Nitrogen balance and Water contamination risk assessement – The Castelo de Bode watershed example

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Abstract

This paper proposes an innovative approach to risk evaluation and prevention to Water stress caused by nitrogen related pollutants contamination. It consists of a collaborative platform applied to a watershed management with an important role on drinking water supply in Portugal. A broad approach is taken integrating, development concerns and water resources allocation.
This example demonstrates the relevance of collaborative web based data management platforms for the assessment of Nitrogen contamination risk. They are crucial to promote collaboration between government and investors, combining the economic and preservation perspectives in a rational and knowledge-based way.

1. Collaborative platforms for Nitrogen balance and water contamination risk assessment

Water contamination, and consequently drinking water preservation, is crucial regarding sustainable development, ecosystems balance and, ultimately, human survival.

The existing legal framework regarding water resources management, environmental impact assessment and drinking water protection, intend to cover the increasing concerns with water resources preservation. The awareness for these problems is increasing along with water demand and recently a new regulation related to risk analysis has been published (EU Directive 2015/1787).
To properly address water resources preservation assuring, simultaneously, economic growth, the water resources allocation to different uses as to be addressed within the land use planning process. It has to consider the most important land uses and, as a consequence, the related intakes and discharges within each watershed. Also of concern are the different water uses and the associated quality and quantity requirements, their space and time distribution, and their priorities.

To address this difficult task the TerAGUA webGIS-based platform is used. This collaborative platform addresses and studies the area of the Castelo de Bode watershed. This watershed is part of the Tagus river watershed, one of the largest rivers in the Portuguese territory. The Castelo de Bode watershed is crucial for the supply of water to a significant part of the Portuguese population. By exploring the data in the TerAgua Platform, the Nitrogen balance is studied, taking into consideration all different human activities along with spatial and temporal water intakes.
This integrated webGIS collaborative platform includes topographic data, cadastre, land use plans, geo-statistics data, environmental quality data, namely water quality monitoring stations data and relevant legal framework.
The developed work explores in detail the relations between land use changes and water quality deterioration associated with nitrogen within the context of this watershed development. It demonstrates the possible relations that can be established between land use in the past decades and nitrogen induced water quality deterioration. It evaluates in particular the relations between forestry, agricultural and domestic use, and Nitrogen-related water quality parameters measurements.

It is crucial to decide water allocation to different activities, like recreation, energy production, forestry, life stock, or agriculture, always with the objective of preventing water stress caused by excess nitrogen.

The results show that the platform plays a relevant role in exploring and consistently understanding the balance and risk of nitrogen-related pollution covering time and space, being the watersheds the territorial unit to use in the study of contamination risk.

Keywords: water, land use, Nitrogen, risk assessement , information management.