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Transboundary drought risk management in Mediterranean Europe. A state-of-the-art analysis for the Guadiana River Basin

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Abstract. Over the past several decades, increasing economic integration and the pressures of globalization have brought transboundary issues to the forefront of political debate around the world. Climate hazards such as droughts know no boundaries, and are one of the key challenges to cross-border environmental management and sustainable development. This paper analyses the current state-of-the-art of transboundary drought management in Mediterranean Europe, in the context of the European Water Framework Directive implementation. The analysis is based on the Guadiana river basin (Iberian Peninsula), which is of particular interest because of its relative aridity, water scarcity, and high drought risk conditions. A political agreement (the Albufeira Convention) regulates water issues between the two riparian countries (Portugal and Spain), but water planning remains strictly at the national level, and an exception regime is applied under drought conditions. The paper highlights the need to identify constraints for an effective transboundary drought risk management, to minimize environmental, social and economic impacts of drought events, and to reduce potential conflicts on water uses and availability between both riparian countries, based on a territorial, integrated and interdisciplinary approach.

Keywords. Drought – Risk management – Water planning – Transboundary – Guadiana.

Gestion transfrontalière du risque de sécheresse en Europe Méditerranéenne. Analyse de la situation actuelle pour le bassin fluvial du Guadiana

Résumé. *Durant les dernières décennies, des questions transfrontalières ont été placées au centre du débat politique mondial en raison d'une intégration économique grandissante ainsi que des pressions générées par la mondialisation. Des dangers climatiques tels que les sécheresses ne connaissent pas de frontières et représentent l'un des défis majeurs de la gestion environnementale internationale et du développement durable. Le présent article analyse l'état actuel de la gestion de la sécheresse transfrontalière dans l'Europe Méditerranéenne, dans le contexte de la mise en œuvre de la Directive-Cadre Européenne sur l'Eau. Cette analyse se base sur le bassin fluvial du Guadiana (Péninsule Ibérique), dont l'intérêt particulier réside dans son aridité relative, sa pénurie d'eau et ses hauts risques de sécheresse. Un accord politique (la Convention d'Albufeira) régit les questions liées à l'eau entre les deux pays riverains (le Portugal et l'Espagne), mais la planification de l'eau reste un domaine strictement national, et en cas de sécheresse l'on applique un régime d'exception. L'article montre la nécessité d'accomplir l'identification des contraintes d'une gestion transfrontalière du risque de sécheresse, la diminution des impacts environnementaux, sociaux et économiques des épisodes de sécheresse, et la réduction des conflits potentiels sur les usages et la disponibilité de l'eau entre les deux pays riverains, basée sur une approche territoriale, intégrée et interdisciplinaire.*

Mots-clés. *Sécheresse – Gestion du risque – Planification de l'eau – Transfrontalière – Guadiana.*

I – Scientific and political state-of-the-art

Over the past several decades, increasing economic integration and the pressures of globalization have brought transboundary issues to the forefront of political debate around the

world. New political geographies have emerged in order to cope with this reality, mostly as trade and economic-oriented intergovernmental organizations (EEC, NAFTA, MERCOSUL, EAEC, ASEAN). In some cases, these economic associations have turned into development organisations, able to deal with issues beyond commerce and trade that pose transboundary challenges to member states. That is particularly the case of Europe, where the former Economic Community has evolved into the European Union (EU), with large transnational competences in all fields of public policy, including the environment.

Transcending local jurisdictions and transgressing borders, environmental issues often challenge conventional governance structures. This explains why overcoming geographic, disciplinary, and institutional boundaries, has been at the core of the EU environmental research and policy efforts in recent years. One of the resulting new concepts, that of Environmental Policy Integration (EPI), is key to the current EU political structure, imposing an horizontal environmental dimension across every field of public policy (such as previously occurring for the social and economic dimensions). Nevertheless, EPI still seems far from being effective, as shown from the results of EPIGOV research project, which aimed to coordinate and synthesise research on EPI and multi-level governance (Homeyer, 2006). Research on these new types of governance has been conducted in order to overcome the previously mentioned boundaries, and has found a privileged field for experiment and action both in environmental and cross-border issues.

In the scope of environmental issues, air and water-related problems seem to be among the most common and challenging in transboundary terms, naturally flowing across national borders. Because of the severity of social and economic impacts, as well as of increasing societal vulnerability, climate and water related natural hazards have concentrated much of the attention of both European citizens and decision-makers. That is particularly the case of floods, droughts, wildfires, and other catastrophic events. Still, little action has been taken in order to actively cope with such events, at the transboundary scale at which they occur.

Most of the research on transboundary water governance has focused on formal legal instruments, conflicts and conflict resolution mechanisms at the national scale (Zeitoun and Warner, 2006), but little emphasis has been put into strategies and methodologies addressing an effective shared governance – namely in critical situations such as droughts or other water-related risks and disasters (Videira, 2007). Recent research efforts from the EU have been conducted on risk-based management of river basins, through integrated research projects such as AQUASTRESS, NEWATER, RISKBASE and SCENES – all of which included the Guadiana river basin, located in the Iberian Peninsula and case study for the present research, as one of the regional case studies.

All of the previously mentioned projects addressed the development of interdisciplinary methodologies and the search for multi-level governance solutions, in the context of uncertainty and global change. The former two, in particular (AQUASTRESS and NEWATER), have highlighted the need for further political and sectorial integration when addressing water scarcity and drought in the Guadiana river basin. Such integration calls for a drought risk management approach, which has received a great research focus and political acceptance in recent years, in order to replace the widely dominant reactive crisis management response (Wilhite and Buchanan-Smith, 2005) – but still needs major efforts for its effective and sustainable implementation.

In this context, a significant effort is being developed by the European Union in order to implement the Water Framework Directive (WFD) and its core principles across its whole territory, and particularly in transboundary river basins. In this case, some of the key tasks proposed include data harmonisation and exchange between riparian countries, inter-calibration and analysis of monitoring networks, and joint reports. Furthermore, the WFD commits the Member States to a common river basin planning process by 2015, with shared objectives, methods, and deadlines. Given this background, a common roof report ought to be designed,

including the characterisation of both national districts, a common catalogues of measures, co-ordinated objectives, and common socio-economic indicators (EC, 2007).

For both Portugal and Spain, however, little has been achieved so far, as both countries seem to lack the political will needed to overcome differences, distrusts, and national focus (Maia, 2003). Drought events, which seem to occur with increasing frequency and intensity over the Guadiana basin, exacerbate water stress and scarcity, as well as water management and planning challenges (Roose, 2006). In fact, there is poor knowledge and experience to overcome gaps and differences arising between both countries' drought planning processes. Drought situations pose an increasing threat, as the conflict potential becomes higher, the flow regime falls into an exception category, and the mechanisms to solve disputes loose strength. Therefore, both countries clearly need a systematic approach to identify planning gaps and to find ways to bridge the differences between their national planning processes, particularly during such water-stressed situations as droughts.

This recurrent environmental hazard has singular features (unpredictability, slow and progressive onset, wide and blur distribution both in time and space, non-structural and diffuse impacts) which have favoured a reactive, post-disaster crisis response. A drought risk management approach has been proposed and set forward in several areas of the globe (Australia, USA), and now needs to be adapted and prepared for implementation in the frame of the WFD, especially in such drought-prone areas as the Iberian southwest.

II – The significance of the Guadiana River Basin

Spain and Portugal share five major river basins, with two-thirds of their borders established by these rivers or their tributaries (Fig. 1). The three main watersheds (Douro, Tejo and Guadiana) are also the largest shared rivers fully within European Union borders. In general, Spanish territory is upstream and about 70% of the mean yearly water resources of these rivers is generated in Spain. The areas of shared river basins total 46% of the surface area of the Iberian Peninsula, accounting for 64% of Portugal's mainland territory, and 42% of Spain's. Transboundary river basins are of particularly high significance to Portugal, due to its fragile geographic position (downstream), and to the fact that 67% of its surface water resources come from such basins (20,300 out of 30,400 hm³), while that value in Spain is only about 39% (42,800 out of 110,100 hm³).

Contrarily to what might be expected from its geographic position, the Iberian Southwest (where the Guadiana river basin is located) presents particularly enhanced Mediterranean climatic features, with little Atlantic influence, and a strong continental component. In fact, the Guadiana is one of the most water stressed European basins, mostly subject to semi-arid environmental conditions. In the shade of the sub-tropical high pressure systems, this region presents the highest summer temperatures, annual solar radiation and potential evapotranspiration, and the longest dry season average records in the whole Europe. More importantly, it also presents the highest values of rainfall variability, which are only surpassed, at the global scale, by arid and desertic climates (Do Ó, 2008). Such extreme variations in rainfall – from season to season, year to year, and region to region – aggravate scarcity in water flows, particularly in the drier south.

Agricultural irrigation is the main source of consumption for both states, which is also a typical Mediterranean feature, because of the need to supply crops with water in their growing season. Although water use in the Iberian Southwest has traditionally been frugal, learning both from scarcity and variability, the last decades have witnessed a major shift. Modern technologies and infrastructures (such as dams, boreholes, pumping stations and irrigation channels), mainly developed after the 1950's, have made water readily available in many areas, while state initiative and subsidies have kept water prices artificially low, and unequal among different users. This has resulted in overabstraction, overuse, and poor efficiency (although some efforts

have been made in the last years, in terms of increasing water conservation and efficiency). These problems are aggravated by the historical focus of both countries, but particularly Spain, on large hydraulic projects featuring not only the construction of local and regional infrastructures, but also large-scale water transfers from wetter to drier regions (Maia, 2003).

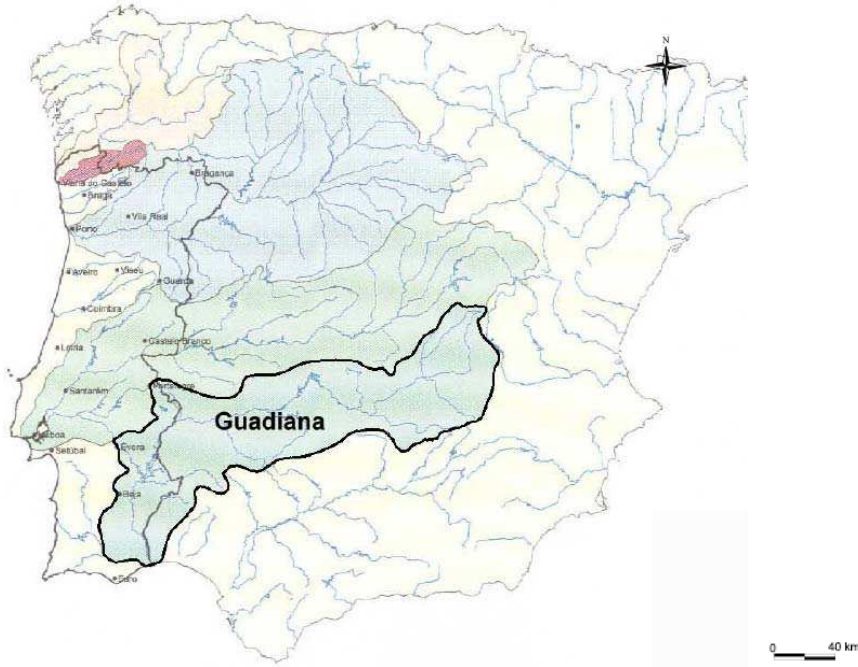


Fig. 1. Location of the Guadiana and other transboundary river basins in the Iberian Peninsula
(Source: http://www.inag.pt/inag2004/port/a_intervencao/planeamento/pbh/pbh04.html).

Given this natural and economic context, the Guadiana is, amidst transboundary river basins in Iberia, a particular interesting case study for the research and planning of shared water resources, due to:

- (i) High rainfall variability and aridity conditions over large parts of the basin.
- (ii) The importance of transboundary water resources for Iberian countries, particularly in the dry Southwest.
- (iii) Water scarcity resulting from a relatively high demand.
- (iv) Climate change scenarios pointing to reduced flows and increasing drought risk.

III – Cooperation and conflict under the Albufeira Convention

Because of the natural and economic conditions previously described, it is understandable that water issues have been at the centre of political tension between the two Iberian countries for centuries – indeed, shared water resources have long been a cause of both cooperation and conflict between them. Portugal and Spain have one of the world's longest records of formal

international relations on water issues, dating back to the Treaty of Limits signed in 1864. Along with several bilateral agreements that followed during the 20th century, these treaties have strongly contributed to reduce such conflict potential (Canelas de Castro, 2006) – but may still be insufficient to deal with the combined pressures of increasing demand (resulting from growth of population, tourism, and irrigation), reducing supply (due to climate change induced increase in evapotranspiration and decrease in surface runoff), and eventually more frequent and intense drought events.

In fact, the number, extension, and intensity of Iberian water conflicts increased during the last century, both at the international, regional, and local levels, and particularly during extreme drought events such as that of 1991/95 (Llamas, 1997). Such conflicts not only undermine bilateral political relations, but also pit different societal groups (for example farmers, environmentalists, and energy utilities) against each other, and build on increasing water scarcity, particularly in the water-scarce and water-stressed southern Iberian river basins. Such trend seemed to be the result of both reduced water supplies during drought events, and increasing demand from human activities and environment.

A seemingly new era of cooperation and institutional relation occurred with the 1998 Albufeira Convention, which broadened the scope of cooperation from a narrow economic focus (primarily on allocating the benefits of hydroelectric power generation), to a much wider framework for achieving the sustainable use and management of shared water resources. Nevertheless, recent drought events (namely in 1991/95, and in 2004/06) have showed increased vulnerability on both sides of the border, and highlighted the need for action in assessing, preventing and reducing water-related risks, taking into account climate change and further depletion of water resources (Ma *et al.*, 2007).

It should also be acknowledged that the exceptional flow regime foreseen in the Albufeira Convention, results in the lack of planning or obligations to the parts in case of a severe drought (under Article 19). Planning options for both countries fall within the Special Drought Plans, recently created in Spain (2006) but still inexistent (although foreseen) in Portugal. Therefore, it is somehow paradoxical that in situations where the conflict potential is higher, joint mechanisms to solve disputes are fewer and weaker. In this context, drought phenomena is paradigmatic since it stands as the most important natural hazard over the basin, represents a significant potential of political and social conflict between the two countries, and threatens the security and efficiency of existing water management and planning in the basin.

Given these facts, the Guadiana River Basin is also of particular scientific and socio-economic significance (to the study of transboundary drought management issues) because of the relevance of historical and institutional water diplomacy between the two countries, and of the severe impacts and lack of preparedness under drought situations.

The WFD proposes to give real added value in transboundary basins, by providing a common reference and planning framework, and increasing information exchange and coordination between riparian States. Thus, it shall contribute to European integration, but huge work is still needed in several fields, such as:

- (i) Developing common systems for monitoring and data management.
- (ii) Giving more ambition to the roof section of an eventual joint management plan.
- (iii) Developing public consultation on an international district scale.
- (iv) Organizing joint management of transboundary aquifers.
- (v) Better coordinating the management of floods/droughts and climate change.

To address these challenges, an interdisciplinary approach is needed, responding to the need of managing river basins as social-ecological systems (Moral, 2009). Such approach is crucial to understand the diverse and intertwined layers (hydrological, ecological, institutional,

economic, social) that constitute the water system, as a framework to address the relationship between natural water resources and social water demands. Therefore, drought risk needs to be assessed using data and methodologies of all scientific fields and economic sectors involved (Do Ó, 2007).

Portugal and Spain have one of the world's longest records of water conflict and cooperation in shared river basins, and therefore stand as a major demonstrative case study within the EU. An interdisciplinary approach to the subject will be crucial for improving the state-of-the-art in the field, using and combining new policy assessment methods and tools, which are capable of addressing both the natural hazard occurrence, the human vulnerability, and the social response to such drought risk, in the face of new concepts that are key to a post-structuralist (Swyngedouw, 2006) and multi-level water governance.

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