

How ecosystems' shifts change the optimal groundwater management strategy

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Abstract (250 words)

The increasing pressure and overexploitation of water bodies in the recent decades are negatively affecting the quality and quantity of aquifers. Its deterioration is also having many negative impacts on numerous ecosystems connected with these water bodies, as is the case of groundwater-dependent ecosystems (GDEs). Therefore, the protection of groundwater resources and ecosystems are key elements in most of the international environmental policies. However, the absence of regulation in most of the aquifers worldwide, along with the non-inclusion of GDEs in groundwater management, is threatening the survival of numerous GDEs and the provision of the several goods and services that these ecosystems supplied to societies. The necessity of maintaining large water table levels and reductions in extractions was supported in a very recent study by Esteban and Dinar (2016). These authors showed the importance of considering GDEs in groundwater management using a linear and smooth ecosystem wealth function. This paper is a complementary analysis that considers the existence of abrupt shifts in ecosystems when general external conditions worsen. The aim is to assess how sudden shifts (with and without hysteresis) in GDEs could condition the optimal groundwater management strategy. The predictable water shortages and water deterioration due to climate change will required a better knowledge of the behavior of GDEs and its relationship with groundwater bodies.

Keywords: GDEs, groundwater management, ecosystems wealth functions, abrupt shifts, hysteresis.

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