MANAGED AQUIFER RECHARGE: A NO-REGRET CLIMATE CHANGE ADAPTIVE MEASURE

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Two main approaches have characterised adaptation to climate change (CC) in the water resources sector. On the one hand, the top-down approach, in which measures are focused on the physical elements and are based on climatic models that often involve numerous assumptions and a high degree of uncertainty. On the other, the bottom-up approach responds to social vulnerability and focuses on historical and recent natural events, frequently disregarding the possible effects of CC. A sound bridge between both approaches are the "no-regret" adaptative measures. These methods are implemented to solve multiple challenges in the present and the future. Thus, adopting no-regret measures results in a "win-win" scenario, irrespectively of the actual unfolding of CC.

In respect to the methodology, this study aims to show that MAR technique can constitute a no-regret CC adaptive measure. To this end, we use the MAR demo site located in Los Arenales groundwater body (Spain) as an example. We show a series of challenges that the MAR sites in the study area are contributing to solve and some attributes that they have to tackle the expected impacts of CC. MAR in Los Arenales aquifer has resulted in i) the restoration of several wetlands, including one of unique geological interest; ii) the fixation of the rural population and the improvement in economic indexes, especially in El Carracillo; iii) an overall increase of groundwater levels, which are particularly significant when compared to Medina del Campo neighbouring groundwater body; v) a certain control on groundwater demand through the conformation of irrigation communities.

Regarding the results, in terms of proven attributes to adapt to climate change, Los Arenales demo site has shown that i) it can still be operable and enhance recharge, even if decreasing streamflow prevents the use of river water surpluses, as in the Alcazarén site, which relies specially on reclaimed water; ii) the considerable number of MAR channels (~50 km) and infiltration ponds (21) in the area represent additional storage to accommodate extreme precipitation events; iii) MAR can lower down the detrimental effects of drought on water availability, as shown through a comparison of standard precipitation indexes (SPI) and standard groundwater indexes (SGI) between Los Arenales and Medina del Campo groundwater bodies. We show that MAR is an effective no-regret and versatile water resources management tool, which provides solutions to several pressures at once. Furthermore,

this technology proves to be adequate in complex areas with hazard drivers that include socio-economic and climatic elements, as for instance, agricultural regions in special in developing countries.