## ABSTRACT

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**XEROCHORE: An Exercise to Assess Research Needs and Policy Choices in Areas of Drought**

FP7 Funding Scheme: Support Action
Project duration: 24 months (01 May 2008 – 30 April 2010)

### Core Group

- Fondazione Eni Enrico Mattei (FEEM, coordinator), Italy
- Wageningen Universiteit (WU), the Netherlands
- Water Management Center GbR (WMC), Germany
- Universitetet i Oslo (UiO), Norway
- Ministero dell'Ambiente, della Tutela del Territorio e del Mare (MATTM), Italy
- Ministerio de Medio Ambiente (MMA), Spain
- Natural Environment Research Council (NERC), United Kingdom
- National Technical University of Athens (NTUA), Greece
- DG Joint Research Centre, European Commission (JRC), Italy
- Centre National du Machinisme Agricole, du Genie Rural, des eaux et des Forets (CEMAGREF0, France
- The International Union for Conservation of Nature and Natural Resources (IUCN), Switzerland.

### Background

Droughts are generated by climate variability. They should not be confused with aridity (permanent dry climate) or water scarcity (water demand larger than availability). Prolonged dry and hot weather resulting in less than normal natural water availability has always been a challenging issue in most parts of Europe. Climate change will likely enhance the scale, frequency and severity of droughts throughout Europe. Droughts have a wide range of impacts (Fig. 1). They affect environment (e.g. water quality, aquatic ecosystems, wetlands, forest fires), economy (e.g. agriculture, forestry, energy sector, waterborne transport, water supply and tourism) and society (e.g. health, poverty). These impacts will likely worsen with the predicted climate change and the increasing population and societies' rising water demands, a situation exacerbated by the need to maintain groundwater storage and river flows for ecological and human services. This emerging situation requires development of adequate drought management plans (DMPs) at different scales (river basin, national and pan-European). It should be supported by a targeted drought policy that is well integrated in the EU Water Framework Directive (WFD) and other policies (e.g. Common Agricultural Policy CAP).

### Objectives

The XEROCHORE objectives were:

- to synthesize knowledge on past, current and future drought events, which includes physical causes and the spatio-temporal characteristics of droughts, human influences and that also considers climate change trends and impacts;
- to compile a roadmap that provides a vision on research needs and steps forward towards supporting the implementation of drought management plans within the WFD development as a result of a European drought policy;

- to provide information on possible impacts of droughts and guidance for stakeholders in the area of planning, implementation and scenarios;
- to further extend and develop the network of drought experts (EU and overseas) established as part of the European Drought Centre (EDC) to assess the international (inside and outside of Europe) state of the art in research related to droughts, addressing the natural/physical system, economic, social and environmental aspects, and policy development;
- to initiate a long lasting platform beyond this project through the network (i.e. extended EDC) that communicates drought related research and policy making within the research community, water managers, policy makers and the wider public.

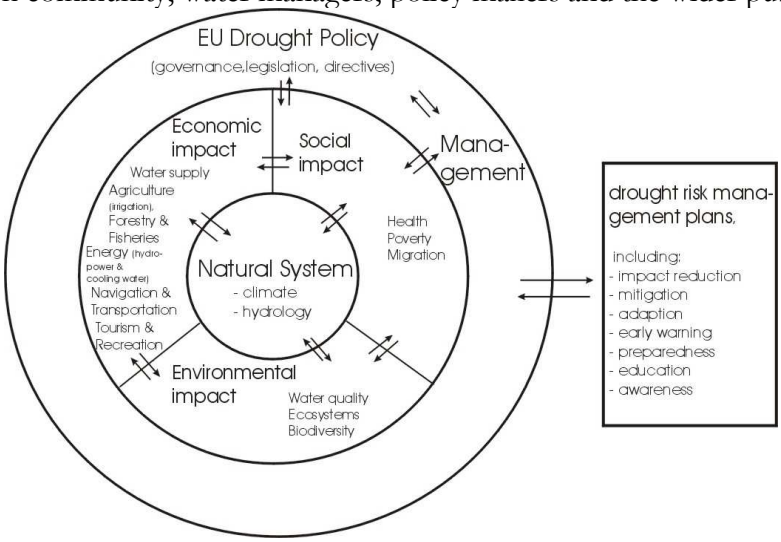


**Figure 1 Integration of relevant aspects towards a future EU Drought Policy.**

## Approach

XEROCHORE involved 11 Core Partners and more than 85 Network Partners whose input was valuable for reaching project's objectives. The project organized three large-scale international events to exchange views and share experiences with Network Partners. These include:

1. Workshop on "Drought & Natural Systems (Climate & Hydrology)", 15-17 June 2009, Noordwijkerhout, the Netherlands;
2. Workshop on "Socio-economic and environmental impacts of droughts", 5-7 October 2009, Venice, Italy;
3. Conference on "Supporting Drought Policies in Europe", 23-24 February 2010, Brussels, Belgium.

The Core Group identified and invited drought experts for each of the two workshops (65-80 experts). In the first workshop the focus was on climate and hydrology and accordingly most experts were from these disciplines. However, experts on the other drought aspects (impacts, drought management and policy) also participated to keep the integrated focus. A similar approach was applied to the second workshop that focused on drought impacts (socio-economic, environment). The design of the workshops (introductionary presentations, key notes, parallel breakout groups, plenary roundtable discussion, synthesis) triggered optimally sharing of experiences. The concluding drought conference presented the broad spread of drought aspects with emphasis on drought management and policy.

Additionally, a Science-Policy event was organized in Brussels (22 February 2010) to brief key experts and policy makers about the results of the project and to exchange views. The event was strongly supported by a member of the European Parliament and attended by staff members of the DG Environment, European Environmental Agency, several river basin authorities, and the Water Directors' expert group on Water Scarcity and Drought.

**Science Policy Briefs**

Important outcomes of the XEROCHORE project are the Science-Policy Briefs (SPBs, Fig. 2), which are an innovative way to bridge the gap between science and policy. The SPBs link major drought issues to the Water Framework Directive 2000/60/EC and assess research needs and policy choices in the area of drought. They provide a review of the state-of-the-art and identify research gaps in the natural system, impact assessment, policy-making and integrated water resources management with assessment of the possible socio-economic and environmental impacts of droughts and give guidance on appropriate management responses.

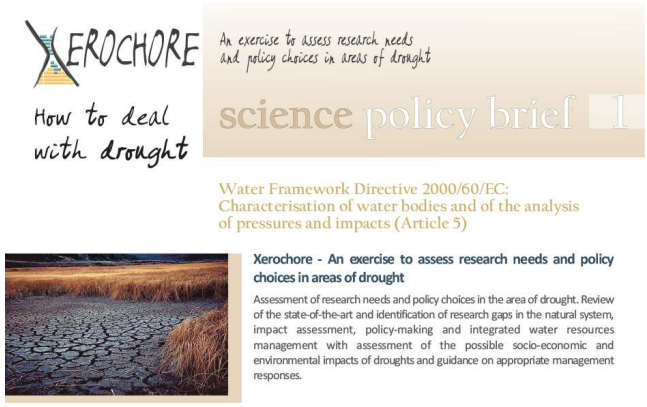


**Figure 2 Example of the head of a Science Policy Brief.**

XEROCHORE has produced the following SPBs referring to specific WFD articles:

- Characterisation of water bodies and of the analysis of pressures and impacts (Art. 5)
- Monitoring of surface water and groundwater status and of protected areas (Art. 8 - relevant also for Art. 1)
- Recovery of costs for water services (Art. 9)
- Implementing a programme of measures (Art. 11, including Annex VI part b)
- River basin management plans (Art.13)

Each SPB addresses: (i) policy focus, (ii) purpose, (iii) policy milestones and relevant XEROCHORE key outputs, (iv) limitations identified by XEROCHORE, and (v) main recommendations.

**Other deliverables**

Other major outcomes from the XEROCHORE project are the guidance documents on: (i) the natural/physical system, (ii) economic and social impacts, (iii) environmental impacts, and (iv) drought management and policy options (Fig. 3). The comprehensive documents include thorough literature reviews and the outcome of the roundtable discussions with the Network Partners. They provide for each of the fields the state-of-the art and research gaps.

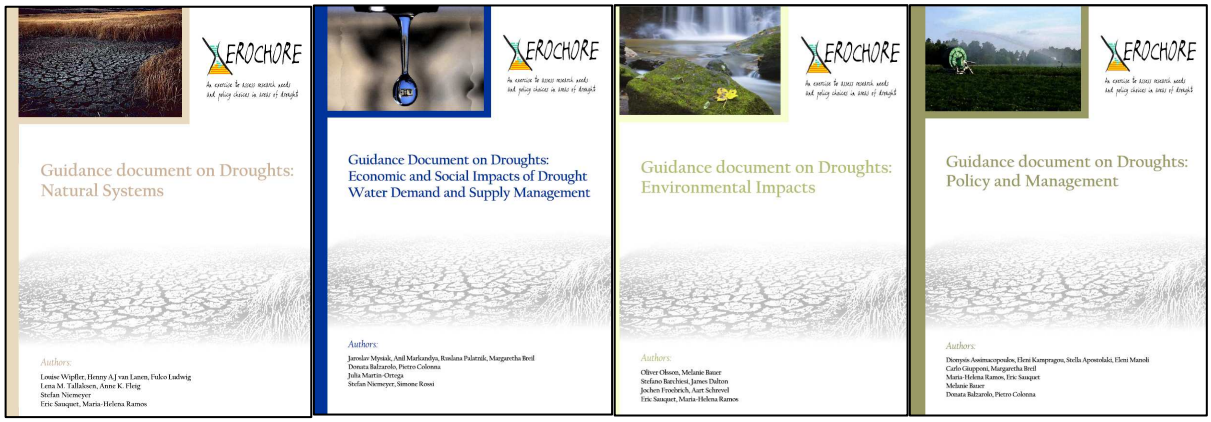


**Figure 3 XEROCHORE's Guidance Documents.**

The Guidance Document on the Natural System explores hydroclimatic aspects of drought, propagation of meteorological droughts into hydrological droughts, land-atmosphere feedbacks; integrated drought assessment framework (atmosphere and land) and drought monitoring (incl. early warning) and forecasting. The review of Drought Impacts and Water Demand/Supply Management Options synthesizes knowledge on economic, social and environmental impacts of droughts. The Guidance Document reviews recent drought cases, methodologies used for the impact estimation; practical issues making the assessment difficult; and research gaps to which future research should be directed. A wide range of water demand- and supply management (WDM and WSD) instruments have been reviewed and experiences from their application synthesised. The review of Drought Policies and Management provides an overview of the European and international policies and management efforts addressing droughts.

**Network of international drought experts**

XEROCHORE has further extended the network of drought experts (EU and overseas) established as part of the European Drought Centre (EDC). The number of members of the EDC has almost tripled to about 250 drought experts during the lifetime of XEROCHORE. About 30% of the members are from overseas[1]. The extended EDC is expected to be a long lasting platform of drought experts after the finalization of the XEROCHORE project.

**Websites**

- Xerochore: http://www.feem-project.net/xerochore/
- European Drought Centre: http://www.geo.uio.no/edc/
- European Drought Observatory: http://edo.jrc.ec.europa.eu

[1] D6.4. Drought Network to be integrated in the existing and then extended European Drought Centre, including also drought experts from outside EU