Drought Management Guidelines in the Mediterranean Region

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Meeting on Strengthening National Capacities to Manage Water Scarcity and Drought in West Asia and North Africa. 24-25 June 2013. Beirut, Lebanon

MEDROPLAN Mediterranean Drought Preparedness and Mitigation Planning

Mediterranean Drought Preparedness and Mitigation Planning (MEDROPLAN)

Europe Aid Cooperation Office, MEDA WATER Programme
Contract number: ME8/AIDCO/2001/0515/59770 - P 027

Objectives

1 Develop Guidelines for Drought Preparedness Plans

2 Set up a Drought Preparedness Network for the Mediterranean countries (NEMEDCA)

Partners

University of Cyprus
National Technical University of Athens, Greece
University of Catania, Italy
Institut Agronomique et Vétérinaire Hasan II, Morocco
Confederación Hidrográfica del Tajo; Canal de Isabel II; Fundación Ecología y Desarrollo; Universidad Politécnica de Madrid, Spain
Direction Générale des Barrages et des Grands Travaux Hydrauliques, Ministère de l'Agriculture, Tunisia

Coordination

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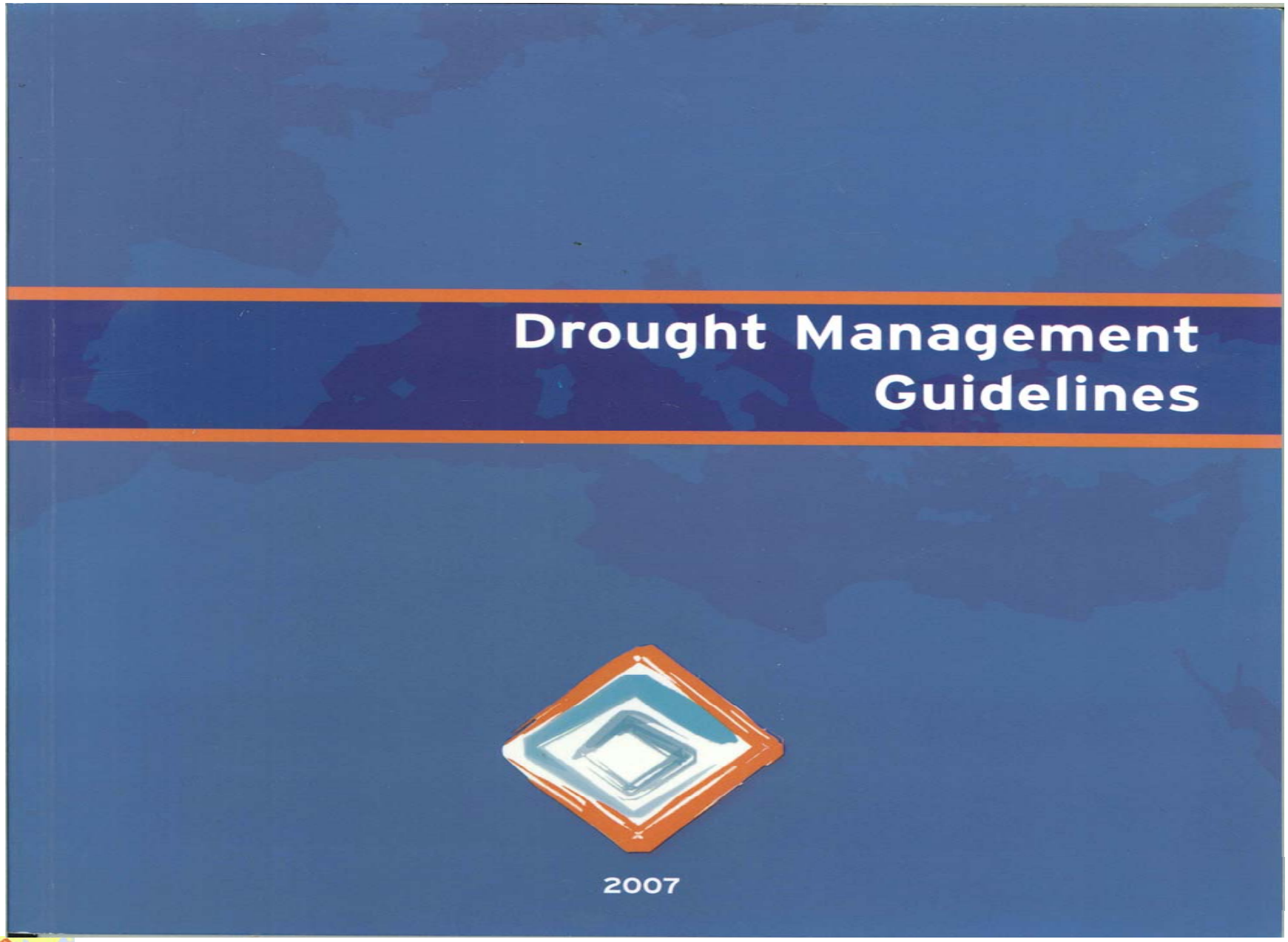
http://www.iamz.ciheam.org/medroplan

MEDROPLAN Partner countries


Drought Management
Guidelines
2007

Guidelines for drought management

What are the Guidelines?

- The Guidelines are a “manual” that provide an **effective and systematic approach to develop drought management plans** based on the existing scientific and technical knowledge and **adapted** to the socio-economic, political and environmental conditions.
- The Guidelines have been based on successful experiences in coping with drought risk in many regions. Most of the successful experiences emphasize **risk-based management** as a critical approach to mitigate the impacts associated with drought in societies with different **vulnerabilities**.
- The proposed approach can be applied in the Mediterranean region but also in other regions of the world suffering from drought.

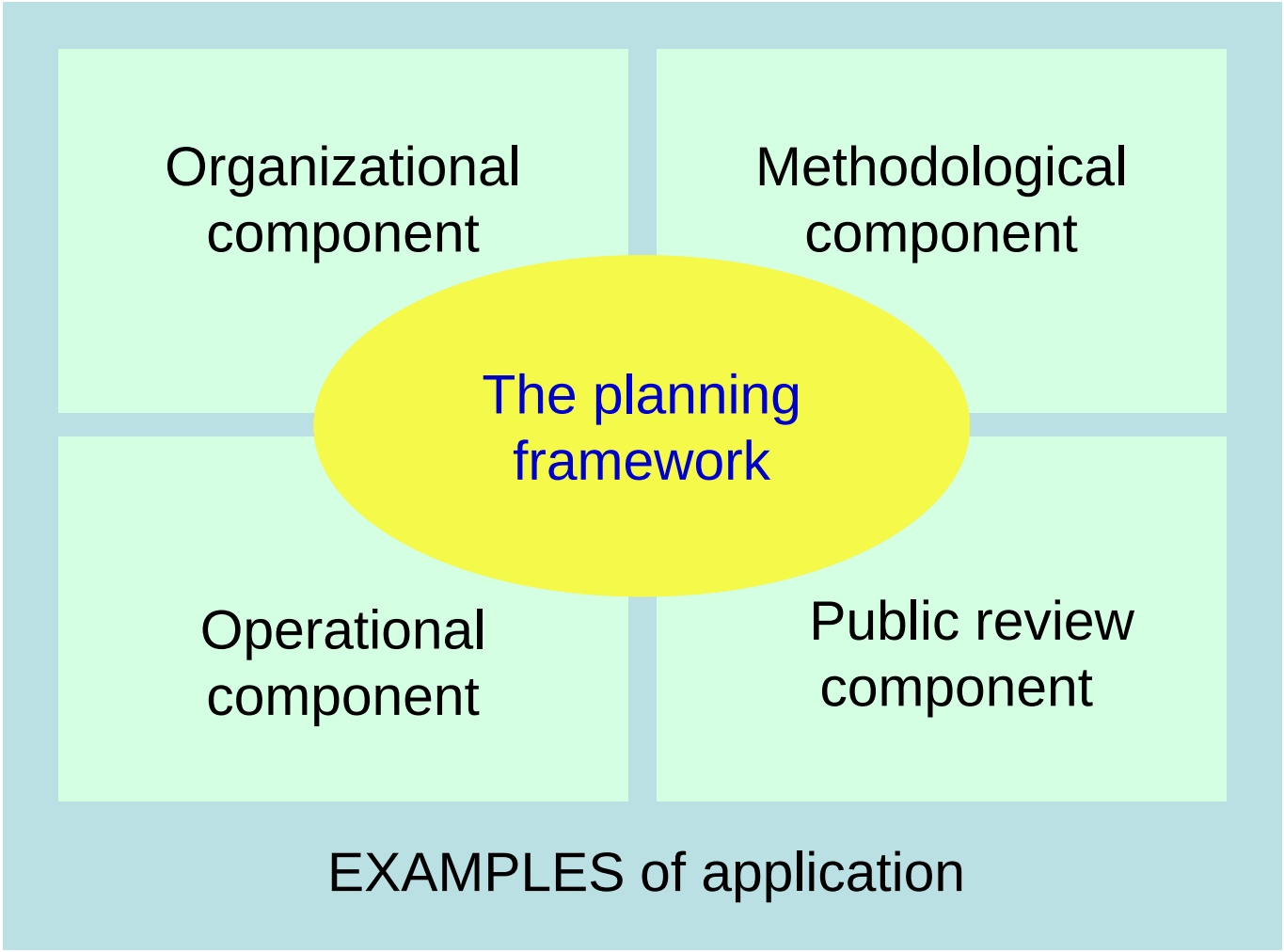
Objectives of the Guidelines

- Moving from a **reactive to a proactive approach** to fighting drought (**preparedness**)
- Placing emphasis on the **institutional and legal framework** and on **stakeholder participation**
- Introducing a **wide range of methodologies to cope with drought**.
- Reaching the broadest audience of **decision makers and stakeholders**, technical and non-technical
- Introducing the **framework of drought management** and **describing the needed elements of drought management plans**
- Providing **scientific and detailed methodology** for drought analysis and management (Technical Annex)

Structure of the Guidelines

1. The **Drought Management Guidelines**, which are a summary of all the components developed within the framework of the project. Published in 6 languages (Arabic, English, French, Greek, Italian and Spanish)
2. **Examples of drought management experiences** in the 6 countries participating in the MEDROPLAN consortium
3. The **Technical Annex** to the Drought Management Guidelines, which is published in English as a special issue of the CIHEAM journal "Options Méditerranéennes". The Technical Annex contains a deeper development of the issues dealt with in Drought Management.
4. The **MEDROPLAN website** that contains all the information contained in the documents mentioned previously and also provides a tutorial that guides the user in developing a drought management plan (CD version)

Components of the Guidelines



The planning framework

1. **Defines the local, regional and national purpose for developing drought planning**
   - Drought plan addresses the full range of possible risks or focuses on a few. This determines the choice of methodologies for developing the plan

2. **Defines concepts and a common language**
   - To increase the quality and acceptance of drought management plans
   - To increase acceptance of or trust in the science that is the basis of the planning
   - To provide essential information and insights about drought preparedness

Why are concepts necessary?

Water Scarcity Regime	Nature produced	Man induced
Temporary	Drought	Water shortage
Permanent	Aridity	Desertification

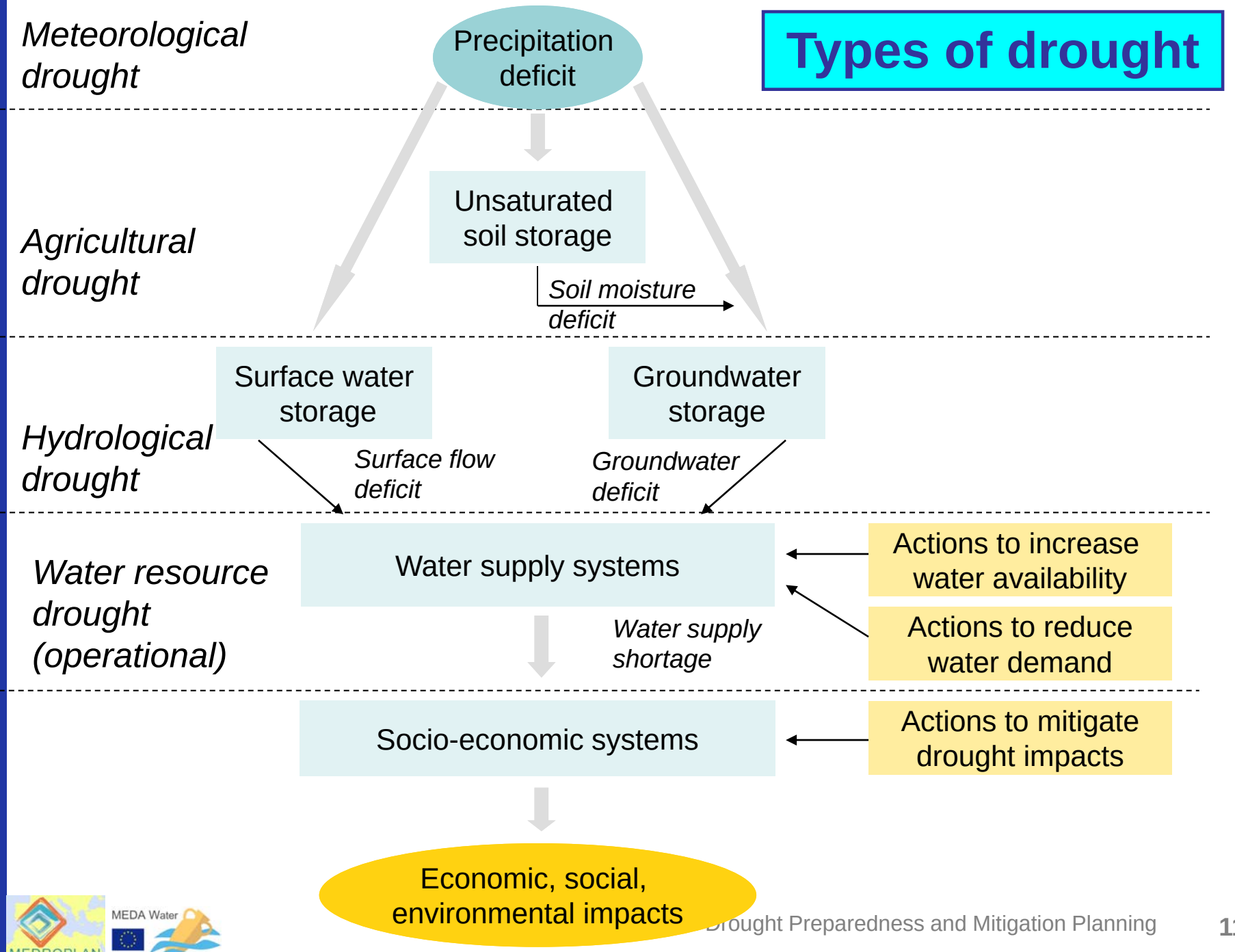
Drought Natural temporary imbalance of water availability (persistent lower-than-average precipitation).

Water shortage Man-induced temporary water imbalance.

Aridity Natural permanent imbalance in the water availability (low average annual precipitation).

Desertification Man-induced permanent imbalance in the availability of water (inappropriate land use).

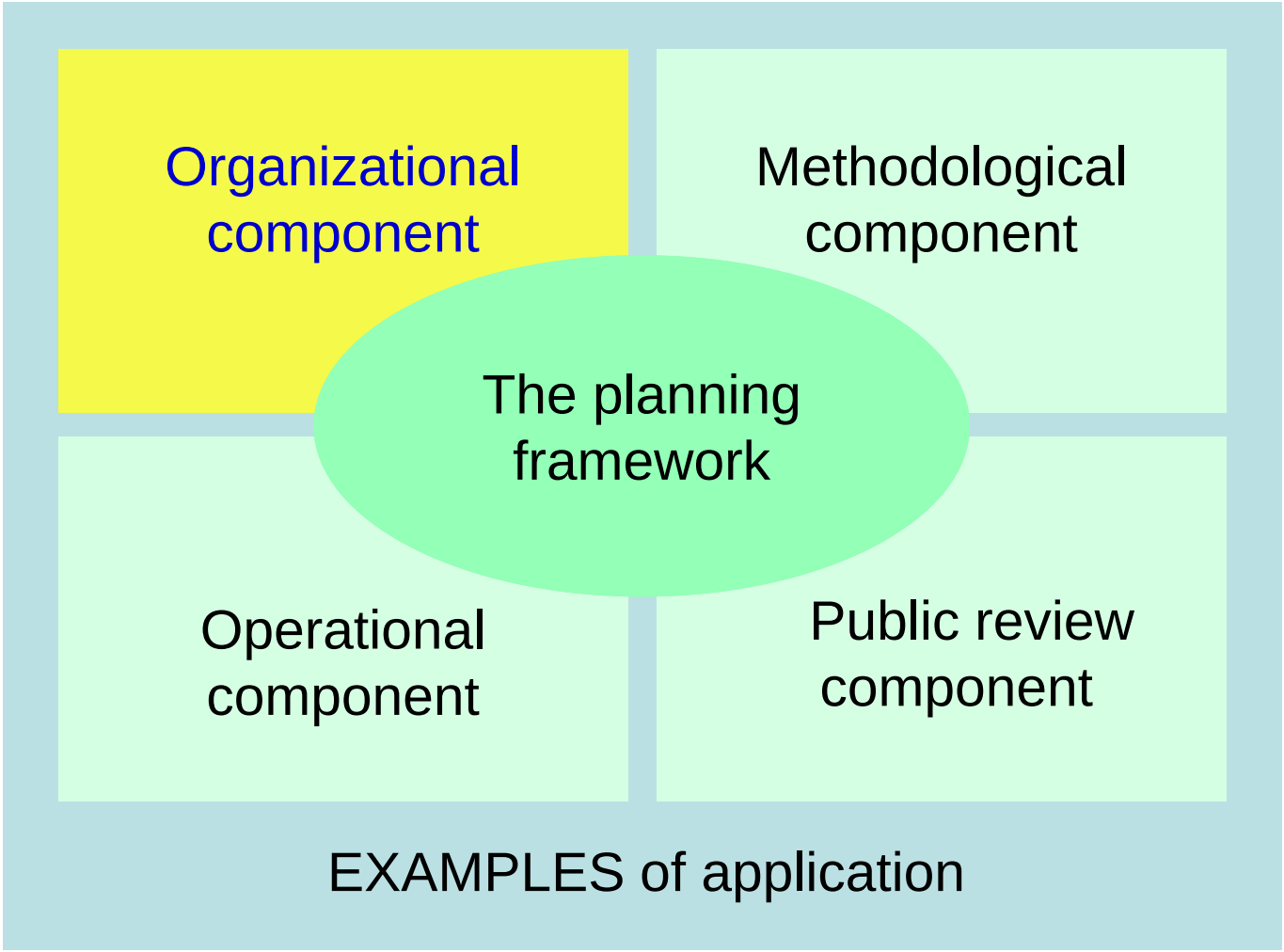
Types of drought



Characteristics of the approaches to drought management

	Characteristics	Limitations
Reactive	- Based on the implementation of actions after a drought event has occurred and is perceived. - Taken in emergency situations but not based in a contingency plan.	- Often results in inefficient technical and economic solutions since actions are taken with little time for evaluating optimal actions. - Limited stakeholder participation
Proactive or preventive	- Actions designed in advance, with appropriate planning tools. - Includes stakeholder participation. - Provides both short and long term measures and includes early warning systems. - Includes a contingency plan for emergency situations.	- The ineffective coordination and cooperation among institutions and the lack of policy to support and revise the proactive plan may lead to an inadequate planning.

Components of the Guidelines



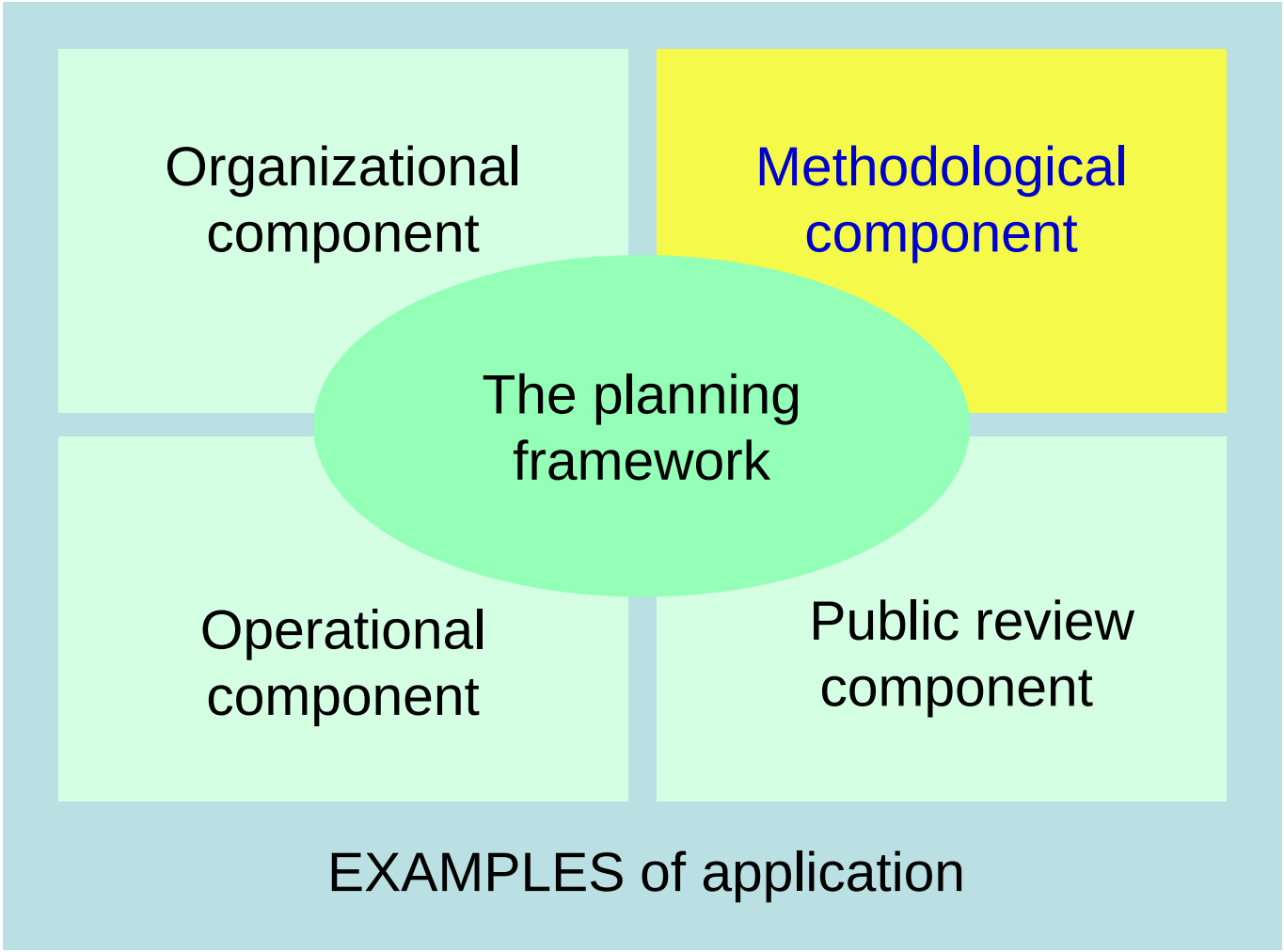
The organizational component

- The management of drought in a defined area requires integrative approaches and integrated management, based not only on the natural features, but also on socio-economic conditions of the area
- Understanding the national institutional regime is a key factor for establishing effective and integrated drought management plans that incorporate monitoring, public participation, and contingency planning
- The organizational component provides a common methodology for analysing the organizations and institutions relevant to water scarcity and drought management.

Expected outcome of the organizational component

- Explicit description of institutions and organizations, including stakeholders, with competence in water policy and administration
- Explicit description of the linkages and hierarchical relations among the organizations and institutions
- Information on existing drought preparedness and management plans
- Description of the data collection system in the country, specifying the institutions responsible, the type of reporting and accessibility, and the primary uses of the data
- Evaluation of the strengths and weaknesses of the legal and institutional framework and potential improvements

Components of the Guidelines



Methodological component

- Defines the **technical approach** to link drought and management actions
- This includes:
  - Drought characterisation
  - Risk and vulnerability analysis (diagnostic)
  - Data, models, and tools

Thresholds for the Indices Used

SPI value	RDI_{st} value	Deciles Value	Category
2.00 or more	2.00 or more	deciles 9-10: highest 20%	Extremely wet
1.50 to 1.99	1.50 to 1.99	deciles 7-8: next highest 20%	Severely wet
1.00 to 1.49	1.00 to 1.49		Moderately wet
0 to 0.99	0 to 0.99	deciles 5-6: middle 20%	Mildly wet
0 to -0.99	0 to -0.99		Mild drought
-1.00 to -1.49	-1.00 to -1.49	deciles 3-4: next lowest 20%	Moderate drought
-1.50 to -1.99	-1.50 to -1.99	deciles 1-2: lowest 20%	Severe drought
-2 or less	-2 or less		Extreme drought

Methodological component

- Defines the **technical approach** to link drought and management actions
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Risk analysis in agricultural systems (Ameziane, Ouassou)

The occurrence of a disaster such as drought depends on two factors: hazard and vulnerability. The model generally used to address risk analysis in agriculture is:

Risk = Hazard x Vulnerability

From this model, three points are important to consider:

- Preventing the occurrence of drought is impossible; In the Mediterranean, drought can, at present, only be monitored.

- Understanding and characterizing the drought hazard in agriculture is therefore an essential component of risk analysis.

- Decreasing the impact of the drought risk by reducing the vulnerability of the agricultural systems is possible.

Defining hazard, vulnerability and risk in agriculture

Hazard is the probability of occurrence of a potentially damaging phenomenon (eg drought)

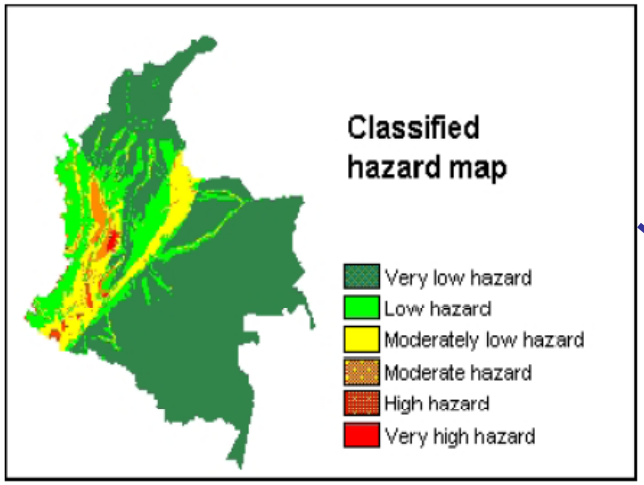
Vulnerability is the degree of loss resulting from the occurrence of the phenomenon

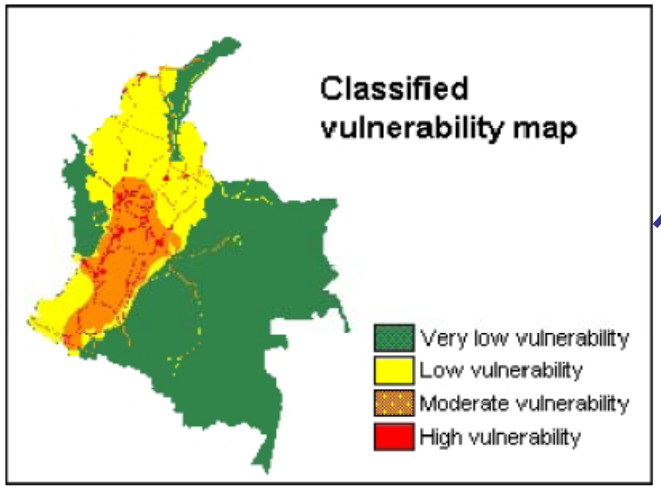
- *Exposure* is the nature and degree of which a the agricultural system is exposed to significant climatic variations

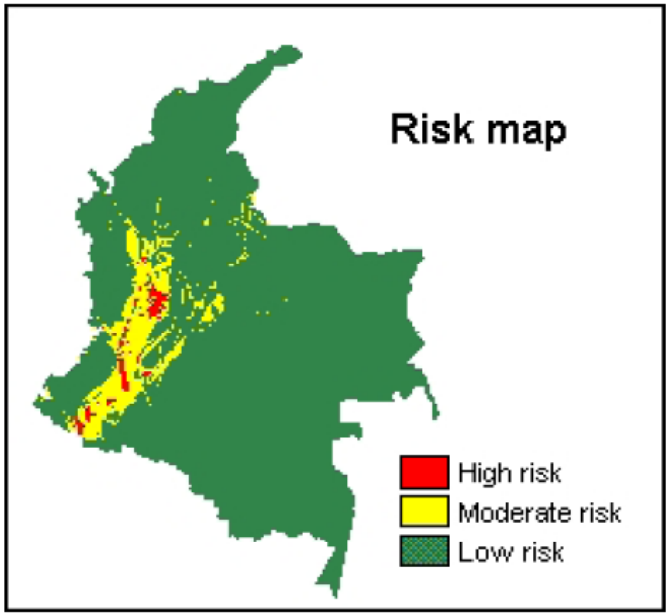
- *Sensitivity* is the degree to which the system is affected by drought

- *Adaptive capacity* is the ability of the system to adjust to climate variability and extremes in order to moderate potential damages or to cope with the consequences.

Methodology for creation of Risk map in agriculture



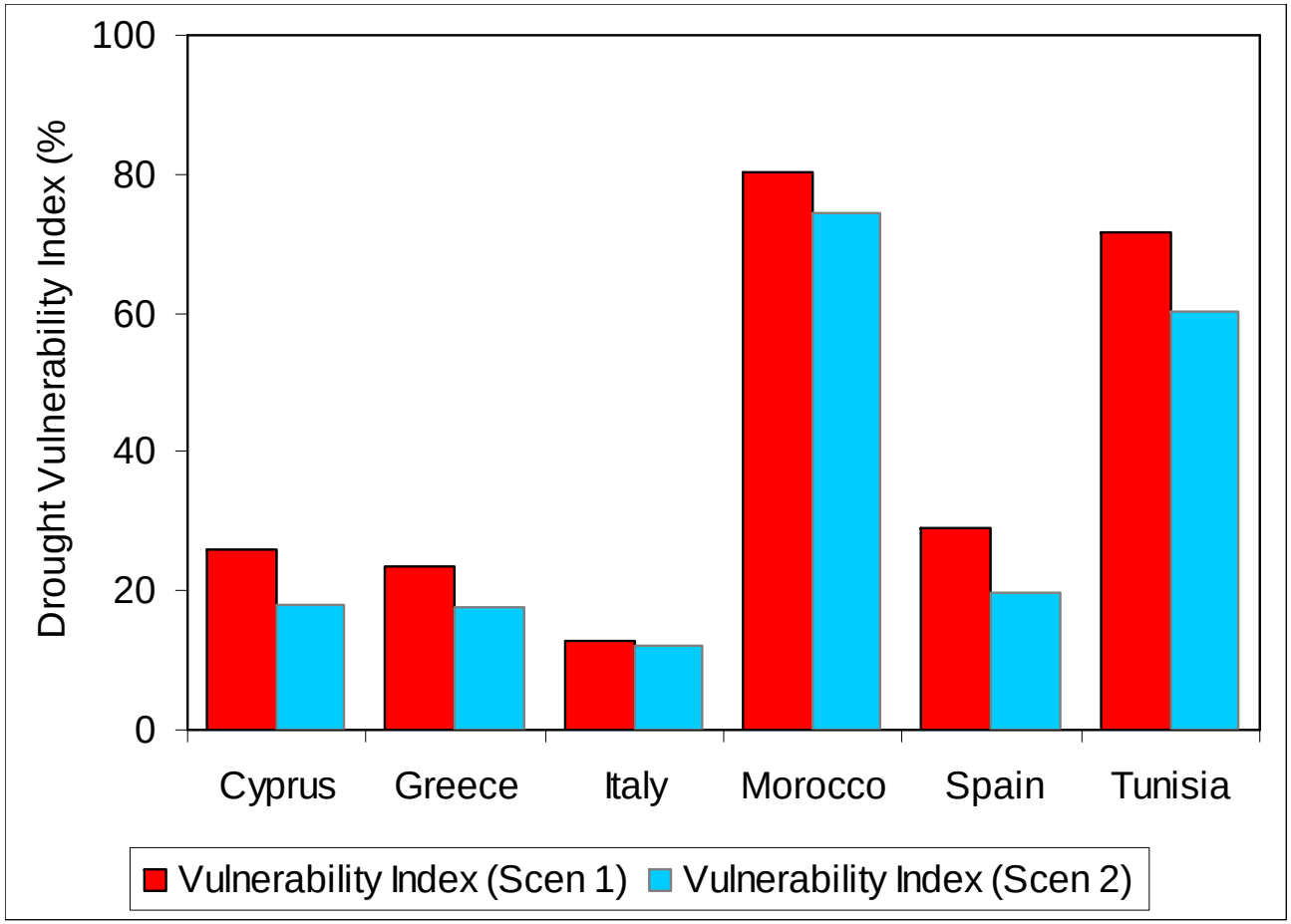




Drought Vulnerability Index (Iglesias)

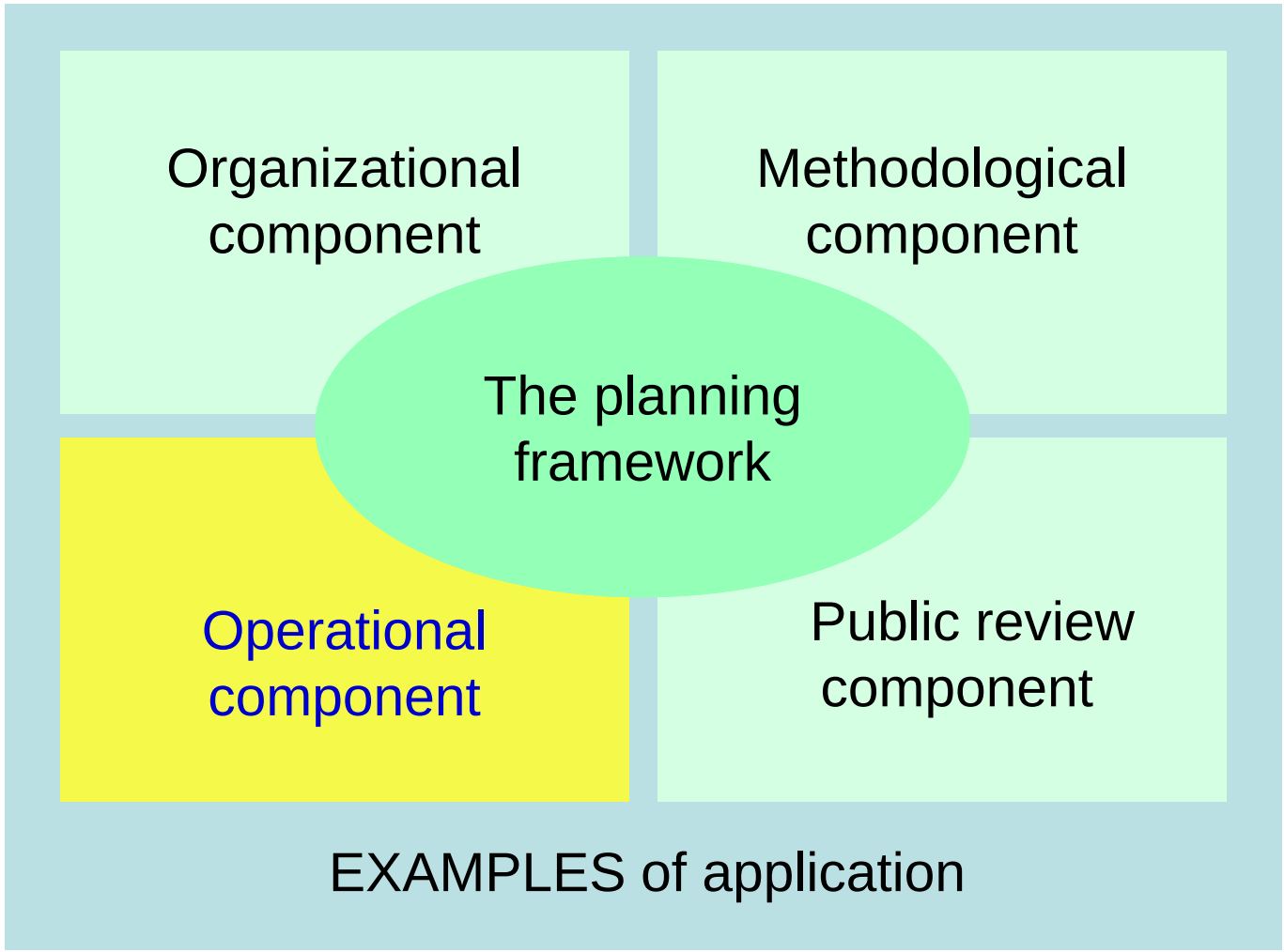
Component	Indicators
Renewable natural capital	Agricultural water use; precipitation; soil degradation; area salinised
Human and civic capital	Life expectancy at birth; Literacy rate Active population in agriculture Population without sanitation water
Institutional response	Drought regulations; Coordination among institutions
Economic capacity	GDP and GDP from agriculture/GDP Energy use; Population below poverty line Access to drinkable water
Mechanisms of risk sharing	Insurance Agricultural policies
Agricultural innovation	Cultivation techniques (fertiliser, machinery); Crop varieties

Drought Vulnerability Index



Scen 1 All components weighted equally

Scen 2 Human and civic resources more important


Organizational component
Methodological component
The planning framework
Operational component
Public review component
EXAMPLES of application

Operational component

Defines strategies to adopt drought management actions

Permanent measures

Measures to be implemented during drought

METHODOLOGICAL COMPONENT

Objective: define methods to assist in permanent drought planning and planning during a drought event and select the thresholds for management actions

Characteristics: Objectivity and simplicity in the presentation of the results

Drought characterisation and monitoring

Methods of analysis:
A combination of indicators and indices to characterize: meteorological, agricultural, hydrological and social drought

Evaluation of drought risk

Methods of analysis:
1. Qualitative evaluation of potential risk (consultation with stakeholders)
2. Quantitative evaluation of probabilities of occurrence or damage

Evaluation of vulnerability to drought

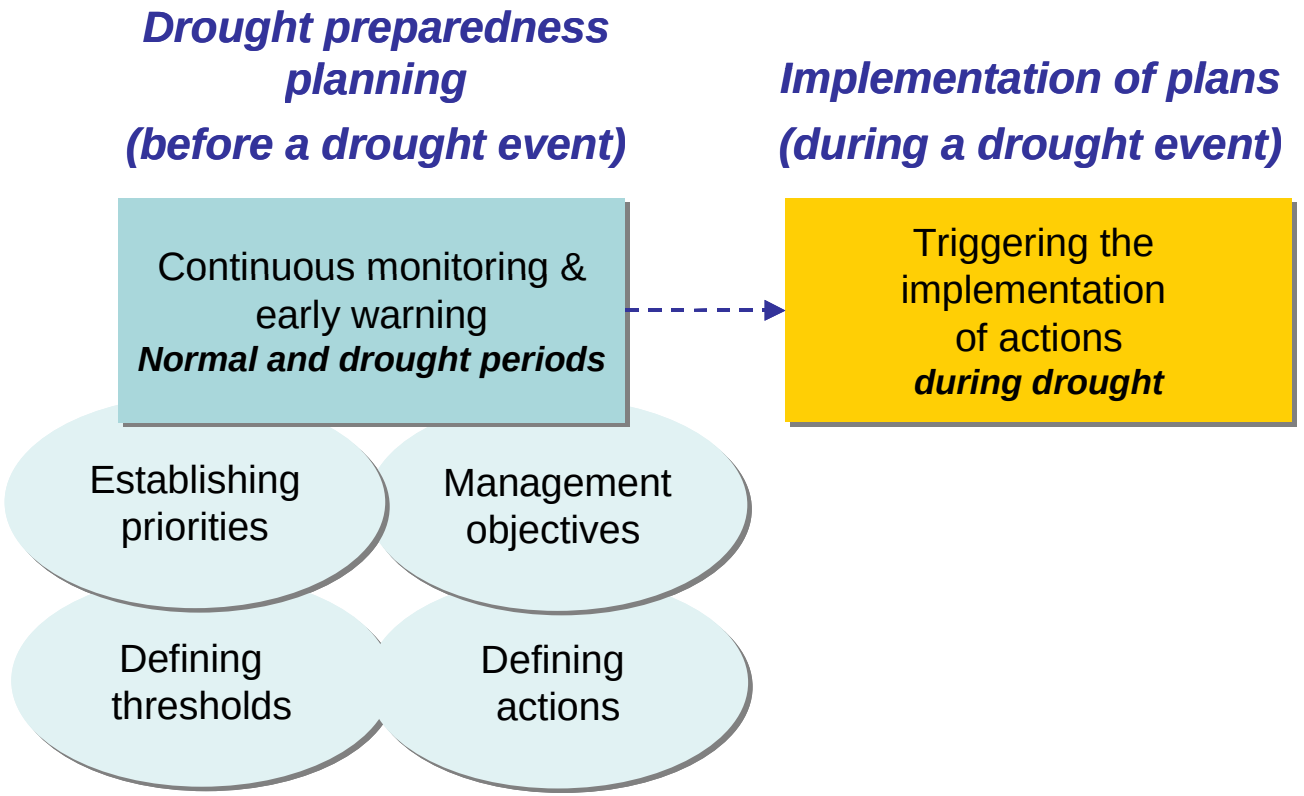
Methods of analysis:
A combination of indicators and indices to define the characteristics of a system that makes it susceptible to suffer losses from drought

OPERATIONAL COMPONENT

Objective: define the operational measures of permanent drought planning and measures during a drought event (responding to drought)

Operational component

According to a proactive approach, operational component includes planning and implementation of the long and short term measures to reduce drought vulnerability and to mitigate drought impacts.



Defining threshold levels and management objectives

INDICATORS

(From Drought Monitoring System)

PRE-ALERT
Moderate risk of drought

Objective: ensure acceptance of the measures to be taken

ALERT
Expected drought likely will produce significant impacts

Objective: overcome situation, guarantee water supply

EMERGENCY
Impacts already occurred and severe water shortage if drought persists

Objective: minimize damage, giving the priority to the drinking water

Defining actions for drought management

PRE-ALERT

- Low cost, indirect, voluntary
- Non structural directed to influence water demand, avoid worse situations
- Focus on communication and awareness
- Intensification of monitoring and evaluation of worse case scenarios

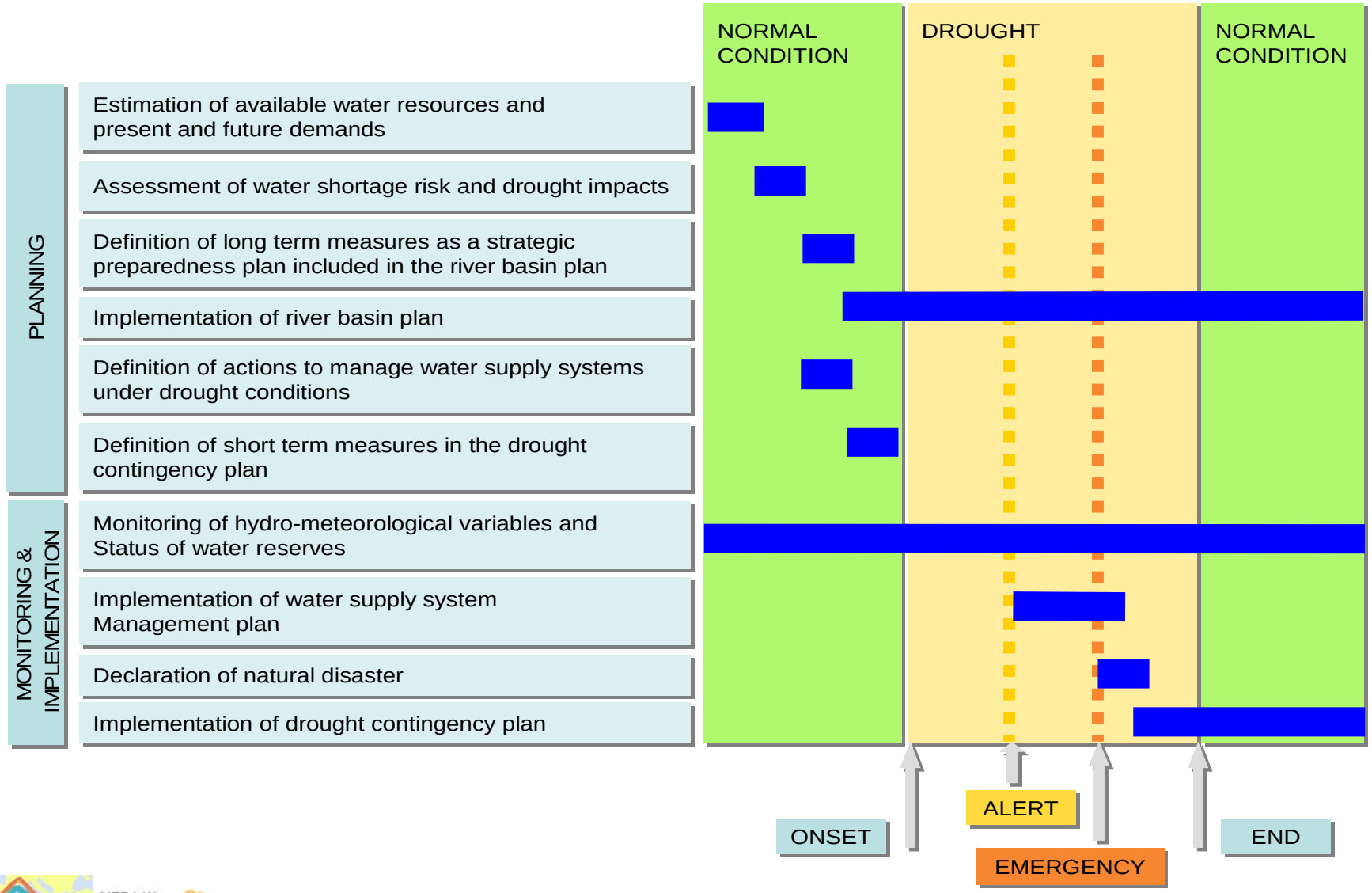
ALERT

- Low cost, direct, mandatory, direct impact on consumption costs
- Non-structural directed to specific water use groups
- Water restrictions except for drinking water
- Changes in management
- Revision of tariffs
- Water Rights Exchange

EMERGENCY

- High cost, direct, mandatory, after the calamity declaration
- Structural, new marginal (for cost or quality) supply sources, water transfers
- Non structural, new groundwater abstraction and/or non conventional resources
- Water restrictions for all users

Sequential steps for planning and implementing drought management actions



Long term measures (to reduce drought vulnerability)

Category	Type of actions	Affected sectors			
Demand reduction	Economic incentives for water saving	U	A	I	R/E
	Agronomic techniques for reducing water consumption		A		
	Dry crops in place of irrigated crops		A		
	Dual distribution network for urban use	U			
	Water recycling in industries			I	
Water supply increase	Conveyance networks for bi-directional exchanges	U	A	I	
	Reuse of treated wastewater		A	I	R
	Inter-basin and within-basin water transfers	U	A	I	R
	Construction of new reservoirs or increase of storage volume of existing reservoirs	U	A	I	
	Construction of farm ponds		A		
	Desalination of brackish or saline waters	U	A		R
	Control of seepage and evaporation losses	U	A	I	
Impacts minimization	Education activities for improving drought preparedness and/or permanent water saving	U	A	I	
	Reallocation of water resources based on water quality requirements	U	A	I	R
	Development of early warning systems	U	A	I	R
	Implementation of a Drought Management Plan	U	A	I	R
	Insurance programmes		A	I	

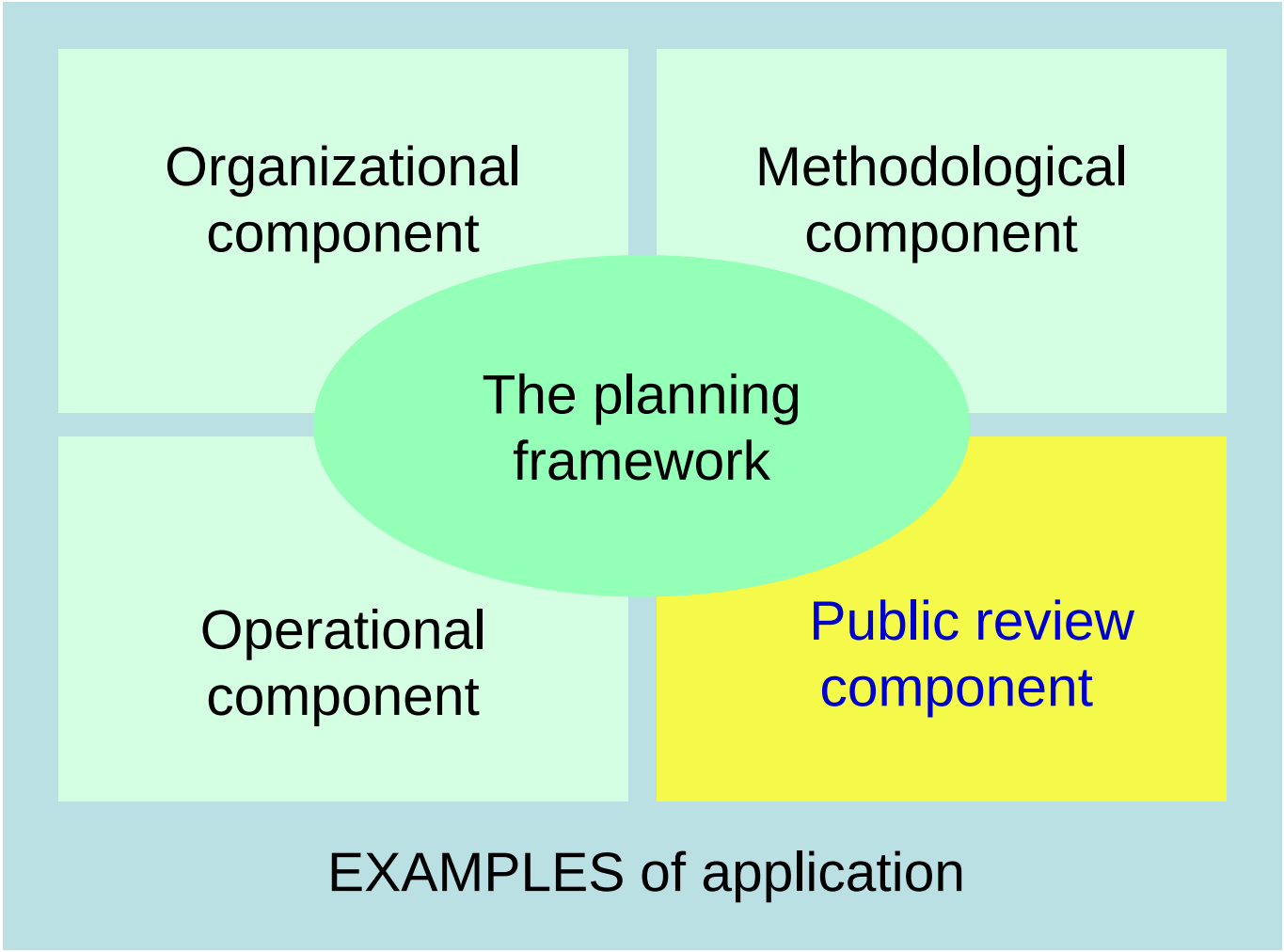
U= urban; A= agricultural; I=industrial; R=recreational; E=environmental

Short term drought mitigation measures

Category	Type of actions	Affected sectors			
Demand reduction	Public information campaign for water saving	U	A	I	R
	Restriction in some urban water uses (e.g. car washing, gardening, etc.)	U			
	Restriction of irrigation of annual crops		A		
	Pricing	U	A	I	R
	Mandatory rationing	U	A	I	R
Water supply increase	Improvement of existing water systems efficiency (leak detection programmes, new operating rules, etc.)	U	A	I	
	Use of additional sources of low quality or high exploitation cost	U	A	I	R
	Over-exploitation of aquifers or use of groundwater reserves	U	A	I	
	Increased diversion by relaxing ecological or recreational use constraints	U	A	I	R
Impacts minimization	Temporary reallocation of water resources	U	A	I	R
	Public aids to compensate income losses	U	A	I	
	Tax reduction or delay of payment deadline	U	A	I	
	Public aids for crops insurance		A		

U= urban; A= agricultural; I=industrial; R=recreational

Components of the Guidelines



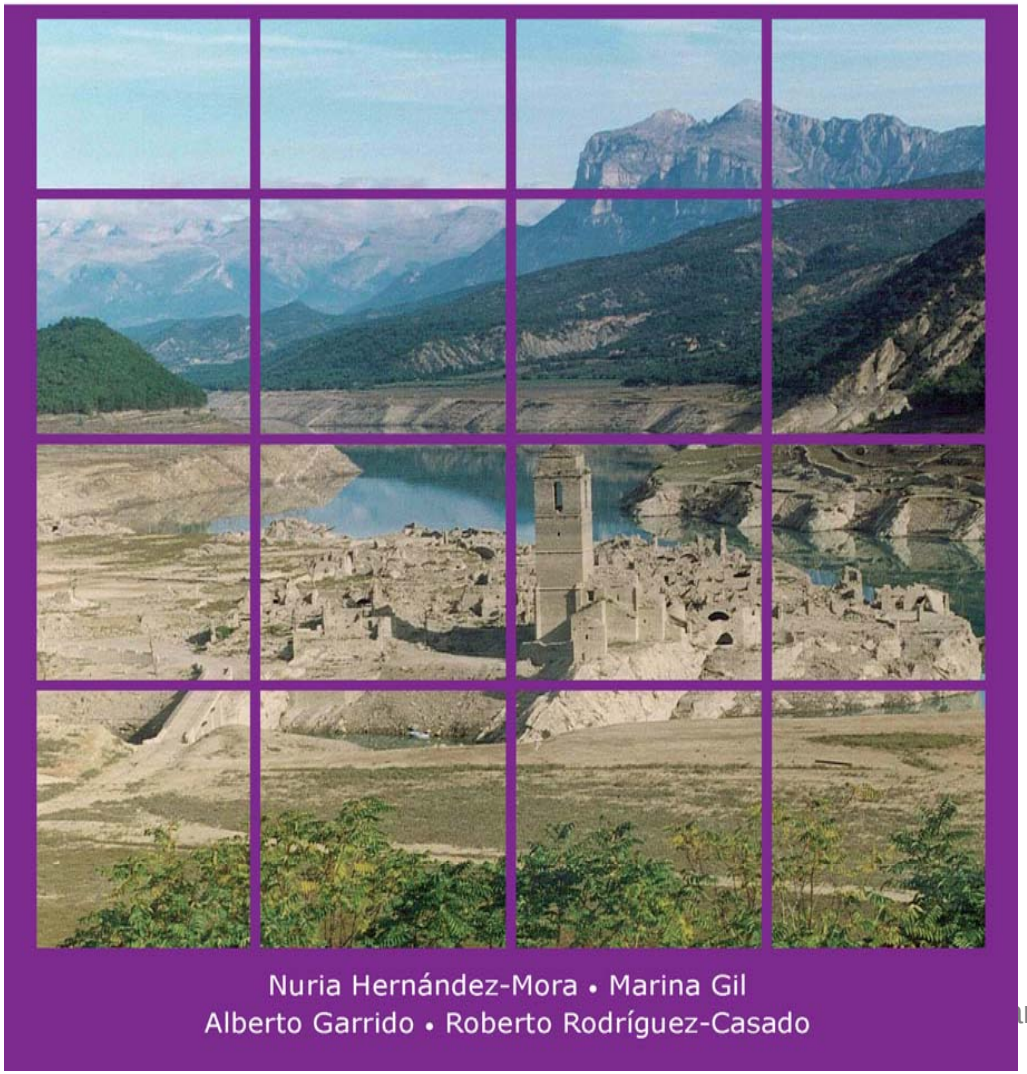
Public review component

Why is it necessary to test the drought management plan?

- Singularity of drought events
- New collection of knowledge and previous experiences
- Dynamic drought, climate, institutions, society

Periodic adaptation of the plan

- Advisable periodic revision of the plan by institutions and stakeholders
- In-depth revision of drought management plan should be made after each drought episode, analysing:
  - response of all the aspects of the plan,
  - ability of prediction and warning,
  - effectiveness of adopted measures
- Continuous feedback process that keeps the plan updated.



The 2005-2008 Drought in the Ebro Valley:

Vulnerability, impacts and management measures

CEIGRAM
Research Centre for the Management of Agricultural and Environmental Risks

- Technical University of Madrid
- State Agency for Agricultural Insurance (ENESA). Ministry of Environment and Rural and Marine Affairs
- AGROMUTUA-MAVDA (private insurer in the agricultural sector)

- 2004-2005 Rainfall 30% lower than the average
- Rainfall recovered in 2006 and 2007, but water reserves remained lower than average (60% in 2004, 40% in 2005, 41% in 2006 and 45% in 2007
- Drought finished in Spring 2008

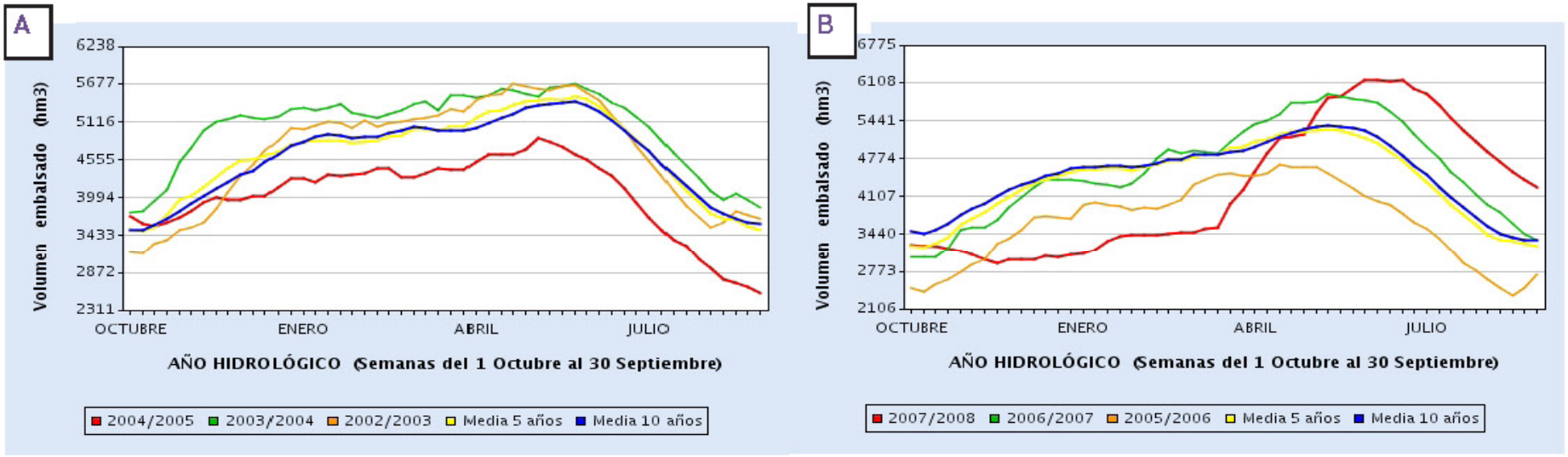


Figura 1. Evolución de las reservas embalsadas en el Ebro en 2003-05 (A) y 2005-08 (B) con respecto a la media de los 5 años (amarillo) y 10 años (azul)

Fuente: Boletín Hidrológico del MAGRAMA (2011)

Standardised Precipitation Index (SPI)

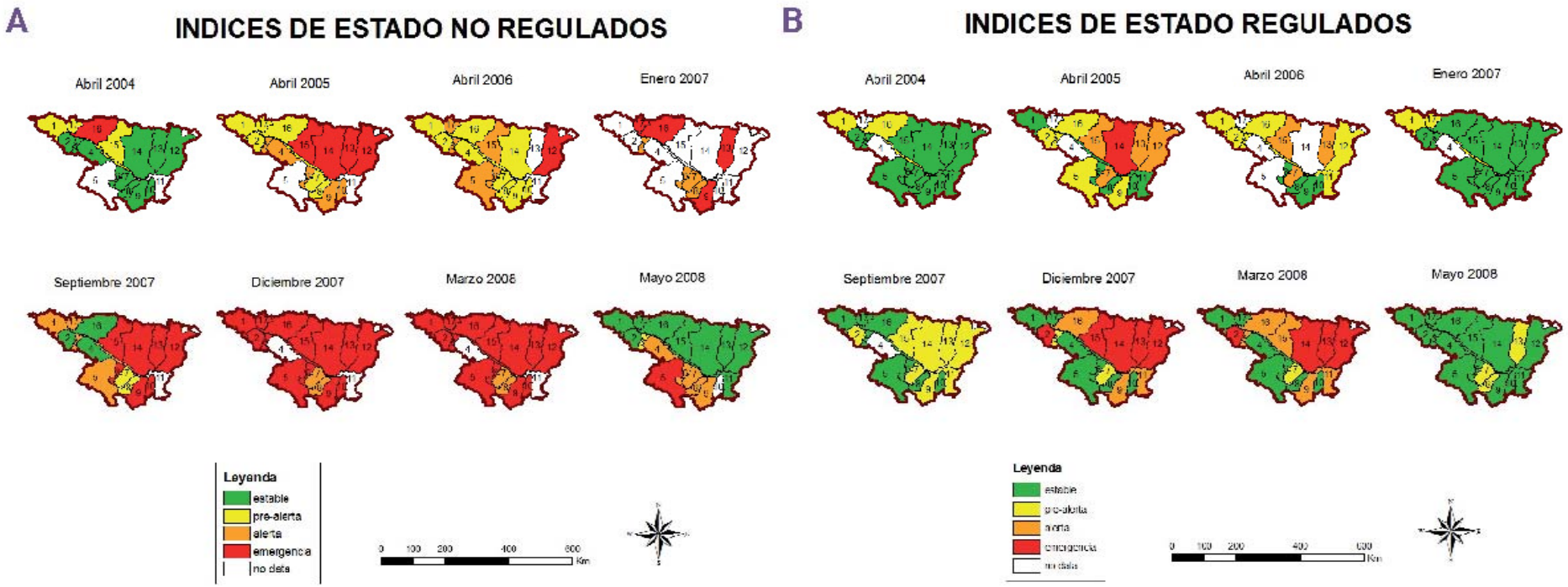


Figura 2. Evolución de los índices de sequía regulados (A) y no regulados (B) en el Ebro (2004-08)

Fuente: Elaboración propia con datos de la CHE

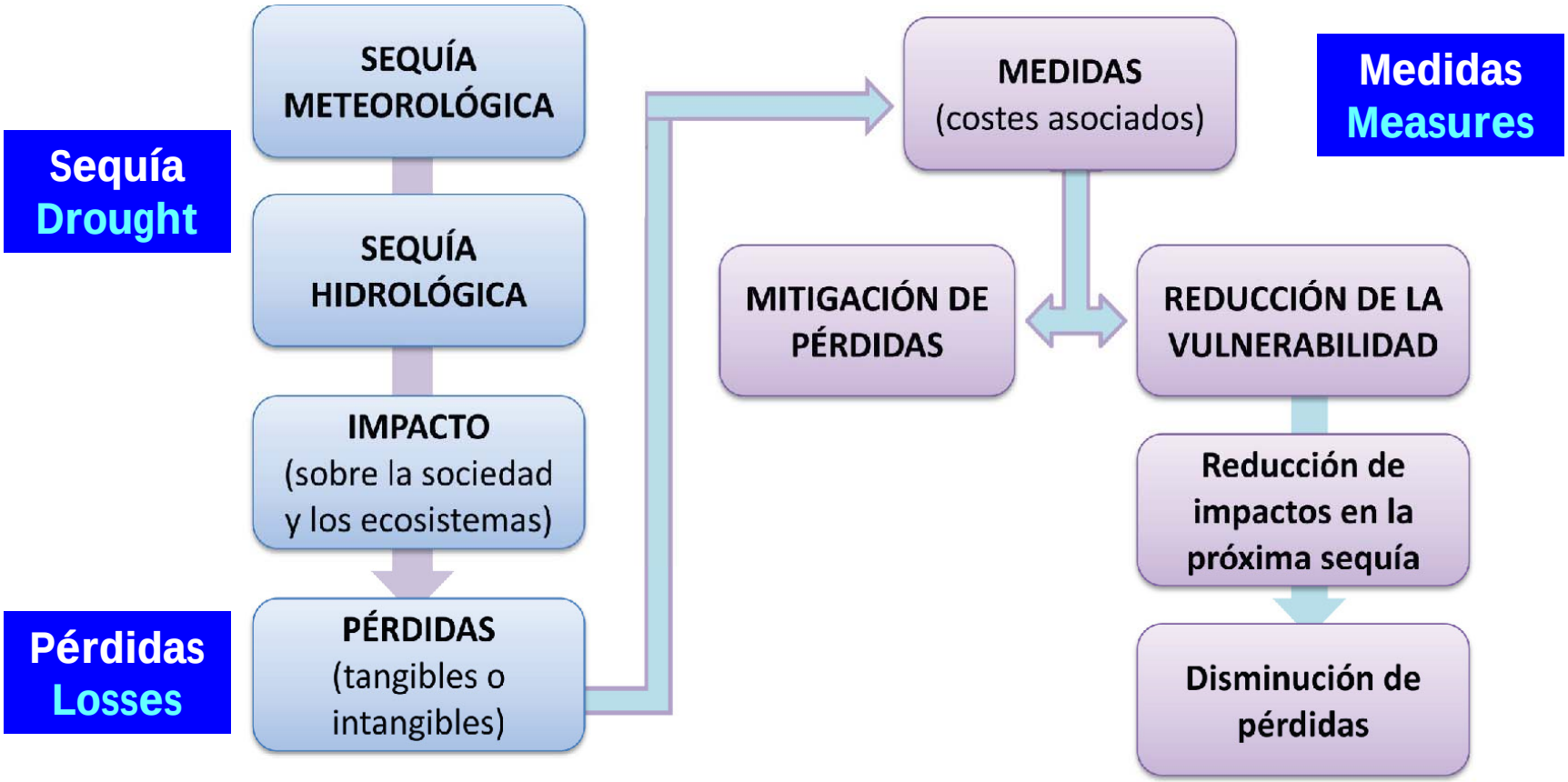


Figura 3. Marco conceptual: impactos, pérdidas y costes de las sequías

Fuente: Elaboración propia

Tabla 2. Distintas estimaciones del impacto de la sequía sobre el sector agrario en Aragón

	Pérdidas de producción del regadío (Millones de €)		Pérdidas de producción del secano (Millones de €)		Pérdidas totales de producción de la agricultura (Millones de €)	
	DGA	**Modelo eq-CEIGRAM**	**DGA**	**Modelo eq-CEIGRAM**	**DGA**	**Modelo eq-CEIGRAM**
Huesca	76,52	57,40	41,96	21,57	118,49	78,61
Teruel	2,05	0,00	38,90	23,78	40,95	23,78
Zaragoza	34,21	21,10	51,75	51,75	85,96	34,10
Aragón	112,80	78,13	132,06	132,60	245,40	136,47

[1] Datos no publicados proporcionados por la Consejería de Agricultura y Alimentación de la Diputación General de Aragón (2010).

Training and Capacity Building (Medroplan, Nemedca and Dewfora)

Advanced Course on "Drought mitigation Methodologies, Tools and management Options". Aleppo, Syria, 18-22 June 2006	24 participants of 14 Mediterranean and Central Asia countries 12 lecturers form different countries (4 of them members of Medroplan team)	In collaboration with FAO and ICARDA
Advanced Course "Design and implementation of drought management plans: organization, methodologies and actions". Zaragoza, Spain, 4-8 February 2008	23 participants and 8 lecturers from 13 Mediterranean and non Mediterranean countries participated in the course	In collaboration with FAO and ICARDA
Advanced Course "Drought forecasting and its use in informed decision making". Zaragoza, Spain, 23-27 September 2013		Dewfora, EU FP7 Project

DROUGHT FORECASTING AND ITS USE IN INFORMED DECISION MAKING, Zaragoza (Spain), 23-27 September 2013

Hour	Monday 23	Tuesday 24	Wednesday 25	Thursday 26	Friday 27
9:00-10:00	Opening	Forecasting meteorological drought **F. Pappenberger, E. Dutra, W. Landman and M. Zaroug**	Forecasting hydrological drought **S. Maskey, P. Trambauer, H. Apel**	Technical visit: drought management in the Ebro basin **M. Omedas**	Forecast reliability and decision making: Assessing reliability of the forecasting process **M. Werner, I. Masih**
10:00-11:00	Introduction to drought and drought characterization **L. Garrote**				
	Coffee break				**Coffee break**
11:30-12:30	The principles of drought forecasting **L. Garrote, W. Landman**	Forecasting meteorological drought **F. Pappenberger, E. Dutra, W. Landman and M. Zaroug**	Forecasting hydrological drought **S. Maskey, P. Trambauer, H. Apel**		Forecast reliability and decision making: Decision making using drought forecasting **M. Werner, I. Masih**
12:30-13:30					
	Lunch break				**Lunch break**
15:00-16:00	Group discussion on drought forecasting in the participants' countries/regions **L. Garrote, W. Landman**	Forecasting meteorological drought – Role play: weather forecasting game **F. Pappenberger, E. Dutra, W. Landman and M. Zaroug**	Case study: The Oum-er-Rbia basin – using meteorological and hydrological forecasting for assessing agricultural drought **Y. Imani**		Group work: using drought forecasting in case of a possible drought event **M. Werner, I. Masih**
16:00-17:00					
16:00-19:00			Forecasting Hydrological drought – Group work: interpretation and linkages at different scales **S. Maskey, P. Trambauer, H. Apel**		

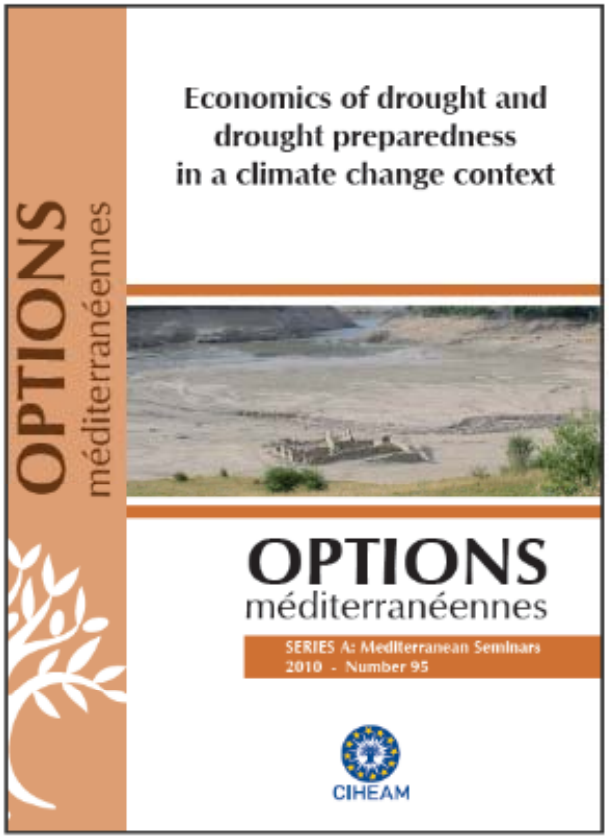
Date	Venue	Subject	Participants
15-17 March 2004	Zaragoza (Spain)	Workshop no. 1. Drought Institutional Mapping, risk analysis and best practices	50 participants of 9 countries. Water authorities, experts and stakeholders, and Medroplan team members
24-25 October 2005	Taormina (Italy)	Workshop no. 2. Presentation of Risk Analysis Studies, Best Practices Synthesis and Drought Identification, and discussion of	55 participants of 7 Mediterranean countries. Water authorities, experts and stakeholders, and Medroplan team members
Autumn 2006	All partner countries	Testing the Guidelines	63 participants. Water and agricultural stakeholders and members of Administrations, and Medroplan team members
15-16/05/07	Marrakech (Morocco)	Workshop no. 3. Presentation and discussion of the Guidelines	98 participants.Stakeholders and decision makers from delegates from Algeria, Cyprus, France, Greece, Iran, Italy, Jordan, Morocco, Spain, Syria, Tunisia, Turkey and USA and representatives from the European Commission, RMSU, ICARDA, IWMI and CIHEAM.
15-16 January 2008	Aleppo (Syria)	Seminar on Applicability of the Drought Management Guidelines in Egypt, Jordan, Lebanon, Palestine, Syria and Turkey.	21 stakeholders representing 7 countries and 2 international organisations attended the Workshop
11 June 2008	Zaragoza (Spain)	Seminar on Applicability and Application of the Drought Management Guidelines in Mediterranean countries	31 stakeholders representing 11 Mediterranean countries and 2 international organisations attended the Workshop
12-14 June 2008	Zaragoza (Spain)	International Conference: “Drought management: Scientific and technological innovations”	113 participants coming from 22 Mediterranean and non Mediterranean countries and 4 international organisations
7-8 October 2008	Tunis (Tunisia)	Seminar on Applicability and Application of the Drought Management Guidelines in Algeria, Morocco and Tunisia	24 stakeholders representing 3 Mediterranean countries and 1 international organisation have attended the Seminar.

Second International Conference
on Drought Management

Economics of Drought and Drought Preparedness in a Climate Change Context

Istanbul, Turkey, 4 - 6 March 2010

Second Announcement



CIHEAM

Centre International de Hautes Études Agronomiques Méditerranéennes
International Centre for Advanced Mediterranean Agronomic Studies

IAMZ

Une volonté méditerranéenne *CIHEAM's Mediterranean focus*

Instituto Agronómico Mediterráneo de Zaragoza (IAMZ)

Training

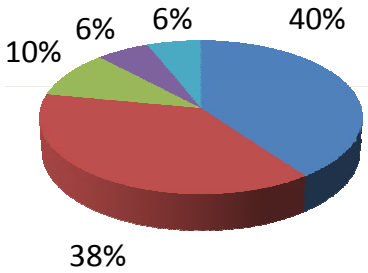
IAMZ does not have regular faculty.

Every year IAMZ invites more than 400 lecturers from more than 50 countries.

Look for synergies with Spanish Universities for the ***MSc***.

Official recognition by the Spanish Higher Education Ministry

Lecturers at IAMZ in the last 10 years:
1749 (58 countries)



University
Public Research Institutions
Private Firms
Public Administration
International Organizations

Training: Participants (2002-2011)

4832 from 102 different countries

Country	No.	Country	No.	Country	No.
Albania	92	FYROM	2	Netherlands	11
Algeria	413	Gabon	1	Nicaragua	6
Angola	2	Gambia	2	Nigeria	9
Argentina	61	Germany	21	Norway	3
Armenia	1	Ghana	1	Palestina	28
Australia	3	Greece	48	Pakistan	3
Bahrain	10	Guatemala	9	Panama	3
Belgium	7	Guinea	1	Paraguay	2
Benin	1	Guinea-Bissau	1	Peru	26
Bolivia	9	Haiti	4	Philippines	1
Botswana	1	Honduras	3	Portugal	170
Brazil	14	Hungary	4	Romania	11
Bulgaria	3	Iceland	1	Russian Fed	1
Burkina Faso	1	India	2	Saudi Arabia	4
Canada	4	Indonesia	2	Senegal	13
Cape Verde	1	Iran	10	Serbia	28
Chile	32	Iraq	1	Sierra Leone	2
China	3	Ireland	11	Slovakia	1
Colombia	23	Israel	7	Slovenia	6
Congo	1	Italy	185	South Africa	1
Costa Rica	17	Japan	1	Spain	1186
Côte d'Ivoire	1	Jordan	24	Sri Lanka	1
Croatia	33	Latvia	1	Sudan	1
Cuba	5	Lebanon	118	Sweden	4
Cyprus	22	Liberia	2	Switzerland	3
Czech R	3	Libyan AJ	7	Syrian AR	28
Denmark	4	Madagascar	1	Tunisia	487
Dominican R	1	Malaysia	5	Turkey	427
Ecuador	15	Mali	1	UK	7
Egypt	334	Malta	40	USA	5
Eritrea	1	Mauritania	30	Uruguay	16
Estonia	1	Mexico	54	Uzbekistan	1
Ethiopia	3	Morocco	528	Venezuela	18
France	61	Namibia	1	Zimbabwe	3

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