WATER MANAGEMENT SOLUTIONS

Jussi Ahonen and Elmira Brooshan; Iranian-Finnish Exchange of Experience on: Drinking Water Treatment

Webinar 14th Feb 2022

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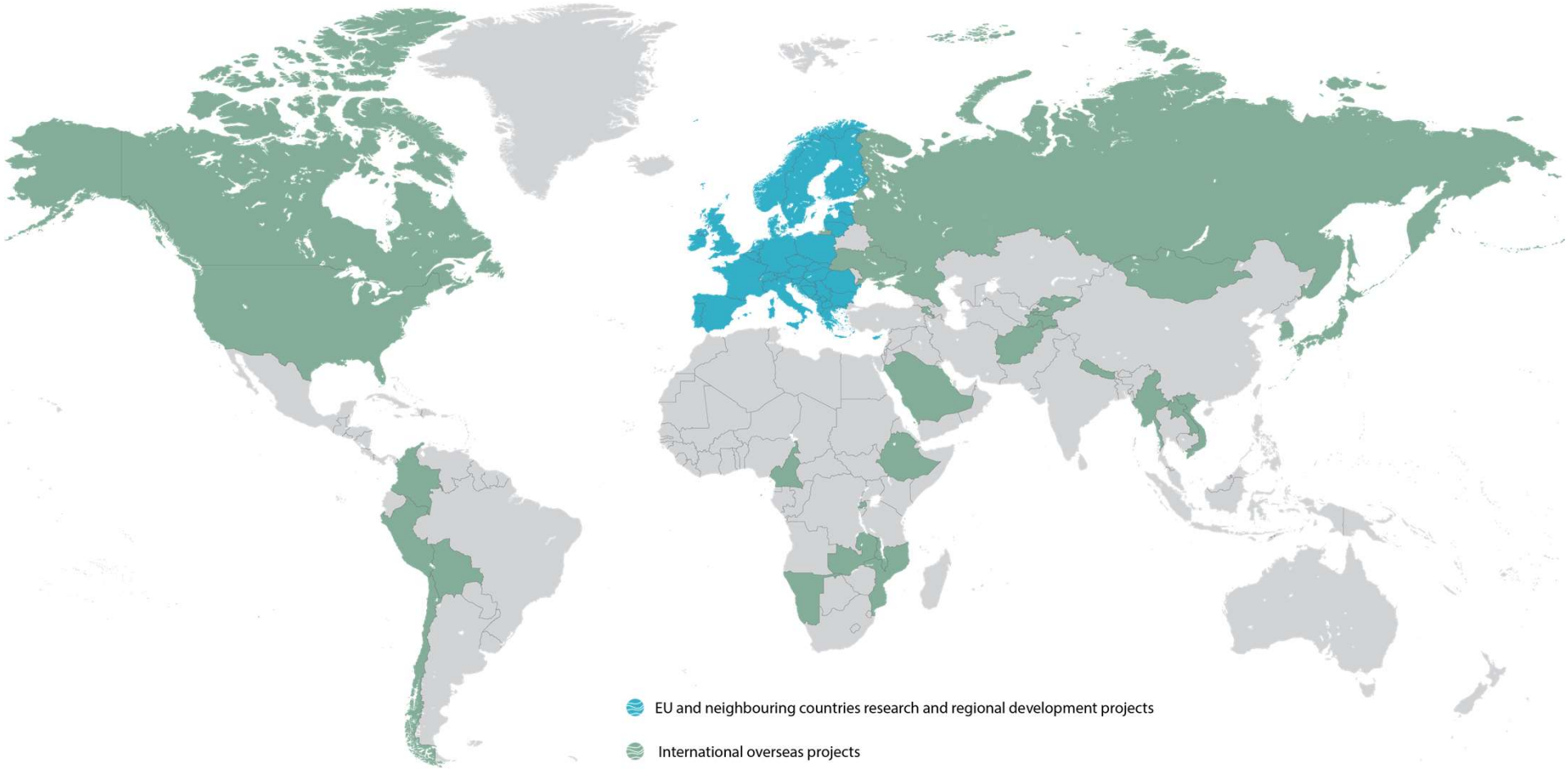
GEOLOGICAL SURVEY OF FINLAND (GTK)



GTK’S SERVICES

Data Sets and Online Services - geo.fi

Mineral Economics

Geodata Management

Mineral Economics

Circular Economy

Water

Environment

GEOLOGICAL SURVEY OF FINLAND (GTK) - WATER MANAGEMENT SERVICES

- Hydrogeological mapping and 3D modelling
- Groundwater flow and transport modelling (4D)
- Water quality and vulnerability assessment
- Water management in mining environments
- **Managed aquifer recharge (MAR)**
- Training and capacity building

MANAGED AQUIFER RECHARGE (MAR)

Where natural groundwater reserves are not sufficient to meet the demand on the water supply!

Where the amount of rainfall is not consistent throughout the year and dry seasons are becoming longer due to climate change.

- Reduce vulnerability to climate change and hydrological variability
- Control over-abstraction and to restore the groundwater balance
- Declining yields, to control saltwater intrusion
- Flood impact mitigation, rainwater harvesting and prevent land subsidence
- Sustain or improve the functioning of ecosystems and the quality and/or quality of groundwater by artificial means.
- Environmentally friendly
- Cost-efficient solution for sustainable water management
- Reliable
- Flexibility
- Applicability to different scales and purposes

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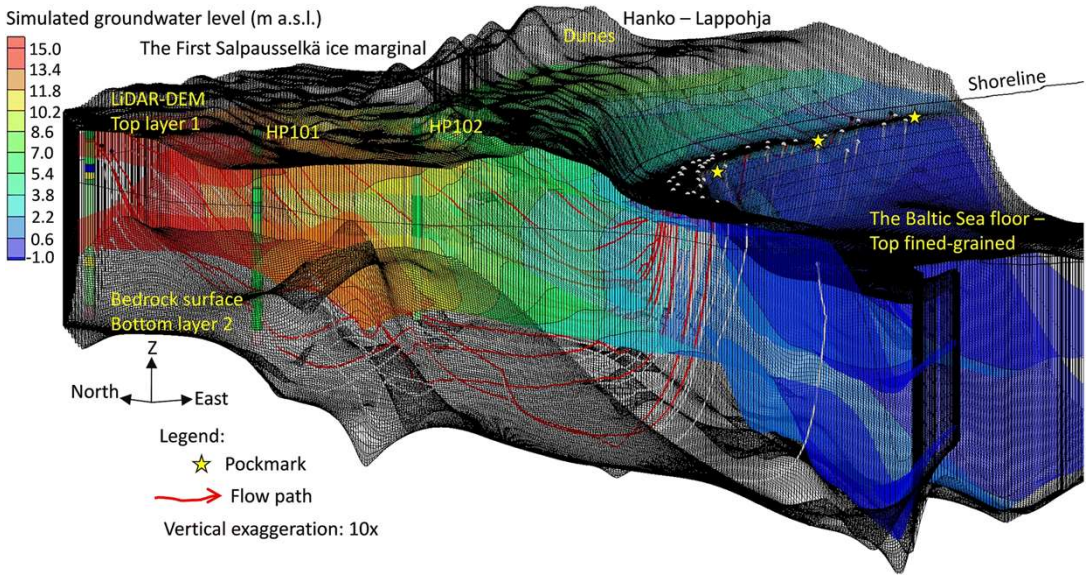
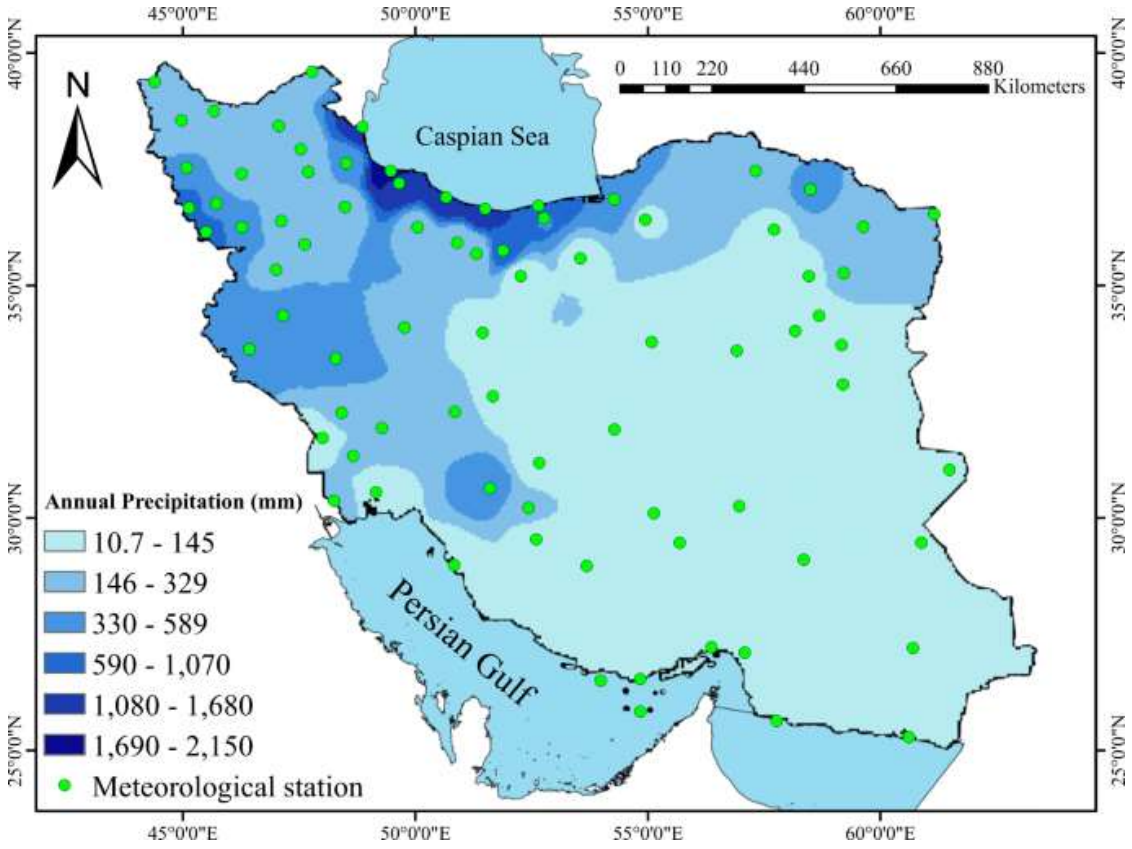
GTK’S MAR SERVICES

- Experience in MAR research at both local and regional level
- Geological and hydrogeological surveys for the MAR project (MAR feasibility study)
- Groundwater flow modelling
- Geochemistry of the artificially infiltrated groundwater
- Tracer studies
- Isotope studies
- Provide expert advice on the means of implementation
- GTK’s MAR activities can be divided into three main pillars:
  - *MAR in-situ assessment*
  - *regional mapping of MAR suitability*
  - *MAR information management*



3D visualization of model grids illustrating groundwater flow paths (Luoma et al., 2021)

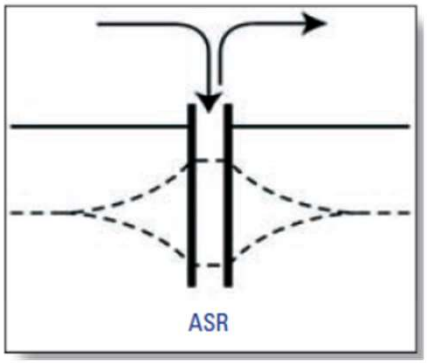
LIMITATION

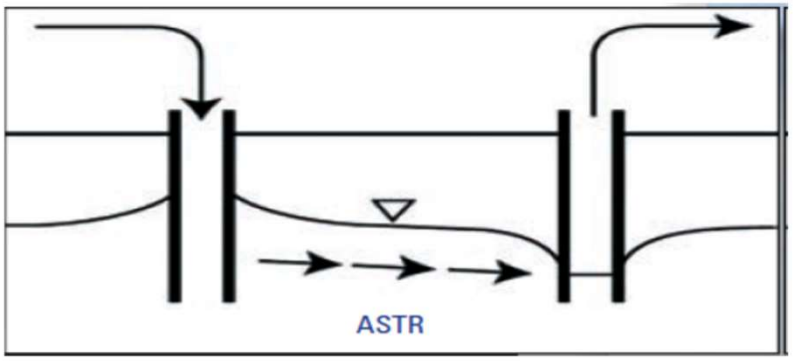


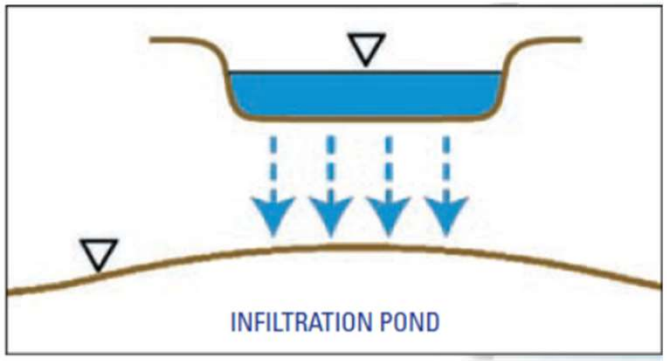
Spatial distribution of annual rainfall in Iran during 1987–2016 (Kaboli et al., 2021)

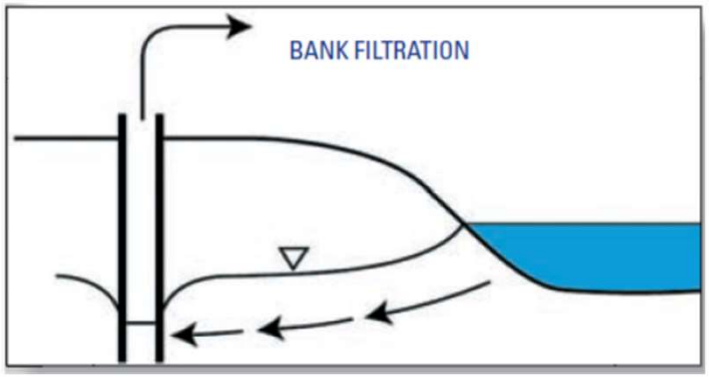
- Not a remedy for water scarcity in all areas!
- Aquifer conditions must be suitable and (excess) source water must be present!
- The potential of MAR applications should be preliminarily assessed before field activities initiate!

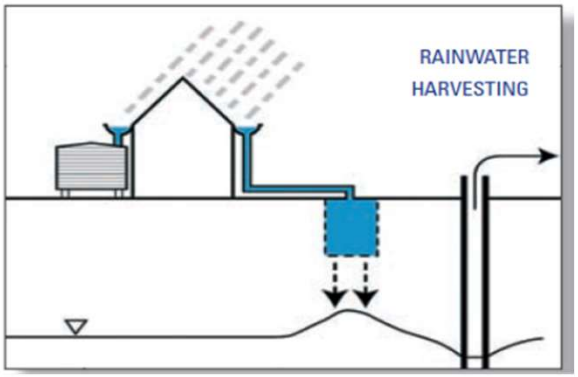
MAR TECHNIQUES



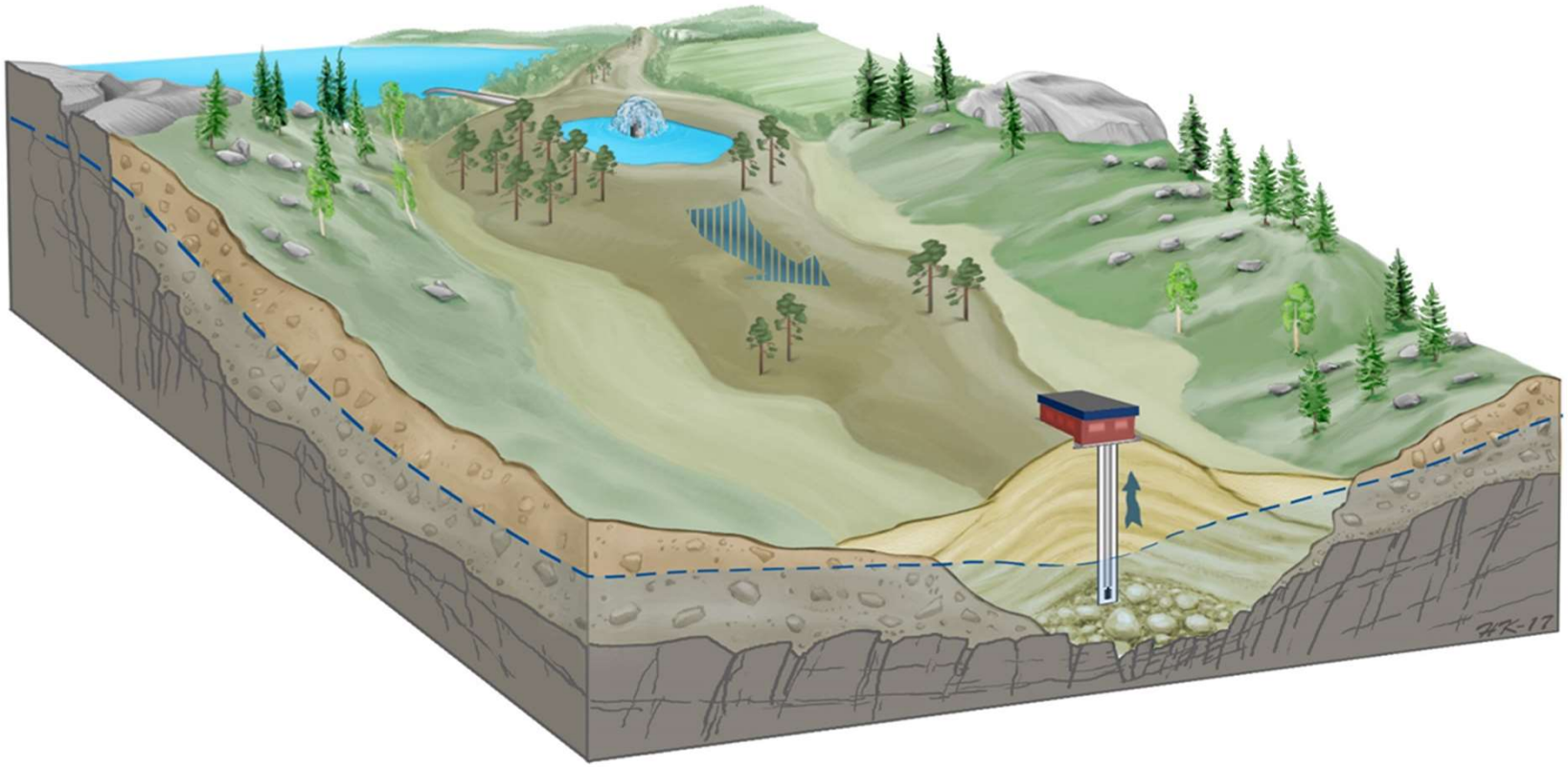








MAR IN FINLAND



MAR IN FINLAND

- MAR has over 100 year long traditions in Finland
- ~ 25 MAR plants, capacities 1 000 – 100 000 m^3/day,
- About 20% of water supply is based on MAR in Finland
- Existing plants are high-tech manufacturing facilities and the newest ones at the top of their industry (for example Turun Seudun Vesi Oy / Virttaankangas)
- Finnish expertise in public and private sector covers the whole concept for implementing MAR
- Finnish MAR network was established recently (under Finnish Water Forum)

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REFERENCES: VIETMAR-PROJECT, VIETNAM (ONGOING)

- Ongoing MAR project in QuyNhon, BinhDinh province, Vietnam.
- Funded: Ministry for Foreign Affairs of Finland (ICI instrument)
- The potential site for MAR is a peninsula formed on a delta system with a total capacity of aquifer over 80,000 m3/d
- Preliminary idea is to apply MAR by rain
  - *water harvesting => natural*
  - *discharge to the sea is over 35,000 m3/d (surface runoff and spring discharge)*
- Studies on feasible MAR application to cope with the long dry season

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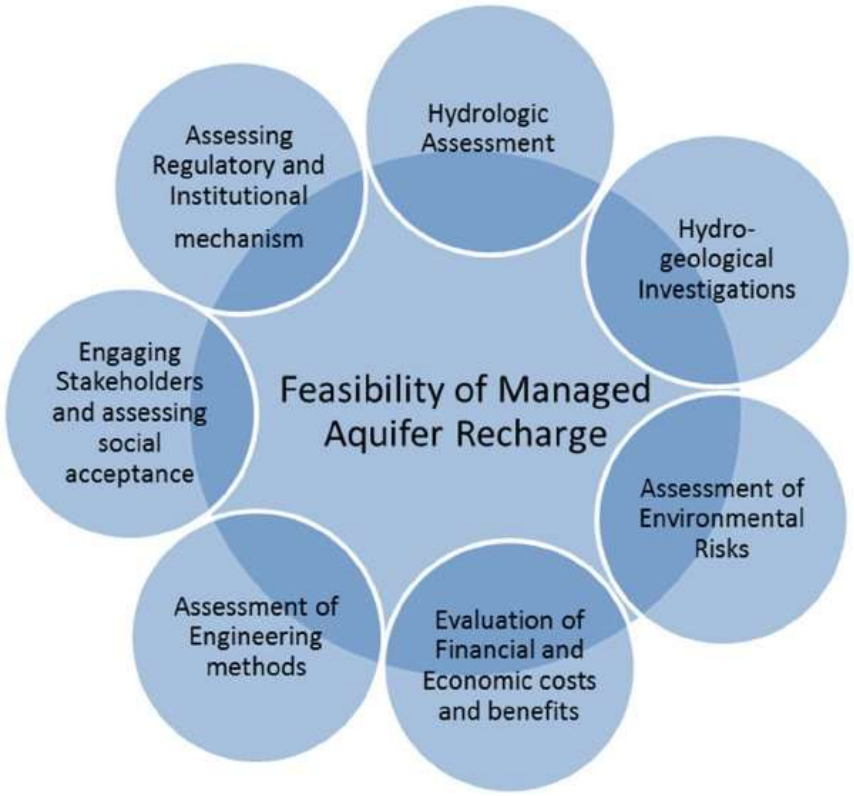
YOUR BENEFITS FROM GTK



- Assess whether the aquifer is suitable for MAR
- Assess how MAR will affect the groundwater flow, the yield of the aquifer and the quality of natural groundwater.
- Ensure that MAR is safe for the environment

(Arshad et al., 2014)

THANK YOU

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