Conjunctive use of surface and groundwater

Challenge: Too little water **Adaptation response:** Water augmentation

Description

Conjunctive use of surface and groundwater refers to the combined use and development of surface water and groundwater as a strategy for climate change adaptation, or sustainable resource use in general. Conjunctive use strategies aim to increase the overall resilience of water supply by utilizing both sources of water, particularly in communities and basins with high water availability throughout the seasons. It often focuses on the advantageous role of groundwater for water storage, distribution and treatment (through biological processes) in not only increasing water supply, but also improving water quality and distribution.

Implementation

Examples of conjunctive use and development application include maximizing surface water use in high flow periods while allowing groundwater to remain in storage, and drawing on groundwater resources during dry season to maintain steady supply. Using groundwater as a 'buffer' to bridge the dry season (but also to prevent waterlogging and salinization) is a very common characteristic of conjunctive use. Conjunctive use can also draw on surface water flows as a way to minimize groundwater table depletion and salinization. This approach aims to maintain an overall water balance between groundwater recharge and surface water recovery.

An important aspect of well-managed conjunctive use is continued monitoring of the quantity and quality of both water sources and water extraction rates, as well as meteorological forecasts to help managers adjust responses in time. This may also require information inputs from stakeholders, for example through extraction rate reporting. Local hydrological, meteorological and geophysical characteristics (such as underground storage availability, production and natural recharge capacity, etc.) inform analysis of the best methods for conjunctive use, along with necessary staff training. Communities and authorities with sufficient resources may also choose to employ more sophisticated hydrological models and decision support systems to identify and inform the most beneficial methods under various hydrological scenarios.

In areas where conjunctive use is new or not a formalized approach, policies and institutional frameworks (for water restrictions) may have to be established to ensure balanced and coordinated use.

Environmental Benefits

- Avoids aquifer and surface source over-extraction and degradation, and supports a more natural water balance where both groundwater recharge and surface water recovery is possible.
- Reduces risks of waterlogging and salinization.

Socioeconomic Benefits

- Increases water security and supply stability, even in locations with high inter-seasonal water variability.
- Increases water availability.
- Reduces agricultural losses from interruptions in irrigation, and improves food security.

Opportunities and Barriers

Opportunities:

- Improves sustainability of surface and groundwater management, while still meeting water demands
- Low environmental impact, and provides several socio-economic benefits
- Implemented at the local level, with direct benefits to the community.

Barriers:

- A high degree of coordination between water-users is required to ensure benefits are maintained and over-exploitation is avoided
- A sufficient level of data on both water sources is required
- It can be challenge to monitor illegal or unregistered groundwater use on private grounds (for example private wells) that may impact groundwater availability, regardless of management plans
- Responsibility for surface and groundwater resources may lie with different authorities, or even in different administrative boundaries.

Implementation considerations*

Technological maturity:	5
Initial investment:	2-3
Operational costs:	1-2
Implementation timeframe:	2-4

* This adaptation technology brief includes a general assessment of four dimensions relating to implementation of the technology. It represents an indicative assessment scale of 1-5 as follows:
Technological maturity: 1 - in early stages of research and development, to 5 – fully mature and widely used
Initial investment: 1 – very low cost, to 5 – very high cost investment needed to implement technology
Operational costs: 1 – very low/no cost, to 5 – very high costs of operation and maintenance
Implementation timeframe: 1 – very quick to implement and reach desired capacity, to 5 – significant time investments needed to establish and/or reach full capacity
This assessment is to be used as an indication only and is to be seen as relative to the other technologies included in this guide. More specific costs and timelines are to be identified as relevant for the specific technology and geography.

Sources and further information

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