

**International Association of Hydrogeologists
COMMISSION ON MANAGING AQUIFER RECHARGE**

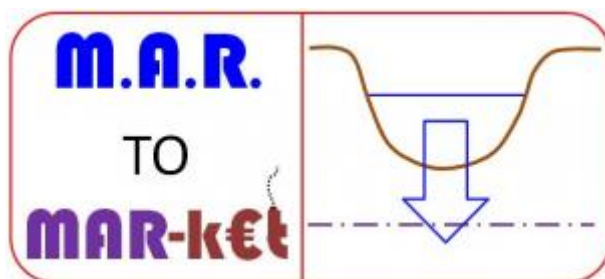
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Spanish: www.dina-mar.es/
Chinese: <http://china-mar.ujn.edu.cn/>

**MAR to MAR-k€t WG
ANNUAL REPORT 2016**

By Enrique Fernández Escalante, Tragsa Group



2016. MAR to MAR-k€t ACTIVITIES.

This annual report summarizes most of the activities accomplished along 2016 with a direct or indirect intervention of MAR to MAR-k€t WG, 5th group of the IAH MAR Commission.

It is worth to mention the close relation of this WG with MAR(solutions) EIP Water Action Group, MARSOL and DINA-MAR projects and ISMAR 10 conference organizers.

There are more than 40 letters of support, and, although only a few of them have been received along this year, some important groups have adhered from Korea, Tunisia and Peru, enlarging the international scope of the WG.

The summary of activities is presented next.

LINKED-IN GROUP MANAGED AQUIFER RECHARGE, DINA-MAR

New posts have been published with a normal activity increasing the number of recipients near to 300: <https://www.linkedin.com/groups/4690290>

MAR BOOKS REPOSITORY

Holding the activity, the repository presented IN 2014 has been updated thanks to the contributions of the MAR family. It has overtaken the figure of 75 free books on MAR by December 2016. [http://www.dina-mar.es/post/2016/12/29/ACTUALIZACION-DIC-2016-Libros-sobre-la-tecnica-MAR-\(repositorio\)-MAR-books-repository.aspx](http://www.dina-mar.es/post/2016/12/29/ACTUALIZACION-DIC-2016-Libros-sobre-la-tecnica-MAR-(repositorio)-MAR-books-repository.aspx)

The screenshot shows the DINA-MAR website interface. At the top, there is a navigation bar with 'Inicio', 'Archivo', 'Contacto', ' Suscribirse', and ' Iniciar sesión'. The main header area includes the 'GESTIÓN DE LA RECARGA DE ACUÍFEROS' title and the Tragsa logo. The central content area features a post from December 29, 2016, celebrating the repository reaching over 75 books. The post text is in Spanish and English, detailing the repository's mission to provide free access to hydrogeology books related to MAR. A sidebar on the left lists various categories and social media links. On the right, there is a search bar, a tag cloud, and a calendar for February 2017.

MAR books repository at DINA-MAR website

PROYECTO MARSOL. NEWSLETTERS

Two new bulletins have been released along 2016 with direct mentions to Mar to MAR-két WG, accessible at: <http://www.marsol.eu/35-0-Results.html>



MARSOL Newsletter 5

METAL DISSEMINATION POSTERS IN THE FIELD DIRECTED AT END-USERS

Holding the activity initiated in 2015, a new metal poster has been set up in a third pilot of Los Arenales aquifer, Alcazarén Area, as dissemination to end-users' example.

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

FP7. Inno-demo call 2013. GA: 619.120

Tragsa Grupo Tragsa

Demostroando la técnica de la recarga gestionada de acuíferos como una solución ante la escasez de agua y la sequía

WP5. Lugar demostrativo 3: ARENALES, Área de Alcazarén-Pedrajas, Castilla y León

El objetivo principal es demostrar la eficiencia de la técnica de la recarga gestionada en una zona irragable ampliamente desarrollada, con el fin de alcanzar soluciones tecnológicas avanzadas mediante la I+D+i.

Socios participantes: Tragsa, MIA, AEM, etc.

WP 13. SOLUCIONES TECNOLÓGICAS Y BENCHMARKING

El objetivo principal es demostrar la eficiencia de la técnica de la recarga gestionada (o MAR) en los "demo sites", con objeto de proporcionar nuevas soluciones técnicas mediante la permanente investigación y comunicación con los agentes locales y el estudio comparado de casos reales.

Socios: Tragsa, MIA, AEM, etc.

SITUACIÓN

Bajo el sector oriental de la comarca de "El Casarillo" se encuentra situado el Acuífero cuaternario superficial al pie de los "cerros torales" de Calles del Pinar que delimita el acuífero de los Arenales en este sector. La actuación comprende territorio de los UAR: Alcazarén, Pedrajas de San Esteban, Ircas, Olmedo y Villaverde de Ircas.

EL ACUÍFERO

Se trata de un acuífero Plio-cuaternario asociado a otro terciario de espesor inferior a 30 m y de gran permeabilidad (arenas sobre un sustrato impermeable). Se han diferenciado dos zonas, N.O. y S.E. con distinto grado de explotación. La capacidad de almacenamiento de agua es alta y recuperable mediante técnicas de recarga artificial o gestionada.

OBJETIVOS PRINCIPALES

- Diseñar soluciones tecnológicas que permitan mejorar la eficiencia hídrica y energética en el sector.
- Fomentar la relación entre la agro-industria y la recarga del acuífero, como recurso estratégico futuro capaz de paliar los efectos adversos del cambio climático.

Operativas:

- Se debe pretratar el agua de escorrentía y por tanto el agua de la depuradora mediante filtros (buenos resultados con filtros de fibras reactivas), evitar bacterias y mantener los dispositivos limpios de materia orgánica.
- Evitar desbordamientos mediante gestión de válvulas y uso de los aliviaderos existentes.
- Gestión supeditada a meteorología, en especial precipitaciones.
- Gestionar debidamente las aguas de los tres fuentes de origen (depuradora, escorrentía, lluvia).

De diseño:

FACTORES EN ESTUDIO PARA FOMENTAR EL REGADÍO:

- Almacenamiento más profundo al sureste y más abundante en el sector noroeste.
- Diversificación de las fuentes de toma.
- Canales de recarga atravesados y recargas las discontinuidades estructurales subterráneas.
- Si el nivel del agua, gracias a la recarga, está cerca de dos metros por encima del "natural", ¿cuál es el ahorro de energía en el bombeo de más de 100 metros para irrigar? Sustituir el 30%.

PRETRATAMIENTO DEL AGUA DE RECARGA:

- Eliminación y desinfección en calderas y filtros heterométricos.
- Minimizar la carga orgánica mediante filtros reactivos con materiales naturales abundantes en la zona.
- Reducir la acumulación de carga orgánica mediante aditivos durante los procesos de limpieza y mantenimiento.
- Evitar el bacheo de las aguas y el aumento de aire en el agua de recarga mediante remanencia en el circuito de recarga.

De gestión:

Gestión a cargo de los usuarios para aumentar la efectividad

- Uso del acuífero como almacén y como "batería".
- Instalación de válvulas para la gestión manual del caudal circulante en las conducciones.
- Uso de pozos como almacén en zonas de menor permeabilidad.
- Perforación de pozos en las zonas de drenaje del acuífero.
- Registro detallado de caudales, agrupación o asociación para la defensa de sus intereses y relación con la agroindustria.
- Reducir efectos "secuencial" al acuífero profundo.

Con el apoyo de: MARSOL, European Commission, etc.

<http://www.marsol.eu/>

Más info en: <http://www.dma-mat.es>

La destrucción de esta placa está pensada por la Ley

Metal dissemination posters installed in Arenales Demo Site

MAR to MAR-k&#eacute;t new participants

A new group which specialize MAR in the region of ICA (Peru) has joined officially MtoM WG in September 2016. Also an irrigation community from Daegeon, Korea, where practices MAR to irrigate strawberry greenhouses joined the WG on April 2016. By last a farmer's association from Medenine, Tunisia, has provided another LoS by 2016 May.

Small companies at Los Arenales have also provided letters of support broadening the scope of the WG, where traditionally most of the partners where from the agroindustry, including a Hotel, a balneario...

ISMAR10 APPLICATION RESOLVED FRUITFULLY

Last June during ISMAR 9 conference, Tragsa Group-IGME-IWRA received the Honor of organizing the next ISMAR 10 in the spring of 2019.

The first institution, by means of some technicians, proposed and supports MtoM WG.



Initial ISMAR 10 banner

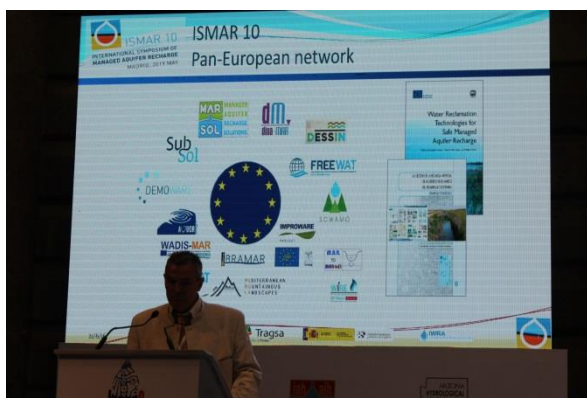
<https://goo.gl/e3hCgr>

The preliminary stage to prepare this candidacy was very fruitful due to the fact that a new network was created and some more projects have joined during 2016:

THE PAN-EUROPEAN NETWORK OF EU FUNDED PROJECTS WORKING ON MAR INCREASES

The platform created in 2015 July to support ISMAR 10 with all coordinators and partners working on **13 EU funded projects related to MAR**, has increased along 2016, with the incorporation of WADIS-MAR and INOWAS projects coordinators. There are 15 members currently, involving, indirectly, about 15 institutions each, apart from the European EIP Water, who supported by written this action.

The platform keeps sharing information and activities since 2015 July within a "no noise" policy.

ISMAR 10 PAN-EUROPEAN NETWORK

Presentation of MAR Paneuropean network during ISMAR 10 slot in Mexico, ISMAR 9 conference

<https://goo.gl/OQrZxP>

MAR-K&T MEETING DURING THE EIP LEEUWARDEN CONFERENCE, 2016 FEB 9th

"Boosting Managed Aquifer Recharge in Europe" open side meeting aims presenting the scientific and innovation achievements of EIP Water AG 128 MARtoMARKet and EU projects on MAR, e.g. FP7 INNO-DEMO MARSOL project, highlighting agricultural groundwater quality rehabilitation issues with MAR and boosting its social acceptance by farmers, willing to proceed with MAR discussion in Europe and in the Mediterranean area.

The MAR side event is aiming to present and discuss the best way for "Training researchers, industry/SMEs, and end users on Water Quality regarding Managed Aquifer Recharge (MAR) and new developments in this field, to foster knowledge among all project partners and to ensure that the project's RTD and DEMO results effectively reaches the end-users". Therefore, we intend to incorporate the achievements gathered in previous EU and national sponsored projects developed, e.g. in MARSOL case-study areas, addressing Water Quality techniques such as Soil Water Aquifer Treatment (SAT), as part of global solutions.

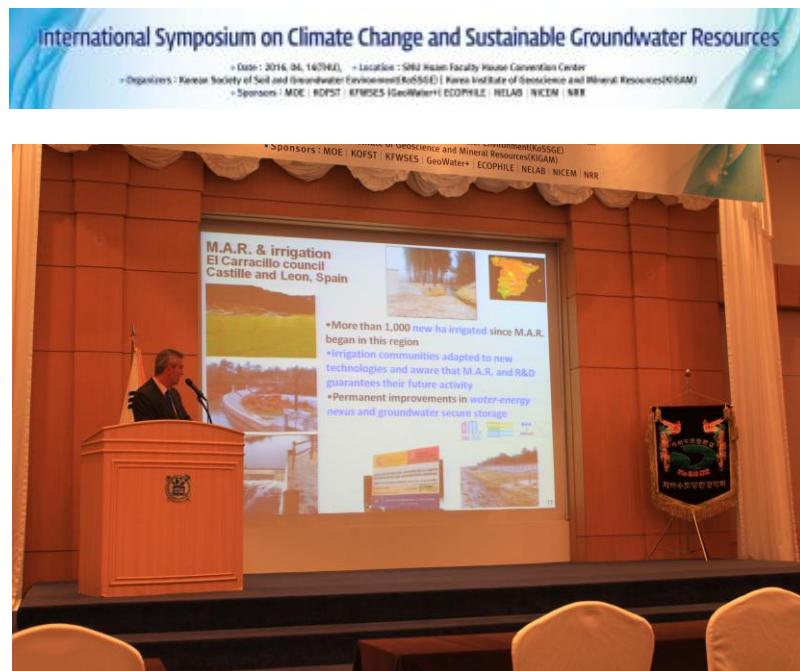


MAR to MAR-k&t AG steering group (Daniela Benedicto, IGRAC; E.F. Escalante, Tragsa; JP Lobo, IGRAC and Rudy Rosetto, Escola Santa Anna)

<https://goo.gl/2DqcNn>

INTERNATIONAL SYMPOSIUM ON CLIMATE CHANGE AND SUSTAINABLE GROUNDWATER RESOURCES. SEOUL, KOREA, April 2016

Presentation of MARSOL, DINA-MAR and MAR to MAR-kēt WG+AG in an international conference of Asian scope. Presentation: “Alternative water resources management techniques to overthrow adverse climate change impacts”.



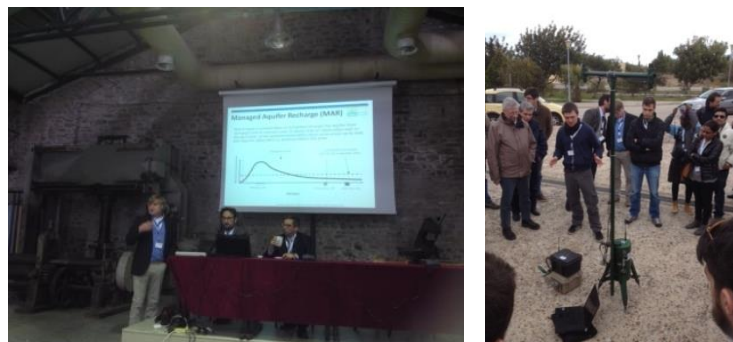
International symposium banner and presentation

<https://goo.gl/DsRTPP>

MARSOL TRAINING WORKSHOP "INVESTIGATION AND MONITORING OF MAR SITES", LAVRION, GREECE, 16 - 18th March 2016

The overall objective of this workshop was to contribute to the training of project participants' staff, researchers, industry/SMEs, and other interested professionals to foster knowledge among all project partners and to ensure that the project's RTD and demonstration results effectively reach interested professionals. The workshop covered aspects of environmental monitoring technologies, focusing on the monitoring of hydrologic and water quality parameters that are crucial for Managed Aquifer Recharge facilities.

The workshop featured in-door sessions as well as participation in active field work and site visits.



MAR to MAR-kēt presence in Lavrion workshop.

<https://goo.gl/yVmxkr>

WADIS-MAR PROJECT COURSE ON ARTIFICIAL RECHARGE, ZARZIS, TUNISIA, 16 - 20th MAY 2016

The capacity building course took place in Zarzis, near Medenine, Tunisia from 2016 May 16 to 20th and counted with 25 practitioners from Algeria, Tunisia and Italy. The IAH MAR Coimmission and MtoM WG was presented to the attendants, with the incorporation of one of the organizing institutions into the WG.



MAR capacity building. Medenide field trip, Tunisia, 2016, May.

<http://www.wadismar.eu/>

<https://goo.gl/Usxdl1>

MARSOL WORKSHOP "WATER TO MARKET. FINANCIAL AND ECONOMIC ANALYSIS OF MAR SOLUTIONS", VENICE, ITALY, 6th June 2016

This workshop on financial and economic aspects of MAR operations has taken place on 6. June 2016, the day before starting the international conference on Citizen Observatories for Water Management, Venice, 7 - 9 June.

The workshop featured presentations and discussions around MAR-related topics such as economical and financial issues and possible market potentials. Based on a survey of MARSOL's demonstration sites, their financial profitability and sustainability were analysed. MAR to MAR-kēt, closely related to MARSOL project, had an specific slot in the presentations schedule.

The Rio Brenta demonstration sites were visited by the participants, and the monitoring system, modeling activities, and respective results were presented.



MAR to MAR-két presence in Venice workshop.

<https://goo.gl/KfudbF>

ISMAR 9 CONFERENCE. MEXICO CITY. 20-24th June 2016

Four oral presentations were exposed from MARSOL, dina-mar and MtoM. There was also a slot during the plenary for MtoM and an ISMAR 10 announce.



Presentation of Madrid as ISMAR 10 hosting city during ISMAR 9 plenary in Mexico.

<https://goo.gl/960ooy>

THE INTERNATIONAL ATOMIC ENERGY AGENCY SUPPORTED A COURSE ON MAR. LA PAZ, BOLIVIA, 18 – 22th JULY 2016

Within the program RLA-7018-001/2016, the IAEA organized the first “Curso Regional en Recarga Artificial de Acuíferos”; La Paz, Bolivia. The course had 38 hour of duration and there were 15 practitioners from 9 Center and South-American countries.

Again the IAH MAR Commission as well as MAR to MAR-két WG was presented to the attendants.



Introduction of the attendants and field trip over 4,100 m.a.s.l.

<https://goo.gl/r5nX5G>

MAR TO MAR-KÉT SLOT IN THE IAH MAR COMMISSION PLENARY DURING MONTPELLIER IAH 60 CONFERENCE. 27th SEPTEMBER 2016.

The WG targets were exposed: to communicate effectively with a wide range of water users and water managers to explain MAR and its benefits. Main case study site- Arenales aquifer (Spain); engaging with: Agro-industry, Water supply industry, Waste water treatment plants (SAT), Desalination companies, Bottled water companies, Golf courses, Public administration, Balnearies & spas (*sallus per aquam*), Hotels and tourist facilities (market uptake).

A five slides presentation was displayed inviting attendants to join this WG.

MARSOL FINAL MEETING. LEIPZIG, GERMANY, 17-19th OCTOBER 2016

21 partners shared their expertise collected along three years in a three days MARSOL final workshop, with presence of the whole consortium, both member of the MAR to MAR-két WG and three members of MtoM AG.



MAR to MAR-két presence in Leipzig MARSOL final workshop.

<https://goo.gl/xhNGsw>

MANAGED AQUIFER RECHARGE, MAR TO MAR-KÉT AG AND MARSOL AT EU CIS WORKING GROUP MEETING

Managed aquifer recharge options and the MARSOL project were presented at the CIS Working Group on Groundwater's 31st plenary meeting in Bratislava, Slovakia, on 26 October 2016.

The working group already published a significant number of guidance documents and technical reports (see links below) contributing to the implementation of EU water legislation.

<https://goo.gl/VzV4Od>

MARSOL BARCELONA ASC: ADVANCED STUDY COURSE FOR YOUNG SCIENTISTS ON "MANAGED AQUIFER RECHARGE: WATER QUALITY AND REACTIVE MODELING". 7-9th NOVEMBER 2016

The ASC was intended for graduate and post-graduate students, PhD students, and postdocs in the fields of geosciences, water research, environmental research, or related areas; it was also directed at professionals aiming at improving or broadening their qualification. A certificate of participation was issued at the end of the course.

Participation in the course was free of charge. In total, 24 participants from 14 different countries (Afghanistan, Bangladesh, China, Columbia, Germany, Greece, India, Israel, Italy, Nicaragua, Peru, Spain, The Netherlands and USA) attended the course.

As usually, MAR to MAR-k€t was exposed to the audience.



Barcelona ASC where organizers allowed a MtoM presentation

<https://goo.gl/SqZCHW>

MARSOL Project and MAR to MAR-k€t WG presentation in Barcelona iWater. 17th NOVEMBER 2016

During iWater international event, MtoM was mentioned during the presentation: Managed Aquifer Recharge as a technique to face frontally climate change adverse impacts.



MARSOL and MtoM presentation at iWater Barcelona international trade

<https://goo.gl/JvhC30>

MARSOL WORKSHOP. MANAGED AQUIFER RECHARGE IN ITALY AFTER THE ISSUE OF DM 100/2016 REGULATION. LUCCA (ITALY), 28 NOVEMBER 2016

Based on the activities carried out as part of projects co-financed by the European Union (MARSOL, WADIS-MAR, AQUOR, WARBO, etc. Plus the MAR to MAR-k€t AG) and pilot projects at national scale, technical and environmental and regulatory aspects and market potentials of this technique were discussed.

After discussing the presentations of the two sessions, a panel of experts drafted conclusions and implications on using MAR in Italy. The event was held in Italian language.

MARSOL WORKSHOP. MANAGEMENT OF AQUIFER RECHARGE: EUROPEAN SOLUTIONS DEVELOPED IN THE MARSOL PROJECT FOR WATER SCARCITY AND DROUGHT MITIGATION. FARO, PORTUGAL, 15 DECEMBER 2016

Final MARSOL Workshop in Faro, Algarve, Portugal, to present the results of the project and particularly of the Portuguese demonstration sites and the actions accomplished by the EIP Water Action Group 128 "MARtoMARKet - Managed Aquifer Recharge Strategies and Actions".



COMING ACTIVITIES

MARSOL Workshop "MAR2FARM" March 2017. Segovia, Spain

Final MARSOL Workshop at Los Arenales aquifer to expose the achievements of the project to end-users and technicians. To be announced soon.

Contribution to the White book on MAR and modelling

The book will be released along 2017 by some MARSOL partners involved in MAR to MAR-k€t WG.

Book: MAR technical solutions and construction criteria (translation into Spanish)

The book will be released along 2017 from MARSOL deliverables 13-1 and 13-3 translated into Spanish plus other contributions. A brief MAR to MAR-k€t WG explanation is ensured.

Many more oportunities have been detected, to be considered and some of them to be deployed and duly informed.

