

A MAR test facility in China

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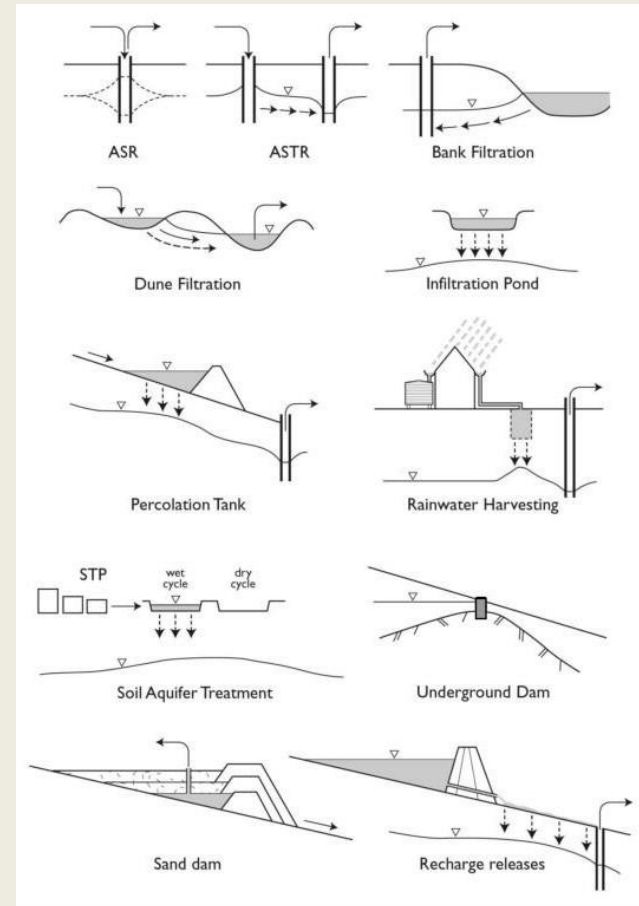
Geological Survey of Denmark and Greenland
Ministry of Climate and Energy

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Workshop on MAR in China,
Embassy of the Kingdom of Denmark, 22 March 2021

Overall aim of MARTEF

It is proposed to establish a Managed Aquifer Recharge (MAR) Test Facility (MARTEF) in China with the overall aim to promote research and innovation partnerships between Chinese and international water specialist and practitioners and thereby to contribute to a **wider use of MAR** in China.



Why MAR

MAR is basically using nature's own capacity for solving the challenges of water scarcity and seasonal precipitation asymmetry with rather simple technology where a water source otherwise unusable or wasted – or sometimes even causing adverse effects – is turned into a drinking water source by different measures. MAR is thereby offering a true **nature-based solution (NsB)** to both rural and urban communities to solve a number of problems in areas with water scarcity or water stress.

Specific objectives of MAR

The objectives of MAR is to:

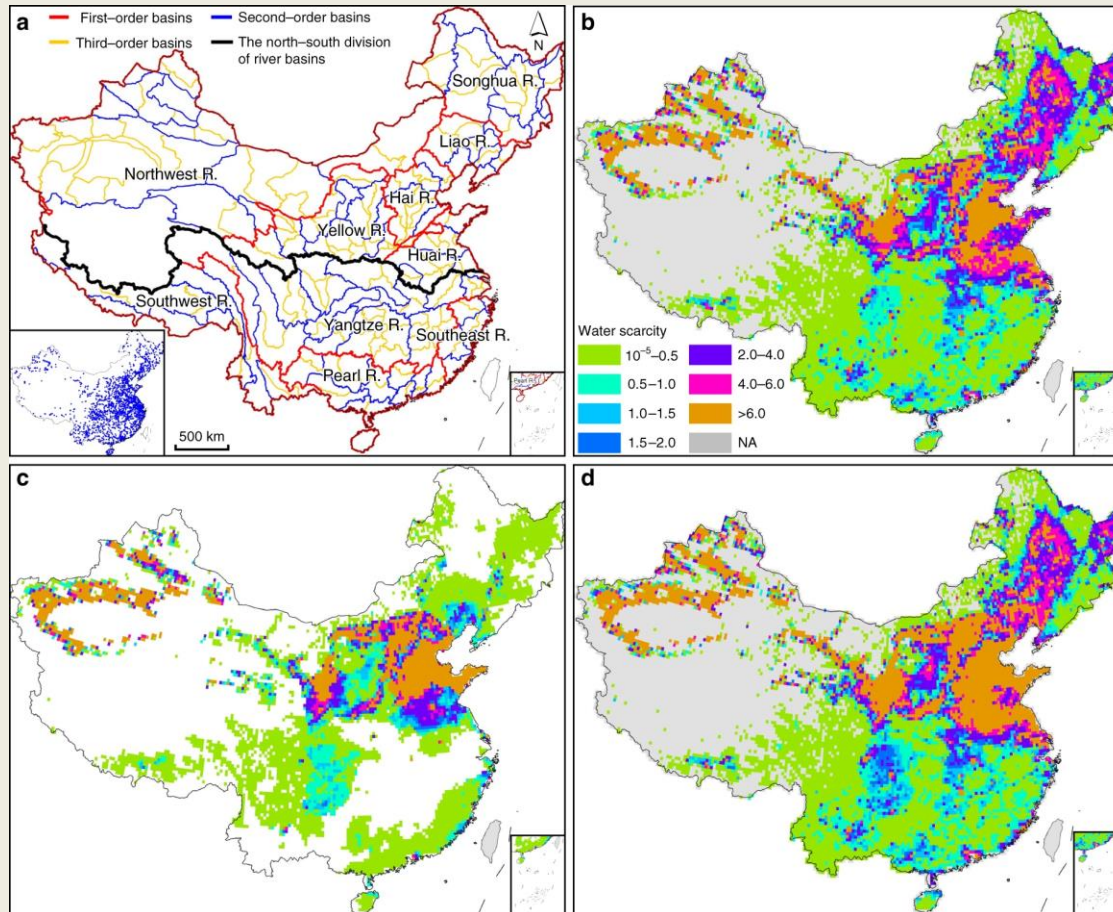
- counteract water scarcity and water stress due to seasonal precipitation asymmetry by saving rainwater through underground storage and by upgrading/treating other water sources for drinking water purposes
- counteract soil subsidence by adjusting/restoring groundwater table
- Counteract flooding
- ensure enough water for multiple users (domestic, agri-culture, industry) in water-stressed areas
- restore ecosystems in areas with groundwater dependent ecosystems (GDE)
- Prevent saltwater intrusion in coastal areas

Why expand use of MAR in China

China is among the countries with very low percentage of water from MAR contributing to groundwater abstracted for water supply (0,1 %) compared to Australia (8,3 %), Spain (6,7 %) and the Netherlands (16,4 %), although China contributes with nearly 12 % of the global use of groundwater.

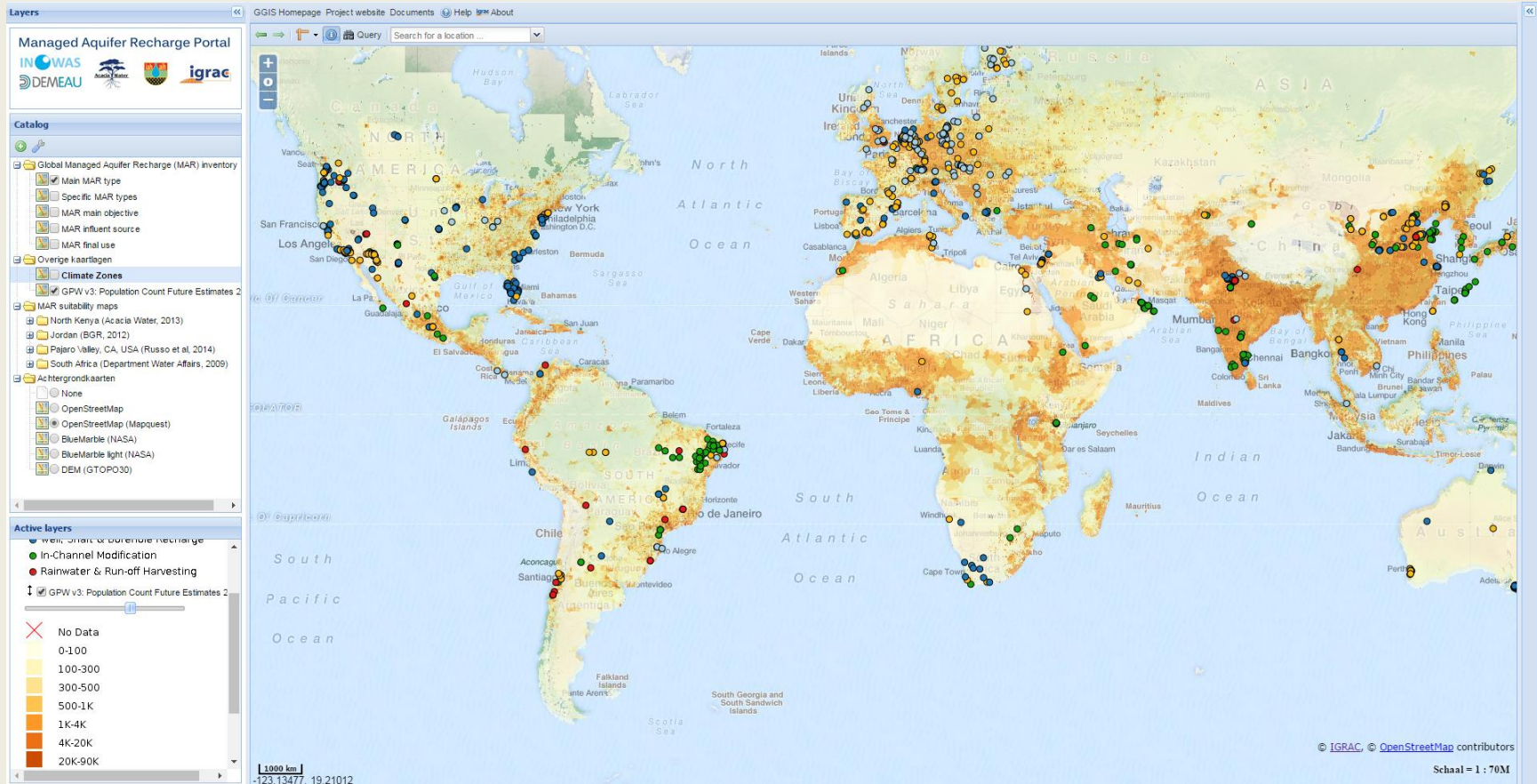
P. Dillon et al. Hydrogeology Journal, 27, 1–30, 2019)

Quantity and pollution induced water scarcity in China



Ting Ma et al. (2020) Nature Communications, vol 11, 650

MAR installations in China and worldwide



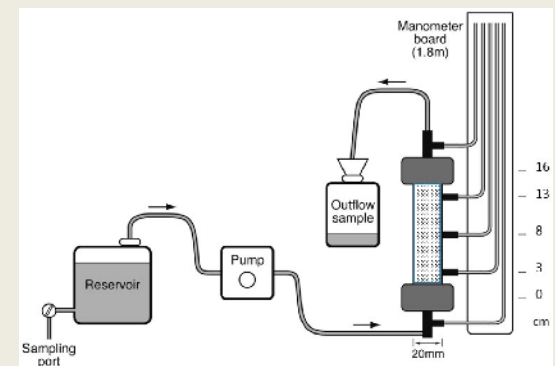
MAR in Spain for comparison

OPERATIVE MAR FACILITIES IN SPAIN



The MAR Test Facility (MARTEF)

MAR applies many different designs and technologies. MARTEF will be designed to allow for lab scale investigations of different aspects of MAR including pretreatment and after polishing technologies. Ideally, it should also include outdoor bench and pilot scale testing facilities for construction of different types of MAR systems (direct well injection, surface infiltration, basins, ditches and ponds, filtration methods), and have space where different tools for field tests can be applied. If successful, it could turn into a **future living lab** on MAR.



MARTEF potential functions

- Test of different technology options (well/basin/ditch/surface infiltration, filter materials, reactive barriers, etc.) under different geological, hydrological and geochemical regimes
- Study infiltration or injection of different water sources and potentials for removal of relevant contaminants and inorganic nutrients
- As part of feasibility studies provide support for MAR site selection and construction
- Test different pretreatment and after-polishing techniques and technological options to enhance infiltration and treatment capacities (optional)
- Serve as a platform for training and educational activities of Chinese professional practitioners (optional) in cooperation with international partners

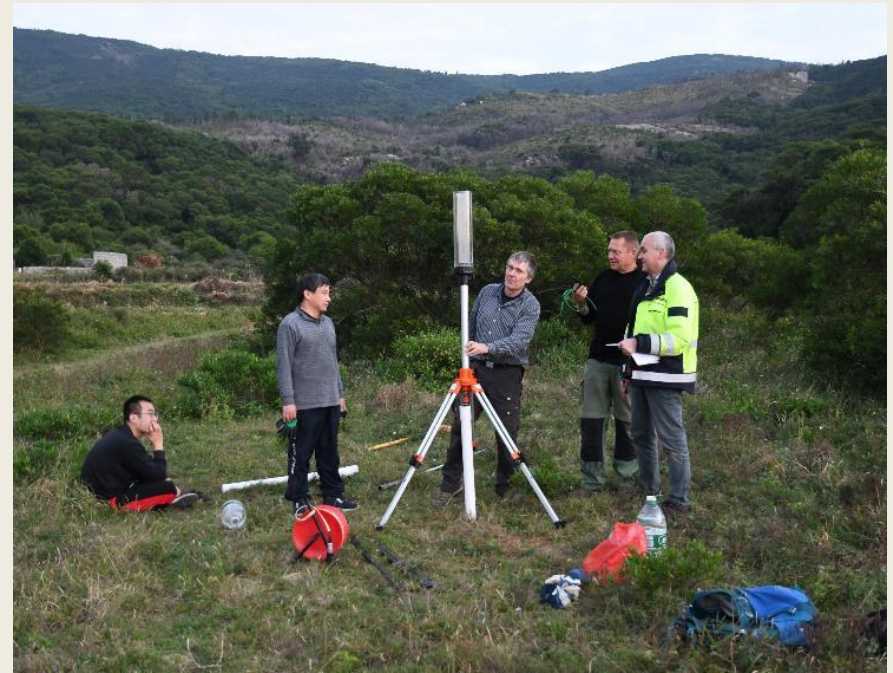
Selection criteria for location of MARTEF



- Access to water source(s) to be used for MAR
- Basic laboratory facilities available
- Basic analytical capabilities within reach and access to advanced analytical equipment
- Office space for computer and desk work
- Outdoor space for testing of field equipment
- Space for meetings and educational activities

Options for location of MARTEF

1. Within an existing institution with an already established laboratory with indoor and outdoor facilities and space for the purpose
2. Existing facilities at a university or a public/-governmental research institution
3. At a space established at a concrete MAR site



Thank you for your attention !

感谢您的参与和关注！

谢谢！