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## **Pumping strategies towards sustainable use in a stressed aquifer: A case study at the Eastern Mancha Aquifer (Spain)**

**Vanessa A. Godoy** and Jaime Gómez-Hernández

Universitat Politècnica de València, Research Institute of Water and Environmental Engineering, Valencia, Spain  
(vaalde1@iiama.upv.es)

The aquifers that support irrigated agriculture are being depleted in many parts of the world. In Spain, the situation is not different, and 27% of its aquifers are in bad quantitative condition, mainly due to overexploitation related to agricultural activities. Although the most obvious solution to that problem is to reduce pumping, the quantitative impact of reduced pumping towards sustainable use of groundwater is anything but obvious. We have analyzed the response of the Eastern Mancha aquifer in Spain to pumping reduction scenarios to find ways to stabilize and, ideally, increase aquifer levels. We apply a water balance approach conceived by geologists at the Kansas Geological Survey, in which storage variation is obtained by subtracting pumping from net input, and a linear relationship is established between annual pumping and average water decline. This relationship can then be used to assess the reliability of the data, the sustainability of pumping, the targets of the ongoing management strategies, and the pumping reductions required to stabilize water levels. This method is applied to data coming from 36 wells measured annually from 2011 to 2020. Precipitation data from three stations are used to assess the consistency of groundwater abstraction data. Although we know that conceptually the relationship between the average water level change and the total pumping may not be necessarily linear, the results are coherent with the historical water use behavior for the area and show that the method is appropriate to evaluate the data. Negative values of water level change indicate that the aquifer was not in sustainable conditions most of the time. The results also show that groundwater pumping would need to be significantly reduced to achieve higher water levels. This work shows that measured data on water level changes and water use can provide rapid and valuable information on the condition of the Eastern Mancha aquifer, as well as its response to pumping reduction scenarios.

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