Mainland Portugal is located in south-western Europe, and has a mild Mediterranean climate, susceptible to the occurrence of regular drought episodes. Analysis of events from the last century shows an increase in drought frequency and intensity since the 1980s, particularly from February to April.

The importance of the extreme 2005 drought event resulted in the creation of a Drought Commission by Government initiative to monitor the progress of the drought and to assist in mitigating its effects, and was very illustrative of the importance of cooperation among national entities and between Portugal and Spain.

Overall, current drought management and planning is based on a crisis management approach, effected through several regulations from affected sectors and across municipal contingency plans. The National Water Authority (INAG/APA) coordinates water management and drought monitoring at national level and 5 River Basin Authorities are responsible for water resources management at river basin level. A system for early warning and drought management is currently being developed by INAG/APA.

**Drought as a natural hazard: past & future**

In the last 65 years (period 1941-2006), there were nine major drought events experienced in mainland Portugal: 1944-45 (extreme), 1948-49, 1964-65, 1974-76, 1980-83, 1990-92, 1994-95, 1998-99 and 2004-2006 (extreme). The drought episode of 2004-2005 can be considered the most severe in the last 65 years, in terms of meteorological data, extent of the area affected, and impacts on different socio-economic and environmental sectors.

Climatic data for the period 1931-2000 show that, since 1972, there is a very consistent trend towards an increase in the mean annual near surface air temperature for all regions in Portugal (about 0.4°C per decade).

Climate change regional models for the period 2080-2100 project a substantial increase in mean air temperature all over Portugal and an increasing frequency of droughts. Temperature increases will be more marked in the inner regions of the mainland (7°C) than along the coast (3°C). Almost all models project reduction in mean precipitation and in the duration of the rainy season, and a decrease in streamflow.

**The current framework for drought management and planning**

Drought management in Portugal is based on a crisis management approach. Until now Portugal did not develop drought management plans and there is no policy or plan developed specifically for droughts. River Basin Management Plans are currently under public consultation within the framework of WFD, and substitute previous River Basin Plans from 2001.

The National Water Authority (INAG/APA) coordinates drought monitoring in Portugal, based on the National Information System on Water Resources (SNIRH), a network of monitoring stations of climate and hydrological data. However, this system is more oriented for flood evaluation and does not allow drought evaluation with a unique classification. The implementation of a system for early warning and drought management is currently being developed by INAG/APA.
Portugal (mainland)

Improving integrated water management and preparedness for drought risk reduction

Current vulnerability to drought

Transboundary water resources are one of the most important factors determining vulnerability to droughts in Portugal, since 64% of the area of mainland Portugal is located within 5 river basins shared with Spain, corresponding to 67% of the total annual average water resources in Portugal (20,300 of a total of 30,400 hm³). Since the drought episode of 2005, cooperation and information exchange between Portugal and Spain on shared water resources has been consolidated. However, most joint planning and management measures are lacking for Portuguese-Spanish river basins. Within the WFD, a common planning process for shared river basins will have to be implemented until 2015.

Overall, there is a strong dependence on surface waters, particularly in the drier southern regions and especially for private irrigated agriculture, which is the activity with the highest water consumption in Portugal. Furthermore, water demand for agriculture and tourism has been increasing and will continue to increase in the future due to the expansion of irrigated agricultural areas. Such vulnerabilities result in frequent user conflicts for water during drought events, especially over water resources from reservoirs with multiple uses.

Lack of good agricultural practices for crop production and livestock farming, and small industries without efficient water treatment systems have led to decreasing water quality of rivers and ground water through diffuse and point source pollution. Lack of efficient irrigation systems in many agricultural systems has contributed to water waste and increased vulnerability to drought.

Reference values and methodologies to determine ecological streamflow for aquatic ecosystems are lacking, as well as continuous monitoring data and updated information on aquatic flora and fauna.

Well-preserved willow riparian gallery forest, central Portugal

Intensive irrigated olive cultivation, Guadiana river basin, southeast Portugal

Research challenges within the context of Drought-R&SPI

Analysis of the drought management approach adopted during the severe drought of 2005 will provide good insights for the understanding of past vulnerabilities to drought, and will promote the understanding of future drought impacts, vulnerabilities and management, as well as the development of measures for better preparedness and risk reduction.

The Portuguese case study within Drought-R&SPI will contribute to:

1. Promotion of drought management at international river basins;
2. Assessment of the current operational framework for drought forecasting, monitoring and mitigation;
3. Scientific studies on drought environmental impacts and ecological thresholds for aquatic ecosystems and biodiversity;
4. Understanding the link between drought and forest fire risks.