

**International Association of Hydrogeologists
Commission on managing aquifer recharge
Report of activities in 2017**



Highlights of 2017

1. We were saddened by the sudden death of Ian Gale on 13 August 2017, at only 67. Ian was founding co-chair of the Commission, a post he held from 2002 until his retirement in 2011. He authored the term 'managed aquifer recharge' and a foundational UNESCO-IAH document 'Strategies for MAR in semi-arid areas'. He was thoughtful, considerate, a great mentor and always encouraging. He was also inspiring, with a creative spark and wise counsel. He is missed.
2. Arising from ISMAR9, Mexico City June 2016, Pieter Stuyfzand and Niels Hartog have edited a special issue of MDPI J Water on the theme: *Water quality considerations for MAR systems*. This was completed in 2017 and has 18 papers published with Open Access (10 of these were without charges to authors). http://www.mdpi.com/journal/water/special_issues/ARS
3. Also from ISMAR9, Peter Dillon, Paul Pavelic, Weiping Wang and Adriana Palma Nava have nearly completed editing a special issue of Springer J of Sustainable Water Resources Management on the theme *MAR in Integrated Water Resources Management*. 18 papers have been accepted and most were published online by Feb 2018. <https://link.springer.com/journal/40899/onlineFirst/page/1> 2 papers are available open access and access to other papers is anticipated following publication.
4. The SWARM issue contains significant papers as outputs of two working groups – two papers on global MAR inventory (Stefan and Ansems) (open access and 300 downloads in first month), and Bonilla Valverde et al (inventory of MAR in Latin America and Caribbean)
5. Also in SWARM a synthesis paper from the economics of MAR working group on factors affecting costs of MAR projects (Ross and Hasnain).
6. IAH-MAR Plenaries were held at IAH Congress, Dubrovnik, Sept 2017 and IGC7, New Delhi Dec 2017. Notes of these meetings are on the IAH-MAR English web site. In Delhi Dr D. Saha (CGWB Member) gave a keynote presentation, outlining scope of plans for MAR in India.
7. In Dubrovnik Plenary a new working group was established to assemble and critically review existing water quality guidelines for MAR from around the world, and produce a paper for ISMAR10 on this, and Manuel Sapiano has agreed to lead this. The guidelines found to date are loaded at: <https://recharge.iah.org/library-mar-water-quality-policies-regulations-guidelines> and more contributions are welcome
8. The Commission is an active participant in GRIPP, and jointly held a publications planning meeting with UNESCO at the Dubrovnik Congress, and the New Delhi plenary resulted in a planned contribution to a GRIPP activity on natural infrastructure.
9. The [Junior Research Group INOWAS](#) and partners ran the 2nd International Summer School on Managed Aquifer Recharge, 4 to 15 September 2017 at Dresden, Germany. More below.
10. A proposal by an international consortium to DANIDA, on MAR on North China Plain was successful. The commission had written a letter of support by offering to disseminate outcomes of that research through the commission's symposia, web site and email list with a view to accelerating and maximizing impacts.
11. Upcoming events BSMAR16 – San Diego, California, USA, 5-7 March 2018 is entitled "Recharge to the Rescue - Managed Aquifer Recharge as a Water Management Tool. This will contain an IAH-MAR Plenary. <https://www.grac.org/events/99/>
12. Dates for ISMAR 10 were announced (20-24 May 2019, Madrid) and the first circular released <https://recharge.iah.org/ismar10-madrid-may-2019> by Enrique Fernandez Escalante.

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.

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Web sites: <https://recharge.iah.org/> (English) Email list: – see site
: www.dina-mar.es/ (Spanish)
: <http://china-mar.ujn.edu.cn/> (Chinese)

2. Current Working Groups

1. MAR for Sustainable Development – Yan Zheng (SUST, PR China)
2. Global MAR Inventory – Catalin Stefan (TU Dresden- Germany) with Nienke Ansems / 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)
5. Monograph on clogging and its management – Russell Martin (WGA Pty Ltd, Australia)
6. MAR to MARket – Enrique Fernández Escalante (Tragsa, Spain)
7. MAR water quality guidance and regulations – Manuel Sapiano (Malta Energy and Water Agency)

1. MAR for Sustainable Development – Yan Zheng

Yan is overseeing the development of a series of fact sheets (initially about 5) on a variety of successful MAR projects that have been in operation for preferably 15 years or more, and of different types in varied settings, covering developing and developed countries. She aims to develop a matrix of measures of success of MAR projects, to include in these fact sheet stories of success. These may be embedded in IGRAC MAR Portal on the web (see Global Inventory Working Group Report) and other formats with some or all linked with GRIPP.

ACTION: Volunteers are sought to suggest exemplar sites where site descriptions may be available. Any volunteers to contact Yan. <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. Outputs of the working group activities are uploaded and maintained here. Two WG papers have been published in the Special Issue of SWARM (Stefan and Ansems) (web based

inventory of global MAR applications)-open access and 736 downloads in first 2months) and Bonilla Valverde et al (inventory of MAR in Latin America and Caribbean)
Catalin's powerpoint presentation is on the working group page :

<https://recharge.iah.org/global-mar-inventory>

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 and submit it.

3. Economics of MAR – Andrew Ross

A paper has been published in SWARM Special Issue (Ross and Hasnain) (Factors affecting costs of MAR schemes) and Andrew reported that he intends to extend this WG work on financial costs to less developed countries, and also to cost effectiveness analysis of selected cases (comparing benefits and costs of MAR projects with alternative approaches to water supply, water security or water quality improvement). A summary of working group activities is at <https://recharge.iah.org/economics-of-mar>

ACTION: Volunteers are needed to provide economic information for MAR case studies that could be brought into the synthesis in this working group. Andrew is keen to have MAR sites from developing countries.

4. 60 years history of MAR – Peter Dillon and Pieter Stuyfzand

A global summary is in prep for submission, review and publication in the Hydrogeology Journal as an open access paper supported by UNESCO as a contribution to IHP VIII. There are 30 co-authors at this stage. Eleven National contributions have been uploaded at the IAH-MAR web site <https://recharge.iah.org/60-years-history-mar> and more are coming. Current annual volume of MAR exceeds 9 cu.km which is about 1% of total annual groundwater extraction but only 0.07% of natural recharge.

ACTION: Volunteers who can write national summaries for any country not already covered and state or regional summaries for India and USA are needed. Please contact Peter if you can help.

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 underway is underway and more contributions are needed. The aim is to complete this for ISMAR10 – Madrid May 2019

- 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 2018 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 (that concluded in 2017) has :

- A MAR book repository of 75 books [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)
- Published all outputs of MARSOL project, accessible at: <http://www.marsol.eu/35-0-Results.html>
- A linked-in network of 279 people <https://www.linkedin.com/groups/4690290>
- Run or participated in the following events; 28 March -workshop “mar2farm” Segovia, Spain; 15 July Debate on effect of El Carracillo MAR on Cega River, Segovia; 31 Aug – 1 Sept, World Bank course on hydrogeology and MAR, Managua, Nicaragua; 4-15 Sept INOWAS summer school on MAR, Dresden, Germany; 25-29 Sept contrib on MAR at EIP Water Conference, Oporto, Portugal; 3 Oct The Instituto Mexicano de Tecnología del Agua (IMTA) released a new multi-author book on MAR: *Manejo de la recarga de acuíferos: un enfoque hacia Latinoamérica* (in Spanish), with numerous contributions from IAH members ; 18-19 Oct MAR and water reuse, Madrid; 27-28 Nov MAR an alternative on adaptation to climate change, Madrid; 12 Dec “Towards a more sustainable management of aquifers” Barcelona. More information at : www.dina-mar.es/ or <https://recharge.iah.org/mar-to-market>

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 <https://recharge.iah.org/mar-regulations> and to give critical review of the assembled material.

ACTION: Anyone aware of national or state regulations regarding MAR and water quality for health and environment protection please provide a copy or send the link to Manuel or Peter.

3. Recently Completed Working Groups

MAR and Groundwater Governance – Tim Parker

Tim led the working group that produced ‘A Call to Action for Groundwater Management’ based on workshops at ISMAR9, and communicated broadly through IAH and GRIPP. <https://recharge.iah.org/call-to-action-on-groundwater-management> This working group having successfully completed its task is now closed.

4. MAR related activities involving IAH members

International Summer School on MAR, Germany

The [Junior Research Group INOWAS](#) and its partners ran the 2nd International Summer School on Managed Aquifer Recharge, 4 - 15 September 2017 at Dresden, Germany. During the two weeks, 22 participants from 19 countries became familiar with different MAR techniques and were guided through steps in planning, operation and optimisation of MAR schemes from technical, policy-related and financial perspectives. More info at <https://tu-dresden.de/uw/inowas/summerschool>. The Summer School is intended to be run in different countries in future and requests to host may be sent to Catalin Stefan at TU Dresden.

MARVI Declaration, India

On 30-31 May 2017 an Indian National Workshop titled ‘Groundwater Monitoring, Planning, Recharge and Sustainable Use: Village Level Participatory Approaches and Tools’ was run in Ahmedabad by the MARVI project team led by Basant Maheshwari (Western Sydney Uni). The workshop was attended by over 120 policymakers, researchers, planners, government officials,

NGOs, farmers and community groups. The aim was to demonstrate and discuss ways to strengthen the institutional capacity and frameworks for effective village-scale groundwater management in rural areas of India. Methods and tools developed in the MARVI project to effectively implement managed aquifer recharge (MAR), assist communities craft cooperative strategies for village level demand and quality management. Outcomes are summarised in the Workshop Declaration :

<https://recharge.iah.org/marvi>

River Bank Infiltration Centre, Roorkee

In New Delhi Plenary, on 12 December, Thomas Grischek described the River Bank Infiltration Centre, a joint activity of University of Applied Sciences Dresden and National Institute of Hydrology, Roorkee. www2.htw-dresden.de The Centre aims to expand riverbank filtration to 5% of municipal water supplies in India. Cornelius Sandhu circulated a questionnaire which will be used to illustrate the extent of current understanding, acceptance of, and opportunities for river bank filtration.

Chapter in Advances in Groundwater Management

Advances in Groundwater Management (2017). Eds: Karen G. Villholth, Elena López-Gunn, Kirstin I. Conti, Alberto Garrido and Jac van der Gun. CRC Books, Taylor & Francis, A Balkema book.

<https://www.crcpress.com/Advances-in-Groundwater-Governance/Villholth-Lopez-Gunn-Conti-Garrido-Gun/p/book/9781138029804>

This is significant compilation arising from the Global Groundwater Governance program. IAH-MAR contributed to Chapter 17 which includes managed aquifer recharge in the context of conjunctive water management.

ICEWaRM Free Webinars on MAR, Australia

ICEWaRM (International Centre of Excellence in Water Resources Management)

<http://www.icewarm.com.au/> runs a [free webinar series](#) and in 2017 three were focused on MAR (15 June, 6 July, and 7 Sept). Video recordings and often the PPTs are freely available at:

<https://www.icewarm.com.au/australian-water-school/resources/> [MARVI](#) was also addressed on 4 May.

MAR Training course, Perth, Australia

26 - 27 October 2017 MAR essentials – a two day workshop in Perth, Western Australia , run by ICE WaRM and NCGRT, attracted 30 water professionals, 30% private-70% Govt staff.

[Australasian Groundwater Conference 2017](#) - Groundwater Futures: Science to Practice.

<http://www.groundwater.com.au/events/1116> 11 - 13 July, 2017, Sydney included 8 papers on MAR.

5. Invitation

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 ISMAR10 in May 2019, 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/>.

Peter Dillon, Weiping Wang, and Enrique Fernandez Escalante

Co-chairs IAH Commission on Managing Aquifer Recharge

26 Feb 2018



World Bank Course on hydrogeology and managed aquifer recharge in Managua, Nicaragua, 31 Aug-1 Sept 2017



2nd International INOWAS Summer School on MAR, Dresden, Germany, 4-15 Sept 2017



Manejo de la recarga de acuíferos: Un enfoque hacia Latinoamérica
(eds: Oscar Escolero Fuentes, Carlos Gutierrez Ojeda and Edgar Yuri Mendoza Cazares), Published by UNAM, IMTA and Divulgacion, Mexico. 3 Oct 2017. (in Spanish)
Download the book, 977 pg, 270 Mb
(External link): goo.gl/38r1fj