



## MARSOL

### Demonstrating Managed Aquifer Recharge as a Solution to Water Scarcity and Drought

#### FINAL STATEMENTS:

**Manuel Sapiano (MEH-SEWCU, MT):** Our challenge is to synthesize everything into a methodology that appeals to responsible persons in authorities/ regulators and industry. Quality issues, issue of certainty are still open. If we look from the point of view of somebody who disapproves MAR, what is the barrier, can we argue with them? Currently, no recharge will be possible in case of dogmatic view of the current directives. When you need water you take the risk of introducing pollutants, at least if the concentrations are very low. We need to present MAR as a safe technology.

**Joao Paulo Lobo-Ferreira (LNEC, PT):** Due to newly collected data a comprehensive modelling of the water budget is possible. Need to put all the little pieces and small projects within MARSOL together, to combine them into a coherent story.

MAR can serve different purposes, it is a difference if it is for drinking water or, e.g., for raising water table in a nature reserve or for combating seawater intrusion; here the legislation should be less strict. But that might not work under current EU legislation.

**Yossi Guttman (MEKOROT, IS):** We gained a lot of experience at the many different MAR demo sites and therefore we think it is possible to bring it to other countries. A.R.O. concentrated on the unsaturated zone which cannot replace industrial pre-treatment. MEKOROT concentrated on the saturated zone and found that the models set up are very useful, and that good information was achieved on infiltration behaviour (e.g., relatively low amounts of water are no problem to infiltrate, but high amounts of water lead to a sharp decrease in infiltration rate after certain time).

**Christoph Schüth (TUDA; GE):** We know all scenarios around MAR, but still there are uncertainties related e.g. to legal issues. We know the processes during MAR, we know how to construct a MAR site, we even know what will happen during infiltration with water components. We need to put all these things together into concrete, presentable suggestions/recommendations.

**Enrique Fdez. Escalante (TRAGSA; SP):** Within all different water management techniques currently available, we have truly increased the state-of-the-art for Managed Aquifer Recharge, nowadays one of the most important activities to face frontally climate change adverse impacts. We have realized the technique is powerful by itself, and a good reaction to water scarcity and drought impacts. Anyway, its full capacity is achieved by means of integration with water transferences, the never arriving low cost desalination, etc. Thanks to MARSOL, I have the feeling the message has been disseminated around, not only to technicians and scientists, but to the whole population.

**Annette Wefer-Roehl (TUDA; GE):** MAR is a sound, safe, and sustainable strategy for climate variability preparedness that can be used with great confidence, and through MARSOL and its demonstration sites the awareness and the acceptance among stakeholders for MAR solutions has been greatly increased

**Jon San Sebastian (TRAGSATEC, SP):** In the future the demand for water gained by MAR will be higher due to climate change, energy issues, increase of population etc. In general, economics is also an issue. Does MAR present a cost benefit? For the EU we have to present suggestions for the future. We have to link people and economy to MAR.

**Andreas Kallioras (TUA, GR):** The possibilities of different techniques to apply in MAR were realized. What is still open is how to optimize and how to handle the big amount of data. A good level was already achieved for the data base but still needs further work. The black box turned into a grey box. More integration is needed between geo and water scientists and engineers. Products must be closer to the market.

**Peter Dietrich (TUL, GE):** There is a lot of effort to clean the waste water and then it is discharged to the sea and then again there is a lot of effort to desalinate this sea water for drinking water purposes. Who is in charge of cleaning the water? MAR source water quality can be improved, what means, there is a need for improved waste water treatment facilities.

**Outcomes in one sentence:**

MAR works, but needs experts to do it

MAR is now a proven technology

MAR is key solution to ecosystems depending on groundwater

MAR is a sound, safe, and sustainable strategy that can be used with great confidence

MARSOL created a new generation of water managers that have an additional option now

The awareness and the acceptance among stakeholders for MAR solutions is greatly increased

MAR as one of the best techniques to face frontally climate change adverse impacts.

**Suggestion:** MAR is a sound, safe, and sustainable strategy for climate variability preparedness that can be used with great confidence, and through MARSOL and its demonstration sites the awareness and the acceptance among stakeholders for MAR solutions has been greatly increased.

