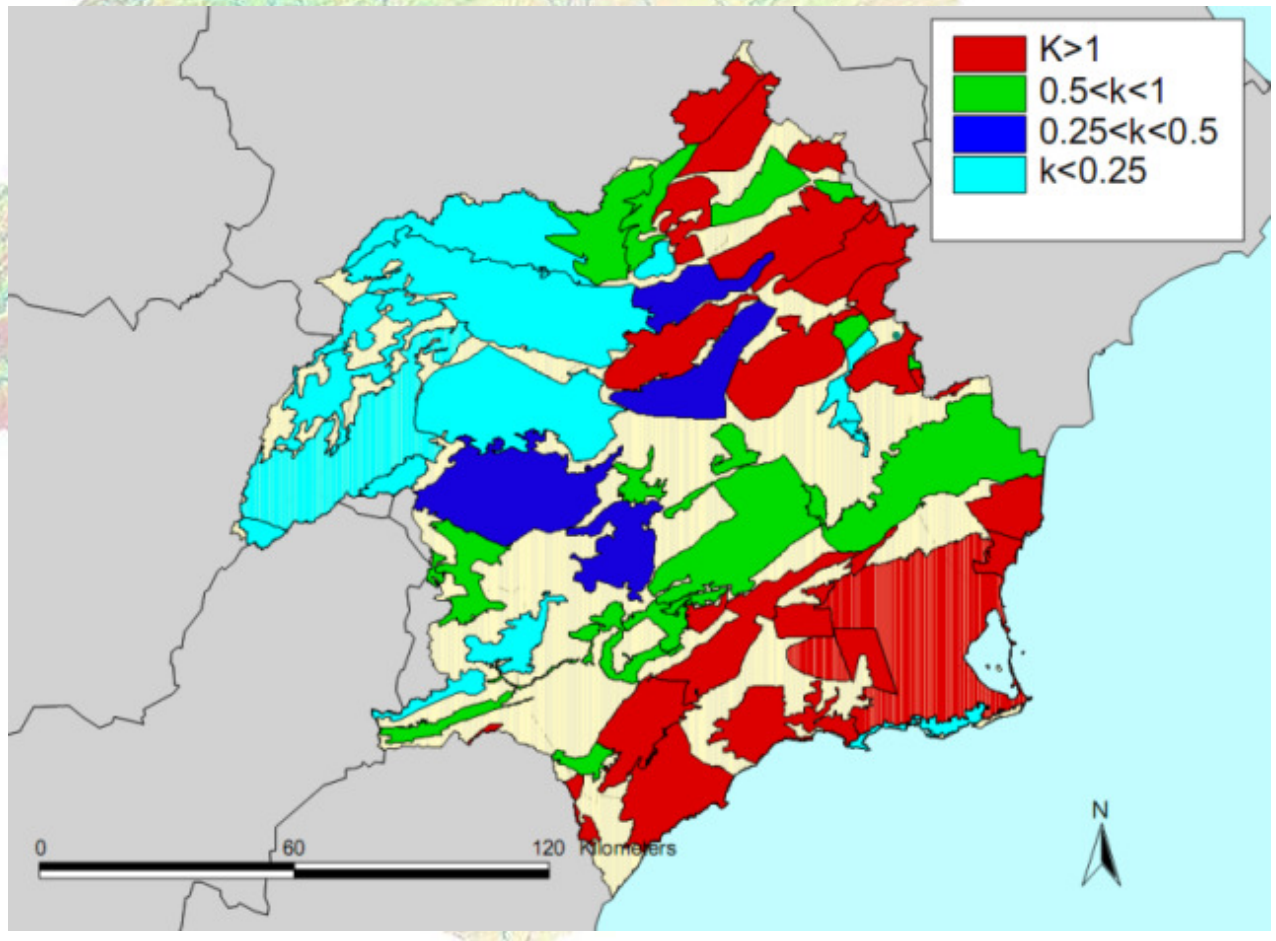
- In the SRB, there are 63 Groundwater bodies

- The groundwater annual available resources are 534 hm^3, but only 334 hm^3 (62 % approximately) correspond to groundwater whose drainage is regulated by dams located in the headwaters of the basin or dams located in tributaries of the right river bank.

1. Basin Characterization: **1.2 Resources**

a. Natural Resources: groundwater

Preliminary Index of water abstraction in the Segura River Basin District



Ratio k=abstraction/recharge
Source: General River Basin District Study. 2007

1. Basin Characterization: **1.2 Resources**

a. Natural Resources: groundwater

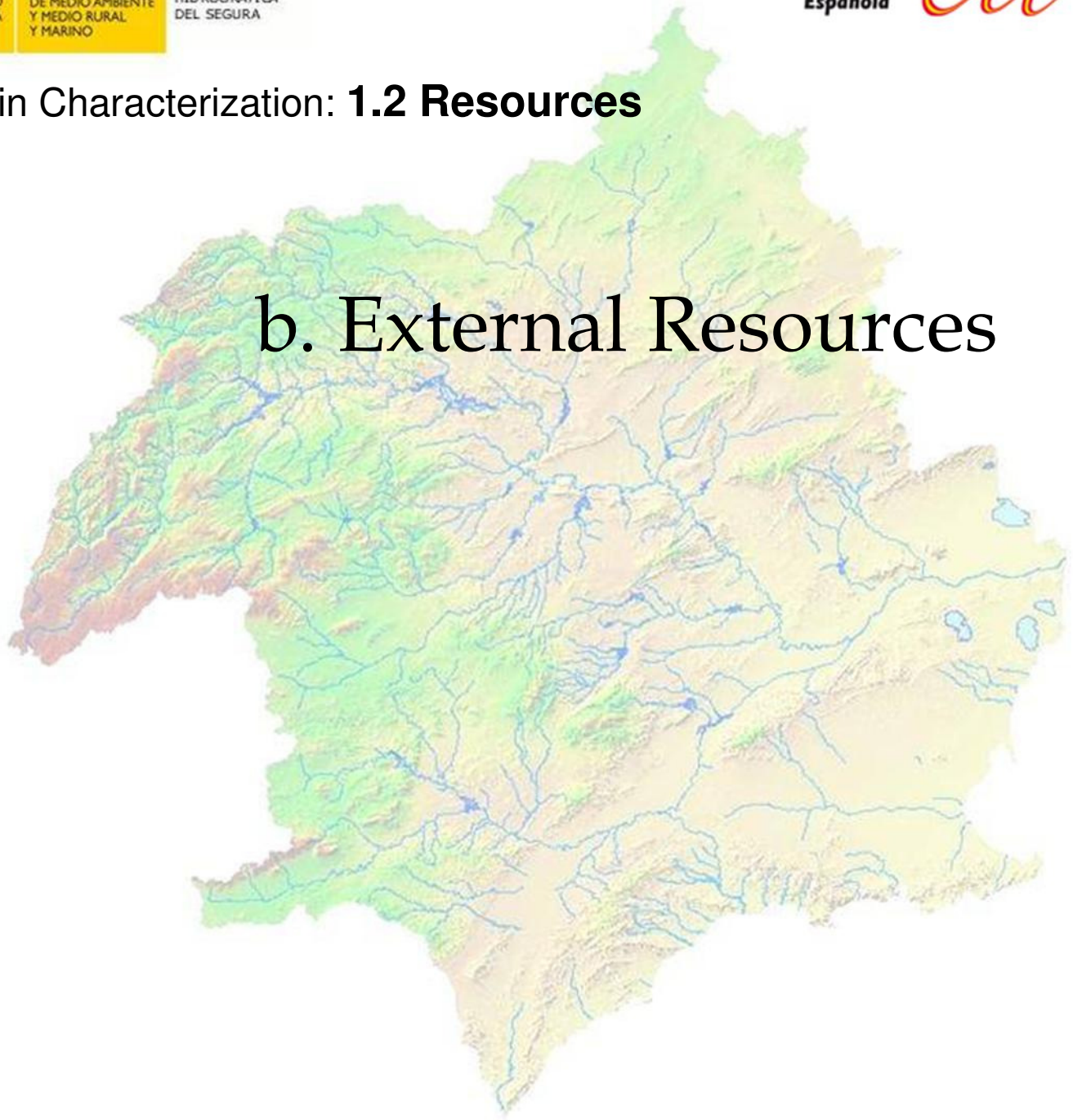
OVEREXPLOITATION *STATEMENTS*

Acuífero	Fecla de la declaración de sobreexplotación
Alto Guadalentín	10-marzo-1987 y 4-octubre-1988 (*)
Bajo Guadalentín	10-marzo-1987 y 4-octubre-1988 (*)
Ascoy-Sopalmo	17-diciembre-1988 (*)
Cresta del Gallo	4-octubre-1988 (*)
Jumilla-Villena	31-julio-1987 (**)
Sierra de Crevillente	31-julio-1987 (**)
Acuíferos de la Unidad Hidrogeológica de Aguilas	6-abril-2004 (*)
Acuíferos de la Unidad Hidrogeológica de Mazarrón	6-abril-2004 (*)
Acuífero de Cabo Roig	6-abril-2004 (*)
Sector Triásico de las Victorias (Acuífero Campo de Cartagena)	6-abril-2004 (*)
Terciario de Torrevieja	6-abril-2004 (*)
Carrascoy	6-abril-2004 (*)
Santa- Yéchar	6-abril-2004 (*)
Aledo	6-abril-2004 (*)

(*) Junta de Gobierno dela CH del Segura
(**) DG Obras Hidráulicas y Calidad de las Aguas

SOURCE: SRB REPORT 2008

1. Basin Characterization: **1.2 Resources**



b. External Resources

1. Basin Characterization: **1.2 Resources**

b. External Resources

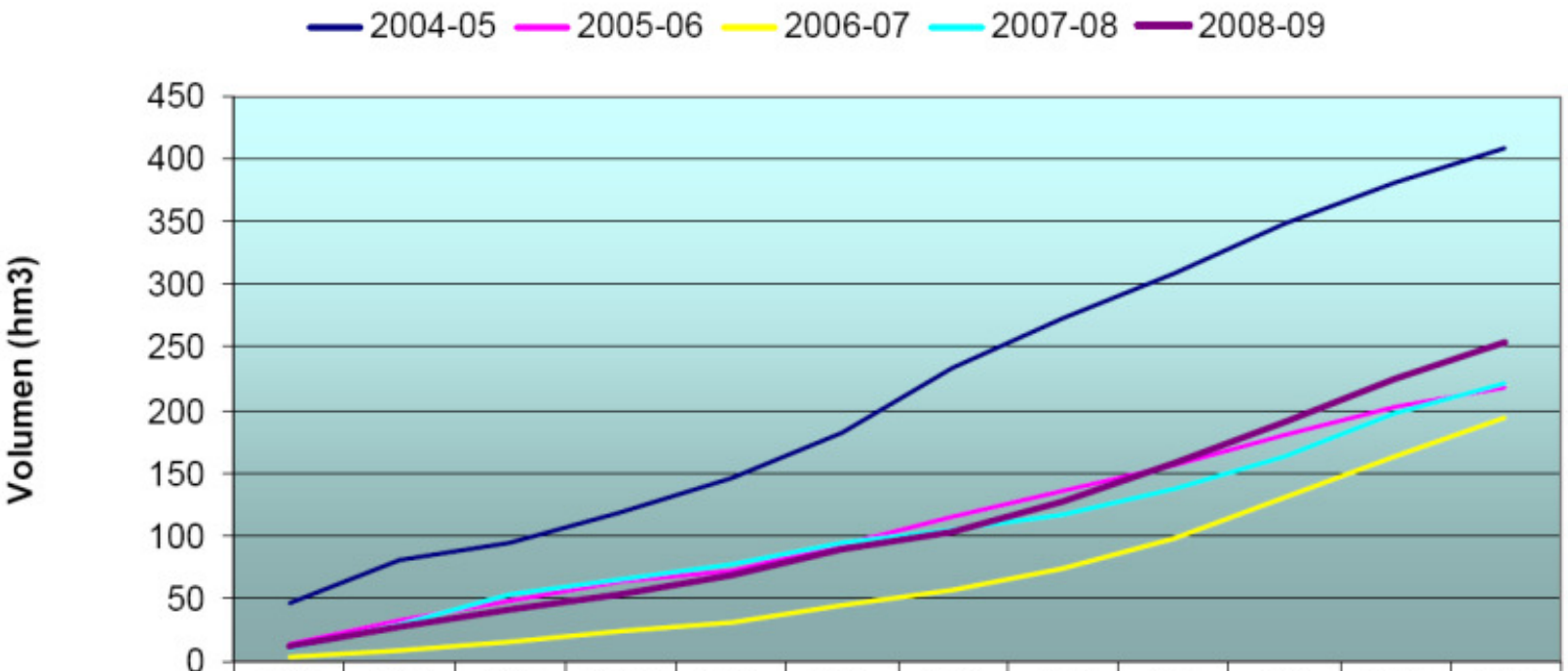
- Water resources from Entrepeñas and Buendía reservoirs, in Tajo River Basin.

- The Tajo-Segura water transfer, with a maximum amount of 600 hm^3/year, is oriented to:
  - **Urban Water Supply: 140 hm^3**
    - Taibilla River Channels Community (SRB) 131 hm^3.
    - Mediterranean basins from Andalucía 9 hm^3.
  - **Irrigation: 400 hm^3**
    - Segura River Basin District: 335 hm^3.
    - Jucar River Basin District: 50 hm^3.
    - Mediterranean basins from Andalucía: 15 hm^3.
  - Water losses: 60 hm^3.

1. Basin Characterization: **1.2 Resources**

b. External Resources

TAJO-SEGURA WATER TRANSFERS IN THE LAST 5 YEARS

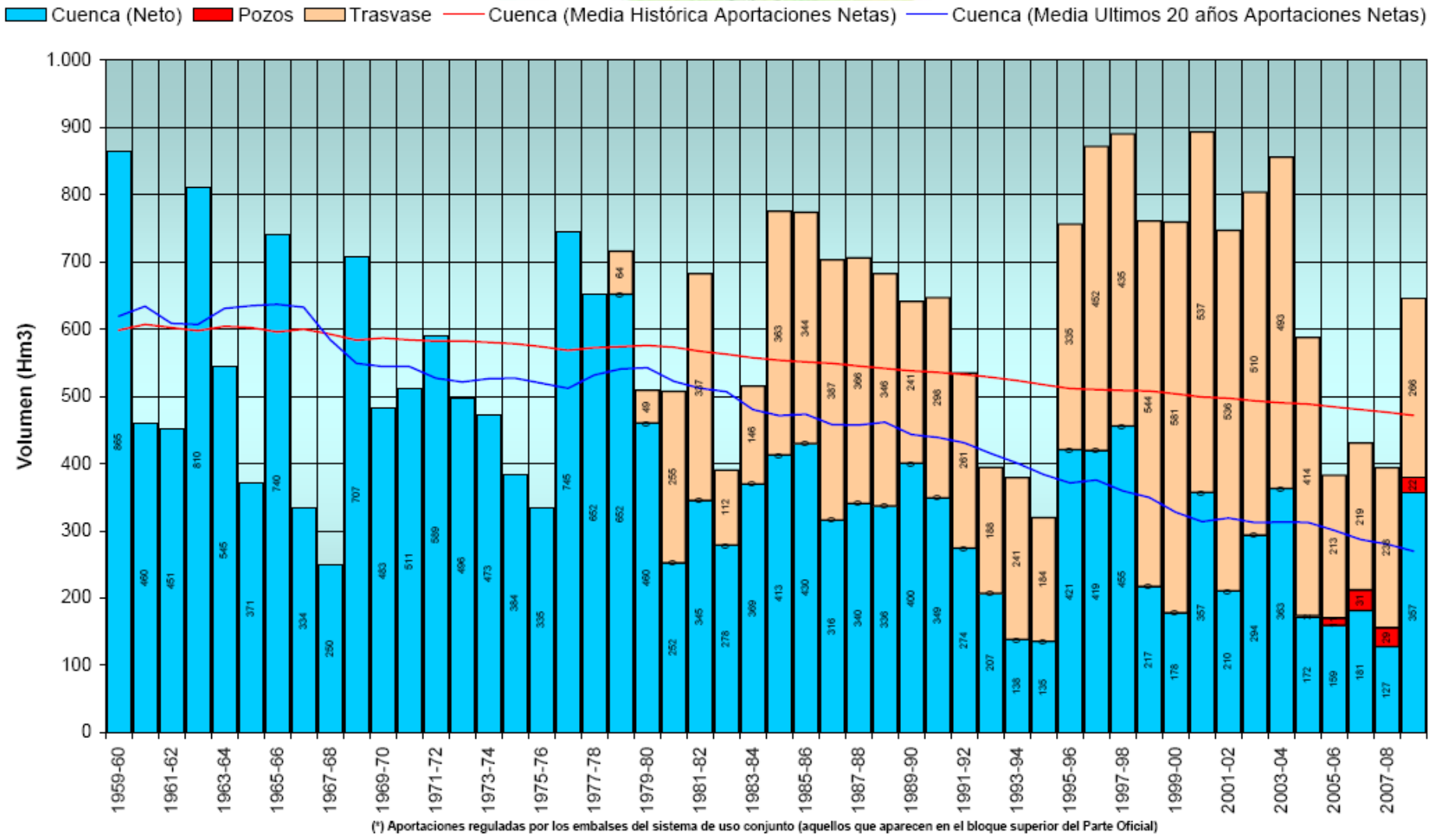


	OCT	NOV	DIC	ENE	FEB	MAR	ABR	MAY	JUN	JUL	AGO	SEP
2004-05	46,394	80,073	94,006	118,586	146,202	181,805	233,155	273,918	309,513	348,865	381,657	409,238
2005-06	13,557	32,246	48,868	62,801	72,958	92,104	114,864	135,298	155,699	179,649	203,301	217,788
2006-07	2,622	8,63	15,713	23,83	30,634	44,86	56,934	74,034	98,278	130,142	162,731	194,252
2007-08	9,929	28,363	52,808	65,207	77,736	94,825	105,575	117,187	137,226	163,503	196,853	220,929
2008-09	11,541	26,641	41,336	52,898	68,618	88,652	102,272	127,005	157,607	190,579	225,296	254,134

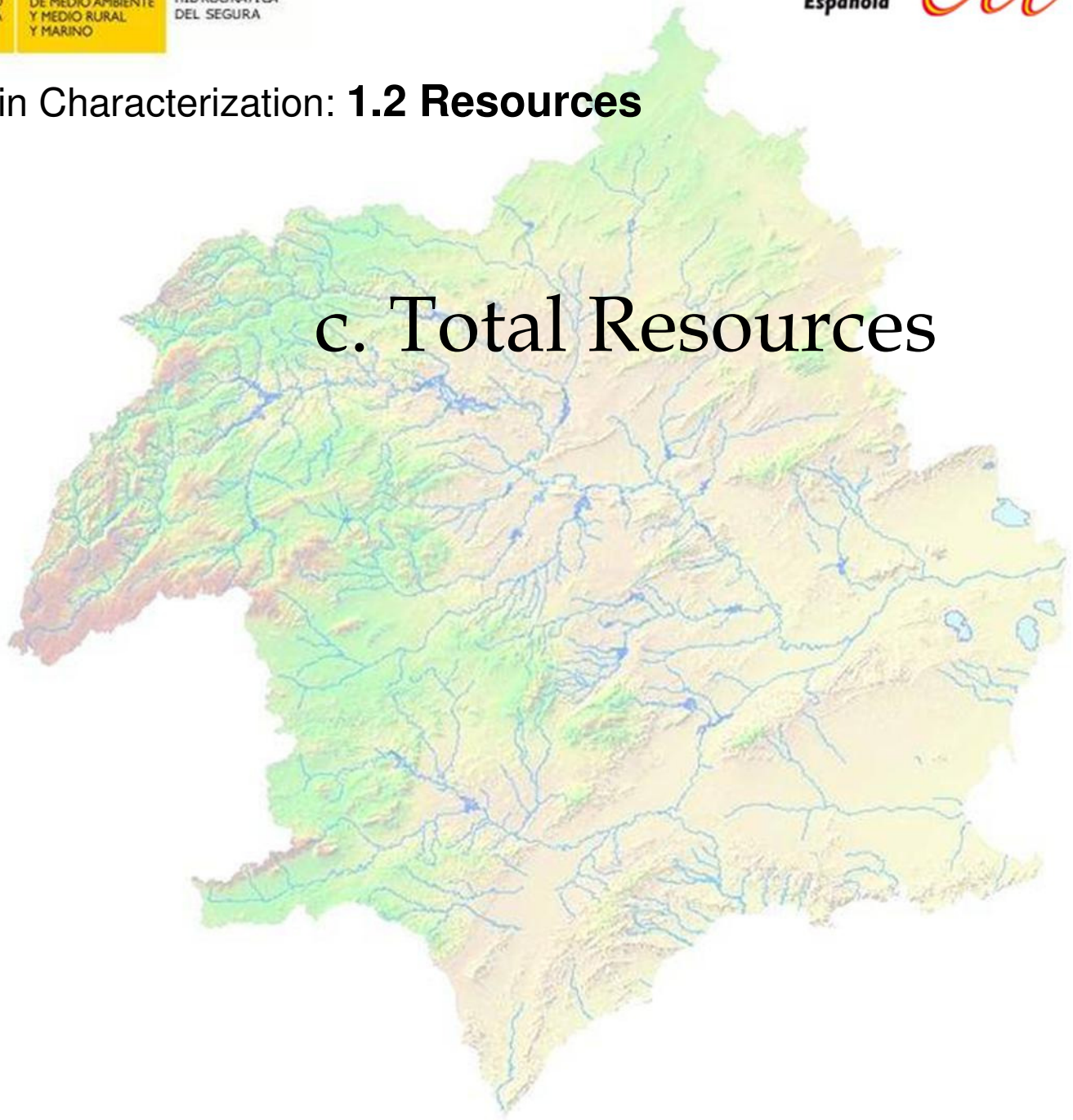
1. Basin Characterization: **1.2 Resources**

b. External Resources

EXTERNAL AND NATURAL WATER RESOURCES. LAST 50 YEARS



1. Basin Characterization: **1.2 Resources**



c. Total Resources

1. Basin Characterization: **1.2 Resources**

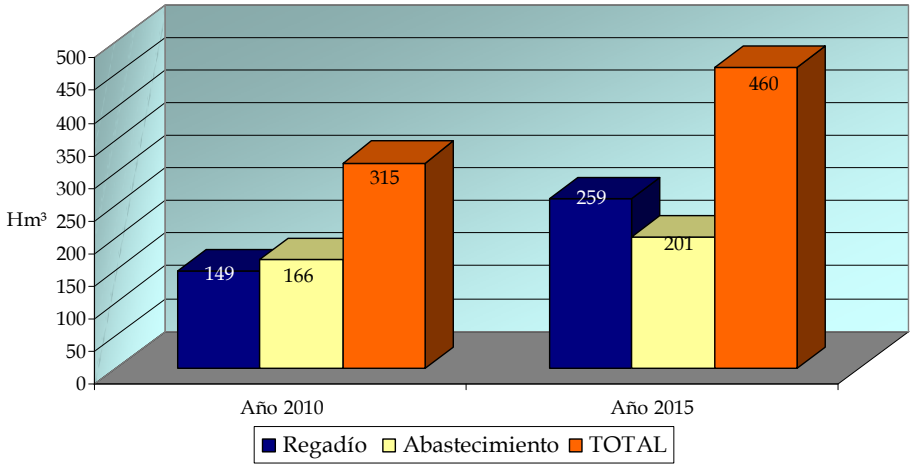
c. Total Resources

1. NATURAL RENEWABLE WATER RESOURCES		
Natural regime of Segura River and Torrential coastal channel rivers	1.000 Hm³	
Drainage to sea. Segura River	-50 Hm³	
Drainage to sea. Torrential rivers and coastal aquifers	-30 Hm³	
Evapotranspiration of reservoirs and direct recharge of aquifers	-60 Hm³	
TOTAL NATURAL RESOURCES WITH POTENCIAL USE		**860 Hm³**
2. EXTERNAL RESOURCES		
First phase of A.T.S	600 Hm³	
Losses	-60 Hm³	
EXTERNAL TOTAL		**540 Hm³**
AVAILABLE RENEWABLE TOTAL RESOURCES		**1.400 Hm³**
3.ABSTRACTED GROUNDWATER		**210 Hm³**
4.TOTAL REUSE OF RESOURCES		**100 Hm³**
5.OTHER NON RENEWABLE RESOURCES		**35 Hm³**
TOTAL RESOURCES		**1.745 Hm³**

SOURCE: WATER MANAGEMENT PLAN OF THE SEGURA RIVER BASIN

1. Basin Characterization: **1.2 Resources**

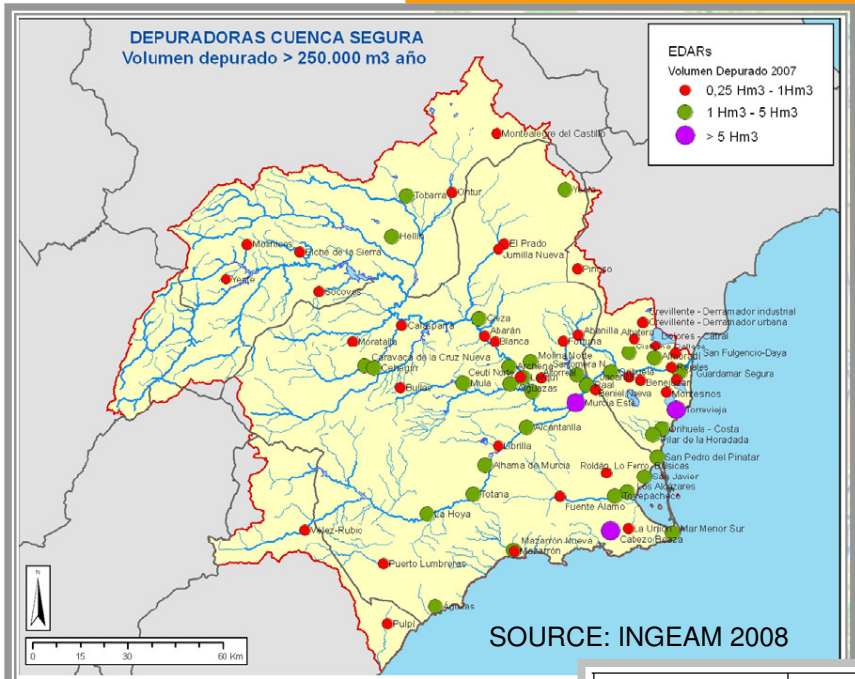
d. Other Resources: Desalination



	2010 Year		2015 Year	
	Irrigation	Urban Water Supply	Irrigation	Urban Water Supply
Valdelentisco	37	20	37	33
San Pedro Pinatar I		24		24
San Pedro Pinatar II		24		24
Águilas	48	10	58	12
Ampliación Águilas- C.R.	8		8	
Torrevieja	40	40	80	40
Desalinizadora Alicante I		18		18
Ampliación Alicante I		6		6
Alicante II		24		24
El Mojón	6		6	
Guardamar			60	
Desaladora C.R. Mazarrón	10		10	
Desaladora de Escombreras. CARM				20
TOTAL	**149**	**166**	**259**	**201**

1. Basin Characterization: **1.2 Resources**

d. Other Resources: Reuse of wastewaters



Comunidad Autónoma	*Provincia*	*Todas las Instalaciones C.H. Segura*		*Instalaciones >0,25 hm³/año*	
		EDAR	*Volumen hm3*	*EDAR*	*Volumen hm3*
Castilla La Mancha	Albacete	14	6,8	8	5,9
Valencia	Alicante	38	26,7	18	24,8
Andalucía	Almería	2	0,6	2	0,6
	Jaén	5	0,1	-	-
Murcia	Murcia	80	102,4	43	100,2
TOTAL		*139*	*136,7*	*71*	*131,5*

1. Basin Characterization: **1.3 Demands**

Summary of demands

Demand \ Time Horizon	2007	2015	2027
Urban supply and Industrial demand	263,2	318,9	360
Irrigation	1.662	1.549	1.549
Environmental consuming demand	30	30	30
TOTAL (Hm3)	**1.955,2**	**1.897,9**	**1.939**

1. Basin Characterization: **1.3 Demands**

AGRICULTURAL DEMAND

- Gross demand. Region SRB District: 1.662 hm^3

- Source of Water Resources:

	WATER RESOURCE			
	SURFACE	PUMPINGS	W. TRANSFER	OTHERS
SRB DISTRICT	34.56%	28.75%	27.91%	8.78%

1. Basin Characterization: **1.3 Demands**

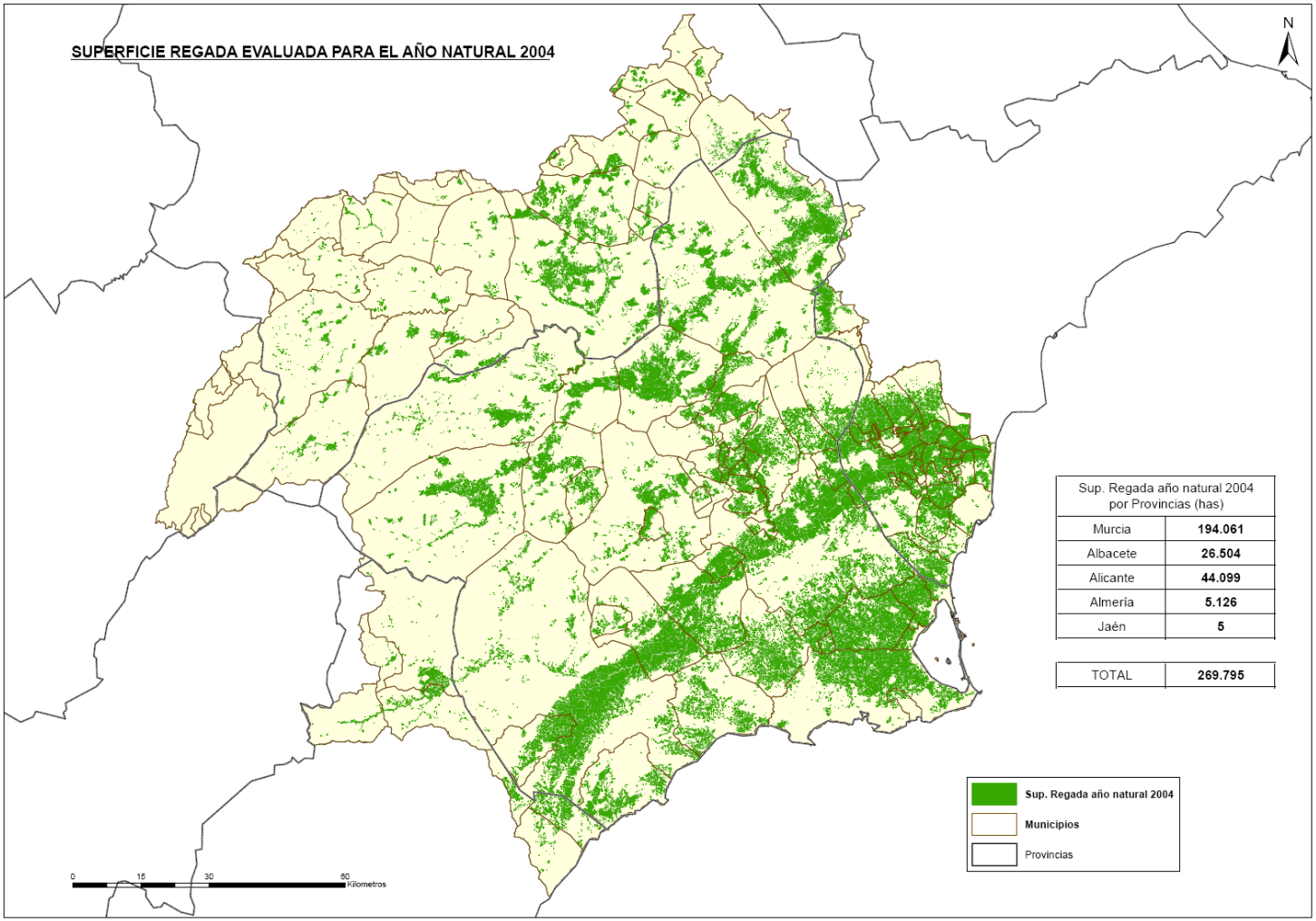
AGRICULTURAL DEMAND

	PHCS Area
Net area	**269.000 has**
Gross demand Volume	**1.662 hm³/año**
Production value	**3.202 M€**
Net margin	**1.202 M€**

High profitability, with an average value production of 1,93 €/m³ and a net margin of 0,72 €/m³.

1. Basin Characterization: **1.3 Demands**

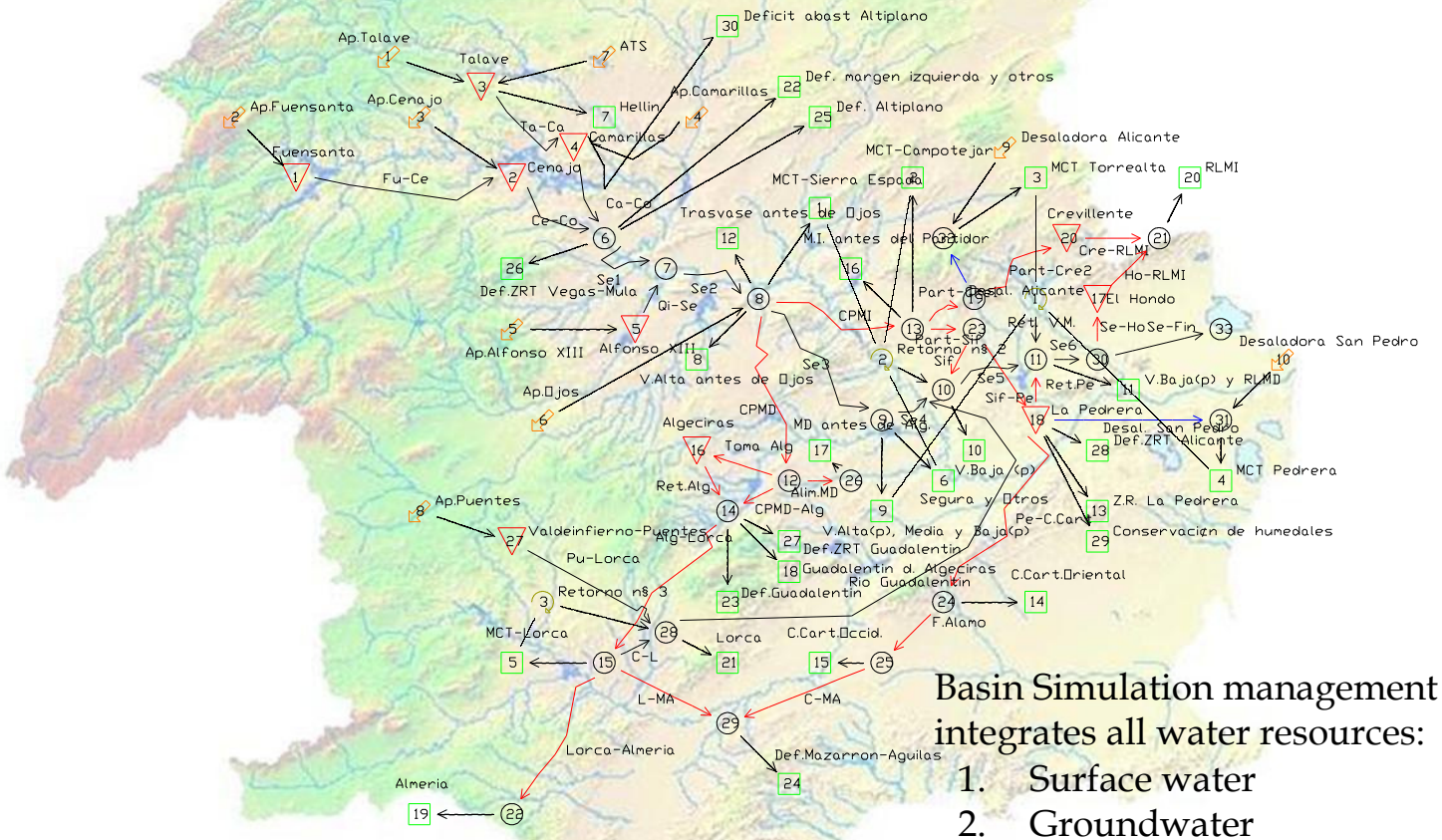
AGRICULTURAL DEMAND



IRRIGATION SURFACE 269.000 ha

1. Basin Characterization: **1.3 Demands**

Integrated water resources management



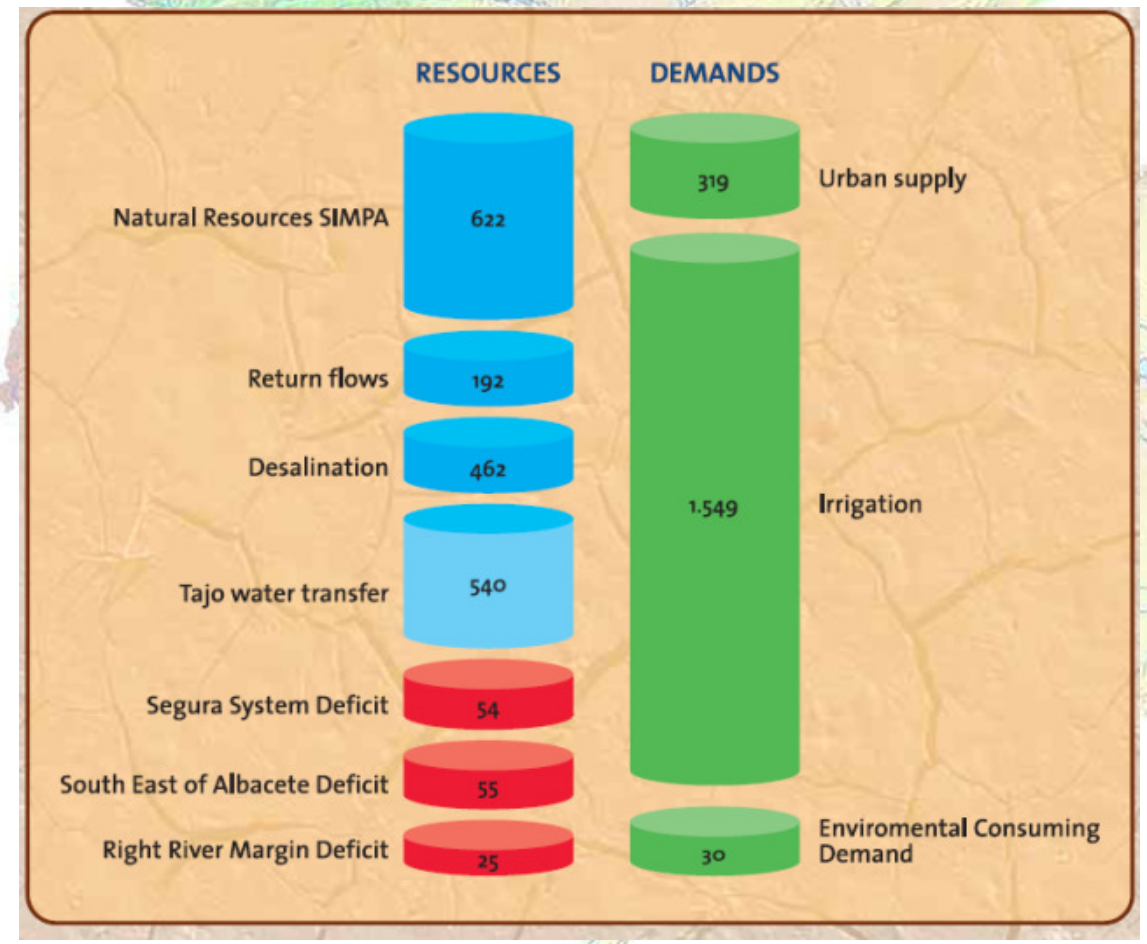
Basin Simulation management model integrates all water resources:

1. Surface water
2. Groundwater
3. Reuse of wastewater
4. Desalination
5. Water transfer

1. Basin Characterization:

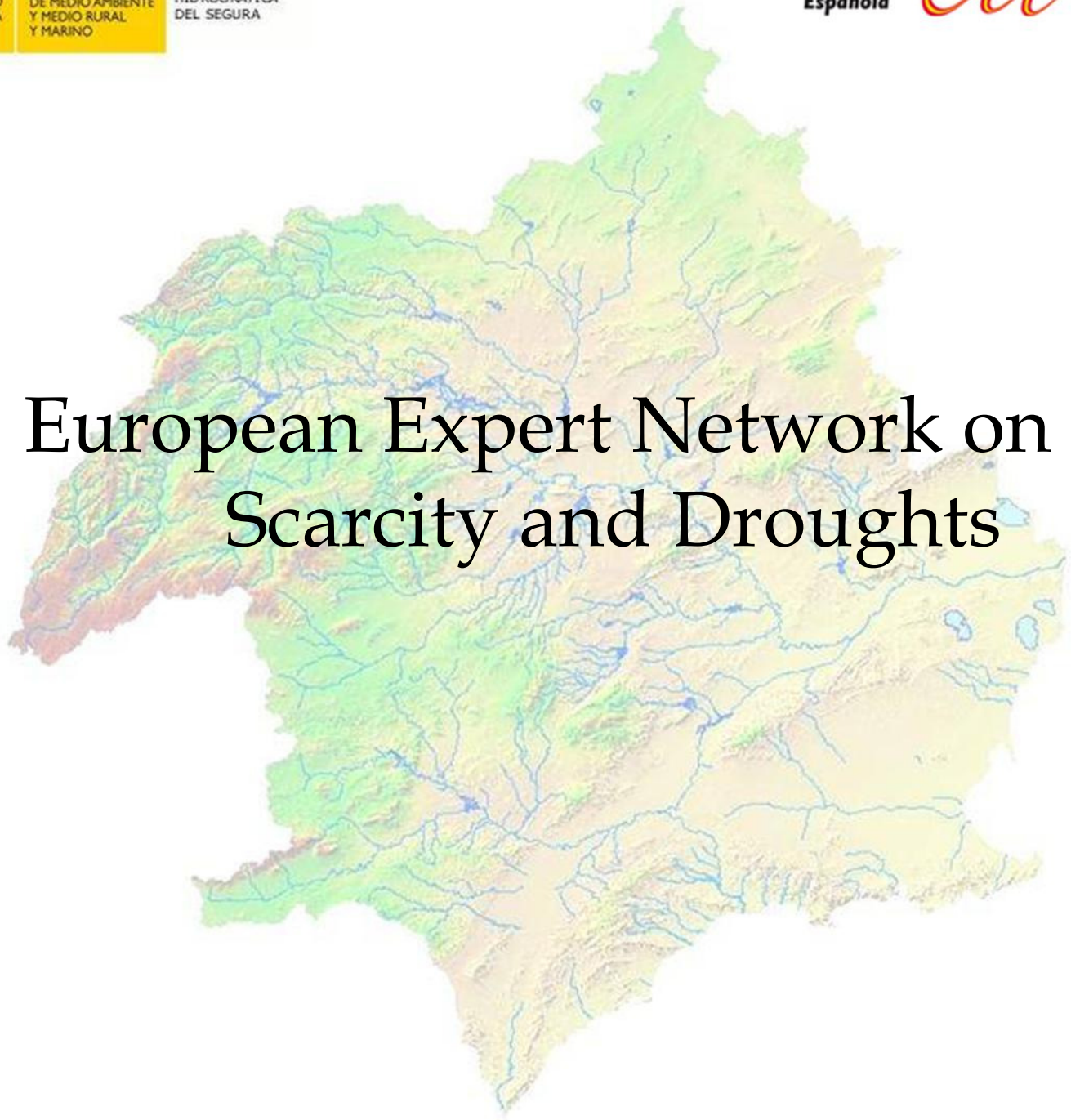
1.4 Balance between Water resources and Demands

***Data in hm³**



Expected in 2015

Source: Overview of the significant issues



2. European Expert Network on Water Scarcity and Droughts

2. European Expert Network on Water Scarcity and Droughts:

European WATER FRAMEWORK DIRECTIVE (WFD-Directive 2000/60/EC):

- It establishes the European water policy.
- Its main **purpose** is to create a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater.
- It sets the **water management unit**: 'River Basin District'- the area of land and sea, made up of one or more neighbouring river basins together with their associated groundwaters and coastal waters
- It makes all Member States develop **Water Management Plans**.
- (Art. 4.6) Temporary deterioration in the status of bodies of water shall not be in breach of the requirements of this Directive if this is the result of circumstances of natural cause or force majeure which are exceptional or could not reasonably have been foreseen, in particular **extreme floods and prolonged droughts.**
- It is introduced in the Spanish regulations by the Refunded Water Law RDL 1/2001

2. European Expert Network on Water Scarcity and Droughts:

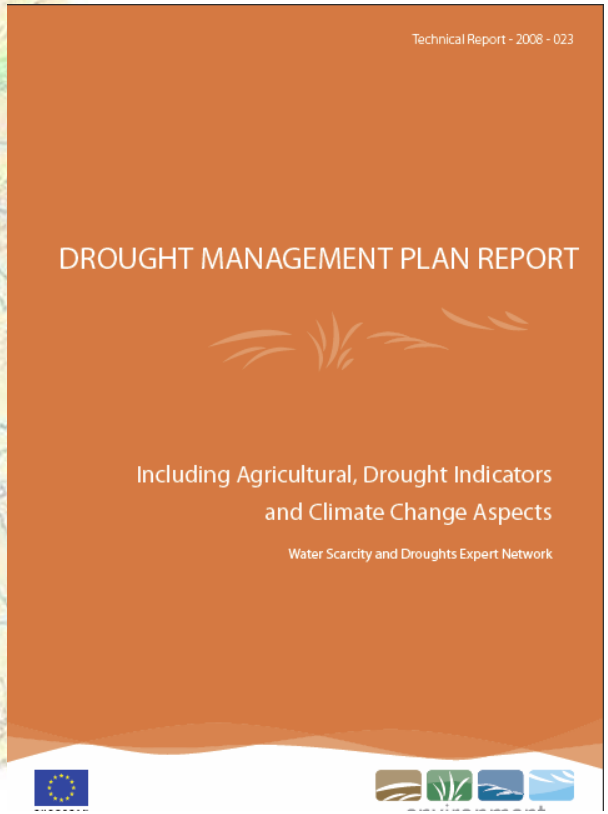
Expert Network on Water Scarcity & Drought:

• It was set up within the WFD Common Implementation Strategy Structure on December 2006.

• The Network developed the technical document "Drought Management Report, including Agricultural, Drought Indicators and Climate Change Aspects" (**DMP report- 2007**)

• MAIN TASKS (among others):
  • Support the **definition of commonly accepted indicators** for water scarcity and for droughts in Europe.
  • Support the creation of **Drought Risk Maps**, through commonly agreed methodology and scales.

• Lead countries: Spain, France and Italy

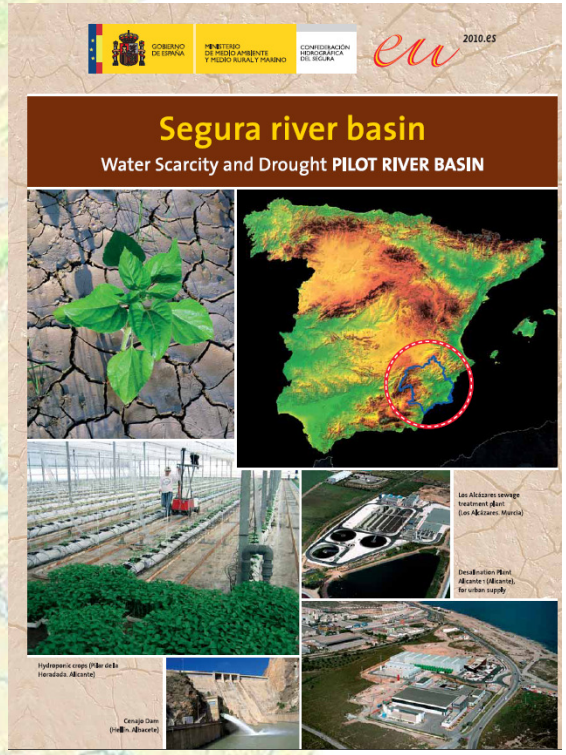


http://ec.europa.eu/environment/water/quantity/pdf/dmp_report.pdf

2. European Expert Network on Water Scarcity and Droughts:

Expert Network on Water Scarcity & Drought:

The Segura River Basin has been selected by the *Spanish Ministry of the Environment and Rural and Marine Affairs* as the **SPANISH PILOT RIVER BASIN**, within the Expert Network on Water Scarcity and Droughts.



ROLE OF THE PILOT RIVER BASINS:

- Share their experience in the indicator selection process.
- Member States will evaluate the initial results in pilot river basins, and check their effectiveness.

The map server of the European Drought Observatory at JRC will be a valuable tool for implementing the results of this process: http://edo.jrc.ec.europa.eu/php/index.php?action=view&id=201

2. European Expert Network on Water Scarcity and Droughts:

Expert Network on Water Scarcity & Drought:

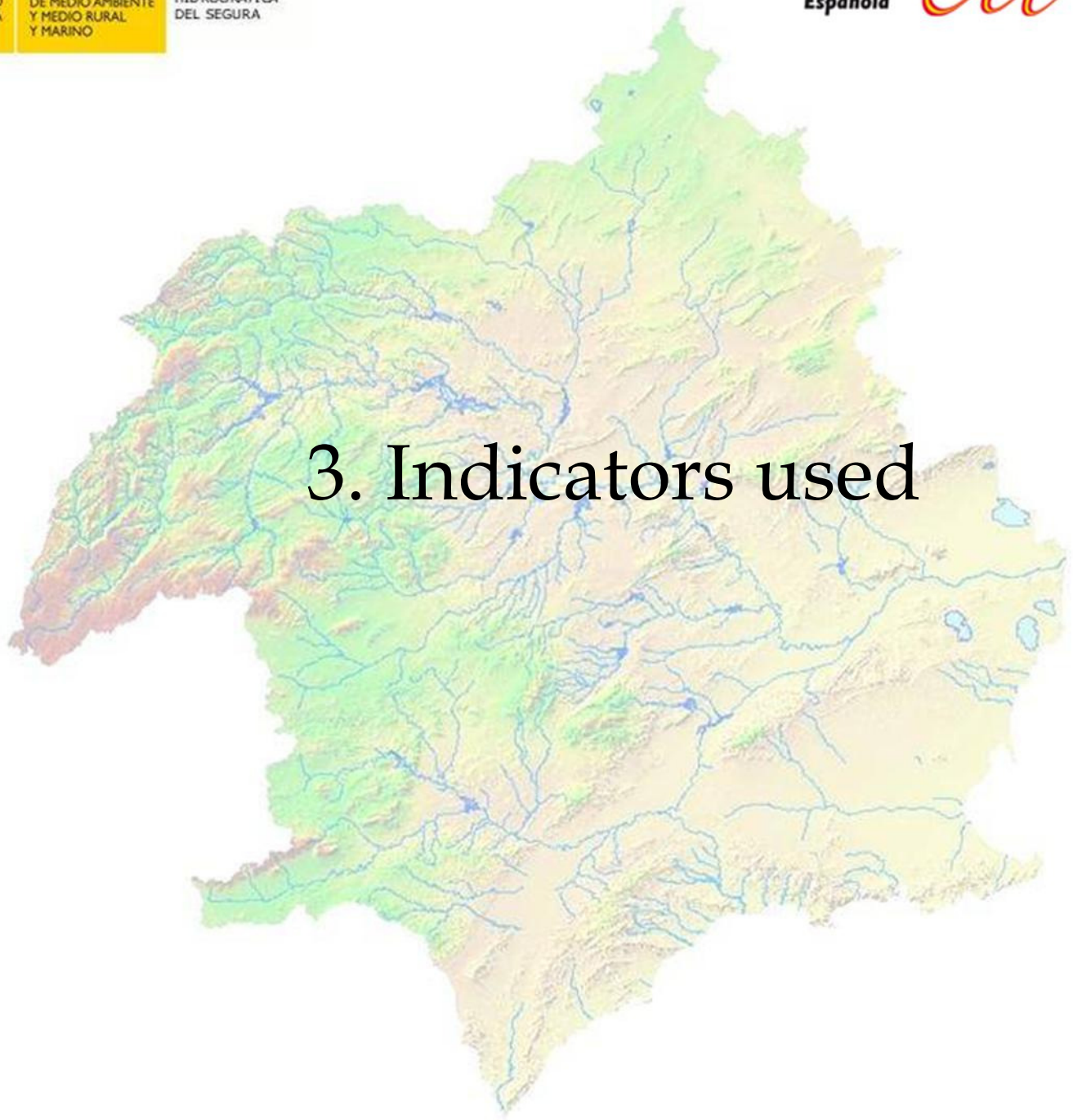
Next steps

The indicative **TIMETABLE** for the Expert Group will be:

- **Year 2010:** first set of indicators to be tested in the pilot member states (Already identified Spain, Italy, France, UK –tbc-, Finland –tbc- …); contributions to EDO. Presentation of initial results in the International Conference "Droughts and water scarcity: the way towards adaptation to climate change", Madrid, Spain, 18-19 February 2010.
- **Year 2011:** Practical application of indicators for additional member states voluntarily; contributions to EDO, and potential contribution to the development of an integration of WS&D aspects under **WISE on a voluntary basis.**
- **Year 2012:** Support the creation of Drought Risk Maps and assessment, contributions to EDO.

NEXT MEETING OF THE EXPERT NETWORK:

September 30, 2010, Helsinki



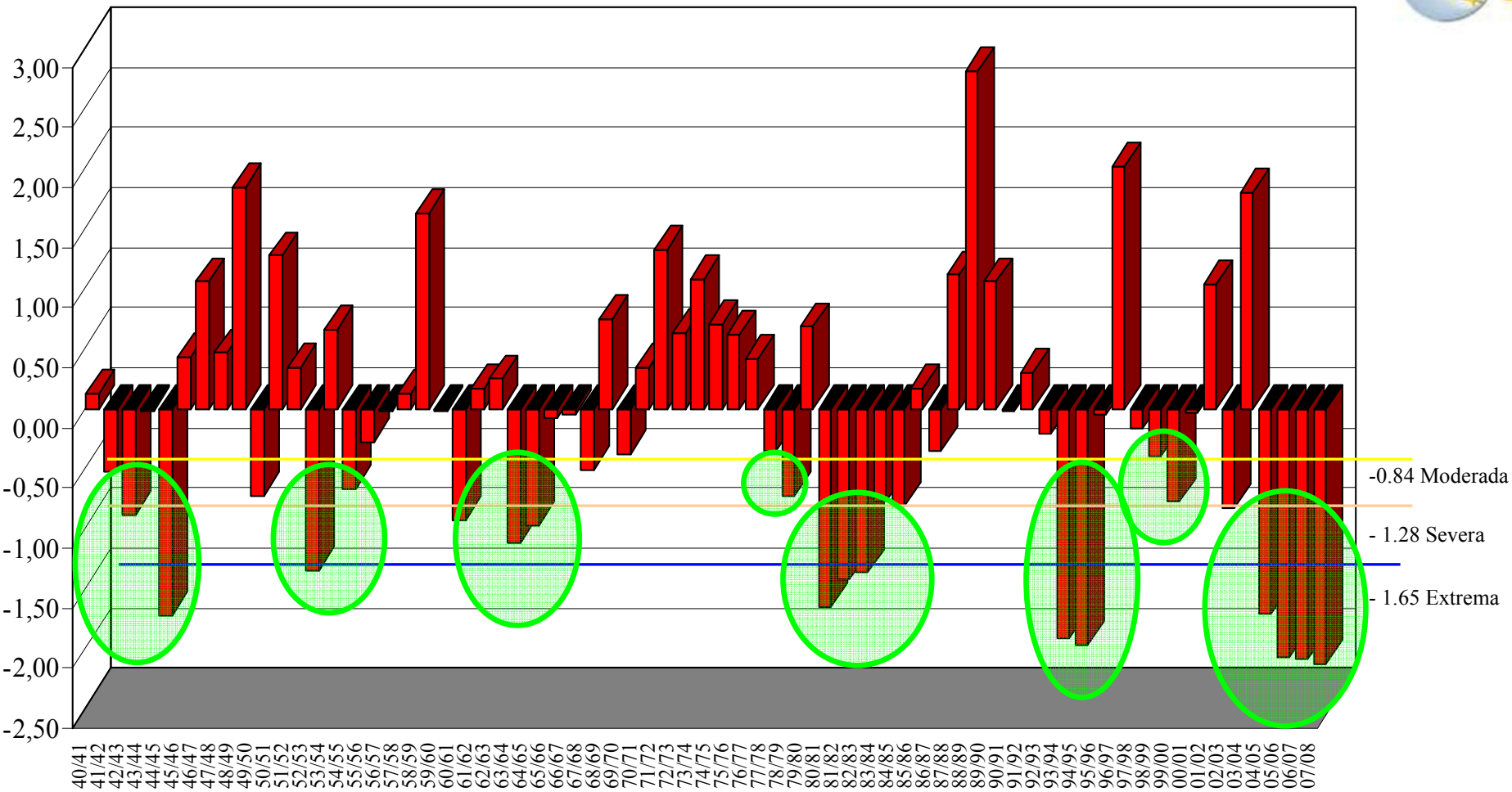
3. Indicators used

3. Indicators Used: **3.1 SPI Indicator**

- SPI indicator only takes into account rainfall values for its evaluation.
- It's based on the probability of registering a certain precipitation, and it allows to quantify a precipitation deficit in several time scales.
- Considered probabilities are normalized, consequently SPI indicator values similar to zero involve the average precipitation, whilst positive or negative SPI values imply a wet year or a dry year respectively.

3. Indicators Used: **3.1 SPI Indicator**

años hidrológicos 1940/41 - 2007/08



The most important long drought events (having an intensity higher than moderate, and lasting than a year) can be clearly identify in the upper graph, in the period of time from 1940 to 2008:

1940-1945, 1952-1957, 1977-1986, 1992-1996, 2004-2008

3. Indicators Used: **3.2 Drought definition**

- It is a cyclical and repetitive phenomenon, difficult to predict and sometimes can suddenly appear.
- In the beginning the drought is characterized by a decrease of precipitation values (meteorological drought), causing consequently a reduction of natural water resources (hydrological drought).
- This hydrological drought may cause supply failures and therefore, is the one that has to be tackle by the natural water resource managers.
- **Drought (temporary situation) shouldn't be confused with water scarcity (permanent deficit situation).**

3. Indicators Used: **3.2 Drought definition**

DROUGHT MANAGEMENT IN SPAIN: LEGAL BACKGROUND

The National Hydrological Plan Law, released in 2001, provides the following measures dealing with droughts (Art. 27):

- The Establishment of a global hydrological indicator system, at national level, which will have to be used when formally stating a drought.
- Development of DROUGHT ACTION PLANS.
- Development of Emergency Plans for Urban supply in cities with more than 20.000 inhabitants.

3. Indicators Used: **3.2 Drought definition**

DROUGHT MANAGEMENT IN SPAIN: LEGAL BACKGROUND

DROUGHT ACTION PLANS
MAIN OBJECTIVES

1. *¿When?*: It is very important because taking measures in advance is much more efficient than facing the drought effects.
2. *¿How?*: A sequence of measures activation should be established according to state of indicators, natural resources and expected drought evolution.
3. *¿Who are the ones responsible for drought management?:* Responsibility for the establishment, execution and monitoring of defined measures, as well as the coordination with stakeholders, should be assigned.

3. Indicators Used: **3.2 Drought definition**

DROUGHT MANAGEMENT IN SPAIN: LEGAL BACKGROUND

DROUGHT ACTION PLANS
DROUGHT INDICATORS

- **Drought indicators of the Segura River Basin Action Plan are hydrological indicators instead meteorological indicators.**
- **A set of representative indicators are defined according to the evolution of natural water resources and demands.**
- **These indicators are composed of several factors, including water in reservoirs and natural water resources in the basin.**
- **The adoption of final indicators is checked with real situation in order to confirm its suitability.**

3. Indicators Used: **3.3 Assessing indicators**

Two main hydrological Sub-systems have been defined within the Segura River Basin, having each of them an associated drought indicator :

- Basin Sub-system.

- Water transfer Sub-system.

Finally, a global indicator is defined to gather the two sub-systems.

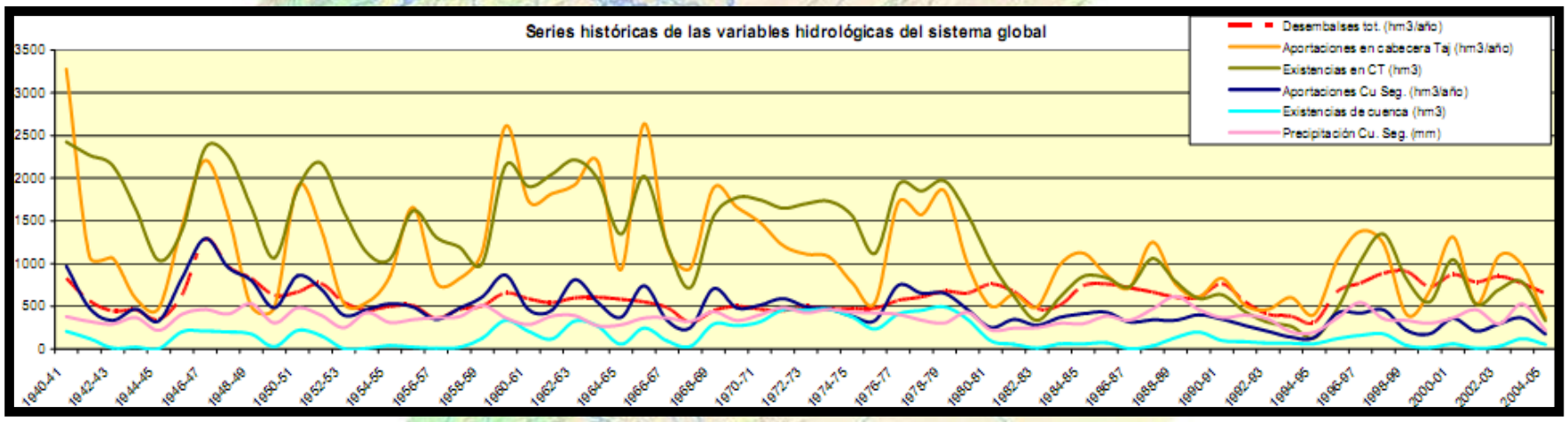
FACTORS taken into account to assess indicators are the most representative hydrological variables regarding resources availability:

-Water in reservoirs.

-Run-off (annual).

3. Indicators Used: **3.3 Assessing indicators**

Basin Sub-system: water released from reservoirs is closely linked with demands and it is a good way to assess deficits. Several factors have been taken into account when selecting the most suitable ones to create the indicator. The graph below includes factors time series together with the water released time series. As shown in the graph, **run-off** is the most similar factor to the water released from reservoirs time series.



Water transfer Sub-system: in this case, considered factors are those from the Tajo headwaters. The most relevant factor in this sub-system is the **water stored in Entrepeñas and Buendia dams,** and this is because the large reservoir capacity that Entrepeñas and Buendia dams have compared with the demands to be fulfilled with water coming from these dams.

3. Indicators Used: **3.3 Assessing indicators**

➢ Final expression of **INDICATORS** is:

-Basin sub-system:

Ve = 0,66*Run-off(annual)+0,33*water in reservoirs

-Water transfer sub-system:

Ve = 0,33*Run-off(annual)+0,66*water in E+B reservoirs

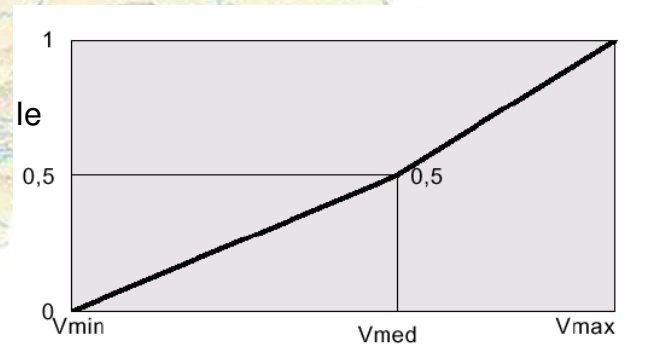
-Global indicator

Ve = a*Ve(basin)+b*Ve(water-transfer)

a, b depend on water rights given in each Sub-system (a=0,48; b=0,52)

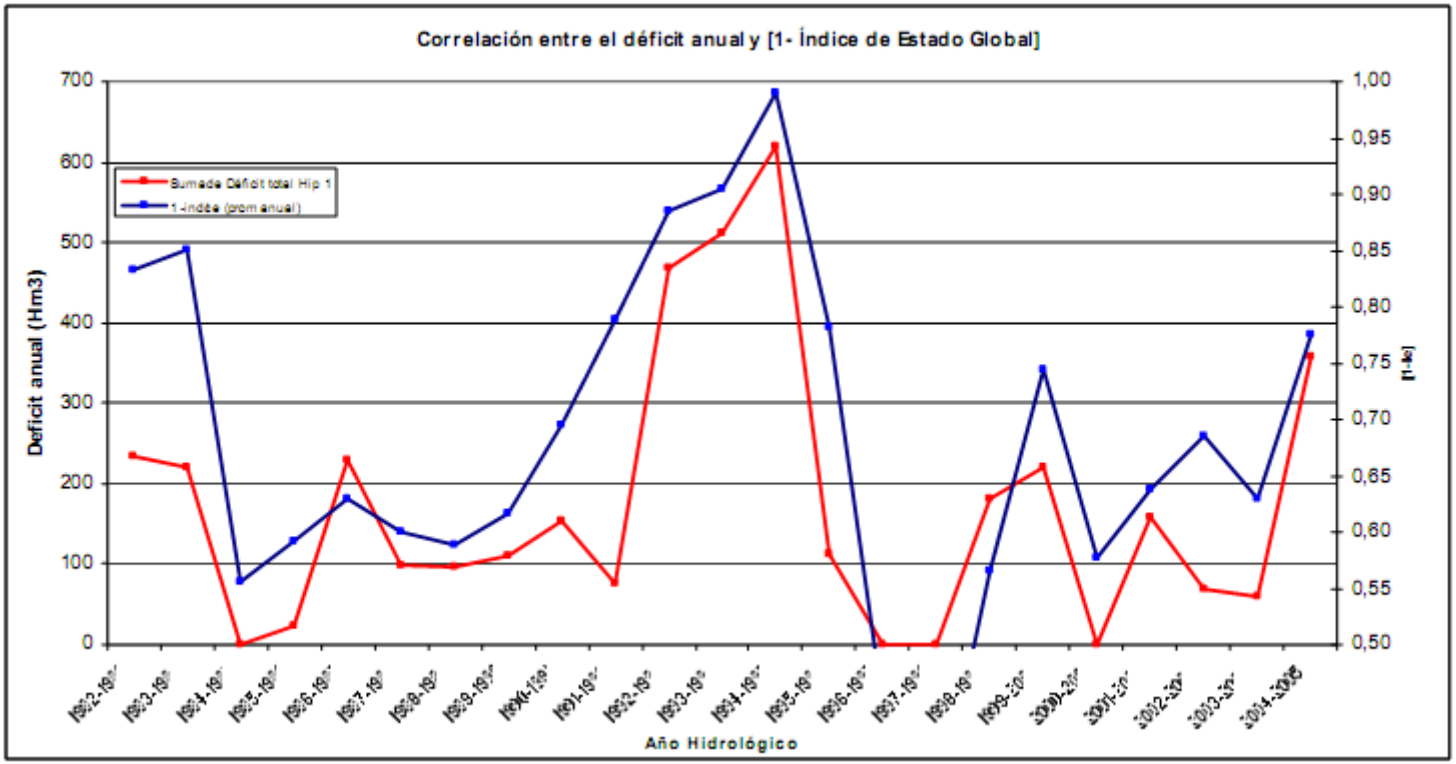
➢ Once the indicator is established, an associated **INDEX** is assessed (monthly) as follows:

Index (Ie) varies between 0,5 and 1 when Ve>Vmed, and between 0 and 0,5 when assessed Ve>Vmed, as shown in the graph.



3. Indicators Used: **3.3 Assessing indicators**

Checking index accuracy:

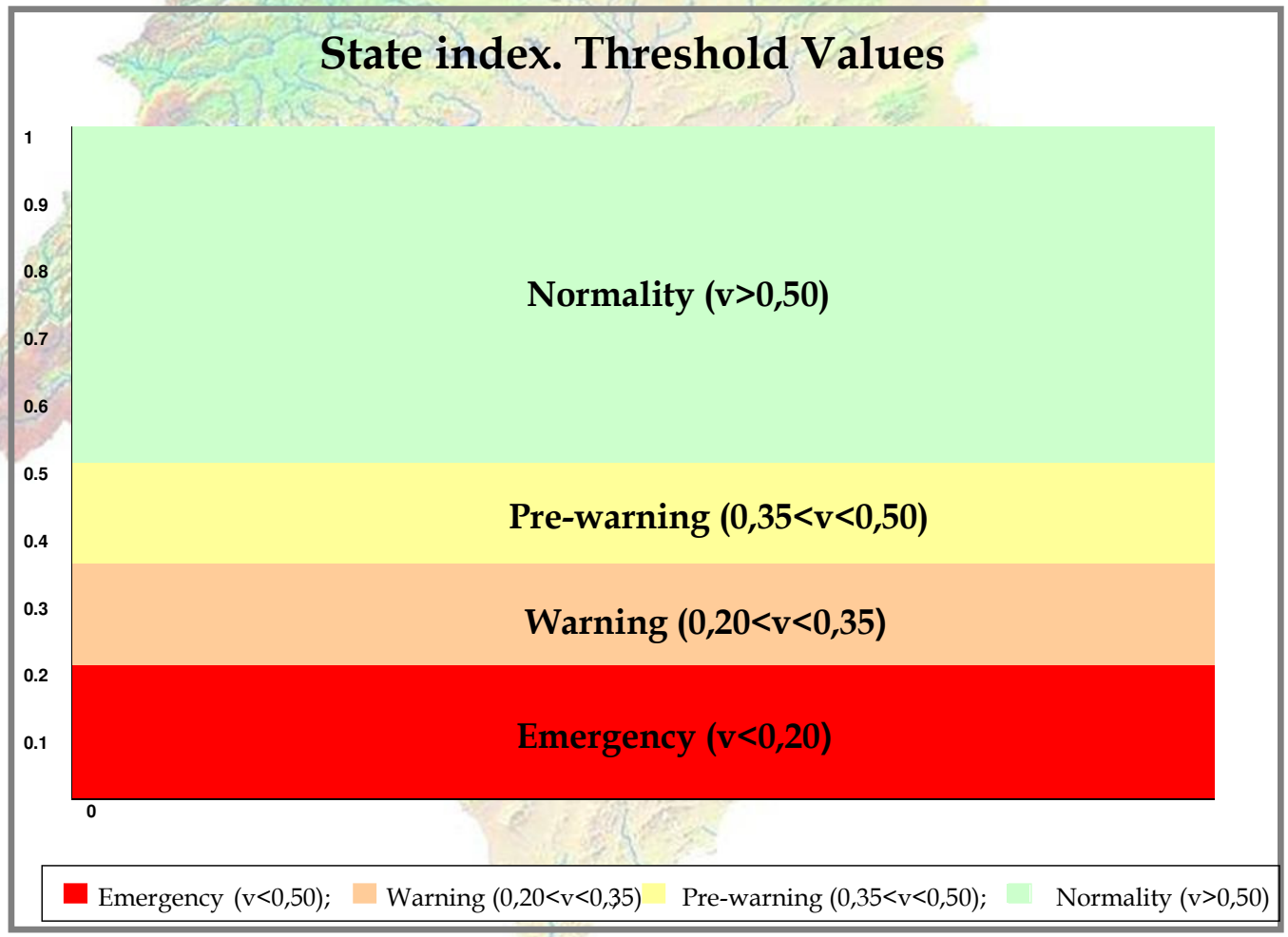


As we can see in the previous graph, drought index and deficit series follow the same trend. Highest deficit periods show lowest index values.

3. Indicators Used: **3.3 Assessing indicators**

DROUGHT MANAGEMENT IN SPAIN: LEGAL BACKGROUND

DROUGHT ACTION PLANS-DROUGHT INDICATORS



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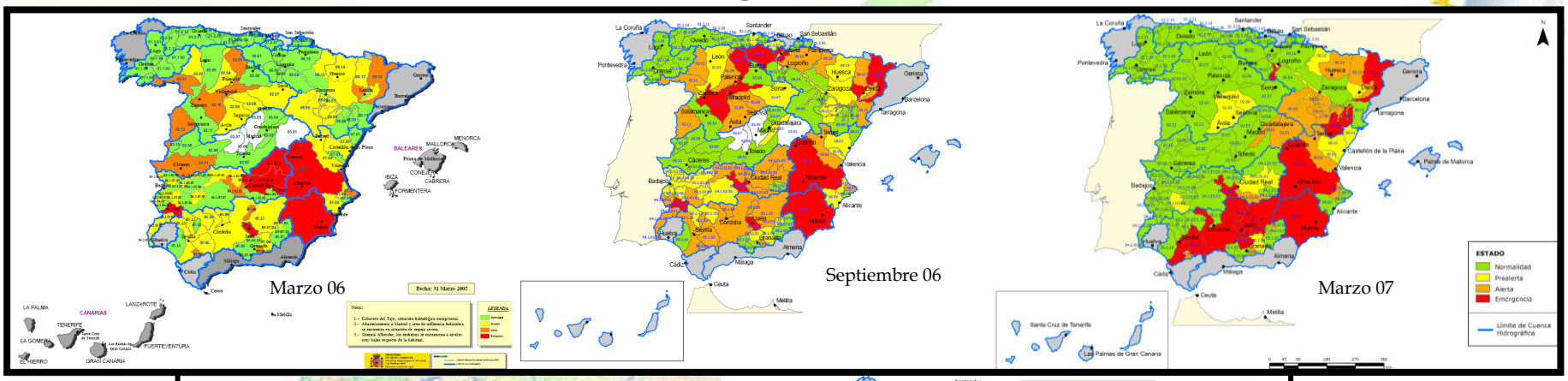
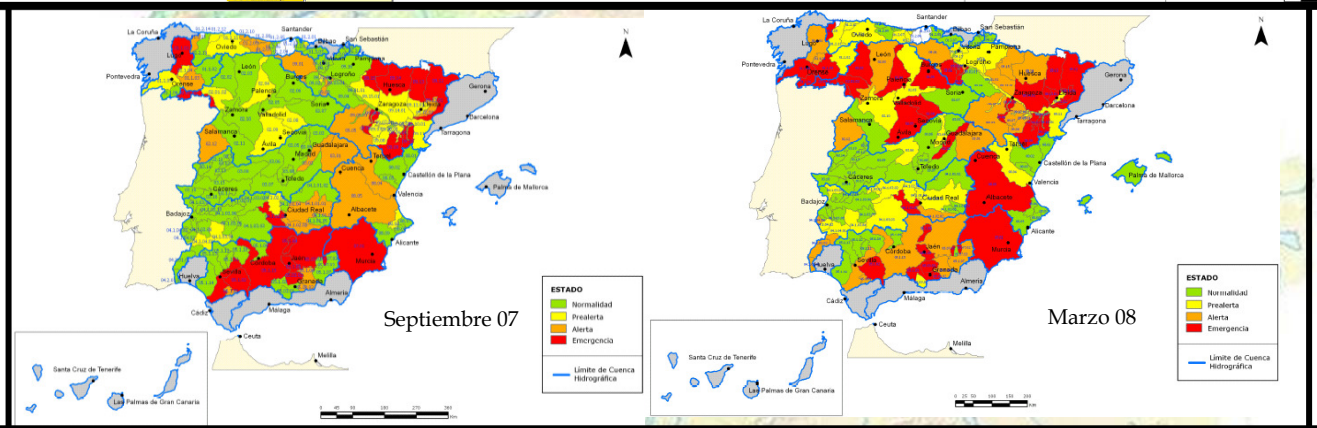
MINISTERIO DE MEDIO AMBIENTE Y MEDIO RURAL Y MARINO
CONFEDERACIÓN HIDROGRÁFICA DEL SEGURA

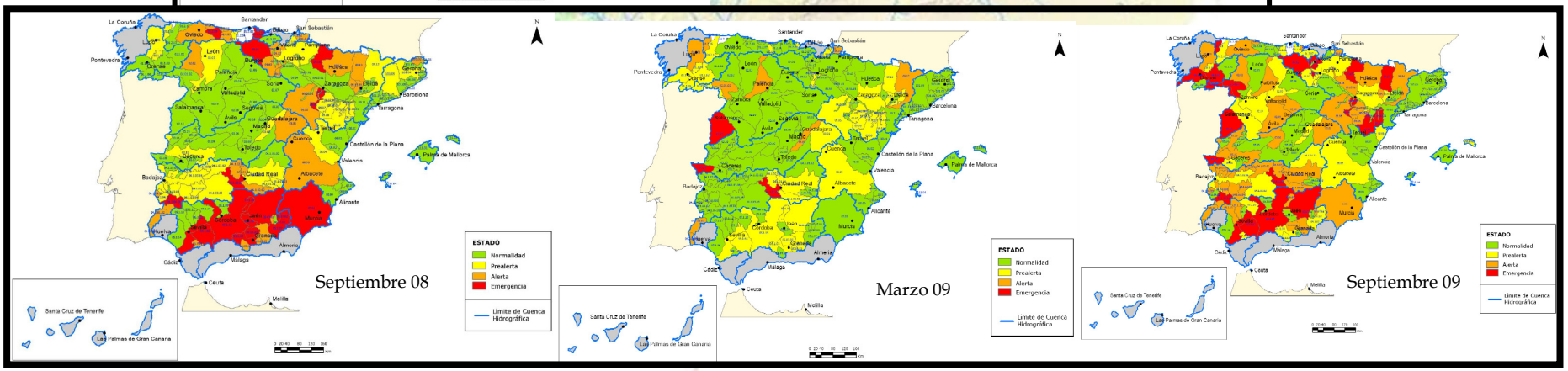
Presidencia Española eu 2010.es

Droughts indicators in Spain





Fuente:
http://www.mma.es



3. Indicators Used: **3.3 Assessing indicators**

DROUGHT MANAGEMENT IN SPAIN: LEGAL BACKGROUND

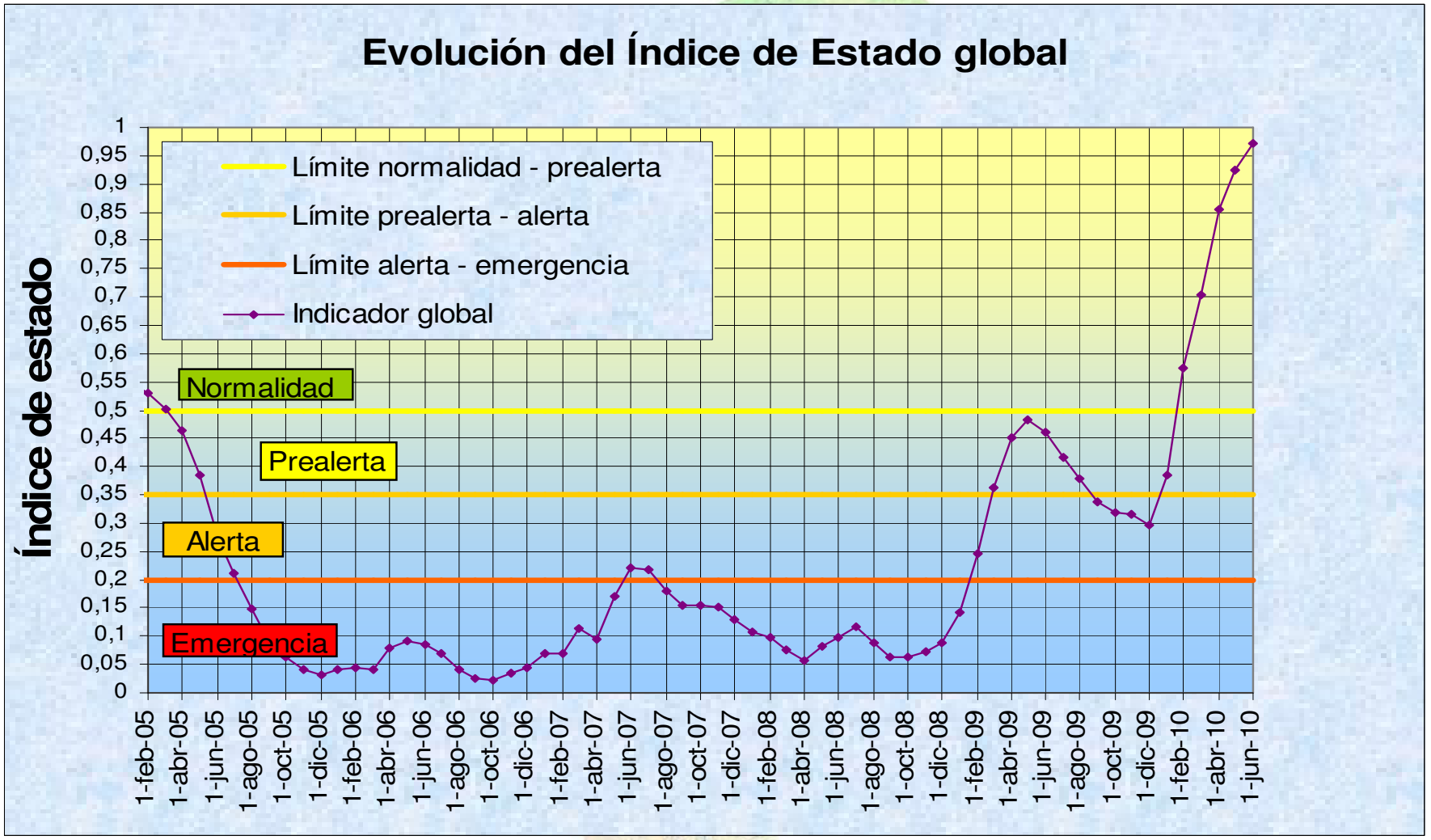
DROUGHT ACTION PLANS-DROUGHT INDICATORS

- Drought severity is classified in three levels, according to the Drought Action Plan. These are Pre-warning, Warning and Emergency.
- The definition of the threshold values is established in order to define which measures and action have to be taken in each drought severity level.
- Threshold values will correspond to State index values after the calibration had been carried out.

Indicators are needed in order to:

- Drought prevention.
- Gradual analysis of first drought stages.
- Activation of measures according to the drought severity level.
- Create an uniform background dealing with drought management with the aim of having a rational management, in particular with help instruments.

3. Indicators Used: **3.3 Assessing indicators**



Updated information can be checked at:
https://www.chsegura.es/chs_en/cuenca/sequias/gestion/index.html

3. Indicators Used: **3.3 Assessing indicators**

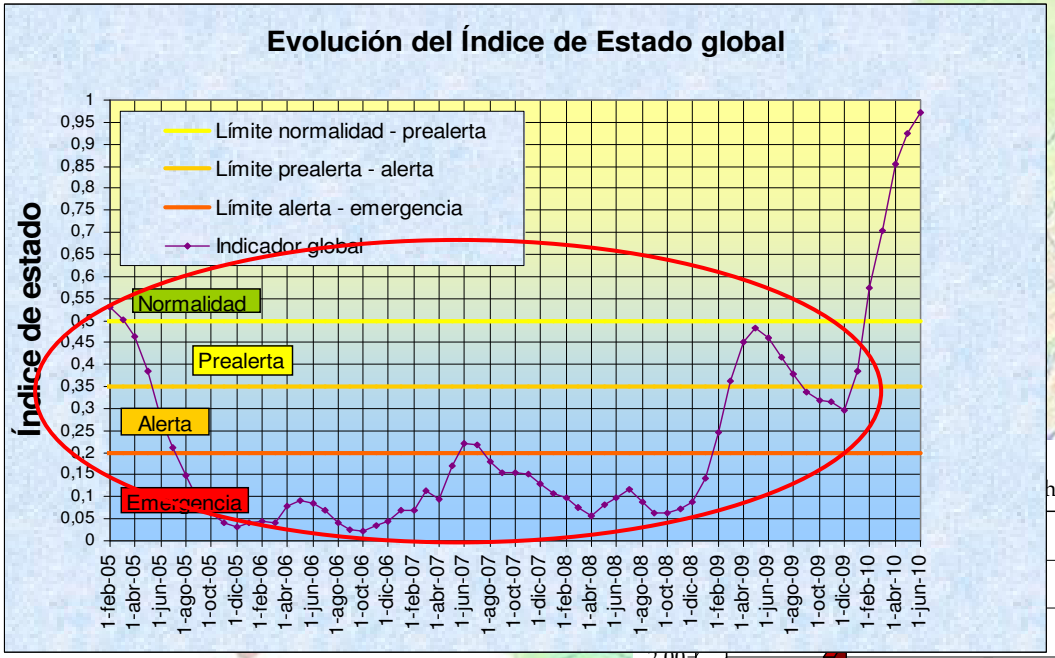
DROUGHT MANAGEMENT IN SPAIN: LEGAL BACKGROUND

DROUGHT ACTION PLANS-MEASURES

Several types of measures have been defined:

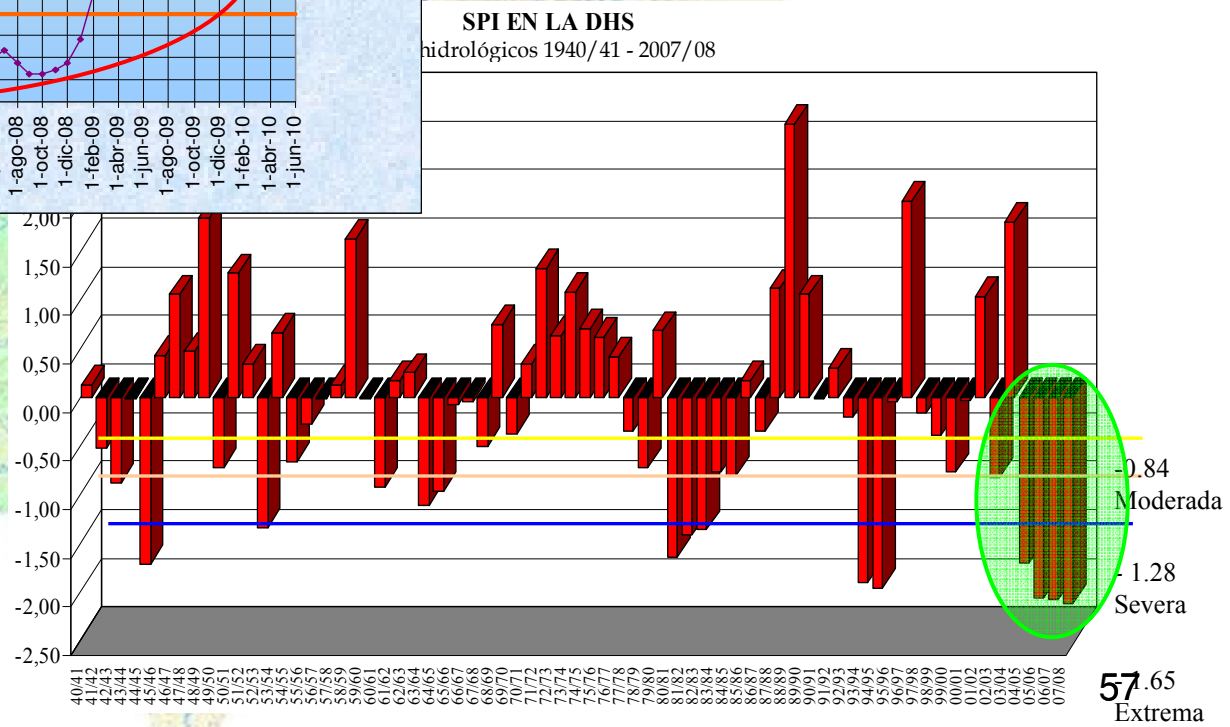
- **Forecast, administrative and management measures.**
- **Operative measures, such as:**
  - **Measures to provide additional water resources (*measures to increase resources*).**
  - **Measures to reduce demands significantly (*measures aimed at manage the demands*).**
- **Monitoring and recovery measures**

3. Indicators Used: **3.4 Last Drought (2005-2010)- Characterization**



Drought 2005-2010

Severe hydrological and meteorological drought. It is clearly shown by indicators.



Year 2007-2008

Water resources: 127,44 hm^3

(It is the minimum value of the water resources time series, in 78 years. Water resources were only the 57.25% of the water resources short time series average,).

3. Indicators Used: **3.4 Last Drought (2005-2010)- Measures**

Several measures, according to Drought Action Plan, were taken:

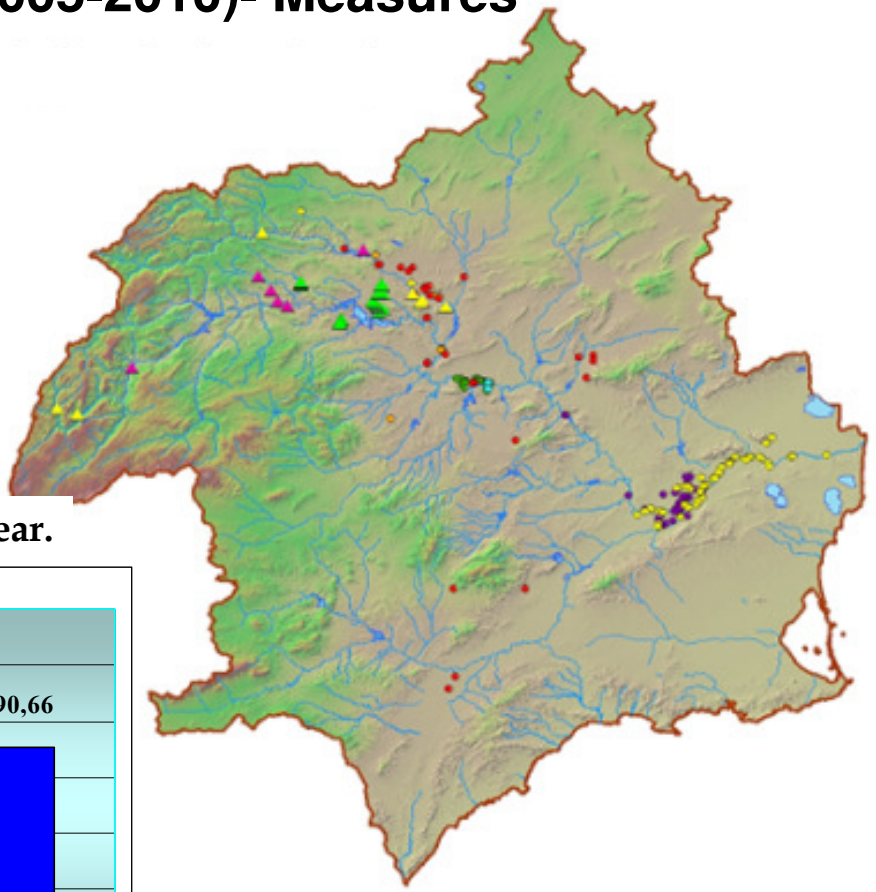
- Weekly monitoring System
- New desalination plants were constructed
- Operation of the Well Strategic Network
- Emergency investments in new infrastructures to increase water resources or to improve demand management.
- Water rights transfer, using water transfer infrastructure (up to70 hm3/year)
- Restrictions to irrigation supply, up to 50%
- Improving installations and networks to reduce water losses.
- Modernization of irrigation systems
- Economic measures to compensate farmers for water supply restrictions.
- Administrative measures, including a drought decree to improve water resource management

3. Indicators Used: **3.4 Last Drought (2005-2010)- Measures**

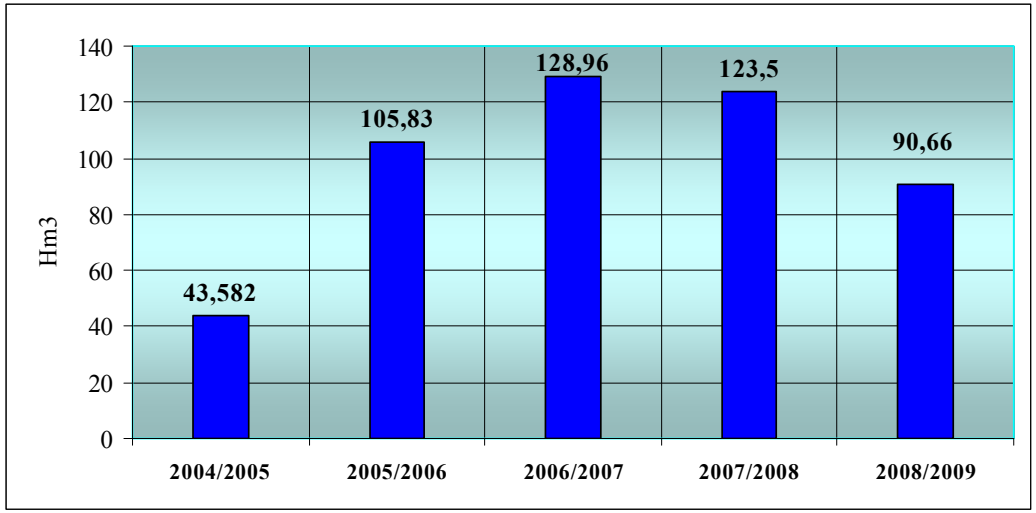
Aimed at minimizing the drought effects, existing in the Segura River Basin from 2005, one of the main measures adopted for increasing the basin resources is the execution of emergency public works such as **Well Strategic Network** (BES). The BES is managed by CHS.

3. Indicators Used: **3.4 Last Drought (2005-2010)- Measures**

Well Strategic Network



Abstracted volume at the end of the Hydrological year.



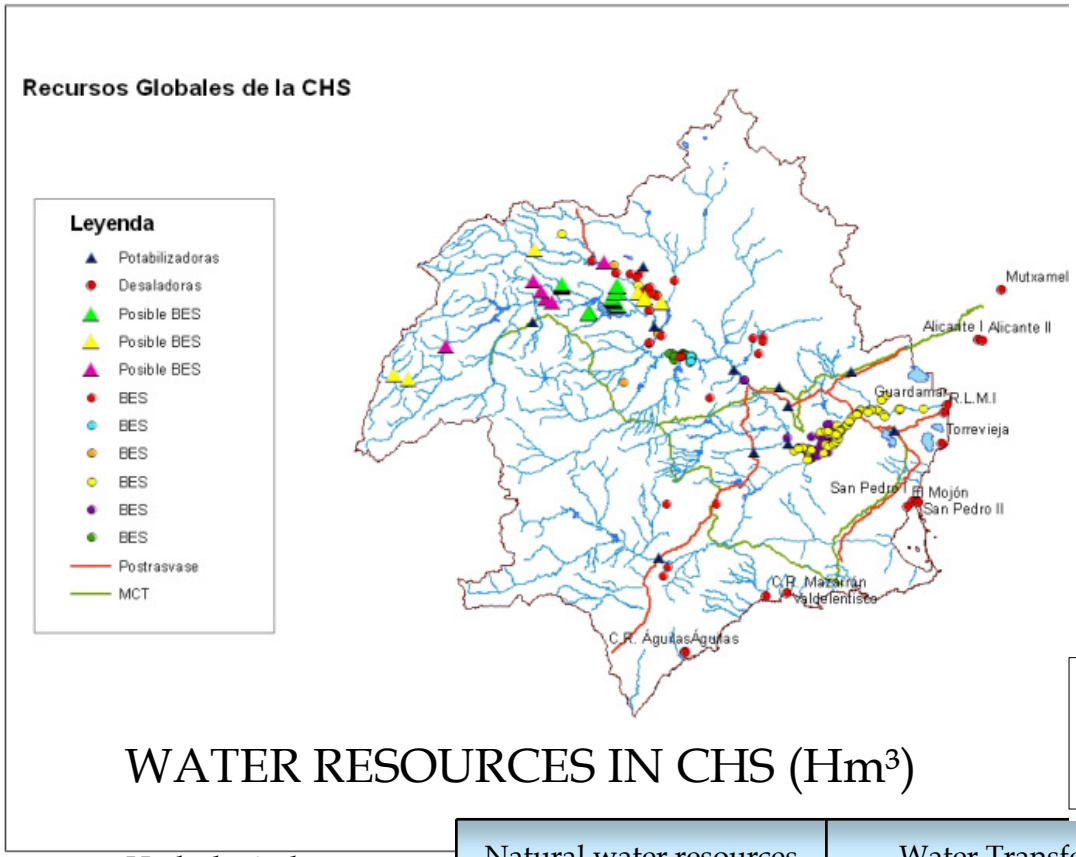
Total Volume (2004/09) = 492,44 Hm^3

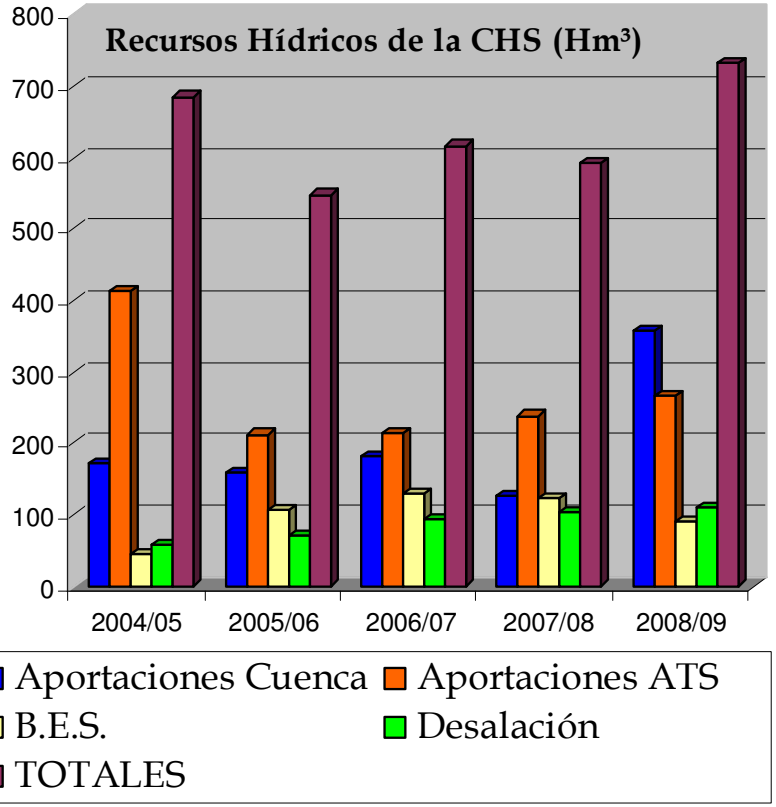
3. Indicators Used: **3.4 Last Drought (2005-2010)- Measures**

In addition to the well Strategic Network, other measures to increase water resources have been taken, such as emergency investments in desalination plants and investment in sewage treatment plants.

DESALINATION PLANTS and SEWAGE TREATMENT PLANTS are measures which not only have increased water resources during the last drought period, but also will help tackle WATER SCARCITY as a general purpose.

3. Indicators Used: **3.4 Last Drought (2005-2010)- Measures**

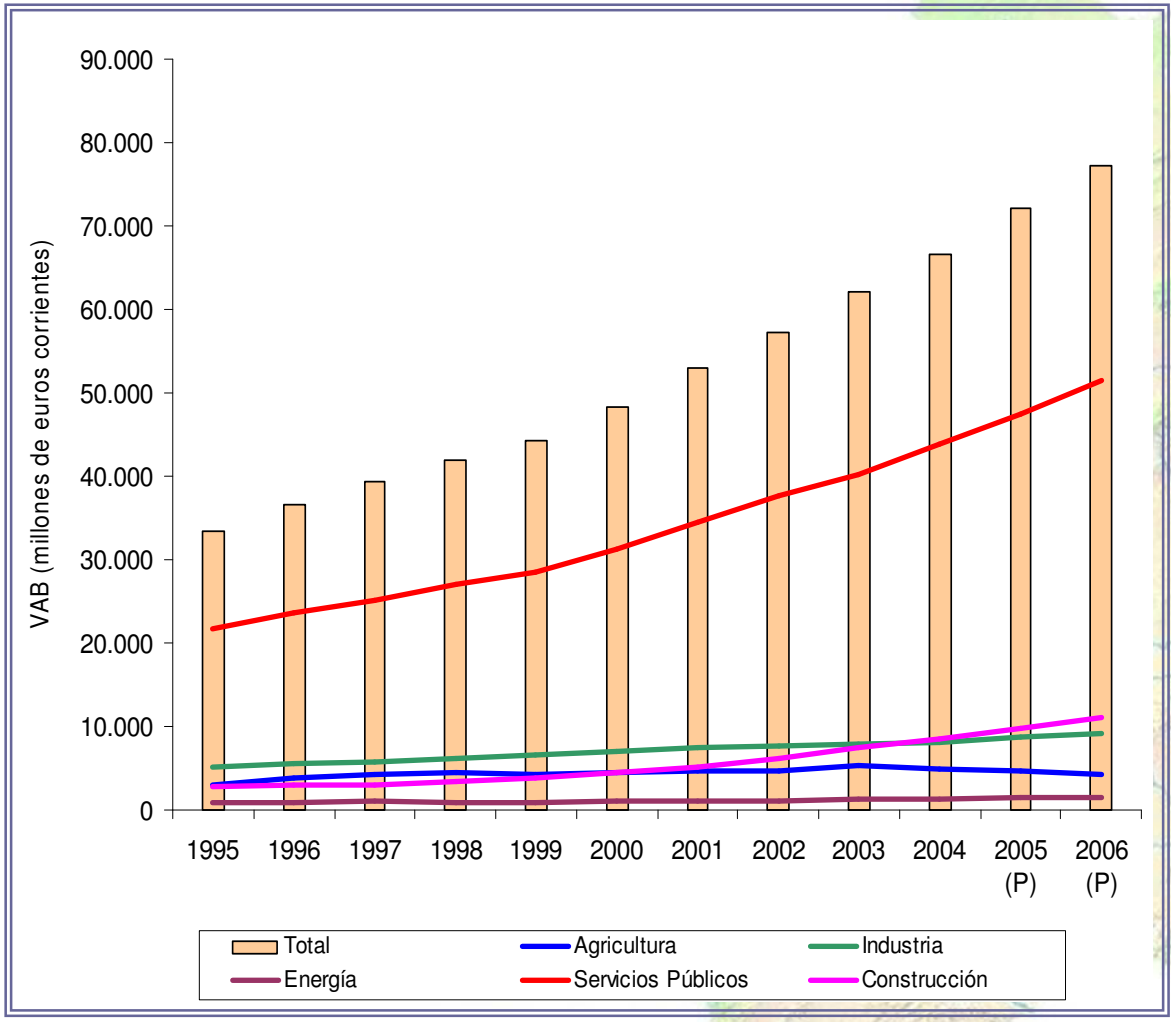




WATER RESOURCES IN CHS (Hm³)

Hydrological year	Natural water resources	Water Transfers	B.E.S.	Desalination	**TOTAL**
2004/05	171,628	414,001	43,582	56,6	685,811
2005/06	159,144	212,753	105,83	71	548,727
2006/07	181,008	213,786	128,96	93	616,754
2007/08	126,917	238,273	123,5	104,1	592,85
2008/09	357,124	265,594	90,66	110,2	823,578

3. Indicators Used: **3.4 Last Drought (2005-2010)- Consequences**



GVA evolution in CHS, by sectors

NO CONSTRAINTS
(increasing the offer of resources and management of demands) granting:

1. **Domestic water supply**
2. **Urban water supply**
   - ❖ Services
   - ❖ Industry
3. **Decrease of environmental impacts**
4. **Agriculture. Decrease of socio-economic impacts**

3. Indicators Used: **3.4 Last Drought (2005-2010)- Consequences**

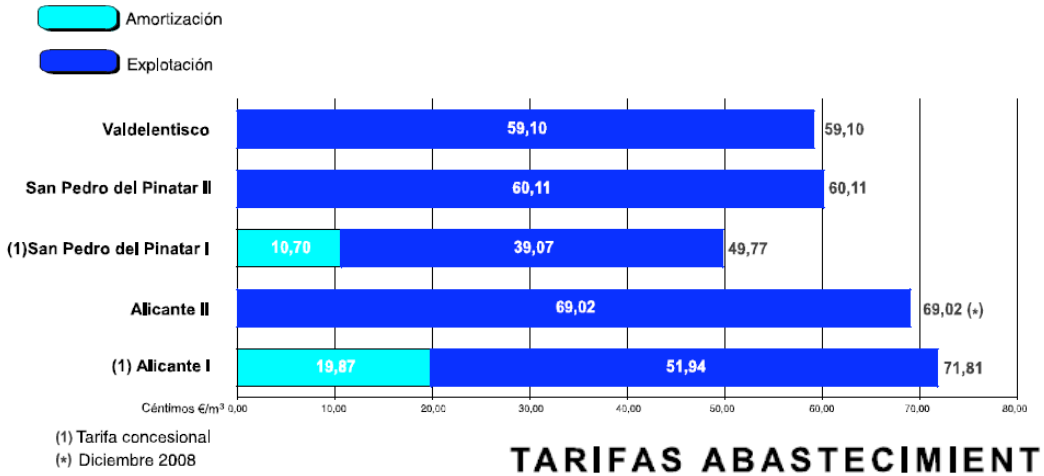
		MEDIA PERIODO SIN SEQUÍA (1990-92)	MEDIA PERIODO CON SEQUÍA (1993-94)	Δ (%)	MEDIA PERIODO SIN SEQUÍA (2002-2004)	MEDIA PERIODO CON SEQUÍA (2005-2006)	Δ (%)
SECANO	SUPERFICIE (Ha)	189.334	176.052	-7,0%	177.557	173.689	-2,2%
	RENDIMIENTO PRODUCTIVO (T/Ha) (*)	1,28	1,23	-3,9%	0,80	0,63	-21,6%
	PRODUCCIÓN (T)	242.935	217.042	-10,7%	141.997	108.867	-23,3%
	RENDIMIENTO ECONÓMICO (€ / Ha)	407	421	3,6%	180	146	-18,7%
	VALOR DE PRODUCCIÓN (M€ de 2002)	77,019	74,165	-3,7%	31,957	25,417	-20,5%
REGADÍO	SUPERFICIE (Ha)	156.383	141.664	-9,4%	156.494	152.821	-2,3%
	RENDIMIENTO PRODUCTIVO (T/Ha) (*)	15,97	14,84	-7,1%	17,27	16,91	-2,1%
	PRODUCCIÓN (T)	2.497.608	2.102.322	-15,8%	2.703.028	2.583.526	-4,4%
	RENDIMIENTO ECONÓMICO (€ / Ha)	5.701	5.476	-3,9%	6.959	6.154	-11,6%
	VALOR DE PRODUCCIÓN (M€ de 2002)	891,614	775,803	-13,0%	1.089	940	-13,6%
INVERNADERO	SUPERFICIE (Ha)	3.691	4.325	17,2%	6.455	5.985	-7,3%
	RENDIMIENTO PRODUCTIVO (T/Ha) (*)	157,47	144,48	-8,3%	140,26	135,10	-3,7%
	PRODUCCIÓN (T)	581.285	624.790	7,5%	905.438	808.579	-10,7%
	RENDIMIENTO ECONÓMICO (€ / Ha)	59.903	55.370	-7,6%	46.977	40.877	-13,0%
	VALOR DE PRODUCCIÓN (M€ de 2002)	221,121	239,447	8,3%	303,255	244,646	-19,3%
TOTAL	SUPERFICIE (Ha)	349.409	322.040	-7,8%	340.506	332.495	-2,4%
	RENDIMIENTO PRODUCTIVO (T/Ha) (*)	9,51	9,14	-3,8%	11,01	10,53	-4,4%
	PRODUCCIÓN (T)	3.321.829	2.944.153	-11,4%	3.750.462	3.500.972	-6,7%
	RENDIMIENTO ECONÓMICO (€ / Ha)	2.264	2.530	11,7%	4.183	3.641	-13,0%
	VALOR DE PRODUCCIÓN (M€ de 2002)	791,198	814,765	3,0%	1.424,190	1.210,511	-15,0%

3. Indicators Used: **3.4 Last Drought (2005-2010)- Consequences**

- Restrictions to irrigation supply, up to 50%.
- Increase of pressure on groundwater bodies.
- Great investment effort: **406,46 M€** from 04-05 to 08-09
- Water price (also connected with water scarcity):
  - Desalination water costs: up to 0,72 €/m3 (in 2008)
  - Urban supply water fare: 0,55 €/m3 (in 2008)
  - Abstracted water cost: up to over 0,25 €/m3

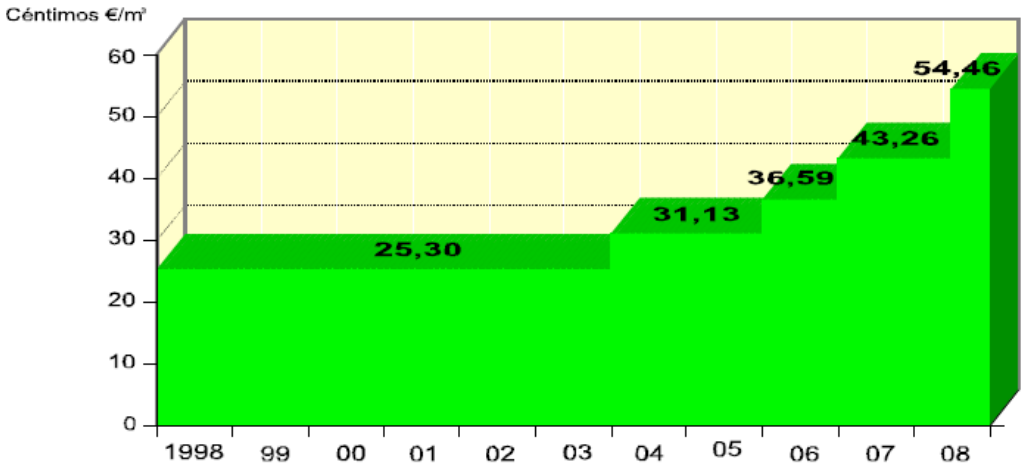
3. Indicators Used: **3.4 Last Drought (2005-2010)- Consequences**

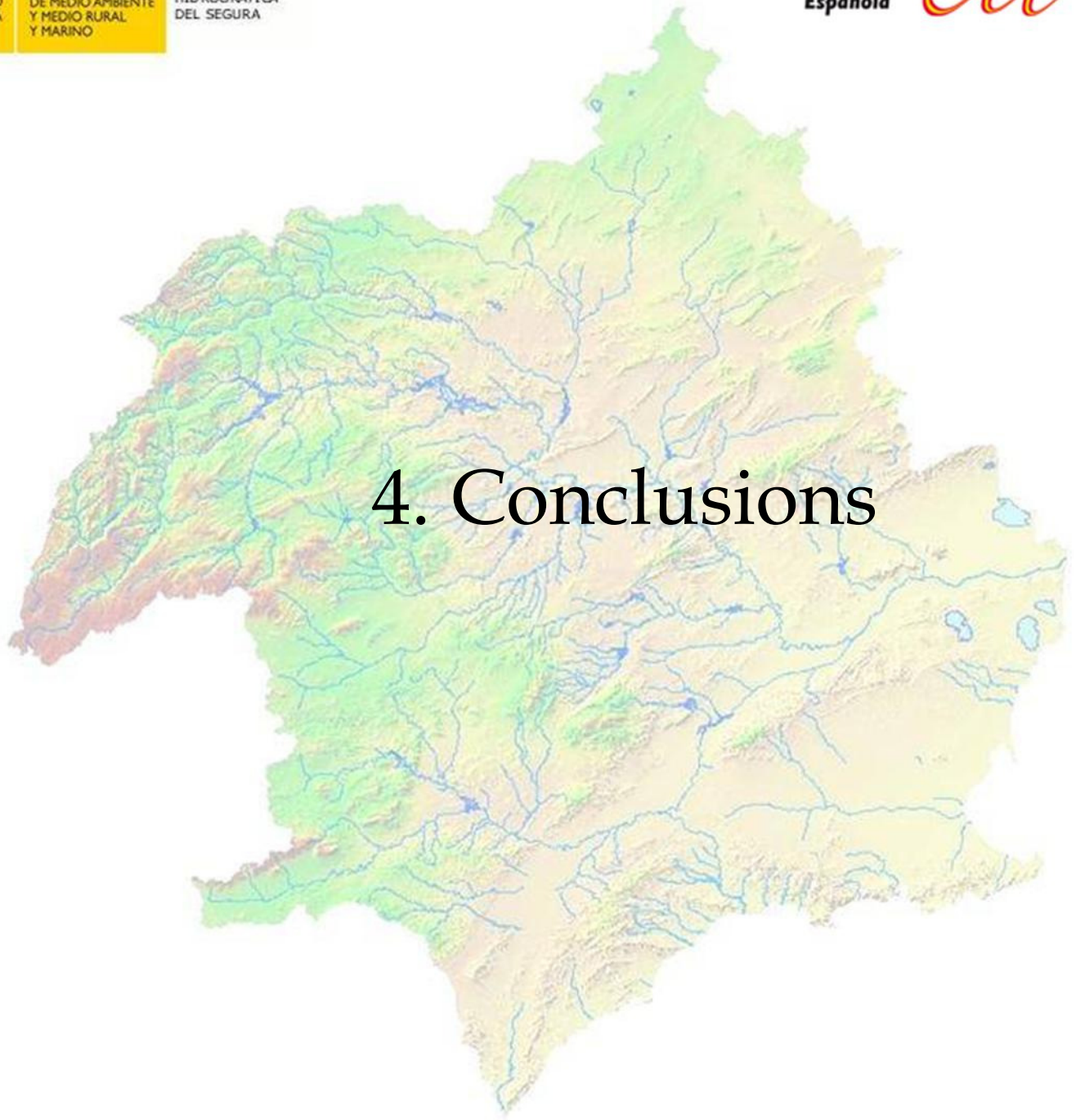
Desalination water cost



TARIFAS ABASTECIMIENTO
(IVA excluido)

Urban supply water fare



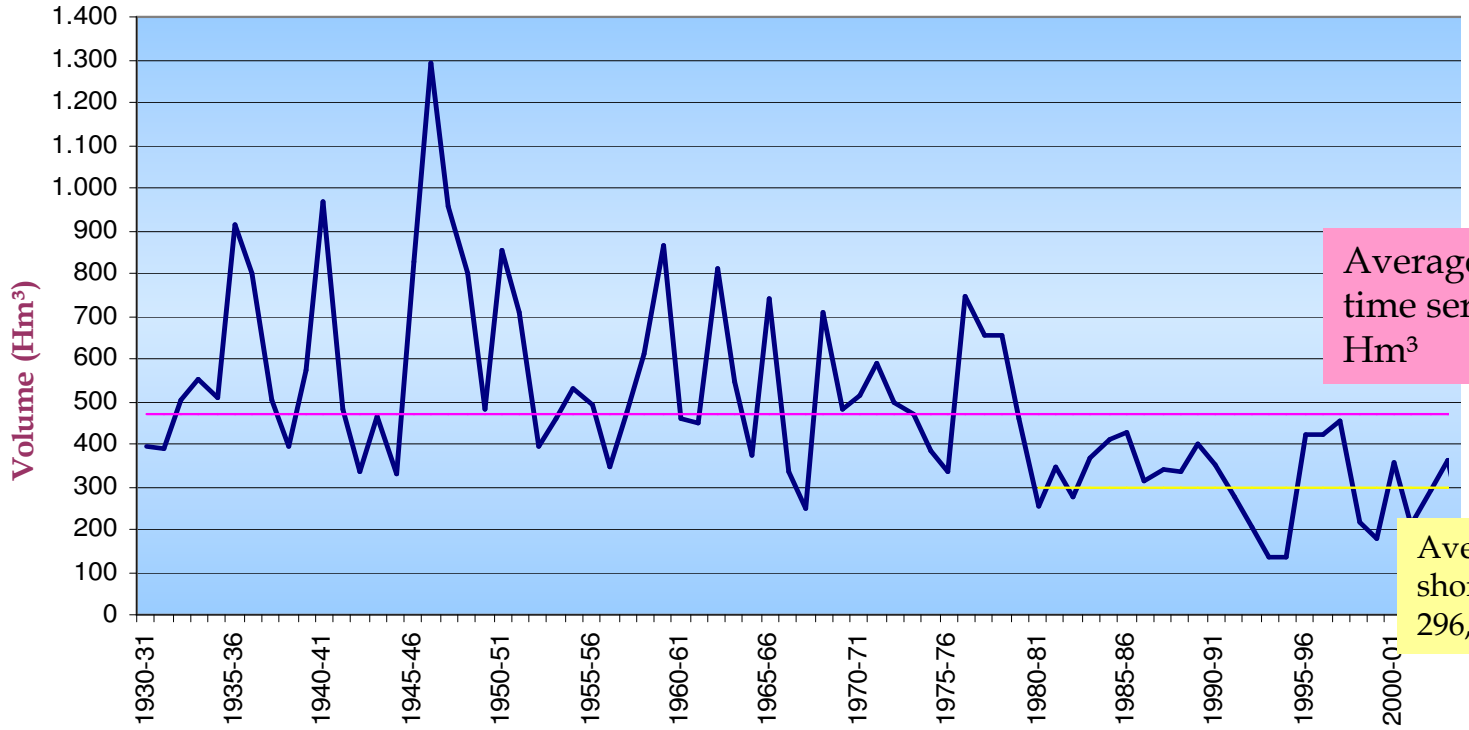


4. Conclusions

4. Conclusions: water scarcity

Segura River Basin (S.R.B.)	442 m³/inhab/year
SPAIN	2.460 m³/inhab/year

Interannual acumulated runoff between september 1931 and september 2009



Average of the long time series = 471,42 Hm³

Average of the short time series = 296,03 Hm³

4. Conclusions: European Expert Network on Water Scarcity and Droughts

Next steps

The indicative **TIMETABLE** for the Expert Group will be:

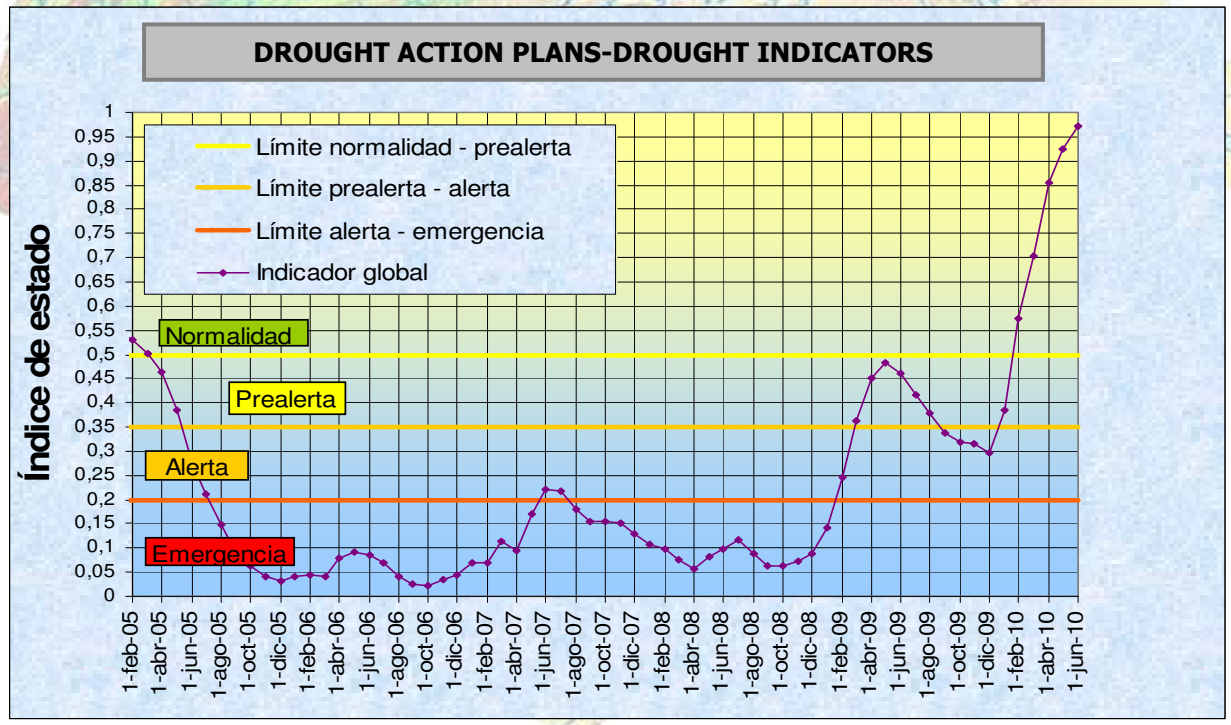
- **Year 2010:** first set of indicators to be tested in the pilot member states
- **Year 2011:** Practical application of indicators for additional member states voluntarily**.**
- **Year 2012:** Support the creation of Drought Risk Maps and assessment.

NEXT MEETING OF THE EXPERT NETWORK:

September 30, 2010, Helsinki

4. Conclusions: drought management

- New desalination plants were constructed
- Operation of the Well Strategic Network
- Restrictions to irrigation supply, up to 50%
- Emergency investments in new infrastructures to increase water resources or to improve demand management
- Modernization of irrigation systems



4. Conclusions: drought consequences

- Restrictions to irrigation supply, up to 50%.
- Increase of pressure on groundwater bodies.
- Great investment effort: **406,46 M€** from 04-05 to 08-09
- Water price (also connected with water scarcity):
  - Desalination water cost: up to 0,72 €/m3 (in 2008)
  - Urban supply water fare: 0,55 €/m3 (in 2008)
  - Abstracted water cost: up to over 0,25 €/m3

THANKS FOR YOUR ATTENTION

For further information, please visit: http://www.chsegura.es