



**Technical solutions to increase Managed Aquifer Recharge effectiveness. DINAMAR-MARSOL-MARSOLUT projects´ findings regarding design and construction criteria, operation and management, including social aspects.**

**Presenter**

Dr. Enrique Fernández Escalante (Tragsa Group & Universidad Politécnica de Madrid).

Possible invited speakers for short slots during session 2.

**Speaker/affiliation level of experience in the subject matter**

The speaker works in MAR since 1999 about 80% of his whole working time. The 94 technical solutions to be exposed have been gathered during the whole period.

**Objective(s) / Outcome(s) of the Workshop**

One of the main problems that have arisen in most of the MAR facilities is how to get an effective and rapid infiltration rate. This challenge presents a technical character: *How to increase the infiltration speed of water into the aquifer, and the MAR facilities´ effectiveness?* A possible solution to these issues is the adoption of soil and aquifer treatment and other complementary techniques called technical solutions or “Tech sols”. In this context, this overview relates the integrated actions and available techniques to be adopted from specific MAR sites around the world.

The technological improvements are willing to:

- Increase the rate of infiltration in MAR operating areas,
- Increase the effectiveness of the already existing facilities,
- Make accessible design criteria to be applied in future MAR systems (design and engineering of a MAR scheme).
- Attend governance and social aspects, specially Co-MAR.

## ISMAR 12 WORKSHOP – MONDAY, 28 APRIL 2024



The objectives of the workshop comprise sub-components, which attendees can use to apply the workshop learnings.

After the international overview of existing tech-Sols, three R&D projects outcomes will be discussed regarding diverse groups of actions, which might be grouped in four different sub-components:

- Design and construction,
- Operation,
- Management, including regulations, guidelines, and Decision Support Systems.
- Public—Private People Partnership (PPPP).

### **Format of workshop**

Presentations, discussions, worked problems (from a purely pragmatic and applied perspective including the scientific and technical support).

### **Themes**

This half day **interactive workshop** intends to show several sets of “technical solutions” based on the current state-of-the-art, and as a repository to store all types of activities applied and/or deployed in the different demo site scenarios of the DINAMAR, MARSOL and MARSOLut projects (eight demo sites in six Mediterranean countries) and other experiences accomplished in the five continents. The different techniques have been aggregated into a data-base, offering different problem-solution binomials, most of them tested during 14 years. Most of the technical solutions are willing to be applied in parallel scenarios all around the world.

A total of 94 different technological solutions will be exposed and explained, asking permanently feedback from attendants, who will be asked to share their T.S.’s experience providing interactivity into the activity.

It is important to state since the beginning that “technical solutions” are not related to Managed Aquifer Recharge (MAR) technique as a problem to solve, but rather the group of activities to increase MAR effectiveness, being MAR the challenge to many water-management related dysfunctions.

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### Description

The workshop is divided in two sessions and seven chapters:

After the summary and the introductory paragraph, chapter 2 provides the state-of-the-art, a hydrogeological literature on past technical solutions applied to improve the efficiency of Managed Aquifer Recharge activities worldwide.

Chapter 3 details the activities and results performed in the different MARSOL(ut) demo sites. After will be exposed the structure of the tech-sols database, defined in terms of problem-solutions binomial. So that, the interaction between the users, the smart solution, the demo-sites infrastructure, and the repository of experiences is guaranteed.

The database structure is deliberately open and flexible to integrate additional future inputs from the involved agents and from the attendees' experience.

The final corollary distinguishes **five sorts of operations**:

- ✓ Applied to water from its original source (in both, quantity and quality)
- ✓ To the receiving medium (in both, soil and aquifer)
- ✓ Management parameters
- ✓ Cleaning and maintenance operations, plus the combination of all of them.
- ✓ Stakeholders' involvement.

An appendix will be included showing a 12 min film on technical solutions in the Los Arenales Aquifer (Spain), with comments on the described elements.

Two books with over 70 pages on Technical solutions and construction criteria produced by MARSOL-MARSOLUT projects teams will be provided in pdfs to attendants, and a selection of additional materials too (stored in a repo).

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PROGRAM. The workshop program includes:

1. Building work designs for Managed Aquifer Recharge facilities
2. Introduction. All attendees  
Instructor: Dr. Enrique Fernández Escalante
3. Context. Technical solutions´ corollary. International State-of-the-art overview.
4. MAR-SOLutions mainly obtained from the experience in eight demo sites from six MED countries (Portugal, Spain, Italy, Greece, Malta and Israel). Examples from Peru, USA, Mexico, Afghanistan, Tunisia, Algeria, etc. will be explained too. Discussion.
5. Break- Networking
6. *Tech-Sols* database and problem-solutions binomias
7. Discussion – All attendees
8. Questions and discussion. Collective summary & photo. All attendees.

### Proposer

- Dr. Enrique Fernández Escalante, practitioner, lecturer and researcher with 33 years of experience in hydrogeology, the last 25 dedicating most of his working time to MAR projects and activities in 18 countries. Member of MAR-SOL project <http://www.marsol.eu>, [MARSOLut http://www.marsolut-itn.eu](http://www.marsolut-itn.eu), coordinator of DINA-MAR <http://www.dinamar.traqsa.es>, and RECACUIF projects, and eventual WB and OIEA consultancies on MAR.
- It is foreseen a possible exposition about regulations and guidelines in the middle of the second session, conducted by another MARSOL Member.
- Possibility of another invited speaker from MARSOLut Project (to be determined).

### Attendee knowledge / experience requirements

Basic knowledge of MAR, no prior experience needed.