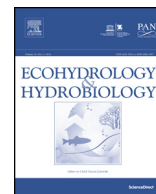




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Original Research Article

## Some operational advice for reducing hydraulic risk and for protecting biodiversity and the landscape in riparian areas – river corridor

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## ABSTRACT

This paper synthesizes, although within the limits of Italian planning perspective, the enormous opportunities emerging from the application of complex forms of knowledge for the benefit of water culture (especially in this period of significant climate changes) interdisciplinary/transdisciplinary for the purpose of stimulating proper cultural behaviors of the inhabitants in terms of water. The implementation of tools of participatory democracy, as set forth for example in the River Contracts, for governing the territory, soil, water, biodiversity, landscape and existing historical and architectural heritage, gives rise to awareness that the land is a common good. Even starting with minor land disputes, inhabitants and manufacturers regain the awareness of place and with this environmental understanding which is useful for overcoming, reducing and settling conflicts between different uses of resources – the common goods, starting with water. As an example, this paper sets out the synthesis of the ecohydrological results of the interdisciplinary and transdisciplinary research carried out to support preparations of the Environmental Plan for the Adige Park in the meander of the River Adige immediately downstream of the city of Verona, Italy. It aims to demonstrate how, through active participation of the population, the protection and renewal of the natural, cultural, historical – environmental – landscape qualities existing there as a whole, together with the sustainable management of the river flow for the protection of biodiversity and of the river's self-purifying capacity have been achieved.

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**1. Introduction: The status of Ecohydrology in the current planning practice in Italy**

It is unnecessary to remind how much aquatic environment influence and is influenced by the surrounding

territory, especially in the current phase characterized by noticeable climatic changes (U.N., 2015). Based on the statement that “rivers are the paths of civilization” (Gambino, 2005), the entire hydrological system (surface water, deep water, ground water and running water) is the foundation on which the history of human populations has been built since ancient times.

In the modern era, on the other hand, the land is addressed in transformation by various planning forms established by local, national and regional legislation. In

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Italy, each region has its own, specific legislative autonomy regarding urban planning as part of national legislation that just provides guidance often focused on collateral issues (measures regarding employment, improvement of productivity, streamlining of bureaucracy, etc.), that is, topics that only indirectly concern the territory/environment, but which encourage or discourage certain current urban planning practices steered, or otherwise, by decentralized local authorities. The examination of this subject calls for a very open discussion, which cannot be left to a single specialty or dealt with exhaustively in this note.

On the other hand, it is worthwhile to highlight an aspect more closely tied to Ecohydrology, that is, the scarce effectiveness of the knowledge base in ecological, natural and environmental matters. And more precisely: research and analysis, often undertaken painstakingly by specialists in various disciplines, have likewise not resulted in consistent and suitable planning. It is almost as if the talk has not managed to find comprehensible translations.

However, another problem arises which is as fundamental as the firstone: there is a failure in achieving suitable control a posteriori over the choices made with or without the consent of the affected populations; on the contrary, the commitment of those who want to put up a challenge is almost always to set up a new fact-finding process, as if that undertaken institutionally were by its nature incomprehensible or untruthful. This means a delay and economic cost, due to having to resubmit new studies.

On the other hand, it is desirable not just for planning decisions, but also preliminary analyses, to be known, disclosed and tied with all the disciplines pertaining to the planning. This means that the disclosure reports required by law under the SEA (Strategic Environmental Assessment Directive) (EC, 2014), the EIA (Environmental Impact Assessment Directive) (EC, 2001) and in application of art. 6.3 of the Habitat Directive (EC, 2007b; European Commission DG ENV, 2001), must not just be drafted in plain language, but also include all actual references and problems concerning the territory under examination.

There has been already some work undertaken to develop certain indices for the analysis and assessment of the natural state and quality of buffer strips of the river banks – riparian areas and for the assessment of the environmental landscape quality of river corridors (Braioni et al., 2001, 2002, 2005a,b, 2006a,b, 2008a,b, 2009, 2012a,b). This work is indispensable above all in this decade in which subject of climate change (IPCC, 2007; Parry et al., 2007) that affect the European continent (European Commission, 2003; Menzel et al., 2006; EC, 2007a) and the ever more frequent flash floods (APFM, 2006, 2007) are at the forefront of scientific and political agendas. Said objectives are the basis for sustainable planning (European Commission, 2012a) which must assure maintaining or allow for the achievement of quality objectives of water bodies, protection of biodiversity and river ecosystems, ensure water security (reducing/eliminating the risk of flooding) and specific characteristics of the fluvial landscape. All of this is required by the following provisions and guidelines: WFD 2000/60, Flood 2007/60, Habitat 92/43, Bird 2009/147 (EC, 2000, 2007a,b, 2009a, 2012a), European Landscape

Convention (Paour and Hitier, 1998), European Declaration for a New Water Culture, Zaragoza Charter (Zaragoza, 2008 in Ercolini, 2006, 2010). These regulations are all closely connected, not just as first reminded, to sustainable planning (Musco and Fregolent, 2014), but also to the new economic conception that attributes very high value to biodiversity and ecosystem services supported by it (European Commission, 2011, Sukhdev, 2008; Board of Millennium Ecosystem Assessment, 2005). The documents of the European Community also point in the same direction (<http://ec.europa.eu/environment/archives/water/adaptation/ecosystemstorage.htm>) in terms of environmental management of waters, biodiversity and ecosystem services, at the same time pointing out at the problem of invasion of the allochthonous species (E.C. Community, 2014). For example, the Blueprint to Safeguard Water Resources (European Commission, 2012b) reaffirms the need to integrate water objectives with other sectoral policies, and the new European agricultural policy proposes, among other actions, the restoration of riparian areas, wetlands and floodplains to contain the water, preserve biodiversity and soil fertility, to prevent floods and drought and, in short, promote “green infrastructures” as an alternative to traditional gray infrastructures.

Conversely, notwithstanding the high and detailed number of provisions, declarations and objectives, in the emotional aftermath immediately after a flood, the most requested and popular approaches to minimizing future flood damage are (1) the indiscriminate cleaning of the riverbeds, without an appropriate assessment of the landscape and ecological impacts, (2) the construction of new embankments forgetting: (a) the limits set out by the WFD, which states that the development of new physical modifications to water bodies, if such changes are expected to lead to a deterioration of the status of the water body, are allowed only under the condition set forth in 4.7.d of the WFD (European Commission DG ENV, 2011), (b) the negative assessment given in the white paper, “Adapting to climate change” (European Commission, 2009) to the presence of buildings in floodable areas, recalling that affirmed 40 years previously by McHarg (1969) in “Design with nature: working within nature’s capacity to absorb and/or control impact in urban and rural areas can be a more efficient way of adapting than simply focusing on physical infrastructures.”

This has given rise to the need to provide some operational and methodological observations to foster a different planning of approach taking account of the new culture of the territory, of the ecological status and of the multi-use of water, riparian areas and fluvial corridor.

**2. Complex forms of knowledge for a different culture of the territory**

Naturally, determining the boundaries of a river’s range entails extensive knowledge of the physical and human relations which have been brought about, consolidated or eliminated in the various historical and protohistorical eras. However, the complexity is even more evident if we consider that currently the focus should be the interpretation of future scenarios on the basis of different hypotheses

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