WASH Field Note FN/47/2020

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Community Involvement in Promoting Groundwater Recharge Through Managed Aquifer Recharge (MAR) Approach – A Pilot Experience in Jaffna, Sri Lanka

SUMMARY

In December 2017, the European Union Catalytic Support to Peace Building (EU-CSPB) Programme supported the rollout of a peacebuilding plan led by the Government of Sri Lanka and other partners. This programme supported a managed aquifer recharge (MAR) strategy in Jaffna to encourage the resettlement of communities after years of internal conflict.

To pilot a MAR feasibility study in Jaffna, UNICEF partnered with the local Government in Jaffna, the National Water Supply and Drainage Board (NWS&DB), the Irrigation Department, and the NGO OfERR-Ceylon. This rainwater harvesting approach was carried out by local communities, encouraging water conservation, water efficiency and local level efforts to promote ground water recharge. Local stakeholders and community members were trained in MAR and UNICEF supported the construction of 120 water recharge pits benefitting 12 Grama Niladhari (GN) divisions (the smallest administrative unit of the country).

The MAR initiative was well-received by both local communities and government. The next phase will include MAR rollout and improving the MAR systems available.

Introduction

The Jaffna Peninsula is unlike any other part of the island of Sri Lanka. There are no streams or rivers in the region, limiting the natural water resources present and potential to create water reservoirs.

Yet, there is groundwater within the cavities of the limestone foundations originating from rainfall. A highly 'karstified' Miocene sedimentary limestone formation is found at a shallow depth in most of the area. A dense network of interconnected caverns, fractures and fissures in the limestone aquifer has created the most highly-productive aquifer in the region. This aquifer is fragile, however, and needs to be managed with care.

Today, the lack of fresh groundwater in Jaffna is primarily due to the depletion of groundwater levels, lack of rainfall, and changes in rainfall patterns over time. Deforestation and land development have also exacerbated the reduced recharging of groundwater and intrusion of salt water.

In December 2017, the European Union Catalytic Support to Peace Building (EU-CSPB) Programme supported the rollout of a peacebuilding priority plan led by the Government of Sri Lanka and other partners. This programme supported the MAR approach in Jaffna to encourage the resettlement of communities after years of internal conflict.

KEY POINTS

1. Communities in Jaffna are clearly concerned about their access to water. They are motivated and willing to invest resources to improve the quantity and quality of their water.

2. The cost of existing MAR options can be reduced by using locally available, low-cost materials such as charcoal, kabock (sand stones), bricks and chips. Using locally-sourced materials would reduce MAR systems' costs and ensure wider MAR adoption.

3. A technical study should be carried out to properly assess ground-water levels and monitor how the MAR approach at household level affects water levels in Jaffna.

Implemented with the support of UNICEF, OfERR Ceylon, as well as local communities, the MAR initiative aims to meet the returning populations' need for safe water.

After more than 30 years of displacement, populations of 12 GN divisions (the smallest administrative unit of the country) have been resettling since 2015. In the past, most people in these areas were engaged either in farming or fishing for their livelihoods. After returning to their land, the displaced populations wished to resume farming with the high-powered water pumps, seeds, plants, and other items they had been provided.

Though there has not been a significant decrease in the total population in Jaffna, the demand for water for agricultural and domestic purposes has increased. Water is required primarily for agriculture, in particular Other Field Crops (OFC). For this purpose, farmers rely on groundwater, through pumping which largely contributes to groundwater depletion. All of this puts tremendous pressure on water suppliers and other relevant stakeholders to fulfil the water demand.

A practical way to save water and meet increased demand is through recharging ground water. Managed Aquifer Recharge (MAR) is a significant adaptation opportunity to increase resilience to climate change and reduce hydrological vulnerability.

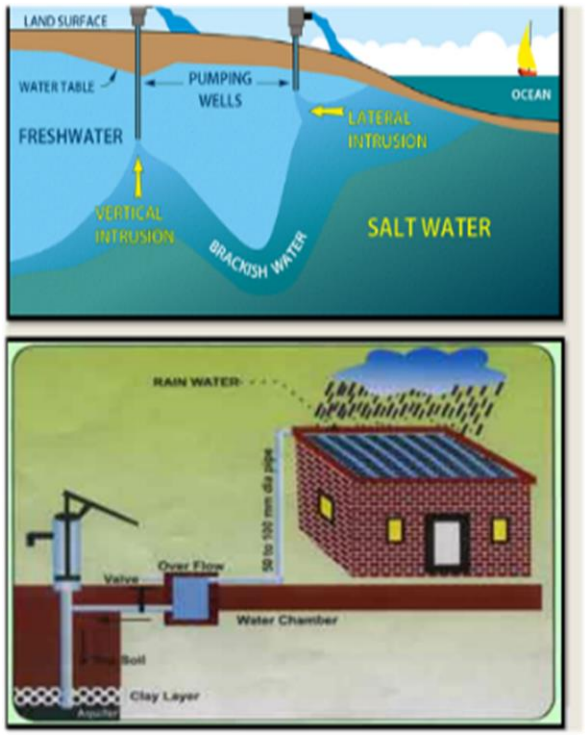
This Field Note outlines how UNICEF Sri Lanka, supported by a variety of partners (including bilateral, multilateral, government and local actors), developed and implemented a MAR pilot approach in 12 GN divisions in the Jaffna region.

Description of Intervention

The MAR pilot initiative aimed to sensitize local actors on the importance of using water efficiently for domestic and agricultural purposes as well as replenishing ground water. The pilot programme encouraged government stakeholders, civil society organisations, adolescents, and school children to use groundwater recharging methods in 12 GN divisions in the Jaffna region.

The pilot took place in several phases, including

Figure 1: Managed Aquafer Recharge systems.



fact-finding, research, materials development and implementation phases.

Research findings were used to develop training materials. MAR advocacy tools were created with the participation of staff members from the Irrigation Department and the National Water Supply and Drainage Board.

In total 30 training sessions were held, with 30 participants in each session, engaged a total of 900 local engineers, geologists, and community members. Trainings were carried out by the national NGO OfERR Ceylon. Pre and postsurveys assessed awareness of the relevant topics before and after the trainings.

A number of initiatives sought to encourage participation of the local community:

1. **House to house visits** emphasized the importance of groundwater recharging and proposed low-cost options for implementation;
2. **Children's clubs** were formed at the village level to facilitate peer to peer education about water scarcity, the sustainable use of water, MAR, and to help rollout the MAR pilot;
3. **Communication banners** were displayed in various public gathering places to reinforce MAR messages;
4. **Several short films** were created to showcase the importance of MAR at the regional level. Additionally, the Ministry of Education filmed the training session and made it available on YouTube.
5. **Local government and civil society** carried out promotional activities to build knowledge and capacity amongst technical partners and communities;
6. **Sri Lanka celebrated World Water Day 2018** with the theme 'The answer is nature'. This campaign was used to highlight the importance of water as a natural resource that needed to be conserved and protected.

For the pilot programme, UNICEF, local government engineers and technical officers provided technical support while UNICEF partnered with the CSO OfERR to provide materials and skilled labor costs (approximately USD 350 per unit). Households contributed unskilled labor (at an estimated cost of USD 20). Cost estimates were shared (which included materials, skilled labor, and unskilled labor costs) and all were informed that operations and maintenance needs (estimated for at least once a year) could incur additional costs.

Two aquifer water recharging systems were proposed to households. Community members could select the system most appropriate for their household. The two options were:

Option One: Roof Water Recharge Pit

In this option, the shape and slope of the house's roof enables rainwater harvesting. The rainwater is

then directed through basic filtering (layers of large stones, small stones, sand and charcoal) into a closed recharge pit. The recharge pit can be close to the dug well (if it is close to the household) or close to the household (if the dug well is not available or located too far from the property). Recharge pits are recommended to be at least 15 meters (50 feet) away from household latrines.

Option Two: Agro-wells/abandoned dug wells

Agro-wells are defined as wells used for agricultural purposes. They are typically shallow with a large diameter. The purpose of an agro-well is to collect runoff /storm water during the rainy season for agricultural use.

Outcomes

Research conducted with national and international partners confirmed that there are sufficient quantities of groundwater stored in local aquifers and that the geology of Jaffna is suitable for managed aquifer recharge. Four main themes from this research (see Table 1) informed that the local authorities' advocacy trainings materials used were adequate to ensure that community members understood the importance of the ground water recharge approach.

Tests held before and after trainings on key MAR issues demonstrated that the trainings had a major impact. The trainings increased knowledge on a wide range of water-related topics from 26 to 38 per cent. In fact, before the training understanding on these topics ranged from 40 to 56 per cent but increased to 78 to 84 per cent after the training. More results from these tests are presented in Table 2.

During the MAR pilot in 12 GN divisions in Jaffna, 120 roof-water recharge pits were implemented. This benefitted more than 500 community members and led to five million liters of water being recharged into the ground water in 2018.

Overall, households benefitting from the roof-water recharge pits were convinced of their value.

Table 1: Themes Used to Develop Advocacy Programme

Themes	Content
Global water challenges	• Scarce fresh water reserves, • Threats to fresh water resources, • Population distribution and water resources, • The higher-usage patterns of water by high-income versus middle and low-income countries, • Problems related to water shortages, • Natural and man-made disasters leading to flooding and droughts.
Water resources present in the Jaffna Peninsula	• Rain-fall patterns, • Freshwater aquifers, • Aquifer potential from limestones and sand dunes, • Surface water sources, • Local geology, • Water lenses, • Local surface topography and contour, • Efficient agricultural and domestic freshwater usage habits during dry and wet seasons, • No local rivers in local landscape.
Critical water issues for the Jaffna Peninsula	***Quality-related:*** • Sea water intrusion/excessive pumping, • Coral extraction and sand mining, • Chemical pollution due to excessive agrochemical use, • Faecal contamination/lack of sewage systems and poor structural designs, • Inappropriate waste oil disposal. ***Quantity-related:*** • Excessive extraction and irrigation, • Lack of practices/technologies for wastewater reuse/rainwater harvesting, • Water wastage (leaks and overuse), • Urbanisation/non-porous infrastructures reducing water recharge, • Sand and limestone mining, • Lack of regulatory mechanisms/ technologies.
Techniques to improve the management of water and sanitation services	• Controlling deep & point-source pumping, • Limiting agrichemical introductions, • Improving the safety of managed water & sanitation systems, • Drip & sprinkler irrigation, • Live fencing to protect water sources, • Rehabilitating irrigation reservoirs, • De-silting to foster groundwater recharge, • Controlling limestone & sand mining, • Encouraging rainwater harvesting, • Integrated water resources management, • Tree-planting programmes.

Table 2: The impact of trainings on participants' awareness on key MAR issues

Parameters	Pre-training	Post training	Change
Knowledge on water resources in the world	49.5%	78.2%	**+28.7%**
Knowledge on water resource problems in the world	49.7%	79.5%	**+29.8%**
Knowledge on water resources in Jaffna	56.2%	82.7%	**+26.5%**
Knowledge on rainfall and fresh water sources in Jaffna	53.2%	80.3%	**+27.1%**
Knowledge on water problems expected in Jaffna	53%	84.3%	**+31.3%**
Knowledge on rainwater recharging	40.9%	79.2%	**+38.3%**
Understanding the importance of rainwater recharging in your location	51.5%	79.5%	**+28%**
Awareness of accessing water throughout the year from rainwater recharging	46.5%	84.5%	**+38%**
Understanding of avoiding drought through rainwater recharging	48.2%	82%	**+33.8%**
Confidence in avoiding floods through rainwater harvesting	49.2%	82.2%	**+33%**
Awareness of reducing water salinity through rainwater recharging	50.6%	80.2%	**+29.6%**
Awareness on reducing inorganic attribute of water	48.6%	83.7%	**+35.1%**
Understanding that rainwater doesn't harm the walls of the wells	44.3%	80.8%	**+36.5%**

Discussions with beneficiaries revealed that they believed replenishing the aquifers was a worthwhile long-term investment for the community.

Agro-wells were also introduced to farmers. Many were initially hesitant to invest in agro-wells as they feared stagnant water may increase the mosquito population. OfERR Ceylon supported the construction of seven demonstration agro-wells to encourage farmers to consider this option.

In support of the MAR pilot, many households have planted trees and plants in their garden and are watering them with domestic wastewater. Some interviewed for this study claim that they have already seen benefits, mainly related to the increased level of water in open dug wells.

The MAR initiative also resulted in community-led conservation initiatives. For example, plastic water bottles and canisters were used to recuperate water and water plants. Additionally, households started organic gardening to avoid ground water pollution.

Figure 2: Examples of water conservation in Jaffna Province

Significantly, the Governor of the Northern Province (which includes Jaffna) became interested and involved in MAR. The local government installed a MAR system on its premises to be used in case of water shortages (using bowers to carry water to households in case of difficulty). Moreover, the local government in Jaffna has drafted a by-law that would require all

newly constructed buildings over 1,524 meters square (5,000 feet square) to integrate MAR systems in their design.

Lessons Learned

The following are lessons learned from the MAR pilot study in Jaffna:

- When the community and local government received adequate information on the pilot, the study was well accepted by these actors. Trainings successfully increased knowledge on a wide range of water-related topics.

- The process would have benefitted from having data on MAR in Jaffna prior to the pilot in order to help carry out evidence-based advocacy.

- The local authority has emphasized the need for households and communities to adhere to local water conservation and environmental protection policies (such as the Environment Act, Catchment Protection Act, and Water Quality Surveillance Act).

- Resettling communities, like those in Jaffna, are confronted with a number of issues and challenges. Access to water is one, but competes with other priorities. MAR rollout in resettling communities much recognize this and provide clear information as well as affordable and safe MAR options.

- Using locally-sourced materials would reduce MAR systems' costs and ensure wider MAR adoption.

- Communities in Jaffna are clearly concerned about their access to water. They are motivated and willing to invest resources to improve the quantity and quality of their water. This was demonstrated by their use of recycled receptacles to harvest water and organic gardening to avoid ground water pollution.

- Tree planting would help with ground water recharging as it would avoid runoff and improve underground water retention.

Next Steps

After the successful implementation of the MAR pilot in Jaffna, the following next steps were identified:

- **Conduct a study on MAR potential in Jaffna** (including hydrological, geological, economic and sociological dimensions). Such a study could provide evidence supporting the effectiveness of MAR systems to local government and communities. This study should look at water efficiency, ground-water level monitoring, and agro-wells which will be important for resettling communities.

- **Increase engagement with farmers in Jaffna** to assist in finding local solutions to challenges they face. More specifically, increased expertise is needed to further develop agro-wells for agricultural purposes as well as advocacy messaging with key audiences. The Department of Agriculture is monitoring agro-well water tables and assessing the models for future advocacy of this option.

- **Investigate locally-sourcing filtering materials** for MAR systems and testing how these locally-sourced filtering materials perform on improving water quality.

- **Develop demand-driven, evidence-based approaches** with local authorities to promote the use of water recharge pits at household and institutional levels.

- **Advocate for new water conservation and water recharging activities** such as tree planting in MAR advocacy programs.

- **Establish a mechanism to monitor ground-water level changes** and the quality of filtered

water (with different filter media) including quantity, biological quality, and salinity.

- **Continue work and advocacy with local government.** While the local government has shown clear interest in MAR's potential in the Jaffna Peninsula, continued engagement will be needed to ensure MAR (and other water access measures) is rolled-out throughout the province. Advocacy will also be needed to develop by-laws to ensure the long-term sustainability of MAR activities.

- **Connect efforts** with the Ministries of City Planning, Water Supply and Higher Education to advocate for resource allocation.

- **Develop a MAR strategy paper** for the Jaffna Peninsula.

- **Develop key criteria** (based on annual rainfall in comparison to roof size) given the fact that the local government in Jaffna has determined that all dwellings with roofs over 305 m^2 will be financially responsible for MAR installation.

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About the Authors

Nilusha Patabendi,
WASH Specialist, UNICEF, Sri Lanka

Radika Sivakumaran,
Child Survival and Development Officer, UNICEF

For more information contact:

Safina Abdulloeva,
Child Survival & Development Manager, UNICEF, Sri Lanka
sabdulloeva@unicef.org

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United Nations Children's Fund
3 United Nations Plaza, New York, NY 10017, USA
For more information, please contact: WASH@unicef.org

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