

Notes of the Plenary of IAH Commission on Managing Aquifer Recharge

Monday 17:00-18.30 in Dubrava 2 room, Hotel Dubrovnik Palace.

Attendees (30 from ~14 countries):

Jim Lamoreaux, Ian White, Andrew Ross, Yogita Dashora, Julian Xanke, Yan Zheng, Ittai Gavrieli, Ian Davey, Nina Rman, Victoria Burke, Jean Christophe Marechal, Gudrun Massmann, Paul Pavelic, Henry Debettista, Manuel Sapiano, Jinchao Li, Jana Glass, Catalin Stefan, Todd Halihan, Uwe Troeger, Manussawee Hengsuwan, Rattana Thirathitham, Alin Chintraruck, Sospeter Wekesa, Olarmoye Tunde, Bridget Scanlon, Tussanee Nettasana, Alicia Sanz Prat, Russell Martin, Peter Dillon (co-chair)

Apologies: Weiping Wang (co-chair), Enrique Fernandez Escalante (co-chair), Nienke Ansems (IGRAC), Dave Kreamer (IAH Science VP), Alice Aureli (UNESCO), Aurélien Dumont (UNESCO), Adriana Palma Nava (ISMAR9 convenor), Rudy Rossetto (Italian network), Karen Villholth (GRIPP)

Agenda:

1. Welcome and Introductions
2. Objectives of Commission - Peter
3. UNESCO IHP VIII 2014-2021 context for IAH-MAR role
4. Summary of outcomes of publication planning meeting
5. Progress reports and plans of Working Groups
 1. MAR for Development – Yan Zheng Martin
 2. Global MAR Inventory – Catalin Stefan and Nienke Ansems
 3. Economics of MAR – Andrew Ross
 4. 60 years history of MAR – Peter Dillon and Pieter Stuyfzand
 5. Management of clogging– Russell Martin
 6. MAR to MARKET – Enrique Fernandez Escalante (PPTs)
 7. MAR and Governance – Tim Parker
6. ISMAR10 Madrid May 2019 – Invitation Enrique Fernandez (PPTs)
7. Process for bidding to hold ISMAR11.
8. Information Sharing
 1. BSMAR16 – San Diego, 5-7 March 2018 <https://www.grac.org/events/99/> -Tim Parker
 2. INOWAS 2nd MAR Summer School and more.. Catalin Stefan
 3. MAR terminology
 4. GRIPP GW Solutions Initiative for Policy & Practice –Dubrovnik meeting 28/10/17 – Paul Pavelic
 5. MAR-NET activities in China – / Germany / Denmark – Yan Zheng
 6. MARVI project – village interventions India- Peter Dillon
8. Next election of IAH-MAR Co-chairs is at ISMAR10
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 next IAH Congress, South Korea, Sept 2018)

Notes of meeting

1. Welcome and Introductions
Peter Dillon (welcomed all to the meeting and submitted apologies for co-chairs absent. Enrique and Rudy were representing MAR at an EC Meeting in Portugal. Alice and Aurelien had already given half

a day on 24th Sept to a publications planning meeting with IAH-MAR leaders. Dave and Karen were at concurrent Burdon Groundwater Network meeting. Weiping was unable to travel from Jinan.

2. Objectives of Commission - Peter - as per our web site: <https://recharge.iah.org/>
 - to promote the securing and expanding of water resources and improving water quality in ways that are appropriate, environmentally sustainable, technically viable, economic and socially desirable.
 - to encourage research, development and adoption of improved practices for management of aquifer recharge
 - to improve knowledge, skills and capabilities of practitioners, water resources managers and regulators.
 - to facilitate international exchange of information between members (e.g. via a web page and an email list), by disseminating results of research and practical experience (e.g. via conferences and workshops), raising awareness of MAR among IAH members, related professions and the community, and its members undertaking projects and activities identified in plenaries as important.

3. UNESCO IHP VIII 2014-2021 context for IAH-MAR role

IAH-MAR aligns with 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
<http://en.unesco.org/themes/water-security/hydrology/ihp-viii-water-security>

4. Commissions publications in progress planning meeting

2 special issues of journals have arisen from ISMAR9 Mexico City, June 2016.

1. Pieter Stuyfzand and Neils Hartog have edited a special issue of MDPI J Water on the theme: *Water quality considerations for MAR systems*. This has 18 papers now published with Open Access, 10 of these were without charges to authors. http://www.mdpi.com/journal/water/special_issues/ARS

2. Peter Dillon, Paul Pavelic, Weiping Wang and Adriana Palma Nava are editing this special issue of Springer J of Sustainable Water Resources Management on the theme MAR in Integrated Water Resources Management. 30 submissions were reviewed, at 14 Oct 2017 : 5 are published online, <https://link.springer.com/journal/40899/onlineFirst/page/1> plus 1 accepted, 9 under minor revision, 4 under major revision, 11 rejected or withdrawn. Likely 15-19 papers by end 2017. Online access is read only, not allowing download of paper. It is so far provided for only two months following publication.

Jim Lamoreaux, Chief Editor of SWARM, indicated that SharedIt is a Springer facility that will help with reading papers on-line in future and that he is also pursuing agreement with Springer for saving the papers on the IAH-MAR web site for free downloading and will let us know the results.

As Springer have web-published these papers between 15 Sept and 11 Oct 2017 without reference to the special issue the specific papers are:

- A simple method using farmers' measurements applied to estimate check dam recharge in Rajasthan, India - *Y. Dashora, P. Dillon, B. Maheshwari, P. Soni, R. Dashora, S. Davande, R. Purohit and H. Mittal*
- Sustainable drinking water quality improvement by managed aquifer recharge in Tuusula region, Finland - *Unto Tanttu and Petri Jokela*
- Managed aquifer recharge and sedimentological characterization within the complex esker deposits in Pälkäne, Finland - *Joni Mäkinen, Esa Kallio and Petri Jokela*

- Modeling the potential for floodwater recharge to offset groundwater depletion: a case study from the Ramganga basin, India - *Pennan Chinnasamy, Lal Muthuwatta, Nishadi Eriyagama, Paul Pavelic and Surinaidu Lagudu*
- Aquifer recharge with treated municipal wastewater: long-term experience at San Luis Río Colorado, Sonora - *Hernández Aguilar M. Humberto, Campuzano Chávez Raúl, Valenzuela Vásquez Lorenzo & Ramírez-Hernández Jorge*

At a meeting on 24 Sept of the IAH-MAR working group leaders, UNESCO and GRIPP coordination of publications was discussed and more will emerge as plans consolidate.

5. Progress reports and plans of Working Groups

These working groups are described on the IAH-MAR web site: <https://recharge.iah.org/working-groups> Brief descriptions of activities were presented by working group leaders.

1. MAR for Sustainable Development – Yan Zheng

Yan reported on the results of the survey she conducted in June 2016 at ISMAR9. These have now been uploaded to the working group page : <https://recharge.iah.org/mar-for-sustainable-development>

Yan will oversee 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 write site descriptions or provide information or existing papers on specific sites. Any volunteers to contact Yan

2. Global MAR Inventory – Catalin Stefan (with Nienke Ansems

[IGRAC MAR Portal](#) – The MAR Portal contains detailed information on 1200 Managed Aquifer Recharge sites around the world as well as regional MAR suitability maps. Outputs of the working group activities are uploaded and maintained here. It is intended to overlay the MAR layer on other thematic maps such as groundwater stress.

Catalin's powerpoint presentation has now been uploaded to the working group page : <https://recharge.iah.org/global-mar-inventory>

Two papers are in preparation for the SWARM special issue.

3. Economics of MAR – Andrew Ross

Andrew reported that he intends to extend existing work on financial cost of MAR (1 article in prep for SWARM special issue) to less developed countries, and also to extend the work of the WG 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>

Catalin and Andrew are collaborating in annual MAR summer schools organised by Catalin's INOWAS Group (see item 8.2 below).

ACTION: Volunteers are needed to provide economic information for MAR case studies that could be brought into the synthesis in this working group.

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

A global summary is in prep for review and publication in the Hydrogeology Journal as an open access paper supported by UNESCO as a contribution to IHP VIII. Further national/regional contributions will be uploaded at the IAH-MAR web site along with a web-link to the paper when published. 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 countries not yet covered are needed. Such countries include Croatia, Japan, Korea, Bangladesh. Examples of information provided by Australia, China and Israel are web mounted now. A common element is a table of MAR annual volumes by decade since the mid 1960's: <https://recharge.iah.org/60-years-history-mar>

5. Monograph on clogging and its management – Russell Martin

First monograph is published (see <https://recharge.iah.org/working-groups/clogging-and-its-management>). Second volume underway is underway and more contributions are needed.

Aim to have Volume 2 ready for ISMAR10 – Madrid May 2019

- Option 1 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
- Option 2 Synthesis of clogging papers from previous ISMAR proceedings.

ACTION: Papers or reports on management of clogging are invited in 2017 and 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 (PPTs)

Enrique was absent as he was presenting on MAR at a meeting of the European Commission in Portugal. He provided powerpoints on a Peruvian example of flood water detention and infiltration, now posted on: <https://recharge.iah.org/mar-to-market>

7. MAR and Governance – Tim Parker

Tim informed that a brief statement 'A Call to Action for Groundwater Management' was developed via workshops at ISMAR9, edited by a sizeable working group and mounted on ISMAR9 web site, and communicated broadly through IAH and GRIPP.

<https://recharge.iah.org/call-to-action-on-groundwater-management> There is ongoing dialogue between Tim and IAH Executive concerning policy principles for groundwater management and an appropriate grouping to address this in IAH.

6. ISMAR10 Madrid May 2019 – Invitation - Enrique Fernández (PPT)

This is the leading global symposium on Managed Aquifer Recharge and Enrique has reaffirmed that ISMAR10 will be in Madrid in May 2019 (in 20 months time) and sends a warm invitation. Please think in advance about the papers you aim to be able to submit in response to a call for papers coming in 2018. This will be the best possible audience to give exposure to your best work. More information will come out in due course.

7. Process for bidding to hold ISMAR11.

Peter advised that anyone wishing to form a team to host ISMAR11 in 2022 should contact him to advise of their interest and to receive details on information requirements of proposals that would need to be received by December 2018. All proposals would be examined by a panel comprising IAH, UNESCO and ASCE (the partners to the series).

8. Information Sharing

1. Tim Parker advised :

BSMAR16 – San Diego, California 5-7 March 2018 <https://www.grac.org/events/99/>
Call for abstracts is out and abstracts are due by 1 November 2017. The title of this Biennial Symposium on MAR is “*Recharge to the Rescue - Managed Aquifer Recharge as a Water Management Tool*” There are a wide array of subthemes and will be an excellent and timely conference with California forced to re-evaluate all options for future water security.

Recharge roundtable in California Oct 2 and Headwaters to Groundwater Oct 12
\$30M to address disadvantaged communities facing depletion and high nitrate groundwater.

Tim also informed that a Spanish text book on MAR is due for release at end of October.
Manejo de la recarga de la acuíferos: Un enfoque hacia Latinoamerica, by Oscar Escolero Fuentes et al. <https://www.gob.mx/imta>

2. **INOWAS MAR Junior Research Group** at TU Dresden Dept of Hydrosociences <https://tu-dresden.de/bu/umwelt/hydro/inowas> ran its 2nd Intl. MAR Summer School 4 - 15 September 2017 in Dresden. This attracted 20 participants from 17 countries. Catalin is keen to turn this into an annual series held in different locations and invited expressions of interest from anyone interested in hosting one of these. Already there is interest from Jordan, Tunisia and China. **ACTION: Any others?**

3. There was discussion on **MAR terminology**. It is very important in technical circles to adopt the standard terminology for each method to avoid confusion and the need to continually define terms. Having internationally adopted standard terms also helps advance progress in MAR. However for our communications with the general public simpler language such as *groundwater replenishment* and *water banking* is more comprehensible and should be used.

4. **GRIPP** - Groundwater Solutions Initiative for Policy & Practice – there will be a meeting on this on Thursday afternoon for any interested in attending, led by Karen Villholth. All welcome. The Commission actively supports GRIPP, which advocates appropriate use of MAR within the full palette of groundwater solutions.

5. **MAR-NET activities in China** – Germany and China-Denmark – Yan Zheng

A Sino-German workshop on MAR was held in June 2017 and consequently collaborative opportunities are being explored, and also with Danish colleagues.

6. **MARVI project** – village interventions India- Peter Dillon and Yogita Dashora

This recently completed 4 year research project involved training farmers to measure groundwater levels in rural villages of catchments in Rajasthan and Gujarat. Subsequently groundwater cooperatives have formed. Yogita’s PhD has been on assessing hydraulic and economic effectiveness of check dams (stream bed recharge structures) and their maintenance requirements.

8. Next election of IAH-MAR Co-chairs is at ISMAR10, May 2019 - anyone who would like to contribute is welcome to nominate. Peter and Weiping are intending to step down so there will be vacancies.

9. Suggestions for new activities – Todd Halihan

Todd advised that Oklahoma were just starting to think about MAR and were unclear on the **policy and regulatory requirements** as the State had not yet developed these. It was decided that the Commission could easily assemble examples from around the world and it would be possible with a working group to give some critical review of the assembled material. A small working group formed including Todd Halihan, Manuel Sapiano (who has recently led such a review for European Commission), Peter Dillon, Russell Martin, Tim Parker and Paul Pavelic (others?). We would start by focussing on water quality – health and environmental issues. Subject to the success of this and interest of members, we could then go on to look at water allocation policies associated with MAR. **ACTION: This working group** aims to assemble materials on IAH-MAR web site within 2 months, and subsequently undertake a critical review.

10. Volunteers to participate in existing and new activities – anyone is welcome to contact the working group leaders with an offer to participate.

11. Information sharing on MAR (not covered elsewhere) - anyone

1. Sospeter Wekesa – described a study on sand dams and subsurface dams in Kenya including socio-economics aspects – Andrew Ross requested to know more. Could this be one of the case studies on economics of MAR? Andrew and Sospeter will discuss.

2. Juliane Xanke – is considering MAR into karst via dam releases in Jordan, Israel and Palestine and defining benefits and costs. Andrew and Julian will discuss.

3. Gudrun Massmann mentioned her project called SMART – Sequential MAR Techniques – involving reinfiltration of river bank filtrate via basins for pollutant removal (reaeration) – may be of broad interest for its novelty and completely natural treatment.

4. Paul Pavelic mentioned a new project in southern Vietnam where MAR is to be used by refitting irrigation wells for recharge with bank filtrate. Makes a good connection with Gudrun's project.

5. Jean Christophe Marechal said that France is starting a new project to produce a MAR suitability map for France and then do demonstration MAR projects at up to five sites. This may interest Catalin Stefan.

12. Close of Plenary (Next Plenary at next IAH Congress, South Korea, Sept 2018)

Peter thanked all for attendance in a lively meeting that demonstrated how fortunate the commission is to have dynamic and persistent working group leaders and continual innovation and growth in knowledge through a wide range of activities described by those present.

Draft PD 16 Oct 2017-revised CS-AR-EFE-29 Oct 2017