



Drought Planning and Drought Risk Management in Spain

The World Bank
Water Global Practice

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Drought Planning and Drought Risk Management in Spain



SPANISH WATER GOVERNANCE SYSTEM

The main institution responsible are the **River Basins Organizations**:

- Water planning
- Stewardship of the Public Water Domain
- Infrastructure management
- Water policing
- Management of monitoring networks

National Government (General Directory for Water in the Environment Ministry) - Basic legislation, general planning, coordination.

Regional governments (autonomous regions) - Land use planning, wastewater treatment, agriculture, protected areas

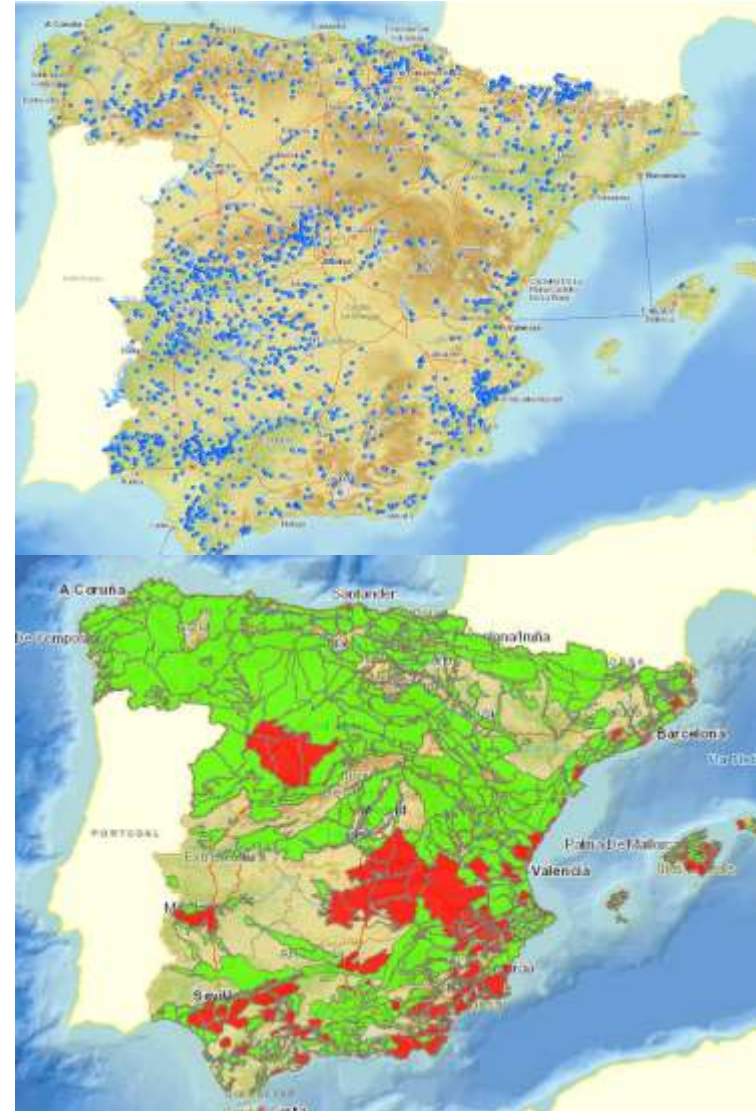
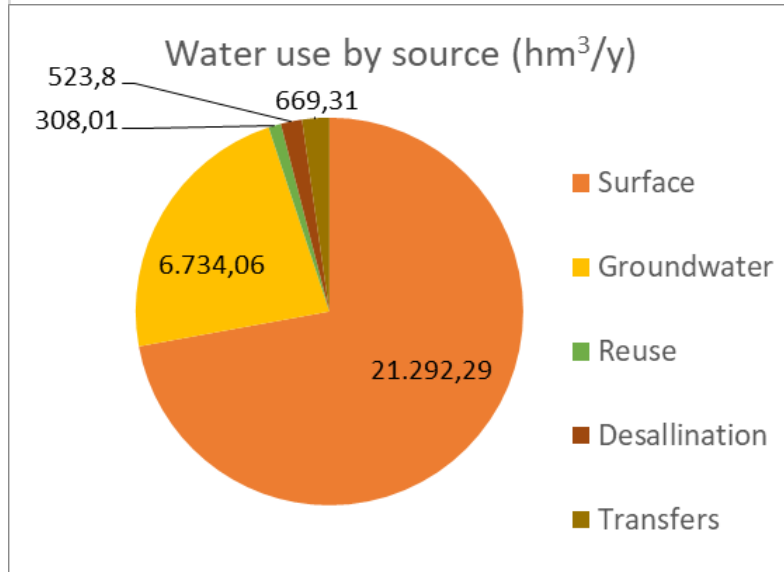
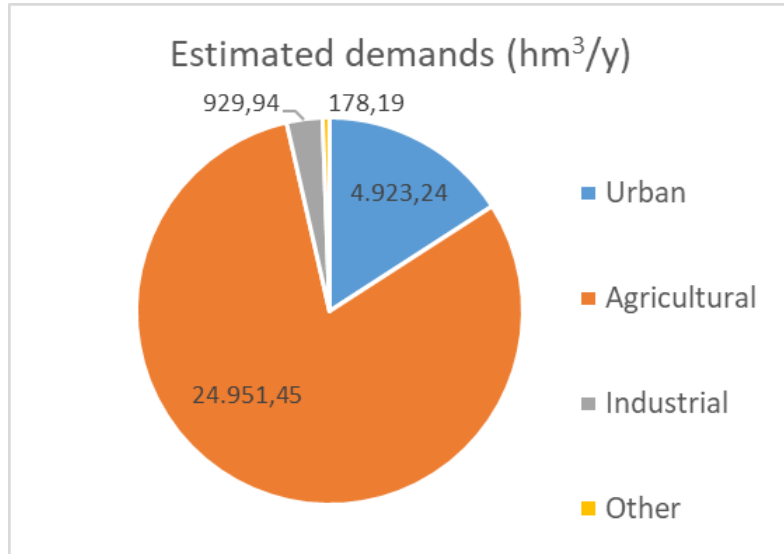
Local Governments – Urban planning, water supply



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WATER RESOURCES AND DEMAND



1,200 large dams,
max. capacity: **56.039 hm^3**

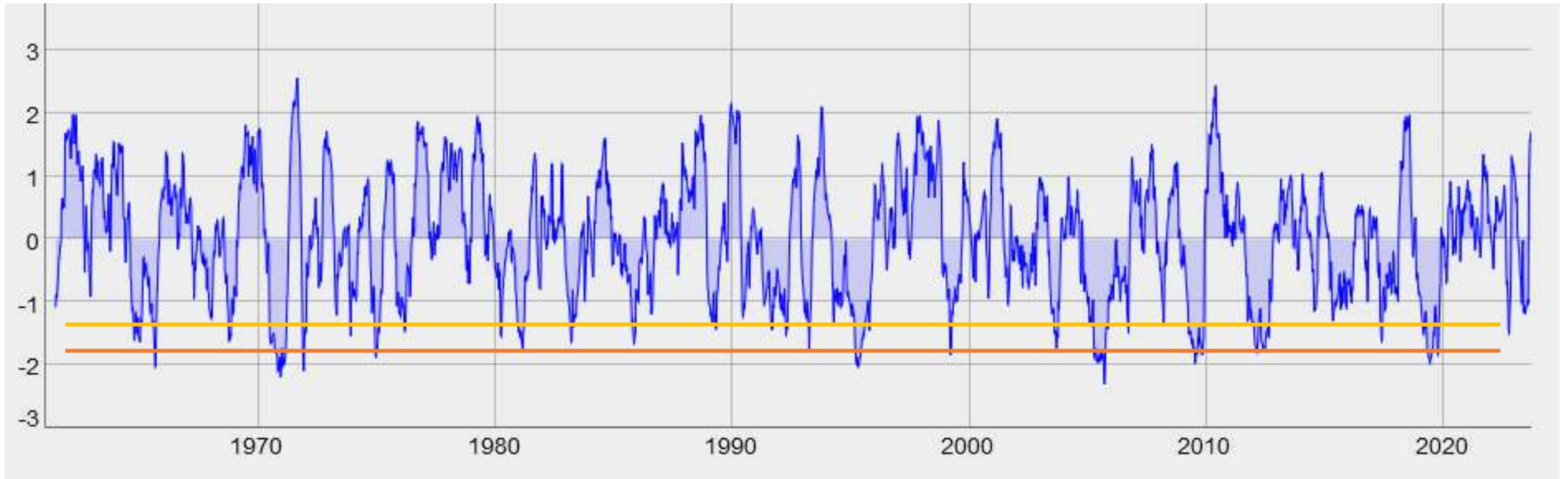
500 Ground Water bodies
50% of demand in the
coast...
Issues of overexploitation

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VARIABILITY is the standard

SPEI6 in 1961-2023 in Madrid



(Meteorological drought observatory, Vicente-Serrano et al. 2017)

CONCEPTUAL FRAMEWORK - Definitions

Drought: Unpredictable natural phenomenon that comes about mainly due to a lack of precipitation which leads to a temporary but significant decrease in the available water resources (definition 62 of the Hydrological Planning Instruction, approved by Ministerial Order ARM/2656/2008).

- **Extended drought:** Drought produced due to exceptional circumstances or other circumstances that could not reasonably be foreseen. The identification of these circumstances is achieved by using indicators related to the lack of precipitation during a time period and taking into account aspects as its intensity and duration (definition 63 of the Hydrological planning Instruction).

Scarcity: Situation of lack of sufficient water resources to meet the demand of water, as foreseen in the respective hydrological plans, once the environmental restrictions have been considered.

- **Structural scarcity:** a continuous shortage of water resources that hinders the ability to meet water demands with the guarantees established in the hydrological plan.
- **Temporary scarcity:** Situation of temporal water scarcity that while allowing the compliance of the guarantee criteria regarding water demands established in the hydrological plan, it, however, temporarily limits the supply in a significant way.

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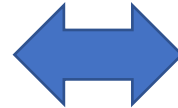


*Separation between River Basin Management and Drought Management
("structural" vs. "temporary" situations)*



River Basin Management Plan (RBMP)

- Goal: Good status of water bodies, **meet water demands** and protect the public domain.
- Evaluation of Pressures, Impacts, Risks and status of water bodies, and setting of Environmental Flow requirements. Includes the Programme of Measures to achieve the environmental objectives (23,000M€)
- Evaluation of Water resources availability, demands and **allocations** through water balances.
- Demands meet a supply guaranteed levels (as set in regulation)
- Revised every 6 years. 3rd cycle, Jan. 2023
- Public consultation 6 months, workshops



Drought Management Plan (DMP)

- Complementary plan to the RBMP
- Goal: Minimize drought impact on users and ecosystems.
- Focused on extended drought and temporary scarcity
- **System of indicators – Scenario - Measures**
- Makes explicit the conditions to declare “Exceptional Drought” and clarify the administrative organization and coordination.
- Revised every 6 years. 3rd cycle, in public consultation.
- Public consultation 3 months, workshops

CONTENT of the Drought Management Plans

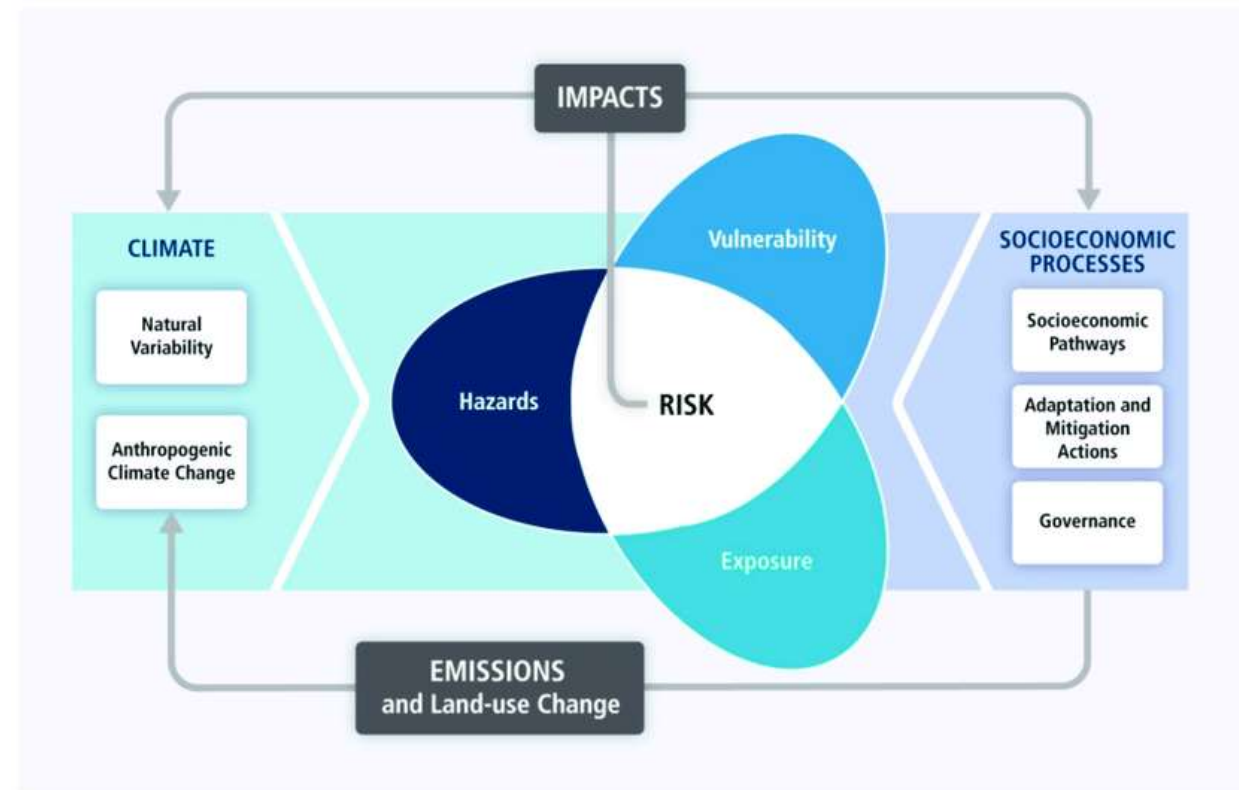
Is set in national legislation

1. General description of the Basin and management units
2. **Detailed description of the management units:** Resources, demands, exploitation index, reserves, applicable measures from the RBMP
3. Historical Droughts and Climate Change
4. Impact Analysis: Hazard, exposure, vulnerability, risk assessment
5. **Indicator System:** Drought, Water Scarcity.
6. **Process for Scenario Diagnosis:** Entry and exit conditions
7. **Actions and measures per scenario:** both general and per territorial unit
8. Public information measures
9. **Administrative organization measures: tasks and responsibilities of each governing body**
10. Impact assessment of past droughts: Environmental and economic (main uses)
11. Ex-post analysis reports: required content
12. Emergency plans for urban supply over 20,000 hab.: Analysis, recommendations and coherence
13. Monitoring reports: requirements.

RISK ASSESSMENT

- **HAZARD:** Drought and temporary scarcity indicators
- **EXPOSURE:** Population, irrigated area, hydropower capacity, industrial value
- **VULNERABILITY:** WEI+, groundwater exploitation levels, demand guarantee levels...
- **IMPACT:** loss of agricultural production (rainfed v. irrigated), hydroelectric production, additional costs of urban supply.

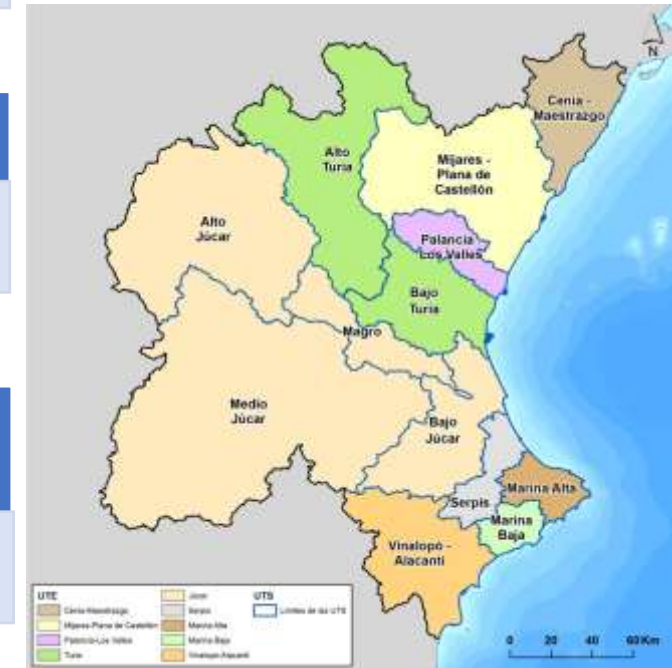
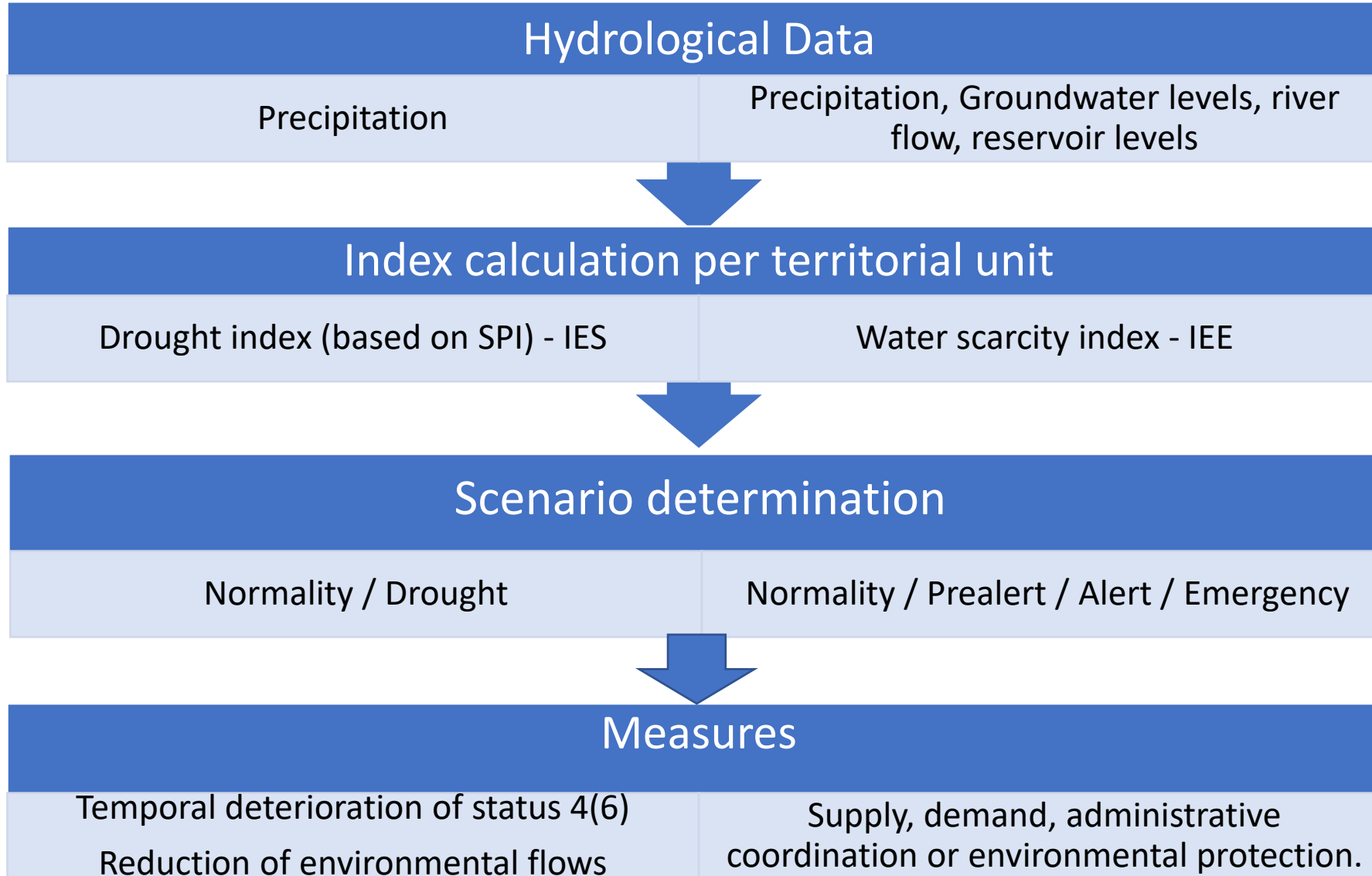
Challenging and data-demanding, issues with data granularity.



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DROUGHT - TEMPORARY SCARCITY



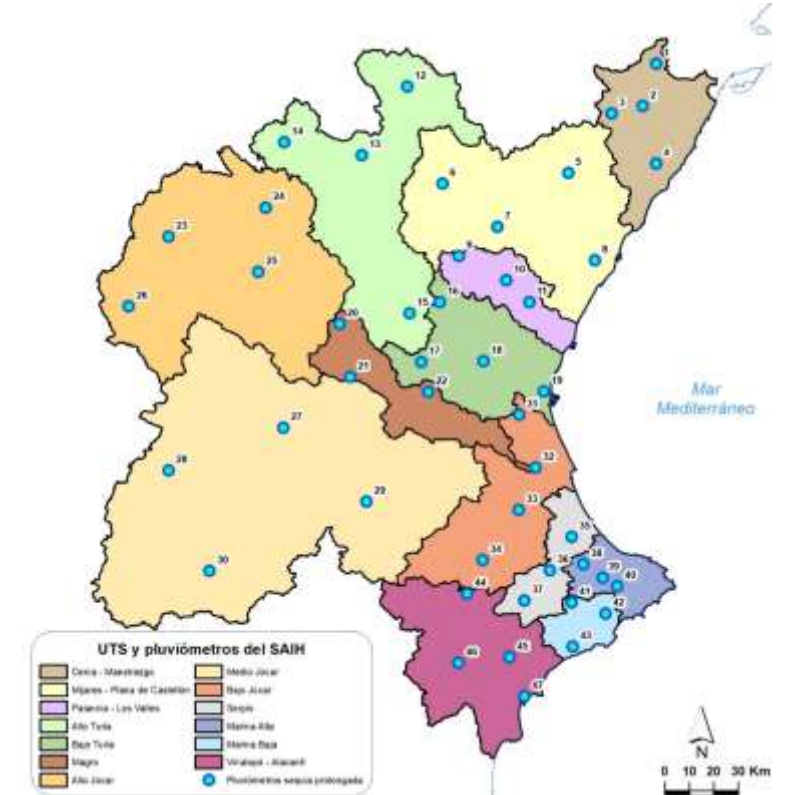
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EXTENDED DROUGHT INDICATORS

Detect decreases in precipitation that may affect water resources availability.

- Based on precipitation data (SPI), runoff (natural conditions), over 3, 6, 9 or 12 months depending on the basin.
- River Basin Organizations' network of monitoring stations
- Reference period 1980-2018
- Normalized Indicator [0-1]
- Validated against environmental flows or historical records of droughts
- Drought scenarios < 0.3



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WATER SCARCITY INDICATORS

Detect situations where potential problems to meet the demand may arise.

- Based on precipitation data, gauging stations, reservoir levels, reservoir inflows, groundwater levels.
- River Basin Organizations' network of monitoring stations
- Reference period 1980/2018
- Indicators are weighed to build up to the territorial unit level
- Data should be available in a timely manner (10th day of the month)



Cód. indicador	UTE	Indicator value	Coefficient	Value of IEE
VE04	Turia	0,66	0,08	0,60
EA01		0,93	0,09	
EE03		0,62	0,04	
EA02		0,64	0,09	
VE05		0,63	0,42	
PZ07		0,38	0,08	
PZ08		0,77	0,08	
PZ09		0,03	0,08	
PZ10		0,62	0,04	
EA03		0,42	0,23	
EA04	0,55	0,20		
PZ11	0,53	0,03		
EA05	0,59	0,03		
EA06	0,46	0,03		
PZ12	0,06	0,03		
VE06	0,52	0,03		
PL03	Júcar	0,48	0,03	0,53
VE07		0,64	0,36	

SCARCITY INDICATOR	SCENARIO
0,75 – 1,00	NORMAL
0,50 – 0,75	
0,30 – 0,50	PRE-ALERT
0,15 – 0,30	ALERT
0,00 – 0,15	EMERGENCY

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WATER SCARCITY ACTIONS AND MEASURES

Water Scarcity Measures				
Situation	No Scarcity	Moderate Scarcity	Severe Scarcity	Extreme Scarcity
Scenario	Normal	Pre-Alert	Alert	Emergency
Typology of actions and measures	General Hydrological Planning, Monitoring	Communication and awareness raising, Monitoring Preparation	Management measures (supply and demand), Control and monitoring (Art. 55 Water act)	Strengthening of the measures, Possibility of exceptional measures (art. 58 Water Act)

- Their aim is to mitigate impact over water uses or the environment.
- They are applied progressively, aiming to an early detection and action from the start of the episode.
- These are temporary measures, to be lifted as the scenario improves.
- The goal of the measures is to manage exceptional situations, *not to solve structural imbalances*. Therefore, they do not include new infrastructure but in specific emergency situations.
- Measures can be classified in terms of their action point: supply, demand, administrative coordination or environmental protection.

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MEASURES PER TERRITORIAL UNIT

UTE 2 Mijares-Plana de Castellón		
Status	Examples of specific measures to adopt	Competent Authority
Prealert	Activate emergency plans for the supply systems of Almassora, Burriana, Castelló de la Plana, Vall d'Uixó, Onda, Vila-real and Consortium of Aguas de la Plana as well as those systems that in the future reach 20,000 equivalent inhabitants	Relevant Municipalities
	Analysis of the possibilities of using additional water reuse resources from the WWTP of Almenara, Almassora, Borriana, Xilxes, Llosa, Moncofa, Vall d'Uixó and Castelló de la Plana.	RBO & reg. Gov.
Alert	...	
	Materialisation of the possibilities of new resources contributed by desalination from the IDAM of Oropesa and Moncofa	RBO
	Restriction of up to 100% of the surface supply to the mixed irrigation systems of the Mijares, with respect to its surface consolidated demand, taking into account the application of the Bases Agreement for the Regulation of the Mijares River.	RBO
Emergency	Reinforcement of monitoring actions for the conservation and protection of the resource and aquatic ecosystems considering the protection of wetlands, the protection of fluvial species and the impact of other measures on the natural environment, with special attention to the Marjal d'Almenara Wetland (RAMSAR).	RBO & reg. Gov.
	...	
Emergency	Intensification of the possibilities of using new resources contributed by desalination from the IDAM of Oropesa and Moncofa.	RBO
	Beginning of the restrictions to protect the available surface resources: between 15 and 25% of the supply to the traditional irrigations of the Mijares with respect to its consolidated demand.	RBO
	Restriction of up to 100% of the surface supply to the mixed irrigations of the Mijares, with respect to its surface consolidated demand, taking into account the application of the Bases Agreement for the Regulation of the Mijares River.	RBO
	Beginning of saving measures to protect the underground resources available in bodies of groundwater in poor quantitative state, especially in Plana de Castelló: reduction of up to 15% .	RBO & users
Emergency	...	



DECLARATION OF DROUGHT

It's a decision of the Presidency of the River Basin Authority contingent on:

- a) Water scarcity at **alert** and **extended drought** scenarios in one or several territorial units
 - b) Water scarcity scenarios at **emergency**
- Applicable to the territorial units that meet the conditions above but can be made extensive to the rest
 - Enables the request to the Ministry to implement measures inc. over water use rights. Any measures will be considered “public utility”, expediting administrative procedures.

OTHER BODIES

Drought Permanent Committee

Technical drought office

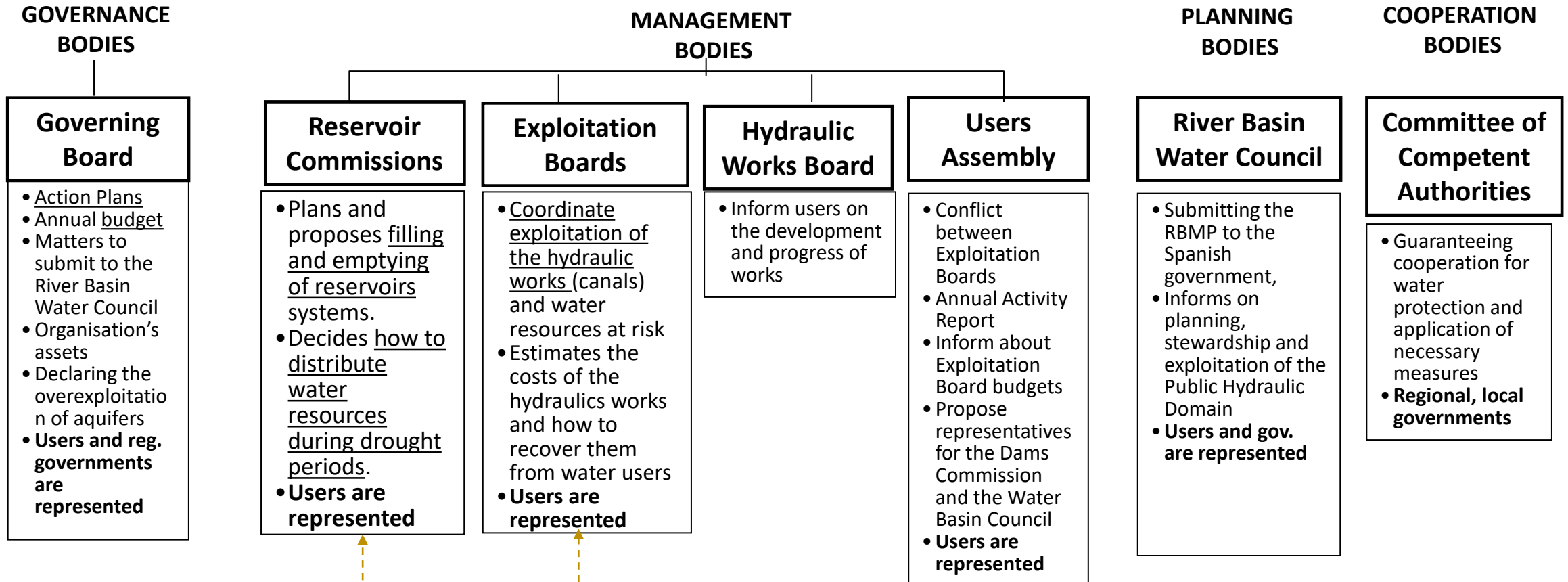
Dam committees, exploitation boards.

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RIVER BASIN ORGANIZATION STRUCTURE

PRESIDENCY



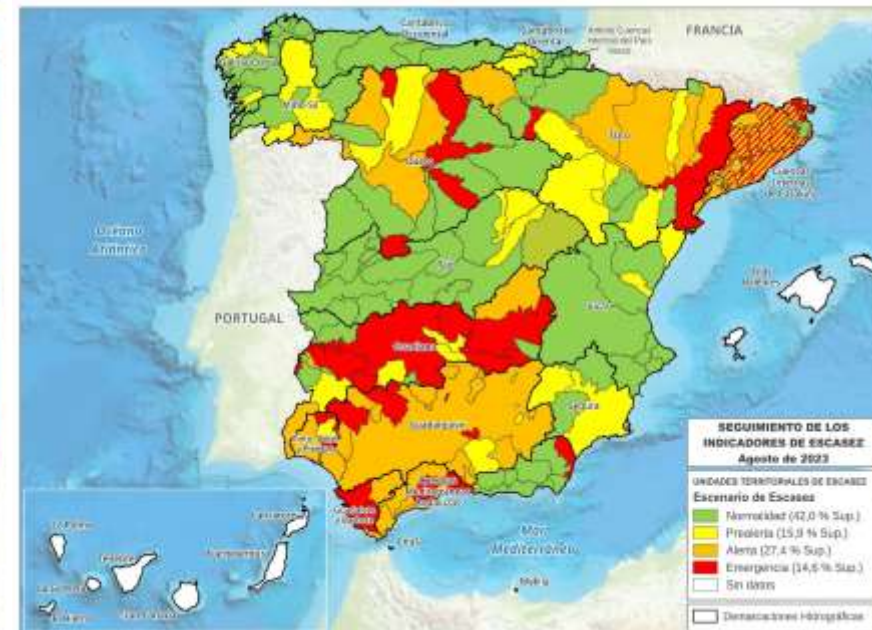
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MONITORING – National Drought Observatory

- Monthly, public reports, on the 10th day of each month are publicly available.
- Assessment of drought and Water Scarcity scenarios at the territorial unit level for all RBD.
- They detail the scope of the event (duration, location, intensity), environmental and socioeconomic impacts, the measures taken and an evaluation of the implementation of the Drought Management Plan.
- Short-term forecast

August 2023



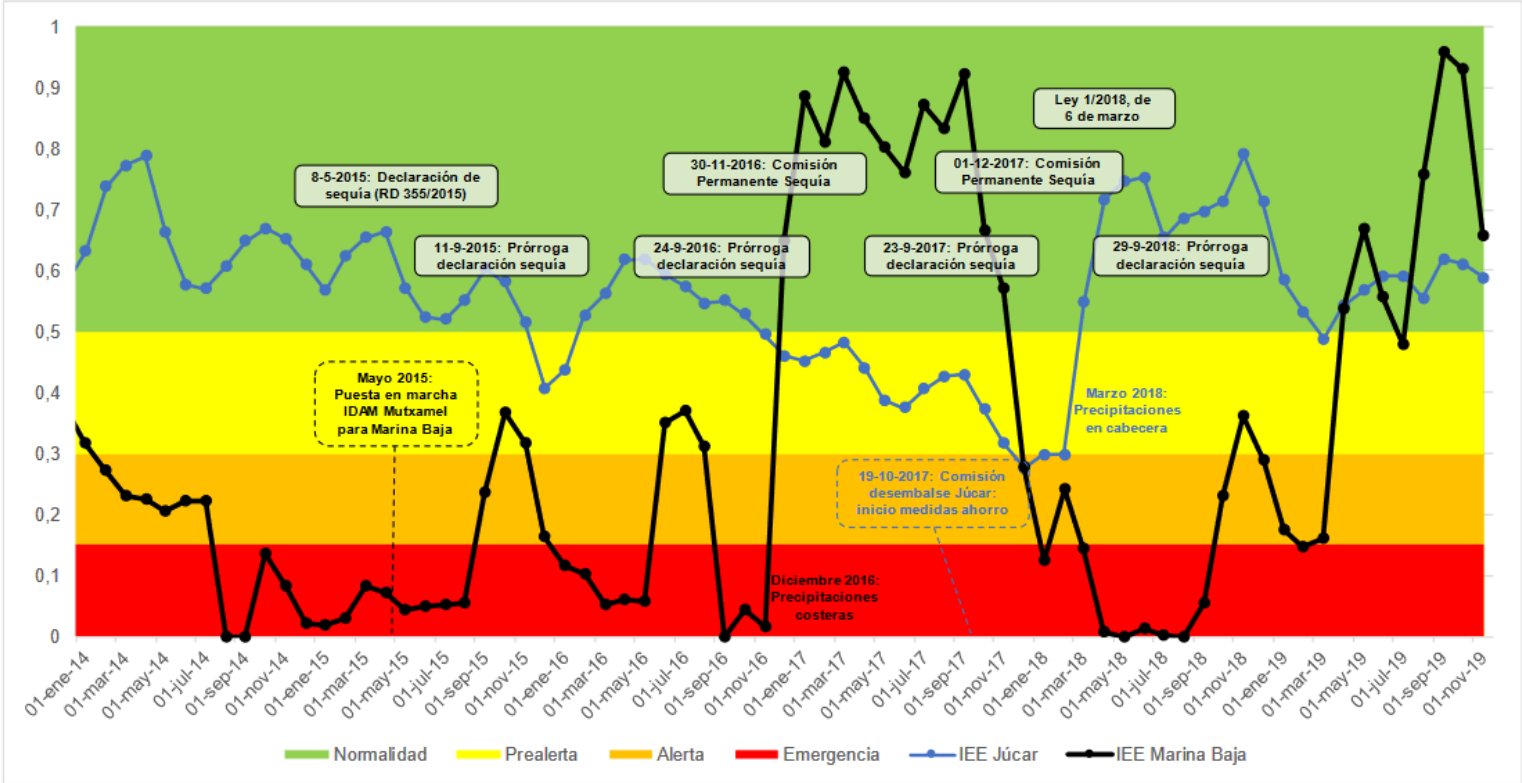


EXPOST – EVALUATION

After events declared as “Exceptional Drought”, the River Basin Authority is required to prepare an analysis of the event, including:

- Extension and period covered
- Measures taken by all actors
- Socioeconomic impacts
- Environmental impacts
- Evaluation of the Drought Management Plan application

The process also triggers the review of the Drought Management Plan



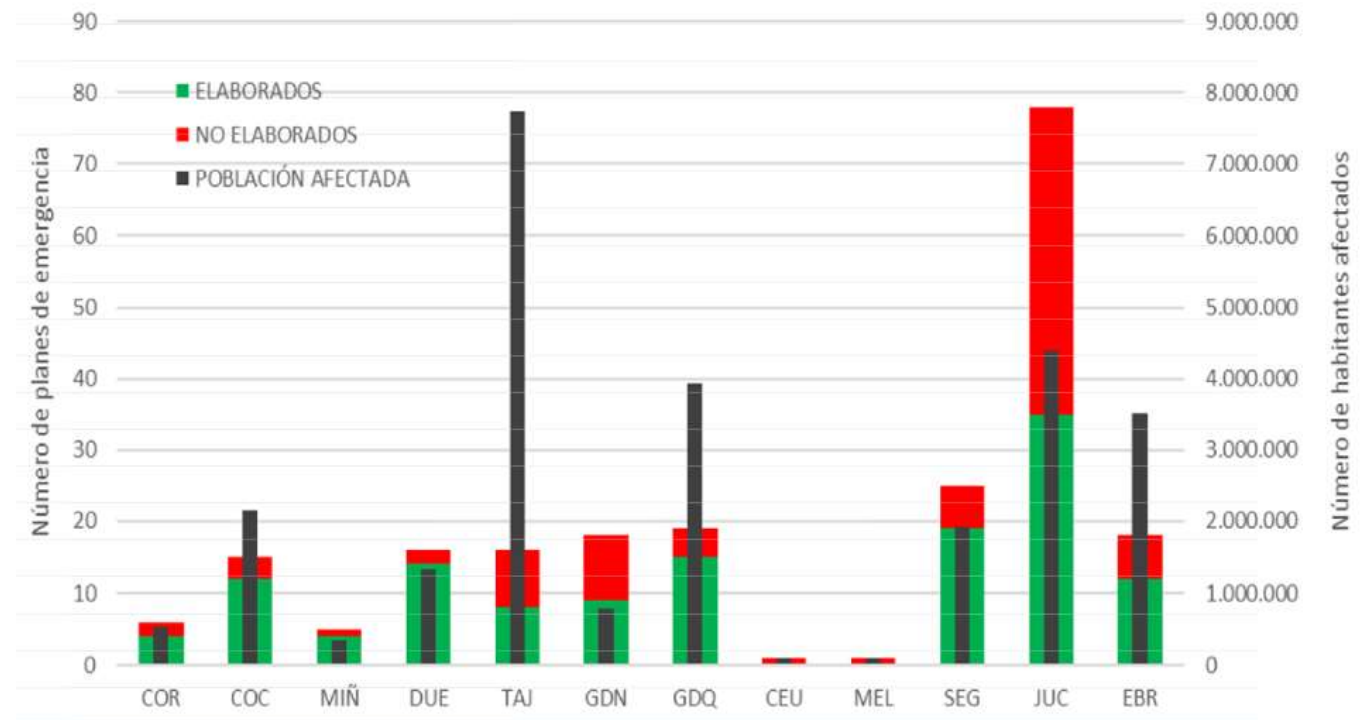
Júcar River Basin, 2015 – 2019 drought report

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DROUGHT EMERGENCY PLANS FOR URBAN SYSTEMS

- Applicable to urban water systems >20.000 hab-eq.
- Responsibility of the local authority with the water provider.
- CONTENT: Detailed study of water sources, their situation, description of demand, water permits, infrastructure, and networks, operating rules, own indicators and scenario, and measures taken, inc. communication to the public and awareness raising.
- Coherence with the Drought Management Plan – indicators and measures
- To be reviewed and informed by the River Basin Authority. Guidance provided.



All in all, increasing uptake, but progress still pending

International Arena - IDRA Initiative

- A network of like-minded countries and international organizations spearheaded by the **governments of Senegal and Spain**, a group of like-minded countries in partnership with various stakeholders at all levels took the initiative to form an **International Drought Resilience Alliance (IDRA)**.
- It's goal is to catalyze political momentum to achieve a **transformational change of actions and mindsets towards drought resilience**
- The alliance was launched **on UNFCCC COP 27 in Sharm El Sheikh**
- The alliance will promote **effective and efficient preparedness and adaptation measures** that go beyond disaster response to reduce vulnerability to drought.
- The alliance seeks to act as **a global facilitator for drought management** focused on systemic risk
- To reduce systemic risks and avoid new ones, there must be **a shift from dealing reactively with drought impacts to getting ahead of the curve and addressing underlying risk drivers.**



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Thank you



Photo source: Afar, wikiloc

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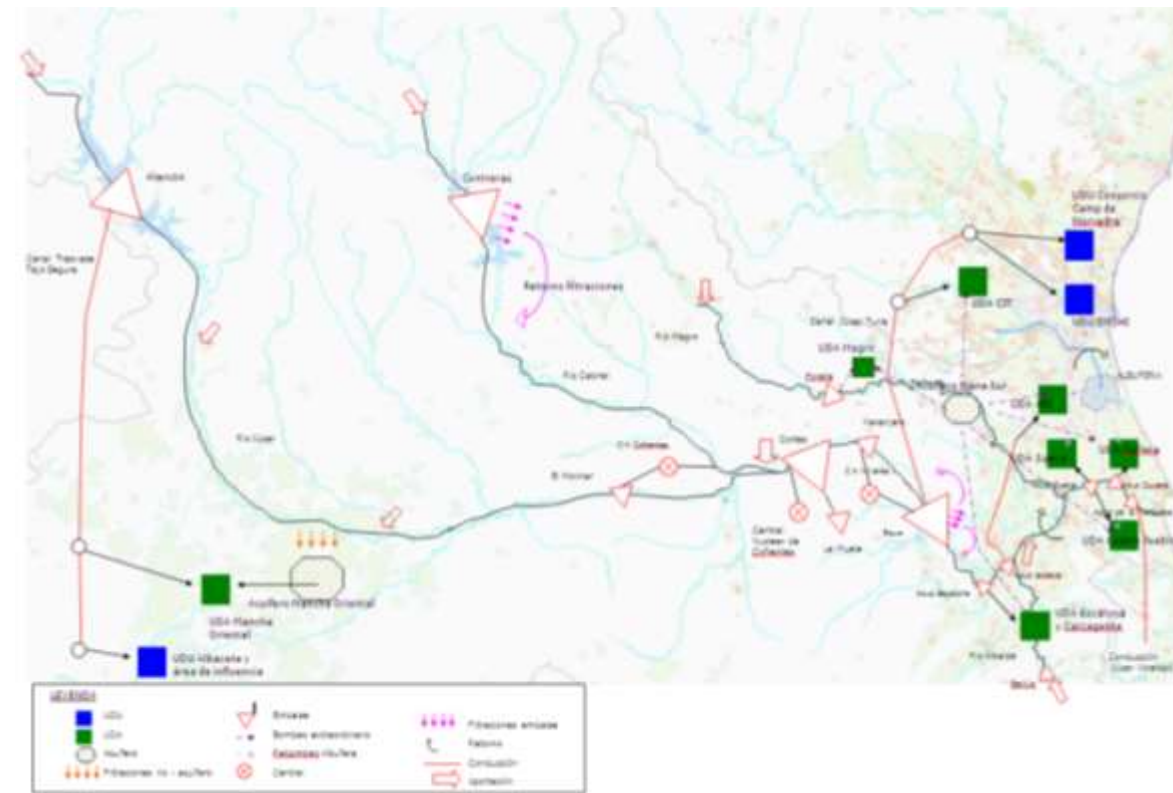
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Additional slides for further detail

River Basin Management plan: Water Balances, reserves and allocations

- Prepared in the River Basin Management Plans
- Using mathematical models (*Aquatool*) for each system
- Environmental flows are considered, as a restriction as set in the regulation
- Allocations (per origin) and reserves are set in relation to available resource, i.e. once all restrictions have been taken into account
- Guarantee levels for the demands should be met
- Reserves are set aside volumes to meet future demands or environmental needs, registered to the River Basin Organization, specifying the beneficiary.



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BASIC DATA NEEDED

Hydrological data:

- River flows (gauging stations),
- precipitation data,
- Groundwater levels
- reservoir levels, reservoir inflows
- Snow levels

Non conventional water resources: reuse, desalination, transfers.

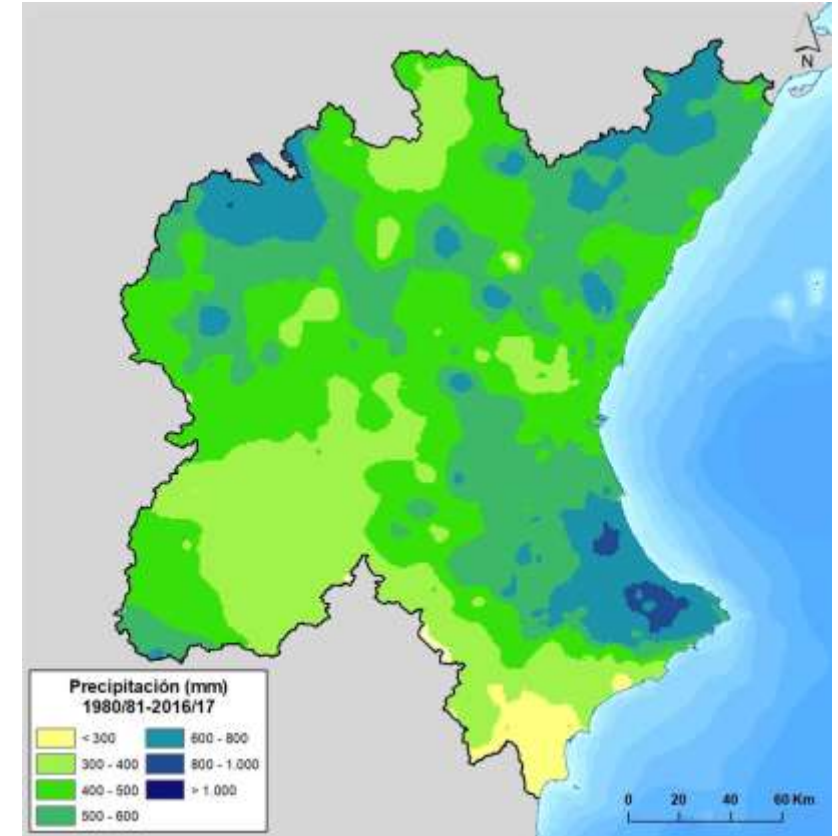
Water demands at the water unit level. Sources, seasonality, permits.

Environmental restrictions: ecological flows, lakes and wetlands needs.

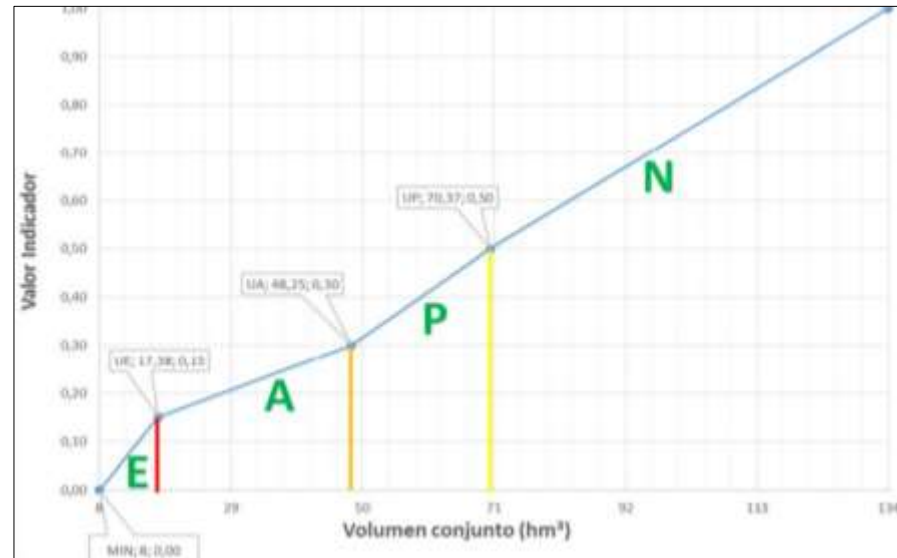
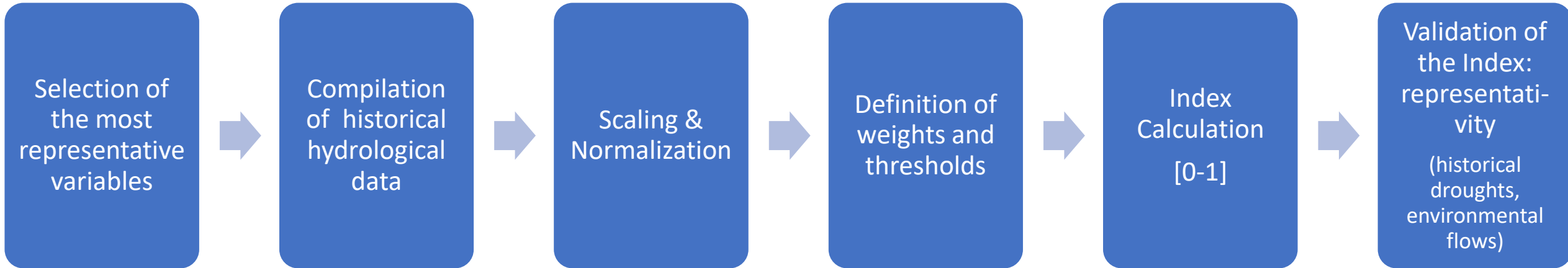
Modelling tools for the evaluation of natural conditions (Drought).

Impact assessment of specific sectors

- Urban: population, vulnerability,
- Agriculture: cultivated surface, irrigation demand, livestock numbers, yield, economic data...
- Electricity: installed capacity, daily/monthly production, price...



System of indicators: General methodology

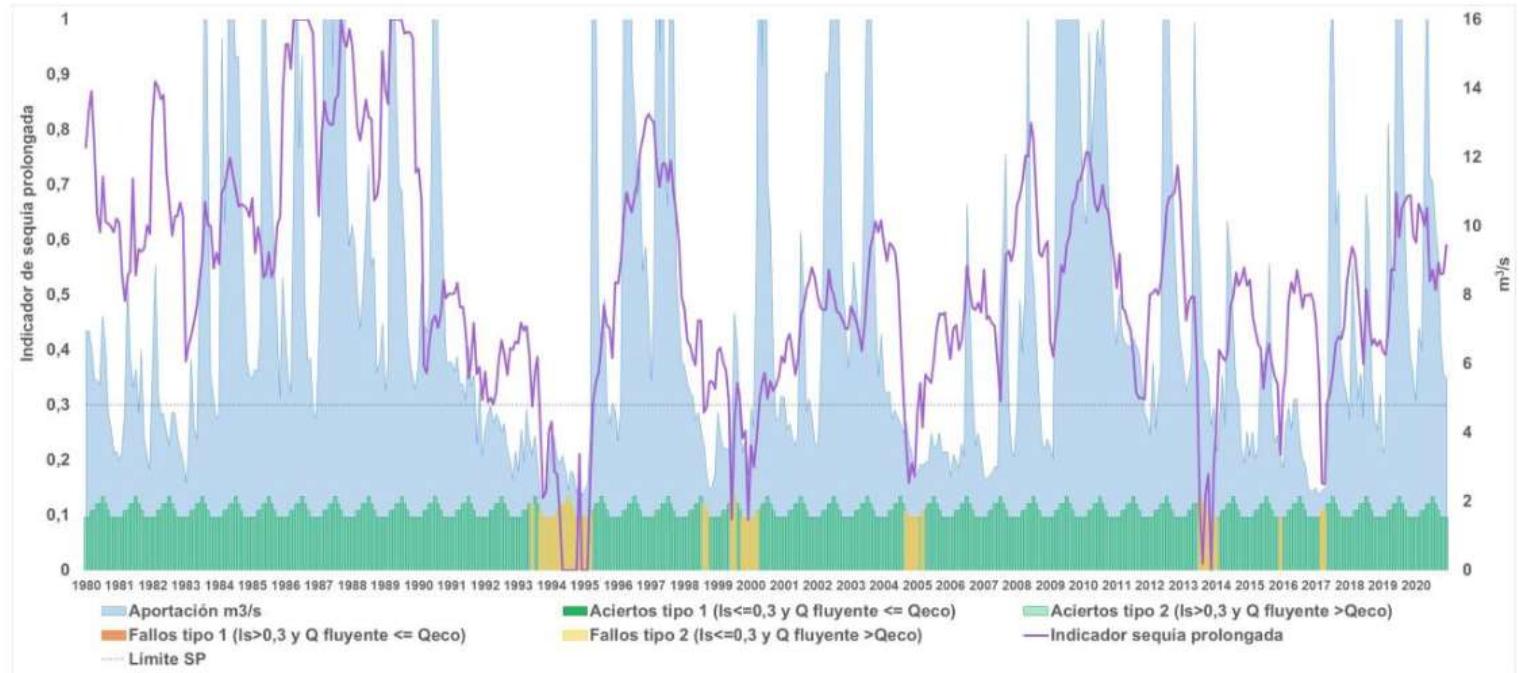


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DROUGHT INDICATORS - Evaluation

- Historical assessment against environmental flows of natural regime
- Alternative: Evaluation against historical droughts.
- In a selection of control points (gauging stations).
- Dependent upon the set of the environmental flows and historical data.



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ENTRY & EXIT CONDITIONS FOR SCARCITY SCENARIOS

- Applied to Water Scarcity. Entry into the scarcity scenario is automatic.
- Entry/Exit requirements are set to provide stability and inertia.
- Scenarios are to be entered one after the other.
- This sets a minimum time to go from normal to emergency and vice versa.
- They are adapted in each basin of the country, but common to all territorial units in the basin.

ENTRY Requirements			
Starting Scenario	Stress Indicator	Nº of months required	Final Scenario
Normality	< 0.5	3 consecutive months	Prealert
	<0.3	2 consecutive months	
Prealert	<0.3	2 consecutive months	Alert
Alert	<0.15	2 consecutive months	Emergency

EXIT Requirements			
Starting Scenario	Stress Indicator	Nº of months required	Final Scenario
Prealert	≥ 0.5	2 consecutive months	Normality
Alert	≥ 0.5	2 consecutive months	Prealert
	≥ 0.3	4 consecutive months	
Emergency	≥ 0.5	1 month	Alert
	≥ 0.3	2 consecutive months	
	≥ 0.15	4 consecutive months	

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EXAMPLES OF SPECIFIC MEASURES: Restrictions on groundwater resources

- PREALERT/ALERT: Start of saving measures to protect the resources available in groundwater bodies with poor quantitative status: general reduction up to 15% of abstractions for irrigation, depending on the territorial unit and the scenario.
- These restrictions will apply, especially in those groundwater bodies with significant abstractions for urban use or with special relation to surface water or protected natural spaces.
- This percentage of average reduction of 15% can be distributed spatially depending on the affection of groundwater abstractions to surface water or protected spaces.

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EXAMPLES OF SPECIFIC MEASURES: Restrictions and additional resources

Established reduction percentage to users from UTE 4 Turia

Demand Unit	Water Source	Reduction percentages			
		Normal	Prealert	Alert	Emergency
Urban supplies	Surface	0%	0%	0-5%	0-10%
Canal Real Acequia de Moncada	Surface	0%	5-15%	20-30%	25-35%
	Total		5-15%	10-20%	15-25%
Vega de Valencia	Surface	0%	5-15%	30-40%	35-45%
	Total		5-15%	10-20%	15-25%
Pueblos Castillo	Surface	0%	5-15%	10-20%	15-25%
	Total		5-15%	10-20%	15-25%
Irrigation of the main Canal in Camp de Túria	Surface	0%	10-20%	30-40%	45-55%
	Total		5-15%	10-20%	15-25%

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EXAMPLES OF SPECIFIC MEASURES: Environmental Impact Reduction

Specific environmental measures in the emergency scenario in UTE 5 Júcar

Status	Measures to adopt	Competent Authority
Emergency	Reinforcement of surveillance actions for the conservation and protection of resources and aquatic ecosystems considering the protection of wetlands and fluvial species and the impact of other measures on the natural environment with special attention to L'Albufera of València, the middle stretch of the Júcar as it passes through La Mancha plain and the final stretch of the river, downstream of the Tous dam, including the Massalavés spring.	CHJ, reg. governments
	Application of specific monitoring programmes to record the environmental impacts associated with critical episodes, with special attention to RAMSAR area L'Albufera of València, the middle section of the Júcar as it passes through La Mancha plain and the final section of the river, downstream of the Tous dam, including the Massalavés spring.	CHJ, reg. governments

In order to safeguard environmental conditions, a **minimum reservoir volume** is set for exploitation purposes, and in all cases environmental management measures must be initiated as volumes close to the indicated value are reached.

Reservoir	Minimum Volume (hm ³)
El Arquillo de San Blas	1
Benagéber	10
Loriguilla	2,5
Alarcón	30
Bellús	6
Contreras	15
Forata	0,75
Tous	39
Beniarrés	2

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RISK MANAGEMENT – Agriculture: Drought Insurance system

