MAINSTREAMING MAR IN BANGLADESH

APPLICATION OF MAR IN THE COASTAL BELT

SEPTEMBER 2017

ACACIAWATER

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Although Bangladesh has made an impressive progress with regards to its' economic growth, it remains a country with low social and economic development. As Bangladesh is one of the most vulnerable delta countries towards climate change the sea level rise and intensification of extreme weather phenomena such as cyclones challenge the vulnerability of the coastal belt. Especially the availability of good quality drinking water is a problem in coastal belt in which poverty is existing already.

In response to these environmental, water quality and social risks, Dhaka University, UNICEF, DPHE and Acacia Water piloted Managed Aquifer Recharge between 2009 and 2015. The aim was to test the applicability of MAR in the coastal and arsenic prone areas. The pilots indicated that MAR is an appropriate technology for water supply provision in Bangladesh in coastal areas with a high potential for upscaling and replication.

Why MAR?

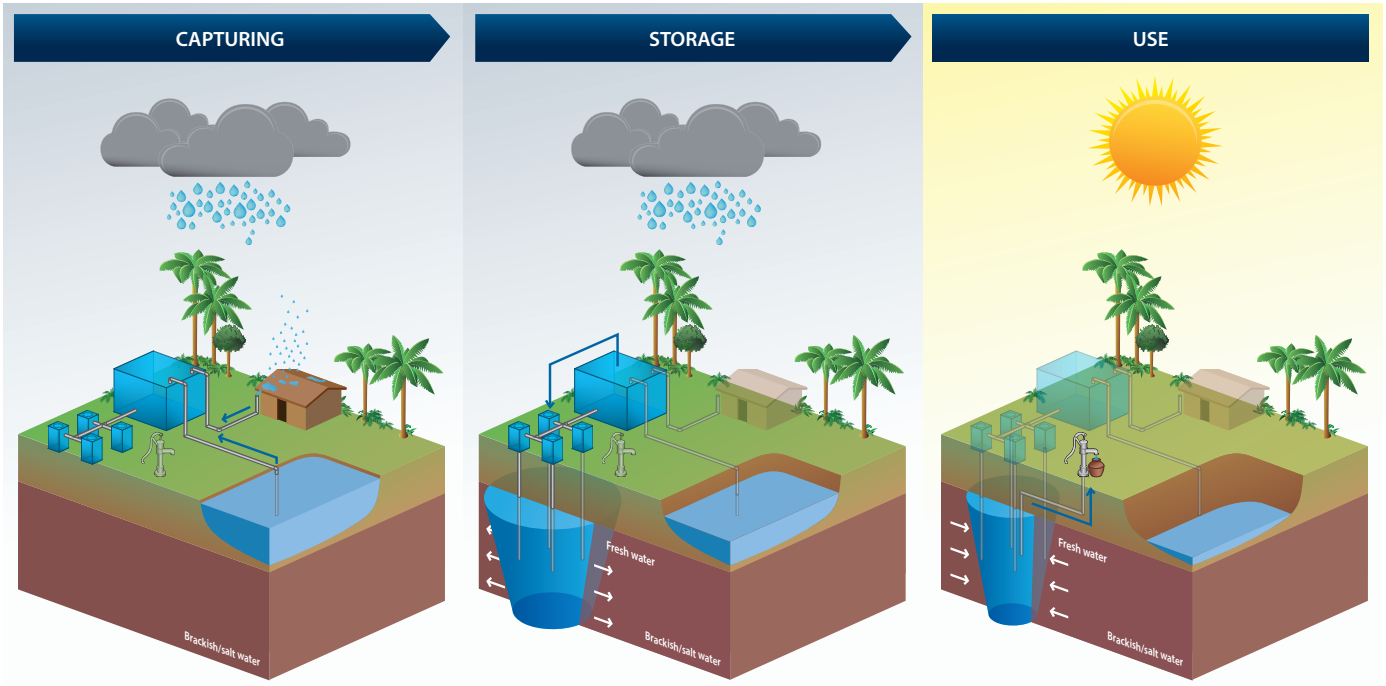
In cases there are no other water supply options available such als shallow or deep tubewells, reversed osmoses and rapid sand filters, MAR is built to store water during the season monsoon rains.

Especially deltas which are pressured by expanding populations, growing economies and which suffer salinization MAR is an promossing opportunity to provide year round fresh water.

How MAR?

A pond is linked to a sand filter and infiltration wells, where it gravitationally infiltrates rainwater under the clay layer. Underground the water creates a fresh water bubble which stays intact because the water mixes only at its very edges with the surrounding saline water. When fresh water is required it can be abstracted from the bubble with a hand pump. The MAR system is thus making safe water available when it is required.

This practice is an excellent option to capture fresh water and store it underground, where it is protected from pollution and is further purified as it flows through the aquifer.



Lessons learned and challenges

The concept of underground fresh water storage in a saline environment has been applied in the coastal belt and proofed its´ success. The most important lessons learned and challenges are:

1. Physical pre-conditions

The storage has to be implemented there where groundwater is originally brackish. A clayey layer has to be present above the aquifer. In order to maintain the fresh water at the right place, the groundwater flow not has to be too strong. Next to these geological pre-conitions, a fresh water pond has to be present at the location to provide the infiltration water.

2. Evaluation rural and urban MAR

The MAR schemes are applied small scale, which showed its´ potential for replication and creating a sustainable water supply for peri-urban and maybe even urban areas.

The main advantage of peri-urban application is the size of the schemes which allows larger amounts of water to infiltrate at a more efficient rate. The approach is both in line with local habits of groundwater abstraction for drinking and national policy to ensure sustainable and safe fresh water for all sectors.

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3. Ownership and management

In the MAR-UNICEF project different management and ownership structures are being explored. Smart planning of the MAR management system allows to reduce operation and maintenance costs. Various ownership models are explored and prooved to be applicable. For every site the pre-conditions have to be assessed to explore the practical implications needed for defining the ownership and management structure .

4. Financial pre-conditions and comparative advantage to common water supply options

Sustainability of the MAR system goes hand in hand with daily operation and maintenance. Feasibility improves when operation and maintenance is conducted in a sustainable manner and in which consumption of MAR water is financially compensated.

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The table below compares the water supply options, the costs of the installation and the costs which has to be paid for the water to sustain daily operation and maintenance.

MAR systems provide numerous advantages compared to traditional water supply options which make them attractive solutions for safe water supply. The main comparative advantages of MAR are:

- Making use of the yearly abundance of monsoon water for later times of scarcity.
- Improved water quality and reduced health risks because the water is buffered and thereby filtered underground.
- The schemes are disaster resilient because the water storage is underground and thereby protected from flooding and other storm surges.

Water Supply Options	Installation costs (tk)	Supply Capapcity (L/day)	Cost of Water	Remarks
MAR	650.000 - 750.000	5000	0.10 taka/L	Disaster resilient Safe for drinking O&M is easy and inexpensive Round the year availability
RO	6000 - 27500000	1000	0.5 - 2.50 taka/L	Can be affected by disaster Safe for drinking Maintenance is expensive Round the year availability
RWH	6000-300000	Depends on storage tank	NA	Can be affected by disaster Not safe if stored for longer period Not available round the year
PSF	100000	4000	Almost free	Can be affected by disaster Safe for drinking (if properly maintained) O&M is easy and inexpensive Availability depends on pond water

Next steps for successful upscaling

Succesful upscaling of MAR in Bangladesh focusses on two specific points of interest, first is the new system design for peri-urban MAR which has to be developed. Second is the continuation of the small scale schemes for community supply.

A new, large scale, system design for MAR in per-urban and urban areas would be more sufficient to operate and maintain. Economies of scale ensure that one big system is more efficient to operate than 10 small scale schemes. Upscaling in size provide more options for water quality control and service level provision like piped water scheme as well.

As MAR schemes are different from other water supply options, the system requires extra provision and resources for operation and maintenance. Besides a well trained care taker and technical supervisor, a constant source of financial resources is needed. The moment MAR is adopted as a water supply option the finances for operation and maintenance must be taken into account immediately.

However MAR requires a different approach than the mainstream water supply options, the advantages in terms of water quality and continued water supply in the saline deltas are worth the investment and provides efficient opportunities for the future.

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