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Climate change policy and water resources in the EU and Spain. A closer look into the Water Framework Directive☆

Gonzalo Escribano Francés [a], Philippe Quevauviller [b], Enrique San Martín González [a], Elisa Vargas Amelin [a,b,*]

[a] Universidad Nacional de Educación a Distancia, Facultad de Ciencias Económicas y Empresariales, Paseo Senda del Rey, 11, Ciudad Universitaria, 28040 Madrid, Spain
[b] Vrije Universiteit Brussel, Department of Hydrology and Hydraulic Engineering, Pleinlaan 2, 1050 Brussel, Belgium

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ABSTRACT

Climate change effects are becoming evident worldwide, with serious regional and local impacts. The European Union (EU) has launched and developed initiatives and policies that scratch the surface of water resources impacts. This article presents an introduction of the existing environmental policy and more concisely in the areas of climate change and the interactions with water resources. It also addresses main management tools, and plans linked to policies, recent updates on the Science–Policy Interface, highlighting major results from research and development projects. Establishing appropriate policies to tackle climate change impacts on water is essential given the cross-sectorial and flowing nature and the importance of water in all environmental, social and economic sectors. There are still some pending reviews and updates in the current EU policy and its implementation, as well as at the national level in Spain. This article identifies existing gaps, and provides recommendations on how and where reforms could take place and be applied by decision makers in the water policy sector.

1. Introduction to climate change and EU policy

The evidence that climate change is producing effects at the global, regional and local scales is growing, as well as the recognition that human action has had a clear impact on its development and on the worsening of natural climatic variations (European Environment Agency et al., 2008; Intergovernmental Panel on Climate Change, 2013).

Impacts in Europe include increases in temperatures, changes in precipitation and decreases in ice and snow, with high vulnerability of mountain and coastal areas as well as the Arctic and the Mediterranean region (European Environment Agency, 2012; European Environment Agency et al., 2008). Decrease in precipitation and runoff in Mediterranean areas, could in addition aggravate other existing problems such as saline intrusion in aquifers, coastal subsidence, water pollution problems and agricultural pressures due to high water demands (European Commission, 2009a,b; European Environment Agency, 2012; Intergovernmental Panel on Climate Change, 2008; Somot et al., 2008). Furthermore, these impacts could translate into modifications in habitats, reduced crop yields, impacts on human health, increasing conflicts over water uses or security issues (Estrela Monreal and Vargas Amelin, 2008; European Commission, 2011).

Many of the problems and impacts on water resources derived from climate change are not new. In fact, Member States of the European Union (MS) have often faced floods, water scarcity, heat waves, prolonged droughts, flows variability, temperature rises, and decreased rainfall. However, studies suggest that climate change will cause a higher frequency and amplification of these problems (Intergovernmental Panel on Climate Change, 2008), as well as a shift to countries that may lack sufficient experience to incorporate uncertainty into water planning (Arnell et al., 2001). Furthermore, impacts will affect water treatment, system reliability and operating costs as many forms of pollution are expected to be exacerbated (European Commission, 2011).

In recent years, European institutions have launched numerous actions, strategies and policy instruments related to climate change in the EU although knowledge and policy gaps still exist. While the specific impacts on water resources vary considerably

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* Corresponding author. Present address: European Commission, DG Environment, BU9, B-1049 Brussels, Belgium.
E-mail addresses: gescribano@cee.uned.es (G. Escribano Francés), philippe@quevauviller.be (P. Quevauviller), esanmartin@cee.uned.es (E. San Martín González), elisa.vargas.amelin@gmail.com (E. Vargas Amelin).

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among European regions, Spain is considered to be in a 'hot spot' where a greater increase in temperature and decreased precipitation, evapotranspiration and runoff are anticipated (Estrela Monreal et al., 2012; Lázaro-Touza and López-Gunn, 2014; Morata Gasca, 2014).

In addition, the variability of temperatures and the spatial and temporal distribution of water resources are very high within the country, with annual mean precipitation values ranging from 2000 mm in the North-West to less than 300 mm per year in the South-East. This variability, coped with the uncertainty of regionalised models and downscaling techniques adds difficulties to estimating the direct effects of climate change in water resources. However, one of the most recent and comprehensive studies developed at national level (Centro de Estudios y Experimentación de Obras Públicas, 2011), provides some important insights of impacts expected in the short-medium term. It predicts a generalised reduction of precipitation and water availability (near −5%, −9% and −17% during the periods 2011–2040, 2041–2070 and 2071–2100 respectively), with the greatest variability occurring in the Mediterranean coast and in the South-East. In addition, the study predicts increases in temperature, evaporation and evapotranspiration, and decreases in groundwater recharge and runoff.

Spain is in the process of complying with EU policies and respond to the recommendations made on climate change mitigation and adaptation, which will be covered throughout the article.

2. EU climate change policies

Over the past years, one of the most important documents on climate change adaptation published by the EU was the White Paper 'Adapting to climate change: Towards a European framework for action' (European Commission, 2009a). This paper established a framework to reduce the EU's vulnerability to the impacts of climate change, and marked the starting point for implementing a strategic approach to ensure that adaptation measures were consistent across different sectors, such as water. More recently, the European Commission published the Green Paper, 'A framework for climate and energy policy in 2030' (European Commission, 2013b). This document set basis for establishing goals up to 2030 on energy and climate policy (carbon sequestration, reduction of greenhouse gases, fund raising and support of a competitive economy).

Furthermore, and with greater relevance, the Commission adopted and EU strategy on adaptation to climate change on April 2013 (European Commission, 2013a). The aim of this strategy is to make Europe more climate-resilient, complement on-going efforts within MS, promote information-sharing, coordination of efforts, and sector and policy coherence. It provides funding tools to strengthen adaptation capacities, and addresses specific vulnerable areas such as water resources.

Moreover, while substantial progresses have been made on mitigation, the 2030 framework for climate and energy policies establishes stronger commitments. As stated by the EU Council conclusions of October 2014 (European Council, 2014), new targets are set to reduce greenhouse gas by 40% (compared to 1990 levels), and achieve a share of renewable energy and energy savings of at least 27%. EU documents that have linked even more closely climate change and water are mainly the Water Framework Directive 2000/60/EC (WFD),[1] the Guidance Document No. 24 'River Basin Management in a Changing Climate' (European Commission, 2009c) within the WFD or the communication of the 'A Blueprint to Safeguard Europe's Water Resources' (European Commission, 2012).

The WFD[2] does not explicitly address the relationship between climate change and River Basin Management Plans (RBMPs), although all qualitative and quantitative water aspects referred in the directive may be affected by climatic changes. Annex II of the Directive however, refers to the need to identify 'significant pressures' affecting water bodies. In addition, the cyclical approach of the Directive, with specific steps and envisioned periodic revisions, which allow incorporating scientific and technical progresses, and the integration of other Directives domains within the text (habitats, agricultural development) make this policy suited to adapt to and manage climate change impacts (Quevauviller, 2014). Given that climate change could aggravate future anthropogenic pressures, expected impacts should therefore be considered within the framework of the Directive (Quevauviller, 2011; Wilby et al., 2006). The Guidance document No. 24, previously mentioned, provides more direct support to river basin organisations for incorporating climate change projections into the second and third planning cycles and more specifically in the assessment of pressures and impacts, monitoring and establishment of measures. For instance, the document recommends the process for determining if measures are climate proof and ensures revisions for each planning cycle (see Fig. 1 in the planning cycle).

Overall, the WFD comprises monitoring, reporting and evaluation systems that could significantly contribute to have a broader and more comprehensive view of climate change impacts in the EU and adaptation actions in the water sector.

As part of the assessment of EU water policies, and more closely on the WFD, the communication of the 'Blueprint' (European Commission, 2012) also presents a series of actions and recommendations that are directly linked to climate change aspects. These include improving water efficiency (especially in irrigated agriculture), reducing losses in distribution networks, promoting 'green infrastructure' and natural water retention measures that minimise impacts of droughts and floods, better integration of risk management and drought issues in RBMPs, and improving the resilience of aquatic ecosystems (e.g. when facing the impacts of invasive species).

Finally, it is important to keep in mind the importance of anticipating to adverse effects of climate change and act in ways so these can be prevented or expected damages minimised. It is therefore essential to address the particularities of water-related disasters, which fall under other EU policies such as the Floods Directive,[3] or the strategy on water scarcity and drought and its communication (European Commission, 2007).

3. Research and development projects, science–policy interface

There have been different research and development lines promoted at the EU level to fund specific environmental related projects, and more specifically to water and climate change. Some of these lines were included the 6th and 7th Framework Programmes and more recently Horizon 2020 (2014–2020).

Within the European Commission, the Directorate General for Research and Innovation is responsible for Horizon 2020 the largest EU Research and Innovation programme that has commitment to dedicate at least 35% to climate-related research, through both specific climate research and the integration of climate into

[1] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

[2] According to its article 19, 'Plans for future Community measures' a revision of the WFD should take place in 2019.

[3] Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks.