

WS&D Expert Group Meeting WFD CIS

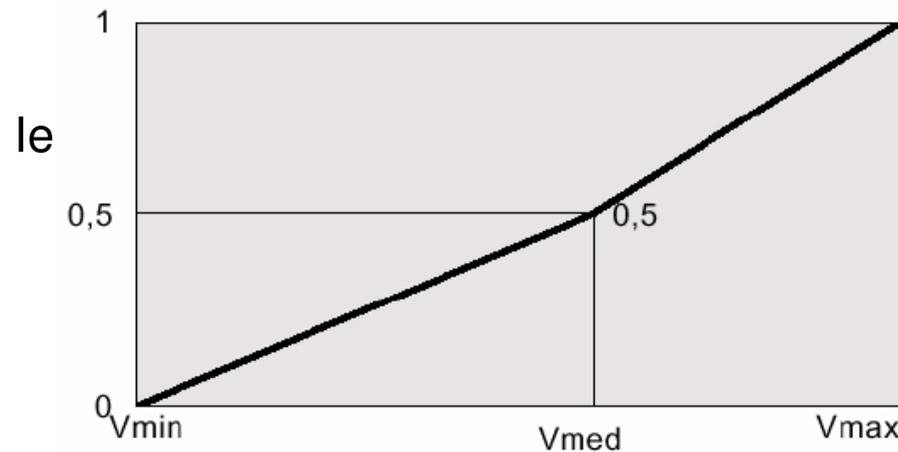
The Hague, NT
February 2011

At basin scale: Magnitude of drought by RBA, Spanish experience

- Select relevant indicators considering climatic and hydrological characteristics of each river basin and/or management unit.
- Aggregate and weight basic indicators based on the associated resources and demands.
- Homogenise indicators using a normalized index. Example: **Status index**

At basin scale: Spanish experience

Status Index (Ie or CHS index)



Thresholds

Condition	CHS Index
Emergency	< 0.2
Alert	0.2-0.35
Pre-alert	0.35-0.5
Normal	>= 0.5

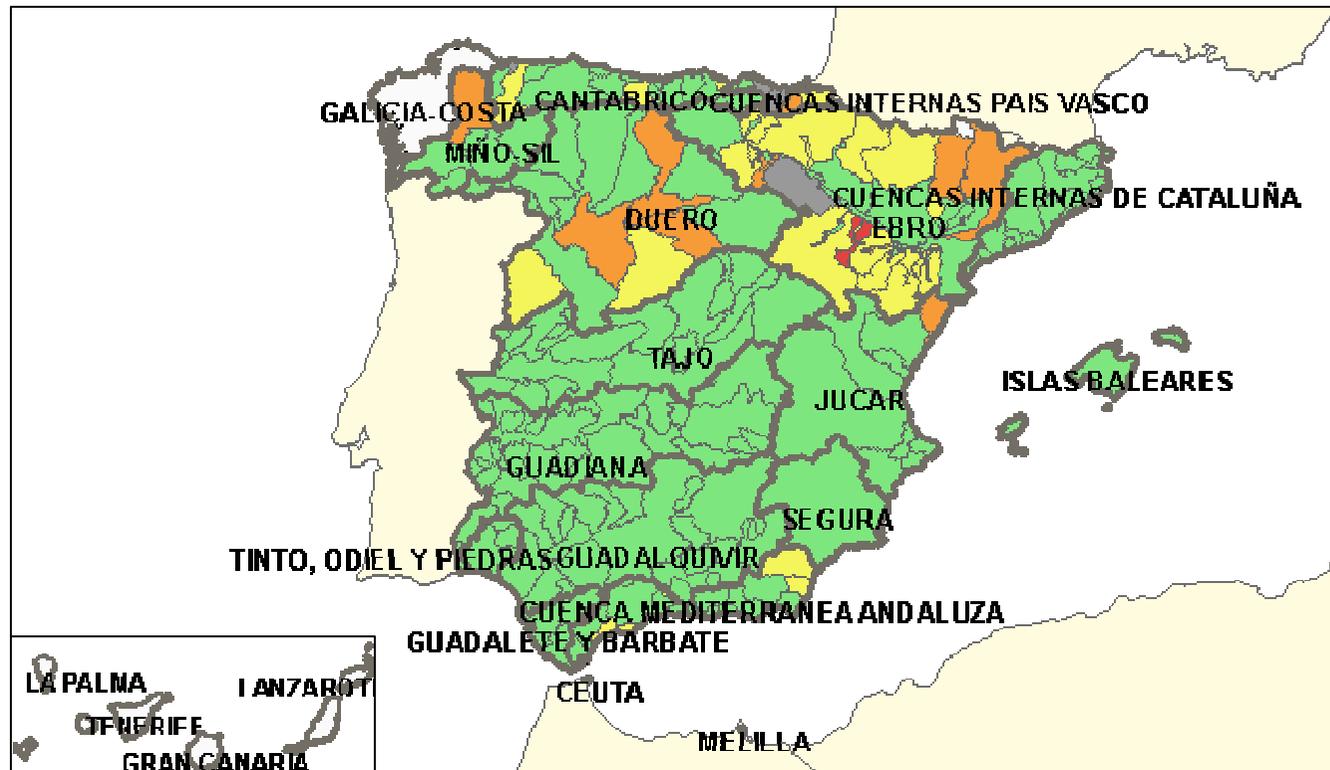
V_i : Indicator value in the selected period (month)

V_{med} : Average value of the hystorical base year or period

V_{max} : Maximum value of the hystorical base year or period

V_{min} : Minimum value of the hystorical base year or period

At basin scale: Spanish experience Status Index (Ie or CHS index)



DROUGHT INDEX Map. December, 2010

SRI Standardized Runoff Index

Segura Pilot River Basin

GAUGE STATIONS- CHARACTERISTICS:

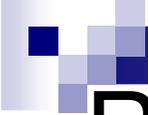
Suitability	Drawbacks
Monitoring ecological status of surface water bodies	It might be artificial if abstraction occurs downstream a dam or an abstraction
Users who depend on surface water	

Segura RB view:

- It is similar to stream flow.
- Gauge stations must be carefully selected.



Segura Basin- Gauge stations

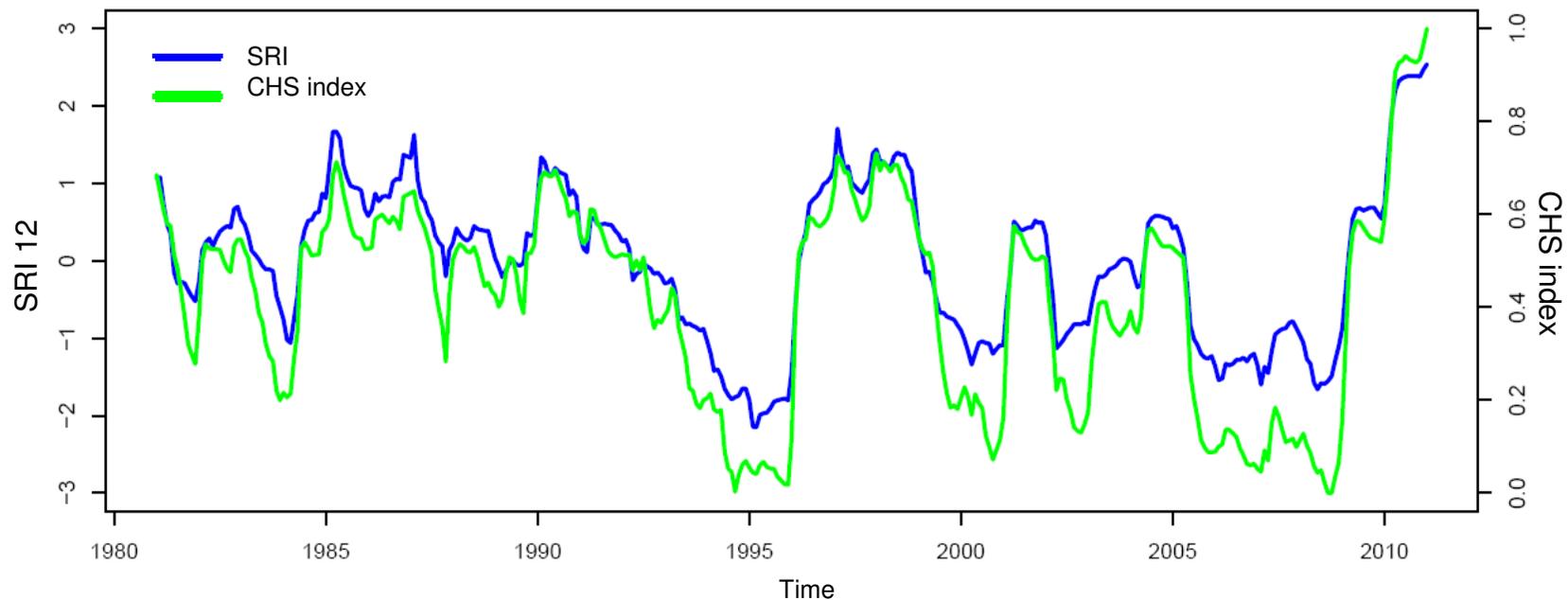


Relevance of the indicator

- SRI, which has similar assessment methodology to the SPI, is used to classify hydrological drought. We also employ an index framework based on a combination of reservoir storage and annual runoff (CHS index), to demonstrate the coherence of SRI.
- The data are provided by River Basin Organizations, considering relevant and selected stream gauges in the Basin. At regional level, an aggregation for the data could be considered, according water resources management concerns.
- The SRI selected for this purpose is SRI12 since it shows the best correlation with CHS Index.

Segura River Pilot Basin

- The behavior of SRI and state Index of SRB (CHS Index), was assessed for the time period 1980-2010, showing a good agreement (Figure 1). SRI was estimated for same time period, from natural runoff of the basin. CHS Index is derived from annual runoff and reservoir storage, at basin scale. Considering selected CHS Index thresholds, pro-active measures are applied in the framework of Drought Contingency Plan in order to mitigate negative effects of droughts.



Segura Pilot River Basin

SRI indicator versus CHS State Index

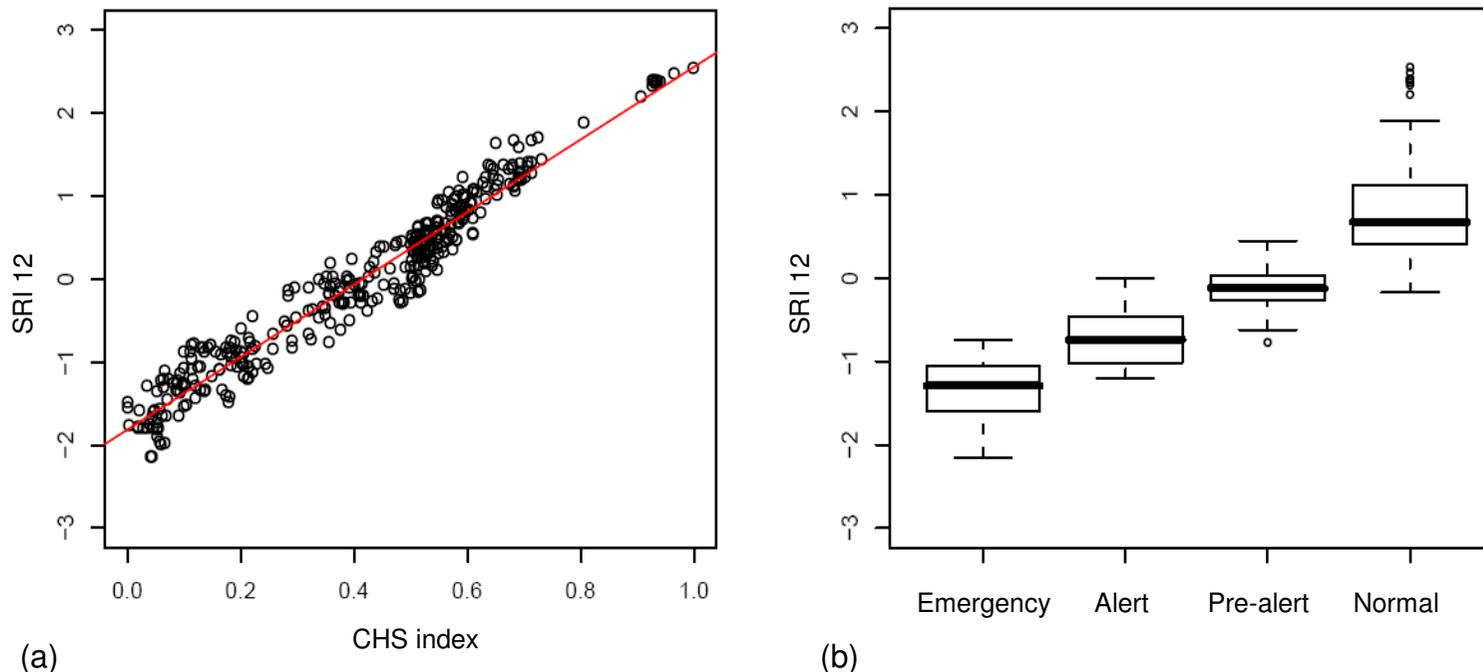


Fig. 2. CHS index versus SRI: (a) Dispersion plot and lineal regression, and (b) boxplot for each CHS Index threshold. Time period 1980-2010

A **high correlation coefficient ($r^2=0.944$) between SRI 12 and CHS index**, for the time period 1980-2010, is observed (Figure 2 (a)). From Fig. 2 (b), the variability of SRI for each CHS index threshold is presented. Normal situation presents the highest variability, however a general good correspondence between SRI and CHS index situations is observed. A positive trend in SRI is detected, according the situation is changing from emergence to normal, for the time period analyzed. The lineal regression is $SRI = -1.814 + 4.369 * CHS\ Index$.

Developing drought risk management plans (source: {COM(2010)228 final})

- Moving from 'crisis response' to 'risk management' in the context of water management is the way to improve society's resilience to WS&D.
- The Commission intends to foster exchanges of information and best practices on drought risk management and to propose methodologies for drought thresholds assessment and drought mapping by means of general recommendations that started with the 'Drought Management plan report'.
- The 'Support to the development of Risk maps' task is scheduled for 2012.