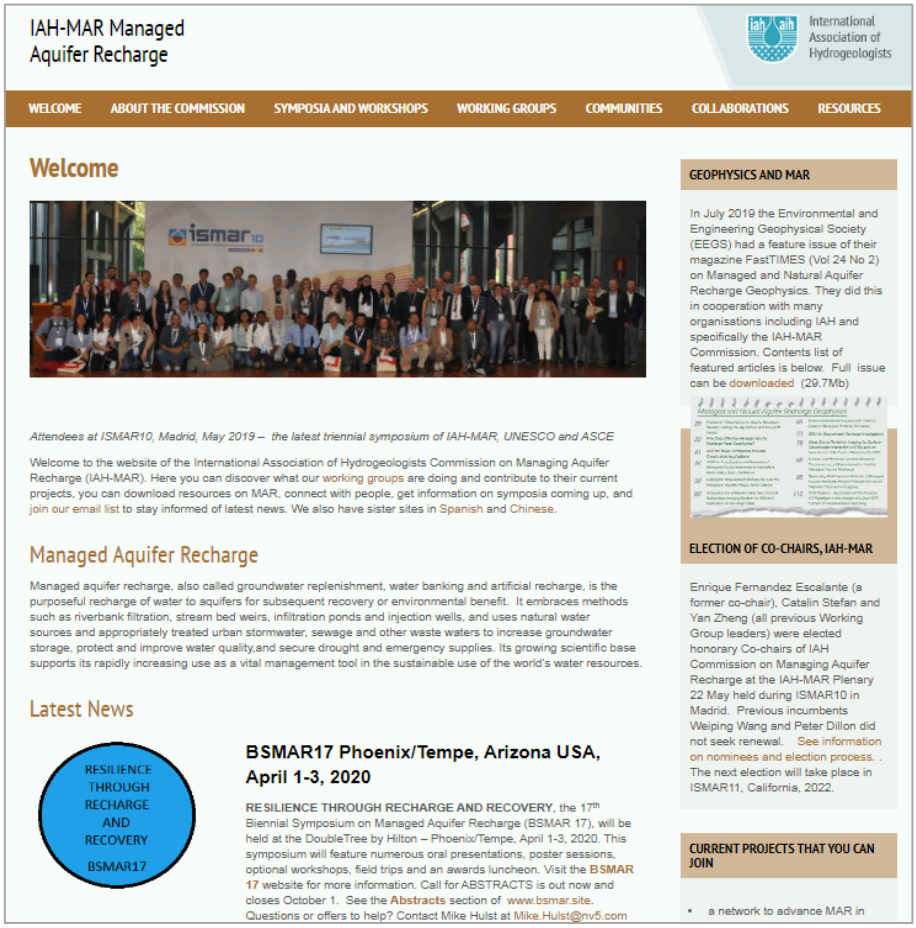
International Association of Hydrogeologists
Commission on Managing Aquifer Recharge

Report of activities in 2019



https://recharge.iah.org/

The MAR society has to collaborate better to make more impact. Let's get it going *(ISMAR 10 outcome)*

1. Aims of Commission

Maximizing the value of Managed Aquifer Recharge for integrated water management

The Commission promotes the securing and expanding of water resources and improving water quality in ways that are appropriate, environmentally sustainable, technically viable, economic and socially desirable. It encourages research, development and adoption of improved practices for management of aquifer recharge and improving knowledge, skills and capabilities of practitioners, water resources managers and regulators. The Commission facilitates exchange of information between members internationally (e.g. via a web page and an email list*), by disseminating results of research and practical experience (e.g. via symposia and workshops), raising awareness of MAR among IAH members, related professions and the community, and through its members forming working groups to undertake projects and activities identified by plenary participants as important.

Co-Chairs 2019

Jan 1st to May 31th:

Peter Dillon (Australia) – pdillon500@gmail.com
Weiping Wang (P.R China) - wangweipingwwp@126.com
Enrique Fernández Escalante (Spain) - efernan6@tragsa.es

Jun 1st to Dec 31th:

Enrique Fernández Escalante (Spain) - efernan6@tragsa.es
Catalin Stefan (Germany) – catalin.stefan@tu-dresden.de
Yan Zheng (P.R China) – yan.zheng@sustech.edu.cn

Web site*:
https://recharge.iah.org/ (English) (includes email list access).

Sister web-sites:

www.dina-mar.es/ (Spanish)
http://china-mar.ujn.edu.cn/ (Chinese)

Email list: – see site https://recharge.iah.org

2. Highlights of 2019 (in Chronological order)

The first semester has been specially focused in the preparation of the 10th International Symposium on Managed Aquifer Recharge (ISMAR 10), the main meeting of the IAH MAR Commission, which took place in Madrid, Spain, from 20th to 24th of May 2019.

Award of Excellence in Ground Water Investigation and Management from Shri Som Pal

Dr Ratan Jain, former chair of Central Ground Water Board, receiving Award of Excellence in Ground Water Investigation and Management from Shri Som Pal, Former Minister of Water Resources, Govt. of India at the National Conference on Ground Water Sustainability, organised by the Indian National Committee of International Association of Hydrogeologists, at Manav Rachna International University, Faridabad on 28 March, 2019.

Dr. Jain´s Award

ISMAR 10

From 2019 May 20th to 24th, the 10th International Symposium on Managed Aquifer Recharge (ISMAR 10) has taken place in Madrid, La N@ve. The conference was organized by Tragsa Group and the Spanish Geological Survey (IGME) under the auspices of the International Association of Hydrogeologists (IAH), UNESCO and ASCE, among others, under the title: *"MAR to solve the global water crisis".*

The Symposium was attended by 320 delegates from 62 countries, and counted on 22 technical sessions, 123 oral presentations, 98 posters, 4 round tables, 3 keynote presentations, side events, six first day short courses, two workshops, three technical field trips, and a lot of knowledge recharged. Eight delegates were supported by UNESCO to attend the conference https://bit.ly/3aDGfrE
Detailed info is provided at http://ismar10.net under the title: *"Affection and faith in MAR is noticeable and contagious".*

ISMAR 10 first banner

Outcomes:

– Enrolled about 50 students and high presence of young people with hydrogeological and engineering experience, a lot of proactivity. Latent concern to continue working so that traditional water management schemes increasingly incorporate special or alternative techniques (MAR). Tranquillity among the participants (there is a lot of youth well prepared to grab the torch…)

– The MAR technique, as seen throughout 22 sessions, is strengthened as an ideal technique for frontal combat against the adverse effects of climate change, as an adaptation mechanism: "recharged aquifers, a solution for the future" and to solve many local water management problems.

– The Spanish Public Administration have participated actively in round tables in which the suitability of the MAR technique as a management system was discussed and demonstrated, with excellent international cases of success.

– There is an urgent need for a legal basis adapted to the current circumstances of climate change and abundance of emerging pollutants, so that MAR technique may develop its full potential on a favourable legal background.

– The European Commission is favouring the MAR technique, always within a conjunctive and integrated system.

– The catalogue of possibilities and the diversity of uses of the MAR technique, its self-adaptability, transparency and resilience make it a solid alternative for environmental sustainability, circular economy and open lines of R&D.

– The slogan of the congress "MAR to solve the global water crisis" was consciously chosen (voted among several options during ISMAR 9); and ISMAR 10 has endorsed its solidity and demonstrated that it was opportune.

Many congratulations and very few complaints have been received at the end of the congress. Among all of them, we highlight the written phrase sent by a technician who has participated for his first time in an ISMAR, referring to the general atmosphere: *"The affection and faith in MAR is noticeable and contagious"*. Other selected comment received in our inboxes: *"The MAR society has to collaborate better to make more impact. Let's get it going"*

Organizers thank to all the assistants, collaborators and sponsors, especially to Suez (Platinum sponsor). www.ismar10.net

https://www.ismar10.net/en/2019/05/31/ismar-10-affection-and-faith-in-mar-is-noticeable-and-contagious/

ISMAR 10 group *resisting* after the closing ceremony

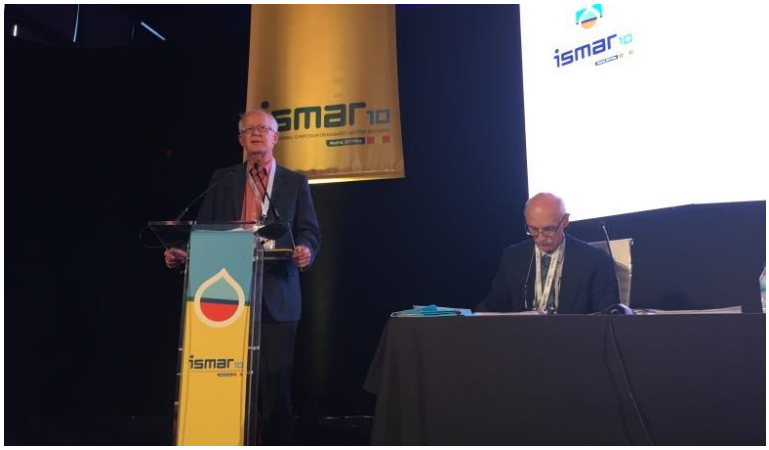
ISMAR 10. IAH-MAR COMMISSION PLENARY

During ISMAR 10, the IAH-MAR Commission held its annual plenary meeting on May 22th with the following agenda:

1. Welcome and Introductions
2. Objectives of Commission /
3. UNESCO IHP VIII 2014-2021 context for IAH-MAR role, plus
    1. UNESCO Travel Scholars
    2. Exemplary case studies publication with IAH and GRIPP
4. Progress reports and plans of Working Groups
5. Invitation to ISMAR11, 2022
6. Election of IAH-MAR Co-chairs – Bruce Misstear, Returning Officer, IAH Sec General
7. IAH Certificates of appreciation – Bruce Misstear, IAH Sec General. The Awardees were:
    Doug Bartlett
    Andrew Ross
    Yan Zheng
    Adriana Palma Nava
    Catalin Stefan and IGRAC
8. Information Sharing
    1. IGRAC MAR Portal – Neno Kukuric / Arnaud Sterckx
    2. Marsolut – PhD education in MAR – Cristoph Schüth / Enrique Fernandez
    3. GRIPP – Groundwater Solutions Initiative for Policy & Practice – Karen Villholth
    4. MAR-NET activities in China – / Germany / Denmark – Yan Zheng
    5. Italian MAR Network– Rudy Rossetto
    6. IGC Roorkee, Oct 2019
9. Suggestions for new activities – anyone
10. Volunteers to participate in existing and new activities – anyone
11. Information sharing on MAR (not covered elsewhere) - anyone
12. Close of Plenary (Next Plenary at IAH 46th Málaga)

ELECTION OF CO-CHAIRS, IAH-MAR

Enrique Fernandez Escalante (a former co-chair), Catalin Stefan and Yan Zheng (all previous Working Group leaders) were elected honorary Co-chairs of IAH Commission on Managing Aquifer Recharge at the IAH-MAR Plenary 22 May held during ISMAR10 in Madrid. Prof. Bruce Misstear, the IAH Secretary General, led the process. Previous incumbents Weiping Wang and Peter Dillon did not seek renewal. See information on nominees and election process. https://recharge.iah.org/iah-mar-co-chair-elections-2019 The next election will take place in ISMAR11, California, 2022.



Prof. Bruce Misstear during IAH-MAR elections

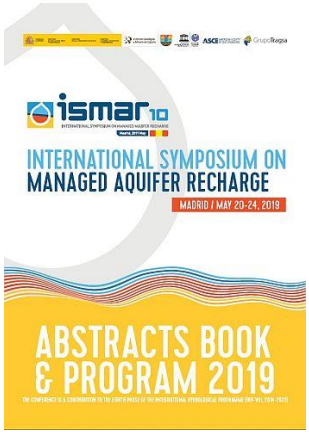
ISMAR 10 FIELD TRIPS

Visit https://www.ismar10.net/en/technical-tours/ for detailed info.

ISMAR 10 field trips 1, 2 and 3 respectively

ISMAR 10 abstracts and program book

The book gathers 258 abstracts submitted to ISMAR 10.



ISMAR 10 abstracts and program book cover

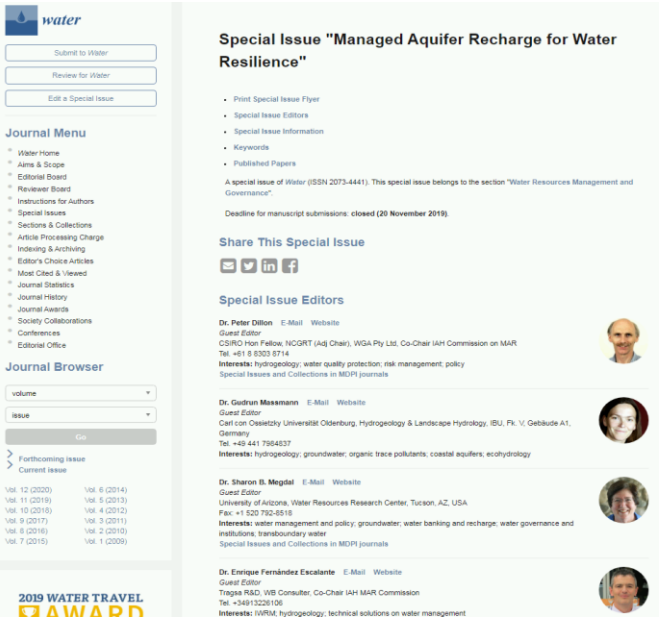
Direct download: https://www.ismar10.net/wp-content/uploads/2019/05/ISMAR-PROGRAM-BOOK-COLOR_A4.pdf

ISMAR 10 Conference´s videos

Most of the presentations from Sala 1 and Sala 2 were recorded and have been posted in YouTube, type TED-talk conference. The list of available presentations can be found in ISMAR10.net website, results: https://www.ismar10.net/videos/

Journal Water special edition (in progress)

Some of the best papers among ISMAR10 contributions have been selected for publication in the special Issue "Managed Aquifer Recharge for Water Resilience" of the MDPI journal “Water”.
By late December eight papers have been accepted and published: https://bit.ly/2sALkQb
At least 18 papers are expected to be published. The number of submissions received exceeds 28, most of them are currently under review.



Water Journal for ISMAR 10. https://www.mdpi.com/journal/water/special_issues/ISMAR10_2019

IAEA Course on MAR in Medellin, Colombia

Once again, the International Atomic Energy Agency (IAEA), as part of its training activities, has promoted a 40-hour Managed Aquifer Recharge course under the title: "Initiation and expansion of knowledge in integrated water management techniques, applied hydrogeology and artificial recharge of aquifers".

The course took place from June 17 to 21 at the University of Antioquia, Medellin, Colombia, and was attended by experts from the Colombian Administration, who collaborated in the slots, the University and an external consultant from IAH_MAR, under the direction of Professor Teresa Betancur.

The course combined theoretical and practical knowledge with videos, books, exercises, debates, a field trip... and a lot of knowledge recharged. More info (Antioquia University)

Geophysics and MAR. FastTIMES magazine

In July 2019 the Environmental and Engineering Geophysical Society (EEGS) published a featured issue of their magazine FastTIMES (Vol 24 No 2) on Managed and Natural Aquifer Recharge Geophysics. They did this in cooperation with many organisations including IAH and specifically the IAH-MAR Commission. Contents list of featured articles is below. Full issue can be downloaded (29.7Mb) https://www.eegs.org/latest-issue

FastTimes and IAH-MAR sharing dissemination canals

Strategic Overview Series: "Climate-change adaptation & groundwater"

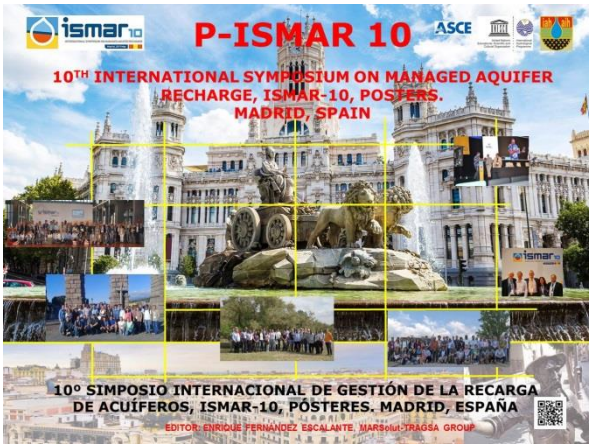
In July 2019 IAH published in its Strategic Overview Series a 6p article "CLIMATE-CHANGE ADAPTATION & GROUNDWATER" led by Stephen Foster. Peter Dillon made an invited contribution to this addressing role of MAR: Foster, S., Tyson, G., Dillon, P., Stigter, T., Taylor, R., Scanlon, B., Andreo, B., Kebede, S., Escolero, O., Taniguchi, M., and Wende, F. (2019). Climate-Change Adaptation & Groundwater. International Association of Hydrogeologists Strategic Overview Series, 6p, https://iah.org/wp-content/uploads/2019/07/IAH_Climate-ChangeAdaptationGdwtr.pdf

Climate-change adaptation & groundwater publication

P-ISMAR 10 (P-ISMAR series,Title 7). POSTERS OF THE 10TH INTERNATIONAL SYMPOSIUM ON MANAGED AQUIFER RECHARGE, MADRID, SPAIN

Most of the poster presentations (66) have been specifically requested by editors to authors, gathered and published in the attached book. Some of them have parallel written papers with the "ISMAR 10 proceedings book".

P-ISMAR 10 access. "MAR to solve the global water crisis".
https://www.ismar10.net/en/2019/09/02/p-ismar-10-p-ismar-series-title-7/
Mirror site (DINA-MAR)
http://www.dina-mar.es/post/2019/09/02/P-ISMAR-10-(descarga-gratuita-del-Ebook-Free-download)-P-ISMAR-serie-Titulo-7.aspx
It has also already been included in the MAR books repository: https://bit.ly/2TEV0UZ



P-ISMAR 10 book

ISMAR 10 PROCEEDINGS BOOK

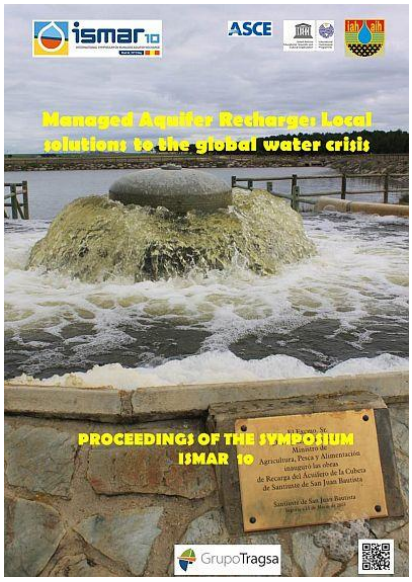
The proceedings book of the Symposium is entitled "Managed Aquifer Recharge: Local solutions to the global water crisis" is composed by papers and extended abstracts.

This book collects all the presentations revised by pairs and exposed at the Symposium. You can hereby enjoy the publication resulting from this cooperation, which consists of 74 papers and 16 extended abstracts, what allows us to share some information that, otherwise, could have been lost. Tragsa Group Editors and the organizers team would like to thank all the authors, whose contribution is sincerely appreciated. https://bit.ly/2v3FhEP

Download the ISMAR 10 proceedings book:

https://www.ismar10.net/wp-content/uploads/2019/11/ISMAR10-procs-book_EF.pdf

Mirror site: http://www.dina-mar.es/pdf/ISMAR10-procs-book_EF.pdf



ISMAR 10 Proceedings book´s cover

IAH-MAR members participated in SIAGRO, Ica, Peru

By 2019 August 20th to 22th took place in Ica (Peru) the International event "Hídrica: International water symposium" (SIAGRO). MAR advances in the area were exposed by IAH members. More info: http://siagro.pe/blog4.html More than 300 attendants.

46th IAH Congress, Málaga, Spain, 24-28th Sept 2019. IAH-MAR Plenary

There were not specific session dedicated to MAR in the Congress, despite 14 papers on MAR were submitted, including the opening speech and that it had been requested to organizers.

More info: http://www.dina-mar.es/post/2019/10/16/Plenario-de-la-IAH-MAR-Commission-en-el-congreso-IAH-46-Malaga.aspx

Roorkee, India, 23 Oct 2019. IAH-MAR Plenary

A Plenary of the IAH-MAR was also held in Roorkee, India on 23 Oct 2019. The INGWC-2020 is to be held in Kerala India 18-20 Feb 2020. Its theme is "Groundwater Management for Sustainable Development: with special emphasis on coastal and urban environment". MAR papers are encouraged and Dr Yogita Dashora will present a keynote talk on MAR. https://www.ingwc2020.in/

MARSOLut PROJECT. First capacitation workshop. First capacitation workshop of the MARSOLut Project in Tragsa. Madrid, 2019 November 6th to 8th. More Info:https://www.marsolut-itn.eu/news-events/network-events/workshop-1/

International Symposium on the use of nonconventional waters for achieving food security (FAO & Government of Spain) November 14-15, 2019. Venue: Casa de América, Madrid, Spain
More info at: http://www.fao.org/land-water/events/ncwsymposium19/en/
Related publications: http://www.groundwatergovernance.org/resources/thematic-papers/en/
IAH participation: https://bit.ly/37aqYMX More than 200 attendants.

Australasian Groundwater Conference 2019 25-27 Nov 2019 Brisbane, Australia
There were 5 parallel streams having 300 oral papers and 77 poster papers. As MAR was not a session theme the 17 papers with a focus on MAR were dispersed through the program. A brief description prepared by Peter Dillon for IAH Commission on MAR has been included in section 4, posted at https://bit.ly/2tyMxrO and https://www.ismar10.net/en/2020/01/20/australasian-groundwater-conference-2019-25-27-nov-2019-brisbane-australia/ . It will be available shortly at https://recharge.iah.org/ too. See section 4 of this report for more details and a summary.

A whole day on MAR workshop. December 11th, 2019, Zaragoza, Spain.
Accelerating action to tackle water pollution and enhance EU preparedness to water-related climate change impacts #EUWIC.
Managed Aquifer Recharge (MAR) has been considered for a long time as an important technology to combat the adverse effects of Climate Change (CC). This is not a gratuitous claim. In this workshop, the organizers supported this statement on the basis of real sites, indicators and cases located all around the world. MAR is being used in the world in combination with other Integrated Water Resources Management (IWRM) measures to reduce climate change adverse impacts as an adaptation and even mitigation strategy to face up CC challenges. Clear examples were exposed by the workshop participants… https://bit.ly/3ar301T Mirror site: https://bit.ly/2Rwy7Al and MARSOLut project site: https://www.marsolut-itn.eu/news-events/past-events/

Dr. Enrique Fernández Escalante (Tragsa Group, Spain) provided evidence on why managed aquifer recharge can be considered a successful adaptation tool for climate change effects.

It is important the set of conclusions provided by the whole attendants during the final debate, download at the bottom of https://bit.ly/2TEz5gD or for direct download: https://bit.ly/2v1RnOI

Dr. Catalin Stefan, head of Research Group INOWAS at Technische Universität Dresden, Germany, introduced the development and application of a web-based real-time monitoring…

Presentations and summary: https://bit.ly/3ardPBa

92 free downloadable books on MAR. DINA-MAR´s MAR books repository upgrade
The repository for books on MAR has been enlarged to 92 units during 2019 and it keeps growing up. Contributions very welcome!
MAR books repository access: https://bit.ly/2TERbz7

New Urban MAR WG
The new working Group inside the MAR Commission has been proposed by Dr. Niels Hartog from KWR, assisted by Dr. Koen Zuurbier, within the context of "continuing urbanization and climate-change are further aggravating urban challenges such as urban heat island effects and poor air quality…". According to the proposer´s words "This Urban MAR working group aims to exchange information and cooperate in the development of technical and non-technical aspects for the successful application of urban MAR and to showcase successful practical examples".
All contributions will be welcome. Download the proposal and description at: https://www.ismar10.net/2020/01/18/nuevo-grupo-de-trabajo-y-comunidad-de-practica-en-la-iah-mar-commission/ or visit shortly the website https://recharge.iah.org/ for further info.

Latin MAR Community of Practice
The new CoP has started working on different approaches to *"Establish a mechanism to promote managed aquifer recharge interdisciplinary participation focused on project development, execution and knowledge transfer in Latin America".* Proposed by Adriana Palma and five more Latin colleagues, new actions are expected for 2020. Download the proposal and description https://www.ismar10.net/2020/01/18/nuevo-grupo-de-trabajo-y-comunidad-de-practica-en-la-iah-mar-commission/ or visit shortly the website https://recharge.iah.org/ too.

The existing CoPs (Australian Group, the Italian CoP and China-MAR keeps their activity. During 2019 the second and the third have modified the term network for the term CoP, so, at this moment, **there are not networks included in the IAH-MAR Commission.**

IMMINENT:
UNESCO book on MAR cases (to be released in 2020 World Water Week)
Also, very shortly, will be released the UNESCO book on MAR cases, containing 28 sites and experiences gathered from all around the world. It will be duly informed by coordinators and Dr. Alice Aureli, who keeps helping in the development or our activities so kindly. Alice also took care of the alignment between ISMAR 10 and the Strategic Plan of **UNESCO IHP-VIII (2014-2021)** "WATER

SECURITY: RESPONSES TO LOCAL, REGIONAL, AND GLOBAL CHALLENGES" Specifically: ***Focal Area 2.2 - Addressing strategies for management of aquifers recharge***.

Dr. Alice Aureli and Dr. Peter Dillon in ISMAR 10

BSMAR17 Phoenix/Tempe, Arizona USA, April 1-3, 2020

RESILIENCE THROUGH RECHARGE AND RECOVERY, the 17th Biennial Symposium on Managed Aquifer Recharge (BSMAR 17), will be held at the DoubleTree by Hilton – Phoenix/Tempe, April 1-3, 2020. This symposium will feature numerous oral presentations, poster sessions, optional workshops, field trips and an awards luncheon. Visit the BSMAR 17 website for more information. Call for ABSTRACTS is out now and closed October 1. See the Abstracts section of www.bsmar.site. Questions or offers to help? Contact Mike Hulst at Mike.Hulst@nv5.com https://bsmar.site/ bsmar@ahssymposium.org

BSMAR 17 banner

ISMAR11, Long Beach, California, April 11th to 16th 2022

Announced at ISMAR10, the next ISMAR will be hosted by California Groundwater Resources Association, Arizona Hydrological Society and Orange County Water District. See the ISMAR11 web site for more information as it unfolds. Chair is Adam Hutchinson (OCWD), and co-chair is Doug Bartlett, (Clear Creek Associates, AZ). Committee members include Sarah Erck, Jim Strandberg, and Robert Bower.

ISMAR 11 logo

This is a return to near where the first ISMAR began in Anaheim in 1988.

If you'd like to host ISMAR12 in 2025 please discuss with co-chairs of IAH-MAR by May 2021.

BRINGING MAR EXPERTISE TO BRAZIL

An initiative of scientist and consultants to share knowledge and best practices on Managed Aquifer Recharge technology with the Brazilian groundwater experts and governmental authorities. The Group has started working by the end of 2019, initially proposed by Daniella B. van Dalen and her Brazilian colleagues Paulo Galvão, Suzana de Lima, Tatsuo Shubo, Victor Coelho and Gisele Kimura (at least).

The Group is willing to contribute with 47th IAH organizers proposing a MAR specific session during the Conference.

IAH 47th congress´ banner

3. Current Working Groups and Communities of practice

1. MAR for Sustainable Development – Yan Zheng (SUST, PR China)
2. Global MAR Inventory – Catalin Stefan (TU Dresden- Germany) with Arnaud Sterckx (IGRAC, NL)
3. Economics of MAR – Andrew Ross (ANU, Australia)
4. 60 years history of MAR – Peter Dillon (CSIRO, NCGRT, WGA Aust) and Pieter Stuyfzand (KWR & TU Delft, NL). Closed during 2019.
5. Monograph on clogging and its management – Russell Martin (WGA Pty Ltd, Australia)
6. MAR to MARket – Enrique Fernández Escalante (Tragsa, Spain). In process of closure
7. MAR water quality guidance and regulations – Manuel Sapiano (Malta Energy and Water Agency)
8. MAR suitability mapping – (formed Sept 2018) - Jose Bonilla and Catalin Stefan and including Arnaud Sterckx (IGRAC), Daniel Goode (USGS), and Jana Sallwey (TU Dresden). It will identify, discuss and evaluate the range of methods in use, and is organising a workshop at ISMAR10.

1. MAR for Sustainable Development – Yan Zheng

Case study fact sheets and descriptions are to be prepared for case studies that demonstrate sustainability. This will be incorporated in the planned UNESCO publication (described above in Highlights) https://recharge.iah.org/mar-for-sustainable-development

2. Global MAR Inventory – Catalin Stefan with Nienke Ansems / Arnaud Sterckx

IGRAC MAR Portal – The MAR Portal now contains detailed information on 1200 Managed Aquifer Recharge sites around the world as well as several regional MAR suitability maps. https://recharge.iah.org/global-mar-inventory

Two summary papers were produced and both are now available from: https://recharge.iah.org/swarm-vol-4-issue-2-june-2018 : Stefan, C and Ansems, N. (2018). Web-based global inventory of managed aquifer recharge applications. Sustain. Water Resour. Manag. Vol 4 (2) p153-162. https://doi.org/10.1007/s40899-017- 0212-6 (open access) - 300 reads a month since published on line !!!!!

Bonilla Valverde, J.P., Stefan, C., Palma Nava, A., da Silva, E.B. and Pivaral Vivar, H.L. (2018). Inventory of managed aquifer recharge schemes in Latin America and the Caribbean. Sustain. Water Resour. Manag. Vol 4 (2) 163-178 https://doi.org/10.1007/s40899-018-0231-y

ACTION: If you have information on a MAR site that you would like included in the international set accessible at IGRAC's web site please visit the portal and complete a template of information https://www.un-igrac.org/global-mar-inventory-site-submission-form and submit it.

Global MAR Portal. 1200+ MAR case studies

3. Economics of MAR – Andrew Ross

https://recharge.iah.org/economics-of-mar

Stage 1: 2016-18: Collection & analysis of financial (cost) data for selected MAR schemes
Stage 2: 2018 onwards: Cost effectiveness and cost benefit analysis of selected MAR schemes.
Stage 3: collection of cases in close connection with the new UNESCO book gathering the experience from 24 MAR sites all around the world.
Outputs: Financial analysis of MAR costs of 21 schemes in 6 countries completed and published: Ross, A. and Hasnain, S. (2018) Factors affecting the cost of managed aquifer recharge schemes, Sustainable Water Resources Management 4:179-190 https://recharge.iah.org/swarm-vol-4-issue-2-june-2018
Next steps: Extension of existing work to cover a wider range of schemes with more MAR types and regions/countries (including developing countries), to analyse cost effectiveness of specific cases where alternatives to MAR have been costed to inform about the competitiveness of MAR compared with other techniques and analysis of benefits compared to costs from specific cases to provide further insights on the value and benefits of MAR. This warrants more case studies particularly in less developed countries, and also covering cost benefit analysis of MAR projects with respect to alternative approaches to water supply, water security or water quality improvement). This is intended in the planned UNESCO publication (described above in Highlights)
ACTION: Volunteers are needed to provide economic information for some more MAR case studies.

Dr. Andrew Ross during his slot in ISMAR 10

4. 60 years history of MAR – Peter Dillon and Pieter Stuyfzand (closed during 2019)

A global summary having 31 coauthors was published in the Hydrogeology Journal as an open access paper supported by UNESCO (as outlined above under highlights).
Dillon, P., Stuyfzand, P., Grischek, T., Lluria, M., Pyne, R.D.G., Jain, R.C., Bear, J., Schwarz, J., Wang, W., Fernandez, E., Stefan, C., Pettenati, M., van der Gun, J., Sprenger, C., Massmann, G., Scanlon, B.R., Xanke, J., Jokela, P., Zheng, Y., Rossetto, R., Shamrukh, M., Pavelic, P., Murray, E., Ross, A., Bonilla Valverde, J.P., Palma Nava, A., Ansems, N., Posavec, K., Ha, K., Martin, R. and Sapiano, M. (2018). Sixty Years of Global Progress in Managed Aquifer Recharge. Hydrogeology Journal https://doi.org/10.1007/s10040-018-1841-z . At this address you can download the paper, and electronic supplementary material: national summaries for 16 countries, and pictures and descriptions of MAR examples. All are freely available thanks to UNESCO covering open access charge. The 16 countries/ areas with summaries are: Australia, China, Croatia, Finland, France, Germany, Israel, Italy, Jordan, Korea, Latin America & Caribbean, The Netherlands, Qatar, South East Asia, Southern Africa and Spain. https://recharge.iah.org/60-years-history-mar

Current estimated annual volume of MAR is ~10 cu.km which is about 1% of total annual groundwater extraction but only 0.07% of natural recharge. This working group, which formed at ISMAR9, has completed its task and disbanded along 2019 providing the results for future research.

5. *Monograph on clogging and its management – Russell Martin*

The first monograph is available (see https://recharge.iah.org/working-groups/clogging-and-its-management). The second volume is underway and still more contributions are needed. New material - seeking papers on

- Low cost low tech applications to reduce/manage clogging
- MAR clogging indicators
- standardization of investigation methods
- case studies on management of clogging during MAR

- Synthesis of clogging papers from previous ISMAR proceedings may also be an option.

ACTION: Papers or reports on management of clogging are invited in 2019 for consideration for inclusion in Volume 2. Please contact Russell if you wish to contribute, or are aware of relevant open access material: rmartin@wga.com.au

6. MAR to MARket – Enrique Fernández Escalante

This working group is the global channel for an Action Group under the European Innovation Partnership (EIP) named: "Strategies and actions to bring managed aquifer recharge technique to industry (MAR(solutions) to MARket)". This hyperactive group in association with MAR-SOL EU project (project which concluded in 2017) has:

- A MAR book repository of 92 books https://bit.ly/2TEV0UZ
- Published all outputs of MARSOL project, accessible at: http://www.marsol.eu/35-0-Results.html
- A linked-in network of 302 people https://www.linkedin.com/groups/4690290
- More information at : www.dina-mar.es/ or https://recharge.iah.org/mar-to-market

During ISMAR 10 was announced that this group will be disbanded shortly with continuity across the European EIP Water Action Group MAR-solutions.

7. MAR water quality guidance and regulations – Manuel Sapiano

At the IAH-MAR Plenary in Dubrovnik 25 Sept 2017 a water quality guidance and regulations working group was established to assemble examples from around the world. Manuel made a contribution to the governance part of the 60 year history of MAR paper. He has exposed a paper in ISMAR10 to list and compare existing state and national water quality guidelines and regulations for MAR. New advances were exposed in the EIP meeting in Zaragoza, Spain, 2019 Dec 13th

ACTION: Volunteers are invited to inform Manuel concerning the existence of such a guideline in their country to send him the web link or a copy to add to those on the web site, to allow a comparative analysis: https://recharge.iah.org/mar-regulations

Mr. Manuel Sapiano, CEO of the Energy and Water Agency of Malta, talking about how to ensure safe implementation of MAR under the EU Water Framework Directive

8. MAR suitability mapping – (formed Sept 2018) - Jose Bonilla and Catalin Stefan

Founders also include Arnaud Sterckx (IGRAC), Daniel Goode (USGS), and Jana Sallwey (TU Dresden). This group will identify, discuss and evaluate the range of methods in use, and has organised a workshop at ISMAR10, May 2019.

ISMAR 10. Workshop nº 3: Utilization of spatial analysis techniques for the identification of potential MAR areas: challenges and opportunities.

***ACTION**: If you have information on a MAR suitability mapping (projects or proposal) that you would like to share the working group is still collecting them to create a guideline.*

Recently approved: 2019 4th quarter:

9. Urban MAR Working Group (formed Nov 2019).

Leaded by Niels Hartog (KWR, The Netherlands). This working group aims to foster and develop the application of urban MAR, and its first proposed activity is to develop a position paper on the conditions, requirements and benefits of using urban MAR in cities. The aim is to present a (first draft) of this position paper at the MAR commission meeting at the 2020 IAH congress in Sao Paolo, Brazil. https://bit.ly/3773Rmj https://www.ismar10.net/wp-content/uploads/2020/01/IAH-Urban-MAR-Working-Group_NH.pdf

10. Latin MAR (Community of Practice):

The concept was initiated in discussions at ISMAR10, followed by a meeting in Santiago, Chile August 2019. Adriana Palma (Mexico), Jose Bonilla (Costa Rica), Roberto Navarro (Peru), Tatsuo Shubo (brazil), Santiago Matta and Edmundo Claro (Chile) are leading this initiative to " establish a mechanism to promote managed aquifer recharge interdisciplinary participation focused on project development, execution and knowledge transfer in Latin America". https://bit.ly/3773Rmj https://www.ismar10.net/wp-content/uploads/2020/01/Latin-American-MAR-Community-of-Practice.pdf

4. MAR related activities involving IAH members

46th IAH Congress, Málaga, Spain, 24-28th Sept 2019.

During the 46 Congress took place a new IAH-MAR Commission plenary (see section 1), September 26th. The agenda was: 1. Welcome and Introductions 2. Objectives of the Commission – Enrique Fdez. Escalante 3. Summary of outcomes from ISMAR 10 and imminent publications meeting 4. Progress reports and plans of Working Groups (PPTs). Possible proposals for a new W.G. 5. ISMAR 11 Announcement and invitation (video) 6. Information Sharing 1. New and on going Projects on MAR. 7. Suggestions for new activities. 8. Volunteers to participate in existing and new activities – anyone e.g. meeting at EIP conference in Zaragoza, Spain, 2019 December. 9. Information sharing on MAR (not covered elsewhere). 10. Q&A.

46th IAH Congress´ logo. Malaga, Spain

The minutes of the meeting can be downloaded directly from: https://bit.ly/2sAkGqE

During the plenary Enrique informed of the contact of the new co-chairs with Dr. Tibor Stigter, chair of the Commission on Climate Change, and his co-chairs. There had been some conversations before the meeting seeking a closer position of both groups and the future preparation of activities together.
Since then, the cooperation between both IAH Commissions (Climate Change and managed aquifer recharge) is effective and nice.

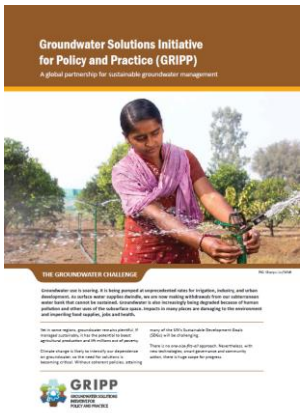
IAH-MAR COMMISSION. ISMAR 10 PLENARY

Information sharing on MAR (not covered elsewhere):

- Maike Groeschke – with BGR starting investigations for a MAR pilot project in Chad – seeking guidance, and will aim to use ISMAR10 for communicating and capacity building
- Boris Matti – six MAR techniques are to be piloted in Kabul, Afghanistan – will aim for papers in ISMAR10 and bringing local staff
- Agnes Tahy – spoke of gross expansion of irrigation in Hungary and potential depletion – would like to map where MAR is possible, and link up with new WG. Also a Water Summit in Hungary next year gives a possibility to highlight riverbank filtration, what contributes 90% of water supply.
- Simon Higginson (Australia) – mentioned the Perth Groundwater Replenishment Scheme (4 papers tomorrow) with extensive deep drilling underway now – Andrew asked if cost information could be provided
- Tao Cui (Australia) - asked whether anyone else had used modelling to plan locations of MAR sites – and Catalin Stefan responded saying they have added optimization to this and Ralph would be talking on this.
- Yongcheol Kim (Kigam) reported that there were many examples of MAR in Korea, that he had pioneered the Jeju- friendly MAR there, Prof Ha was giving a summary talk of six types of MAR, also including the oldest riverbank filtration site which is a feature of tour no 5 on Wednesday.

Contribution to GRIPP Advances in Groundwater Governance volume

Through the work of Richard S. Evans & Peter Dillon, who authored ch 17 *Linking groundwater and surface water: conjunctive water management*, MAR has its place within the volume prepared by a large consortium on Groundwater Governance. The book: Villholth *et al* (eds) (2018) Advances in Groundwater Governance, CRC Press, is now available for free down load from GRIPP and IGRAC web sites:
http://gripp.iwmi.org/2019/01/11/book-on-advances-in-groundwater-governance-now-open-source/ and https://www.un-igrac.org/news/open-access-book-groundwater-governance



gripp.iwmi.org

37th CIS Working Group Groundwater Meeting in Helsinki, Finland. 14-15 October 2019

At the invitation of the EU Commission and the Finnish Presidency of the EU, Dr. Catalin Stefan, head of Research Group INOWAS at TU Dresden, and Prof. Christoph Schüth from TU Darmstadt, attended between 14-15 October 2019 the 37th CIS Working Group Groundwater Meeting in Helsinki, Finland. During the meeting, Mr. Manuel Sapiano, CEO of Malta's Energy and Water Agency introduced the background for the need of a specific guidance document on MAR and briefly assessed the existing EU policy related to MAR. Since the use of correct and coherent terminology is paramount, a common understanding of artificial recharge / MAR as well as a classification of MAR techniques are needed as preliminary step in the guideline development. Further key issues include the assessment of the impact of unsaturated soil zone in the mitigation of contaminants, the definition and application of exemptions according to the Groundwater Directive, guidance on a comprehensive risk assessment framework in relation to the application of MAR, guidance on permitting structure, as well as clear definition of recharge water quality.

Mr. Sapiano also emphasized the existence of a large pool of research initiatives that are addressing the technical aspects related to the application of MAR under various social and hydrogeological conditions. To underline this, Prof. Schüth presented the main results from the EU-funded project MARSOL (http://www.marsol.eu) where MAR benefits are demonstrated at different locations in seven countries. The experience gained shows that MAR can be safely applied as mitigation solution against droughts and climate change. The excellent research and demonstration activities from MARSOL will be continued in the recently funded project MARsoluT (https://www.marsolut-itn.eu). Dr. Stefan acknowledged the need for a regulatory framework for MAR at EU level and assured the audience about the existence of excellent best practices that can be consulted during the development of MAR guidelines (for example, over 1200 MAR case studies are included in the Global MAR Portal, jointly developed by the INOWAS Group at TU Dresden and IGRAC, Netherlands - http://marportal.un-igrac.org). Further, Dr. Stefan introduced the SMART-Control project (www.smart-control.inowas.com), a research project funded under the Water Joint Programming Initiative (Water JPI). The main objective of the project is the development of a web-based, real-time monitoring and control system for MAR applications. The potential relevance of the project in the development of MAR guidelines lies on the role of a real-time monitoring and modeling framework

in the understanding, assessment and reduction of risks associated with MAR. In the end, Dr. Stefan also briefly introduced the activities of the Commission on Managed Aquifer Recharge of the International Association of Hydrogeologists (www.recharge.iah.org) and offered support for the dissemination of outcomes at the interface between science, industry and policy sectors.
The proposed timeline for the development of MAR guideline coincides with the official mandate of the WG Groundwater and spans between 2019 and 2021.

Australasian Groundwater Conference 2019 25-27 Nov 2019 Brisbane, Australia
5 parallel streams, 300 oral papers and 77 poster papers.
MAR-Relevant Award Winners: At inaugural IAH Aust Chapter Awards, Steve Parsons and team from Jacobs won the Groundwater industry excellence award, for the West Gate Tunnel Project. Jacobs led the design of groundwater recharge schemes to manage groundwater drawdown, contaminant movement and ground settlement impacts. Dr Benjamin Birt led the team from QTEC, to win the IAH groundwater innovation and technology award- for leading the introduction of Borehole Magnetic Resonance logging techniques in Australia. NMR was a significant contributor to the detailed characterisation of permeability and porosity of target aquifers for the Perth Groundwater Replenishment Scheme.
Summary and conclusions report, prepared by Peter Dillon:
-David Schafer (UWA) described the reactive transport processes governing **fluoride release and attenuation** in the Leederville aquifer (Perth Groundwater Replenishment Scheme) using lab batch experiments, field data and PHT3D modelling and showed that carbonate rich fluoro-apatite was the dominant source, peak concentrations were within drinking water guidelines and attenuated through reprecipitation. Adding calcium chloride to injectant was evaluated in lab studies and could be considered, as a backup if needed in future sites if elevated F release is an issue.
-Paul Magarey (Groundwater Science) described episodes where ASR with stormwater in a confined aquifer on the Adelaide Plains led to artesian flowing wells. These were due to **cumulative impacts of ASR**, and in part due to decline in groundwater extraction by industry. There is no groundwater management plan for the area although one has been in development for 12 years.
-Larysa Hayes (Geoscience Australia) described an interdisciplinary approach to determining the storage capacity of an MAR site in alluvial aquifer on the River Darling using sonic drill core analysis, including clay content, electrical conductivity of pore fluid, downhole geophysics and airborne electromagnetic surveys. This allowed **probabilistic estimates of storage capacity** for MAR design.
-Benjamin Birt (Cteq) winner of the inaugural IAH groundwater innovation and technology award- for leading the introduction of **Borehole Nuclear Magnetic Resonance logging** techniques in Australia described how the NMR detected hydrogen in the formation, which had correlations with porosity and with permeability as derived from pumping tests. It has also been used to log existing wells (not with steel casings) at MAR sites, including Perth Groundwater Replenishment Scheme.
-Cassie Turvey (RPS) described the feasibility study for improved water management including **MAR in an urbanising area with shallow water table** at Rockingham south of Perth. Subsurface drainage has been installed to prevent excessive rise in water table and these have now become perennial drains. 7ML/ha is discharged, at better quality than native gw and suitable for irrigation, but has high Fe and Mn. Up to $3Mm^3$/yr will be available in winter for recharge and 3 wells are proposed to be installed 2 with continuous recharge to the confined Leederville aquifer and one ASR well for injection and recovery. The main remaining investigations are to determine the degree of confinement of the Leederville aquifer in this area and treatment requirements for Fe and Mn.
-Peter Reeve (Flinders Uni) described the development of experiments using a common standard design from Europe (DEMEAU 2015) for **column studies of fate of selected anthropogenic organic chemicals** in aquifer materials (Port Willunga limestone, Adelaide) with and without biofilms. Preliminary batch studies suggest biofilm presence does not influence sorption to this material but ongoing column study work aims to elucidate whether biofilm presence could impact factors such as biodegradation under differing environmental conditions.
-Craig Flavel (Water Technology) described a **pre-feasibility study for MAR opportunities for all of Sri Lanka**. Lack of basic data on aquifers, existing and projected water shortages, and a very short time scale made this an ambitious project that lead to recommending several sites for demonstration projects, by necessity focused on

areas where hydrogeology was better defined. Cascade check 2 dams have been in use for 2000 years in this area to buffer small-scale irrigation and drinking water supplies.

-Peter Dillon (CSIRO/Flinders) discussed **possible changes to Australian MAR Guidelines based on a review of experience** in application and in new research in the 10 years since they were produced. Only minor changes are needed, the largest of which is to include temperature as a hazard to be managed in cases of geothermal reinjection, aquifer thermal energy systems and operations where the aquifer is relied on for water quality improvement.

-Karen Barry (CSIRO) presented results of field research on the northern Adelaide Plains for the **removal of total organic carbon, total nitrogen and total phosphorus at four stormwater ASR sites**. Analyses were based on comparing frequency distributions for concentrations in injected and recovered water. This showed 50th percentile removals across the 4 sites of 51-59% for TOC, 0-49% for TN and 29-53% for TP. These sites have been in operation for at least 10 years, and no change in removal has been observed over this time, but studies on the fate of removed nutrients would improve understanding of the sustainability of operations.

-Andrew Ross (ANU) spoke on his **summary of costs and benefits derived from 26 operational MAR sites**. Sites using natural waters had lower costs than using recycled waters and infiltration schemes had lower costs than those with recharge wells. Benefits derived from avoided costs or net value of additional agricultural production gave benefit: cost ratios between 1.5 and 7.5. The full results will be published in a UNESCO book in 2020 on MAR case studies.

-Louise Lennon (Jacobs) described a desktop study to assess the **feasibility of several water supply options including MAR for developing agriculture in part of the Northern Territory**. Water use is less than allocation at present and options included (a) do nothing different, (b) training and capacity building for farm use to increase to allocation, (c) small scale MAR at sites with identified potential, and (d) store water in above ground dams. Taking account of production and transport costs for the most profitable crops, (b) was most economic, followed by (c) or (a) with (d) last. However more investigations are required to produce specific designs and costs.

-Yogesh Jadega (ACT Gujarat, India) evaluated **community-centric aquifer management strategies in coastal regions of Gujarat with a focus on local aquifer management institutions** for self-dependent adherence to managing water demand, and for monitoring and maintenance of stream bed recharge structures.

-James Hansen (Qld Gov) spoke about a prefeasibility study to assess the **potential for sand dams and subsurface dams**. This 'Underground Technologies Prefeasibility Study' was a broad-scale GIS study produced mapping products to identify alluvial areas with prospects for further investigations for increasing subsurface water storage.

-Kirstten Brouns (Mandalay Resources) described potential for aquifer recharge for **mine water disposal** (which she correctly said was not MAR) where a gold and antimony mine at Costerfield in Central Victoria had been given a Research, Development and Demonstration Licence to reinject 730ML of dewatering water into the same saline aquifer for recirculation to avoid expanding surface water storage and treatment plant. They would be monitoring including the movement of a nitrate and antimony plume in the aquifer.

-Jonathon Hanna (BHP Resources) described **BHPs return of dewatered water at iron ore mines to aquifers for future beneficial use**. This was an integral part of BHPs mine plans at 5 sites, and accounted for an increasing proportion of the 65Mm^3/yr of water produced,. BHP aim to maximize 3 MAR to accord with BHP's Water Stewardship Position Statement aligned with UN SDG 6. Technical uncertainties included estimation of future volumes of extraction and of MAR capacity. Good quality water was needed to support minesite rehabilitation at mine closure.

-Mal McGivern (BHP) followed by describing a surplus water operationalisation program to address **controls and managing the environmental, regulatory, operational and maintenance risks and interconnections with potable water sources**.

-Ryan Morris (RDM Hydro) and Lauren Helm (Origin Energy) described the removal of screens and **under-reaming of wells to reverse the clogging of deep wells used for reinjection of desalinated and deoxygenated coal seam gas associated water**. In five renovated wells the injection capacity was increased 50% at only 15% of the cost of a new well. The cause of clogging was iron precipitation from corrosion of mild steel casing even at low oxygen concentrations, and an anti-corrosion additive is expected to prolong the life of wells and ultimately further under-reaming is also possible.

Many other papers of broader relevance in hydrogeology including impact assessment on GDEs, geophysics, advances in large data analytics and visualization, uncertainty analysis, isotopes, monitoring methods were also presented.

A whole day on MAR workshop. December 11th, 2019, Zaragoza, Spain.

Accelerating action to tackle water pollution and enhance EU preparedness to water-related climate change impacts #EUWIC (see section 1).

CC ISSUES	MAR SOLUTIONS	SITES	INDICATORS
Evaporation	Underground water storage	*Canal del Guadiana (CLM)*	+48 hm^3/year
	Temperature decrease	*P. de Mallorca (I. Baleares)*	-1.5-6ºC of air temperature
Evapotranspiration	Soil humidity increase	*Gomezserracín (CyL)*	+15-20% soil moisture
Water demand	Reclaimed water infiltration	*Alcazarén (CyL)*	+0.4 hm^3
	Punctual infiltration	*Canal Isabel II (Madrid)*	+5 hm^3/year
Water availability	Self-purification	*Santiuste (CyL)*	+/-12-53% in water q parameters
Run-off	Off-river storage	*Santiuste (CyL)*	+2.62 hm^3/year out of Voltoya River
Wetlands	Restoration	*Santiuste (CyL)*	-5% recharge vol. (Alkaline lake)
	Gravity flow water distribution	*El Carracillo (CyL))*	+40.7 km of canals and pipes
Hydro Electric Power	E savings / Lower emissions	*El Carracillo (CyL)*	-36% E costs (-10,780 kg CO_2)
Floods	Infiltration of extreme flows	*Losa del Obispo (Valencia)*	+0.05 hm^3 in 14 hours
	Forested Watersheds	*Neila (CyL)*	-15-40% of diverted flood volume
Droughts	Multiannual management	*Santiuste (CyL)*	Supply for 3 years with no rain
Saltwater intrusion	Intrusion barrier wells	*Llobregat (Cataluña)*	30 years to regain water table

Indicators for the success of MAR solutions for mitigations of climate change effects at different locations in Spain

The set of conclusions provided by the whole attendants during the final debate were:

-One open question launched during the debate to the whole assistance was whether anybody finds any constraint against the main statement of the session (**MAR faces actively climate change adverse impacts**). Nobody acting as "the lawyer of the devil" proposed any reason to contradict this affirmation. Anyway the response brought up several open questions, such as:

- Is the regulation related to the binomial MAR-CC appropriate?
- to what extent the economic barriers impeding SAT-MAR to succeed can be jumped over?,
- can MAR become an industrial process?...

Regarding the first question, the conjunctive response was clearly NOT and requires an urgent improvement: "the legal system does not fit for purpose". Regarding the second, the response is strongly related to the context. The third still remains being an open question.

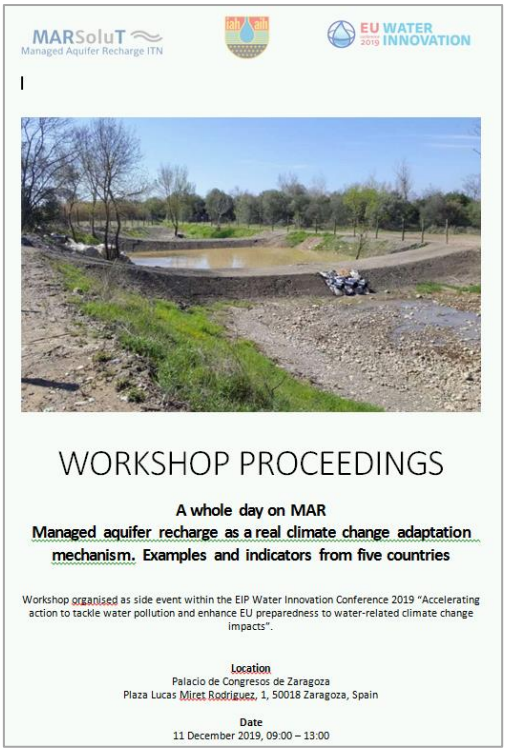
-MAR is something else… Managed Aquifer Recharge is considered, very often, an Integrated Water Resources Management Technique, but according to the inputs from the attendants, can be considered ***"something else"***, such as a mechanism of adaptation to climate change, a complex tool to combat water scarcity and drought and even an excuse to put together groups of scientists and practitioners studying how to solve urgent environmental impacts by means of an accurate risks assessment, planning and implementing practical actions with a strong scientific basis.

-Barriers pendant to be jumped over. The spread of MAR experiences is still finding severe cultural and political problems, not only of economical nature. Anyway the indicators of implementation confirm that MAR is becoming more and more accepted, especially in developing countries and in arid-semiarid areas (see Dillon et al, 2019). The preventive principle is being considered, perhaps, with a certain exaggeration in Europe, in special regarding SAT-MAR experiences. Not all the attendants agreed on this statement and some persisted in the slogan: "Not to have MAR" is better than "I have a bad MAR". The general agreement is that water authorities are, in general, conservative and the increase of the reuse and new experiences on SAT-MAR could convince them to support new implementations. This case is a vicious circle. The biggest barrier for MAR is still cultural and political, with new agents on the stage such as pollutants, pharmaceuticals… new problems are being solved with new actions (reactive barriers…) so science related to MAR cannot stop.

-Practical proposals from the attendants. The best way to protect MAR is an effective MAR, what means to gain conscience of the advantages and awareness of the economic and environmental benefits in the medium and in the long terms. Some attendants defended that the cost-benefit is equivalent to the effort paid in communication.

Regarding the statement: "Water scarcity brings MAR", this concept is only well understood by technicians, but not by the general population and some authorities, especially at local scale (yet). Once again a proper communication becomes a first-row action, as long as technical solutions are efficient and supported by

guidance documents. More effort must be paid during MARSOLut project for a wise dissemination and IAH MAR Commission must play a very important role so as to achieve this target.
The current guidelines adopted by different countries (WHO, Australian) and the imminent European Guidelines, expected for 2020, should be applicable for developing countries, but the environmental context should condition this applicability.
In general the Italian attendants expressed that wise monitoring is barely considered in the current regulations. Monitoring schemes for MAR and their know-how are missed in the regulations. It must be done during the design phase… A good monitoring is able to secure water for recharge only in case the quality standards are met. So MAR keeps being an opportunity but not a threat.
-Environmental perspective. The relation of MAR with ecosystems, some attendants miss concrete studies on the effect of MAR in riverine vegetation and streams that stay dry most of the year. Also the direct infiltration in karsts requires more detailed studies. Also modeling of the distribution of flood or flash water inside big cities is becoming a usual issue. Sometimes MAR water is jumping from the river to other position of the same river, even into a different river, spending money, what entails a certain introspection to assess the convenience by means of a cost/benefit study.
The "new supply of new water" in irrigation may become an asset as MAR in irrigation is willing to improve the water quality.
The MAR water from a WWTP poured into a river justifies river bank filtration, the most extended MAR system in countries such as Germany, Italy, Hungary… although still remains the doubt about the forced classification of RBF as a pure MAR technique.
-The final dilemma: *either to act or to get ready and wait*? The environmental circumstances will force the implementation of MAR techniques, at least in the Mediterranean countries, were indicators such as the Palmer severity index… mentions situations of extreme drought by the year 2100. So, some of the attendants mentioned the necessity of being ready with the formation of new experts in the technique´s designs and applications', taking into account that MAR is not philosophy, but rather science. The argue was about the proactivity degree: should experts wait for MAR to be duly implemented due to climate change impacts or the pressure on governments should be higher so as to keep a preventive policy?
Within this context, according to the general feeling of the attendants, "MAR as a climate change adaptation/mitigation measure" is becoming a puzzle and each one should provide his/her chip.


MARSoluT
Managed Aquifer Recharge ITN
EU WATER INNOVATION 2019

WORKSHOP PROCEEDINGS

A whole day on MAR
Managed aquifer recharge as a real climate change adaptation mechanism. Examples and indicators from five countries

Workshop organised as side event within the EIP Water Innovation Conference 2019 "Accelerating action to tackle water pollution and enhance EU preparedness to water-related climate change impacts".

Location
Palacio de Congresos de Zaragoza
Plaza Lucas Miret Rodriguez, 1, 50018 Zaragoza, Spain

Date
11 December 2019, 09:00 – 13:00

https://bit.ly/2Tzyhtl

Download the final report including the conclusions: https://bit.ly/2v1RnOI

5. Planning for future activities / lines of action

Sharing responsibilities on the Commission (using the tasks listed on the new co-chairs nomination page as starting point):

#	Activity	Comments
1	Helping interested people to develop and refine activities to advance MAR by forming working groups to complete these tasks and promote outputs	Suggestion for possible new working groups: Training on MAR (summer schools and web learning - to be discussed further, Yan-Catalin); SAT-MAR in Mediterranean, linked to MARSOLUT PhD project
2	Calling for and selecting applications for the next ISMAR before the preceding one (in a committee with IAH, UNESCO and ASCE)	Existing committee: Alice Aureli (UNESCO), Secretary General of IAH, Peter Dillon (IAH-MAR), Doug... (ASCE)
3	Helping as needed with communications leading up to ISMARs and other things that conf organiser may request	
4	Ensuring that there will be refereed publications emerging from ISMARs and help select editors and journals as required	Experiences from other ISMARs are valuable (incl. partner journals, etc.), especially fresh experiences from ISMAR10
5	If possible, see that ISMAR poster papers are accessible beyond the conference, in a way that recognises their un-reviewed status	Books of proceedings since ISAR4 collected by Enrique and published on DINA-MAR. Publication on IAH-MAR website possible?
6	Seeking to maximise international benefits of the Commission, taking particular account of developing countries and aiming to publish as much as possible in open access refereed publications, or via the IAH-MAR web site. (Leave no one behind.)	To be discussed further
7	Maintaining the web site	Catalin leading, all three having access and providing content, incl. replacement in Catalin's absence
8	Sending around occasional emails to the list with relevant news	New host for the email list to be found, attention to be paid to new EU regulations (if the hosting will be in EU)
9	Convening plenary sessions of IAH-MAR at ISMARs and IAH Congresses at as many other relevant conferences as possible to widen connections and advance activities	Commission shall organize plenaries at each ISMAR and IAH congresses, co-chairs to agree who attends what.
10	Writing letters of support to those who request it for MAR-related research proposals (offering IAH-MAR communication channels to disseminate outcomes to a very relevant international audience)	Important: use the template and keep track of all letters issued (Excel file).
11	Contacting networks of the commission and keeping them engaged	General introduction letter to be sent to all networks and working groups of the Commission, as well as other IAH Commissions (saying hello), potentially engaging in join activities (based also on previous experiences) with other IAH Commissions (i.e. climate change, karsts, regional GW flow)
12	Liaising with IAH, UNESCO, GRAC, AHS, IWA and other organisations as needed to maximise the achievement of objectives of the commission (see our welcome page for current objectives) and broaden exposure to Commission activities	Important task, to be further developed. At first glance (based on some existing personal contacts): - IAH - UNESCO - IGRAC - IWA

#	Activity	Comments
		- IEP / EU - GRAC
13	Assist the ISMAR organising committees by liaising with UNESCO to seek funding to help with travel costs for early career scientists from developing countries, and to establish selection criteria, solicit proposals, review them and make recommendations to UNESCO for awards. To also arrange where an ISMAR has made a profit for some of this to be banked with IAH to expand support of such delegates to future congresses.	To be further discussed. UNESCO Seeking alternative funding sources (All)
14	Preparing annual reports on IAH-MAR activities for IAH Executive and for posting on IAH-MAR web site for public information early each calendar year, and preparing a request to the IAH Executive as advised, in order to extend the life of the Commission before its charter expires (currently each 6 years).	Leader varies according to the year of the IAH-MAR Commission will be in charge of that year
15	Reviewing objectives, methods and communications of the Commission from time to time and certainly at the time of bidding for an extension of the Commission's charter.	During quarterly meetings, more often if required (i.e. before / after ISMAR or IAH Congress).
16	Think about new ways the Commission can increase its benefits and implement discussions and actions that will see these bear fruit.	Preliminary ideas: • Keep Working Group Active • Training • Outreach • Finding Economical support • Linked-in IAH MAR Commission Group • Etc.

Enrique Fernández Escalante

Catalin Stefan

Yan Zheng

New IAH MAR Commission´s co-chairs since 2019 June

6. Invitation for future activities

Members of IAH and others are invited to participate in this Commission to receive and contribute news and information via our email list, to attend symposia and workshops, notably ISMAR11 in April 2022, and to join and initiate formation of working groups that produce needed specific outcomes over a finite time frame. You can join our email list from the English language website https://recharge.iah.org/.

If you find this Commission useful, you are likely to find joining IAH as a member is also useful https://iah.org/join-us – through access to Hydrogeology Journal, newsletters and a wide range of Commissions and Communities of Practice, and discounted registrations to IAH Congresses and ISMARs.

The continuity of the AH-MAR Commission is ensured for the new decade.

Peter Dillon, Weiping Wang and Enrique Fernández Escalante >
>Enrique Fernández Escalante, Catalin Stefan and Yan Zheng.
Co-chairs IAH Commission on Managing Aquifer Recharge during 2019
EFE, MS, PD, CS, RR, JB, YZ January 2020.

The outgoing and new IAH-MAR-Commission co-chairs. Photo: Jon San Sebastián

"Affection and faith in MAR is noticeable and contagious"
(ISMAR 10 outcome)

IAH MAR Commission is really thankful to Dr. Peter Dillon and Dr. Weiping Wang for the intense effort and nice dedication to the Group.

Special thanks also to Dr. Ian Gale, who unfortunately passed away two years ago. Ian paid a huge attention to this Commission since its inception.

Thank you very much to all of you too.