



Service contract for the support to the follow-up of the
Communication on Water scarcity and Droughts

Proposal for a revised Drought definition

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■ QUALITY CONTROL SHEET

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1. AIM

The aim of this short report is to review the different definitions and descriptions used by the European Commission when referring to drought and water scarcity, and to propose a “standard definition” to be used onwards in the policy context.

This document does not deal with the definitions of prolonged droughts (WFD and CIS, 2009), or other operational drought concepts (the sequence of meteorological, agricultural and hydrological drought).

2. CURRENTLY USED DEFINITIONS

Currently, the EU water policy context is based on using the following definitions:

- The MED Joint Process WFD/EUWI Water Scarcity Drafting Group (2006:13-24) served as an agreed baseline for the latter Communication on WS&D. According to the detailed and reasoned definitions of the document:
 - “...Drought is a normal, recurrent feature of climate, although often erroneously considered an unexpected and extraordinary event. It occurs in virtually all climatic zones, but its characteristics vary significantly from one region to another. Drought is a temporary aberration within the natural variability and can be considered an insidious hazard of nature; it differs from aridity which is a long-term, average feature of climate...

Droughts generally result from a combination of natural factors that can be enhanced by anthropogenic influences. The primary cause of any drought is a deficiency in rainfall, and, in particular, the timing, distribution, and intensity of this deficiency in relation to the existing water storage, demand, and use. This deficiency can result in a shortage of water necessary for the functioning of a natural (eco-)system, and / or necessary for a certain human activities...

An imbalance in water supply and demand is a situation where there is insufficient water to satisfy long-term average requirements... Defining scarcity for policy-making purposes is very difficult. The term ‘water scarcity’ has the following specific meanings: an imbalance of supply and demand under prevailing institutional arrangements and/or prices, an excess of demand over available supply, and/or a high rate of utilization compared to available supply, especially if the remaining supply potentials are difficult or costly to tap...”
- The 2007 Communication on Water Scarcity & Droughts details “...while ‘drought’ means a temporary decrease in water availability due for instance to rainfall deficiency, ‘water scarcity’ means that water demand exceeds the water resources exploitable under sustainable conditions...”.
- The main website¹ for “Water scarcity and droughts” includes separate definitions and additional information on causes, indicators and forecasts, including a set of maps. The key definitions used are:

¹ <http://ec.europa.eu/environment/water/quantity/about.htm>



- Water scarcity occurs where there are insufficient water resources to satisfy long-term average requirements. It refers to long-term water imbalances, combining low water availability with a level of water demand exceeding the supply capacity of the natural system.
- Droughts can be considered as a temporary decrease of the average water availability due to e.g. rainfall deficiency.

CIS (2009:24) defines that "...a drought - contrary to water scarcity - is a natural unpredictable phenomenon. The appearance of a drought is not generated by human activities. However, the impacts of a drought episode may be exacerbated by mismanagement practices..."

Furthermore, the European Drought Observatory (EDO) highlights that "Drought is one of the major weather related disasters. Persisting over months or years, it can affect large areas and may have serious environmental, social and economic impacts. These impacts depend on the duration, severity and spatial extent of the precipitation deficit, but also and to a large extent on the environmental and socio-economic vulnerability of affected regions"².

EEA uses also the following definitions. Following EEA (2001:8), "...drought results from a combination of meteorological, physical and human factors. The primarily cause of any drought is a deficiency in rainfall...human factors include demand for water...". In EEA (2009:9), water scarcity is associated to *overexploitation*, and "...droughts are distinct from water scarcity, being a natural phenomenon defined as a sustained and extensive occurrence of below-average water availability..."

A number of problems due to the definitions can be identified as follows:

- Length and detail: very detailed definitions vs. very short texts
- Contradictions and overlaps (e.g. due *for instance* to rainfall deficiency; and regarding the duration of the events)
- Key difference related either to the temporary duration (e.g. *temporary* vs. *long-term*) or the causes (*natural phenomenon* vs. *imbalances*). Furthermore, some definitions remark the imbalance from the *excess of demand* side and others do it from the *insufficiency to satisfy requirements* angle.
- Unclear explanation of the interrelationships between the different events

3. KEY CONCEPTS

The terms water scarcity and drought are complex. There is no scientific agreement about their precise definition, in particular regarding drought³, and due to the very similar effects of both events, water managers, public and media use both terms often in an indistinct manner.

Another approach is using water scarcity as an overall item and relating drought to particular events, ranging on a temporal scale from weeks to a decade.

² <http://edo.jrc.ec.europa.eu/php/index.php?action=view&id=2>

³ E.g. Mishra & Singh (2010).

From the policy point of view, and in particular in order to define adequate policy responses, it is necessary to make a different distinction between concepts, based on their causes and the opportunities for action. The following Figure 1⁴ could be used as a baseline:

		Temporary extension		
		Short-term (days, weeks)	Mid-term (months, seasons, years)	Long-term (decades)
Causes	Natural	Dry Spell	Drought	Aridity
	Man-made	Temporary water overabstraction	Water scarcity	Desertification

Figure 1: Key elements for the definition of water scarcity and drought

Thus, drought is the term to define natural events that last mid-term, and water scarcity is used for man-made situations in the mid-term. Out of the above-mentioned terms, those are the key ones for EU policy action, and the actions should also affect positively the long-term concepts. The short-term concepts will be addressed by (water) management actions of the competent authorities.

3.1. SIMILARITIES AND DIFFERENCES BETWEEN DROUGHT AND WATER SCARCITY

Furthermore, there are similarities and differences between drought and water scarcity. They can be defined in the following way for the EU policy purposes⁵:

Aspect	Drought	Water scarcity
Causes	Natural, due to a reduction of precipitation over a certain time period. High Temperatures, strong winds, low relative humidity, timing (onset, duration and end) as well as characteristics of rain can increase the severity.	Man-made, due to (over)abstraction of water resources, or their pollution (reducing their suitability for water uses).
Occurrence	Drought is a normal, recurrent feature of the all climates and can happen in all parts of Europe.. Its occurrence can be related to large-scale changes in atmospheric circulation patterns.	Due to the increase of water consumption, water scarcity is increasingly relevant across Europe. Water scarcity is characterised by a reduction of the available water resources (e.g. streamflow, lake or groundwater levels, salinization of coastal groundwater)
Duration	Droughts are very variable in their duration. They can last from a few weeks to several years	Usually, water scarcity is characterised by a permanent degradation/decline of water resources
Impacts	Very variable according to occurrence, severity and duration of the event as well as the sensitivity of affected ecosystems, economy and society. When occurring in already water scarce areas, droughts shall have the most severe effects	

⁴ Based on Vlachos (1982) quoted in MED Joint Process WFD /EUWI Water Scarcity Drafting Group (2006)

⁵ Sources: compiled from all quoted references

	If water scarcity and drought pass certain thresholds, they can significantly affect the environment (terrestrial and freshwater ecosystems, air, soils), the economy (agriculture and water uses) and society (e.g. urban water shortages, welfare, recreational activities, cultural and aesthetic concerns)	
Spatial extent	Regarding the geographical extension, droughts and water scarcity can happen at local level or cover entire RBDs. Drought events are even reported for wide areas of the EU. Over the time, water scarcity shall affect similar areas (due to the continued decline of water resources); droughts can have similar or different geographical patterns.	
Predictability	Drought forecasting is currently based on statistical information, and its development is planned in the frame of EDO, with a timeframe for forecasting of (several) weeks or months	Water scarcity is predictable for the mid- and long-term in the frame of RBMPs if adequate information on water availability and consumption has been compiled
Interaction	When droughts occur in an area characterised by water scarcity, their impact will be more severe. Heat waves can aggravate droughts and water scarcity situations. Water scarcity can also be an effect of overexploitation due to (accumulated) drought events, but this does not apply vice versa (drought is not an effect of water scarcity)	
Environmental thresholds	(Freshwater) ecosystems are often characterised by and adapted to recurrent droughts. Nonetheless, exceptionally severe droughts -or the combined impact of droughts with man-made overabstraction/ water scarcity can result in irreversible changes in the ecosystems	Water scarcity usually affects the ecological status of ecosystems, depending on its duration, relevance and the sensitivity of the ecosystem (incl. functions and elements)
Costs	In general, few data are available about the precise costs of water scarcity or drought situations. If data are available, they should evaluate the combined effects of a drought and geographically overlapping water-scarce area	
Indicators	The Standard Precipitation Index (SPI) reflects temporal deviations of rainfall with respect to the statistically expected rainfall derived from a reference period	The Water Exploitation Index (WEI) reflects the relation between water availability and abstraction/consumption
	Several indicators (e.g. streamflow, groundwater, snowpack, soil moisture and vegetation response) reflect the combined impact of water scarcity and drought	
Possible measures to prevent or mitigate effects	Drought forecasting, risk prevention (e.g. insurances, climate change adaptation, increased flexibility of water usage, protection of vulnerable species and habitats, governance rules for different drought thresholds) and emergency actions (e.g. water supply)	RBMPs, water management and allocation, water demand management, increase water efficiency and reusing, pricing policies, etc.
Possible policy responses	Development of Drought Management Plans (DMPs), water allocation systems and water governance rules and regulations. Support for insurance systems. Financial support for emergency actions (e.g. Solidarity Funds)	Reduction of pressures via sectoral policies (e.g. agriculture, energy, urban development) related to water usage (e.g. on water-usage planning, water allocation and pricing systems, control)

Figure 2. Similarities and differences between droughts and water scarcity

4. PROPOSED DEFINITIONS

The following definitions are proposed to be used by the European Commission when referring to water scarcity and drought under its policy framework:



4.1. DROUGHT DEFINITION

Drought is a temporary negative deviation from average precipitation values (a rainfall deficit), and is a normal, recurrent feature of European climates. Its severity can be increased by high temperatures, strong winds, low relative humidity, the timing and characteristics of the rainfall, and the duration of the drought episode.

4.2. DEFINITION OF WATER SCARCITY

Water scarcity is the effect derived from the imbalance between the natural availability of water resources and water demand. It is caused by man-made (over)abstraction of water resources, or their pollution (reducing their suitability for water uses). Due to the increase of water consumption, water scarcity is increasingly relevant across Europe. Usually, water scarcity is characterized by a permanent and continued degradation or decline of water resources.

4.3. COMPLEMENTARY TEXT

Both, the drought and the water scarcity definitions can be complemented by information on their impacts, whenever the context is appropriate (e.g. policy documents):

If droughts or water scarcity pass certain thresholds, they can significantly affect the environment (terrestrial and freshwater ecosystems, air, soils), the economy (agriculture and water uses) and society (e.g. public water supplies, welfare, recreational activities, cultural and aesthetic concerns).

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