Managed aquifer recharge (MAR)

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

Description

Managed aquifer recharge (MAR) is a water management approach that can be used to maximize natural storage and increase water supply system resilience during periods of low flows and high seasonal variability. During these periods, such as in the dry season, aquifers are intentionally recharged to recover water. A *managed* recharge implies that the recharge process is controlled and ensures health and environmental risks are minimized. MAR is a vital adaptation opportunity for developing countries coping with water variability and shortages.

Implementation

Methods of recharge include either modifying the landscape or building new infrastructure, for example through injection wells or various landscape design infiltration structures. Some include open structures, such as open ponds, soil aquifer treatment facilities (similar to ponds, but using reclaimed water), and trenches. Other types include dams to control water flow that promote aquifer recharge (e.g. sub-surface dams and sand dams). Direct injection is also employed, particularly in deep confined aquifers, using water from other wells (for example, for seasonal water supply regulation). The chosen methods should help to reduce the costs of transporting and storing water, as well as losses associated with evaporation during the recharge process.

Water sources for recharge can differ. Commonly used types include surface water, stormwater and treated wastewater. Other water sources, such as water from other aquifers or desalinated water, can also be used. The water must be of adequate quality and should not compromise the quality of existing aquifer resources. Some pre-treatment may therefore be needed before recharge.

Environmental Benefits

- Maintains healthy environmental flows and reduces the risk of water source over-extraction and degradation.
- Sustains groundwater dependent ecosystems, such as wetlands.
- Reduces risks of saltwater intrusion and land subsidence.
- Improves water quality through the infiltration process.

Socioeconomic Benefits

- Increases water supply system resiliency.
- Reduces potential water losses from evaporation.
- Creates potential for productive use of alternative water sources, such as recycled wastewater and stormwater runoff.
- Increases freshwater supply for activities and household use.

Opportunities and Barriers

Opportunities:

- Flexible technology that can be applied at various scales and for various purposes

- Many low cost water recharge approaches are available, for example simple constructions such as trenches and pits.

Barriers:

- Cannot be used to alleviate acute water scarcity over extended periods of time, and only available where excess water is available
- Is not suited for all aquifer types at all geographies.

Implementation considerations*

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

* 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

AKVOPEDIA (2014), Managed Aquifer Recharge (MAR), http://akvopedia.org/wiki/Managed_Aquifer_Recharge_(MAR)

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