Groundwater prospecting and extraction

Challenge: Too little water **Adaptation response:** Alternative water sources

Description

Groundwater prospecting involves various methods to locate suitable quality and quantity groundwater for extraction. Groundwater prospecting and extraction can both be part of general water resource management strategies to increase supply, or respond to climate change induced water scarcity or variability. Prospecting and extraction methods depend on the desired water quality and its final utilization, and can include hydrogeological investigations, geophysical surveys, remote sensing assessments, and the more simple method of investigating already existing well sites in the area and their depths and characteristics.

Implementation

New site prospecting might include geological, meteorological, hydrogeological and hydro-chemical site analysis, along with an analysis of existing well sites in the area. These analyses in particular look at remote sensing data from satellites that provides planners with information on geophysical conditions that can be linked to Geographical Information Systems (GIS) to map and identify potential prospecting zones. The information may be supplemented with an analysis of existing groundwater-related regulations, plans and conservation acts.

Test drilling sites can be built to assess water quality and quantity and identify appropriate extraction points, particularly for the construction of larger wells. In many countries, special permits, prior notification or other types of applications are required for permission to extract and utilize groundwater for private or commercial purposes. Permits may also include restrictions on extraction volumes.

Various groundwater models can be utilized to improve long-term management, for example to better understand the effects on water quality and quantity at various pumping rates, or to assess potential interference with other wells. In general, groundwater sites intended for large scale extraction over longer periods of time would require more complex prospecting and modelling assessment approaches. For smaller household use, location and extraction models can be relatively simple.

Testing for water quality is often required – both to ensure suitable quality of the extracted resources, and monitor and limit pollution contamination of the drilling. Wells or boreholes are built at those sites that have suitable water quality and are not at risk of contamination.

Environmental Benefits

- Alleviates pressures on existing surface or ground water sources, and avoids their degradation.

Socioeconomic Benefits

- Increases water supply and water security in communities with limited freshwater availability.
- Minimizes need for water treatment.

Opportunities and Barriers

<u>Opportunities:</u>

- Technological advances are making it easier and more cost-effective to identify groundwater prospecting zones
- Integrated surface and groundwater use increases sustainability and resilience of the water supply.

Barriers:

- Requires a good overview of existing wells and boreholes, which can be difficult to obtain as many are done on an ad-hoc basis or without acquiring the necessary permissions
- Poor extraction coordination for multiple wells can lead to water table depletion and salinization
- In many countries, data needed for aquifer prospecting and extraction is insufficient or of poor quality.

Implementation considerations*

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

* 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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