

Abstract

Future climate, trends in population growth and land use changes are likely to exacerbate the risks associated with environmental and human water security in many parts of the world. For instance, the occurrence of drought events is increasing globally, as shown by recent major droughts in Europe and South Africa, which seriously jeopardized secure access to water resources, not only for human consumption and irrigation, but also for industrial uses and ecological functions. Therefore, there is an urgent need to devise methods to increase the resilience of water supply systems in the face of increasing drought risk. Within this context, groundwater is the most effective and scalable option to store water, being less affected by evaporation compared to surface reservoirs. Groundwater storage is even more important in arid and semi-arid regions as well as where swift reductions in snowfall and rainfall are occurring. Groundwater is also superior in terms of quality, being less exposed to contaminants than its surface counterpart, and benefitting from the role of active soils in retaining and degrading contaminants. However, over the last decades, land use changes (e.g., uncontrolled urbanization) and inefficient management have drastically decreased groundwater recharge fluxes, i.e., aquifers' replenishing input. In addition, increased groundwater withdrawals for drinking water supply and irrigation (which can account for up to 80% of total water uses), as well as diffuse pollution from intensive agricultural practices, are putting more and more pressure on aquifers worldwide.

The general objectives of AQUIGROW are to:

- I. quantify current recharge fluxes in several study aquifers used for irrigation and/or drinking water supply in Europe, Israel and South Africa;
- II. identify critical issues in the sustainable management of these aquifers, both in terms of water quantity and quality, related to current practices, planned land use changes and predicted climate change scenarios;
- III. develop numerical tools and management solutions to improve recharge fluxes and their quality, as to increase available groundwater storage and preserve its use especially in times of drought.

Project AQUIGROW will reach these goals by:

- I. providing stakeholders with advanced integrated surface-subsurface hydrological models (ISSHMs), incorporating main plant processes (biomass accumulation and water uptake) and complemented by anthropogenic process models (i.e., traditional and precision irrigation and land management practices) assisted by the latest Earth Observation data;
- II. testing and deploying managed aquifer recharge (MAR) techniques, including unconventional soil aquifer treatment (SAT), in several pilot sites representative of European, Middle East and African landscapes, to investigate their sustainability in terms of water quantity and quality;
- III. identify and assess barriers related to social and cultural acceptance of MAR and SAT and to policy regulatory frameworks and propose ways to overcome them.

The overarching scope of AQUIGROW is to solve primary water-related threats to human and aquatic ecosystem security in the whole range of climates (from arid to semi-humid) included in our test sites and to co-develop approaches for improved water resources management in the future. Our driving principle is the joint management of blue (i.e., water of aquifers, lakes, and rivers) and green water (i.e., soil moisture) resources for identifying and solving critical issues related to hydrological, agricultural, socio-economic and ecological droughts, resulting in a joint framework that can ultimately allow for satisfying the multiple demands of quality water for water abstractions, environmental flows and crop water requirements. The lasting impacts of AQUIGROW will be beneficial to several stakeholders (e.g., water utility companies, irrigation authorities, farmers), with obvious and ultimate benefits for the general public at large.



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- INSTITUT NATIONAL DE RECHERCHE POUR L'AGRICULTURE, L'ALIMENTATION ET L'ENVIRONNEMENT - FRANCE
- POLITECHNIKA GDANSKA - POLAND
- STELLENBOSCH UNIVERSITY - SOUTH AFRICA
- TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY - ISRAEL

► Funding organisations

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Irrigation management

KEYWORDS