IAH Commission on Managing Aquifer Recharge Plenary

6:50 – 7.40pm, Tues 27 Sept 2016

Rondelet 2, Corum, Montpellier, France, IAH 43rd Congress

Present: **26 Attendees from 13 countries:**

Enrique Escalante (Spain), Emelio Custodio (Spain), Solenne Grellier (Fr), Andrew Ross (Aust), Jana Ringleb (Ger), Jana Sallwey (Ger), Heiko Dirks(Ger), Edda Kalbus (NZ), Aurelien Dumont (UNESCO), Andreas Antoniou (NL), John Chilton (UK), Victoria Burke (Ger), Gudrun Massmann (Ger), Gesche Grutzmacher (Ger), Alessio Barbagli (It), Rudy Rossito (It), William Burges (UK), Andrew Butcher (UK), Adriana Palma Nava (Mex), Tim Parker (USA), Michel Lafforgue (Fr), Patricia Bobeck (USA), Antonio Chambel (Port), Fairouz Slama (Tunisia), Julian Conrad (Sth Africa), Peter Dillon (Aust).

Agenda:

1. Welcome and Introductions -- IAH Exec Rep/UNESCO Representative
2. Objectives of Commission / UNESCO IHP VIII 2014-2021 context for IAH-MAR role
3. Plans of current working groups
    1. Monograph on clogging and its management – Russell Martin
    3. MAR for Development – Yan Zheng
    5. MAR to MARket – Enrique Fernandez Escalante
    6. Global MAR Inventory – Catalin Stefan and Nienke Ansems –Andreas XXX IGRAC)
    7. 60 years history of MAR – Peter Dillon and Pieter Stuyfzand
    8. Economics of MAR – Andrew Ross
    9. Call to Action on Groundwater Management – Tim Parker
4. Other outcomes of ISMAR9
    1. Scientific Publications – Pieter Stuyfzand, Jim Lamoreaux
    2. Poster repository – Enrique Fernandez
    3. Any other comments – Adriana Palma Nava
    4. IAH-MAR Plenary at ISMAR9 – IAH Commendations and IAH-MAR election results
5. Invitation to ISMAR10 Madrid, May 2019 – Enrique Fernandez
6. Information Sharing
    1. GRIPP – Groundwater Solutions Initiative for Policy & Practice – Karen Villholth
    2. Groundwater Management – an IAH MAR Commission? – Tim Parker
    3. Making MAR information accessible/potential for MAR? – John Chilton
    4. Upcoming open meetings by the EU MAR Projects – Enrique
    5. INOWAS MAR activities- Jana
    6. Status of web site and email list - Peter
7. Suggestions for new activities – anyone
8. Volunteers to participate in activities – anyone and set time to meet
9. Information sharing on MAR (not covered elsewhere) - anyone
10. Close of Plenary (Next Plenary at next IAH Congress)

Notes of Meeting:

1. Welcome and Introductions

Peter Dillon (Australia) and Enrique Fernandez Escalante (Spain) welcomed all to the meeting and gave an apology for our third Co-Chair, Weiping Wang (China). Peter welcomed our new IAH

President Antonio Chambel, who also attended ISMAR9 representing IAH (then Vice President, Science and Programmes), Aurelien Dumont, representing UNESCO-IHP and Andreas Antoniou (representing IGRAC). Due to the late start to the meeting, much of the content was presented very quickly, with the promise that the content would be reported in full in the notes of the meeting.

Objectives of Commission and UNESCO IHP VIII 2014-2021 context for IAH-MAR role
The commission's objectives are

- 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.*

Peter briefly summarised how IAH-MAR contributes to International Hydrological Programme VIII (2014-2021) and specifically how the commission supports the achievement of *Theme 2 (Groundwater in a changing environment),* ***Focal Area 2.2*** (***Addressing strategies for management of aquifer recharge***).
http://www.unesco.org/new/en/natural-sciences/environment/water/ihp-viii-water-security/

Focus Area #2.2 Strategies for MAR

General objective*:*

Improve security and quality of water supplies especially in water scarce areas under climate change and population growth.

The Specific Objectives of IHP Strategies for MAR have influenced the formation of IAH-MAR working groups (whose reports are given at item 5) and progress these objectives.

Specific Objectives*: (showing in red the relevant Working Groups of the Commission)*

1. Integrate managed aquifer recharge into IWRM to address effects of locally changing climate (*WG4*), population and food production (*WG2*, WG3, WG9 & joint proposal IAH-UNESCO – now being followed up within GRIPP proposal of IWMI and partners, incl. IGRAC, IAH)
2. Develop and apply methods to assess impacts of recharge structures on water availability and quality, social and economic resilience and local ecosystems (*WG2*,WG3, WG6, WG8, ISMAR9 (SWARM J and J Water thematic issues)
3. Evaluate the costs and benefits of recycling of appropriately treated urban waste and storm water for aquifer recharge (WG5, WG8, ISMAR9 (J Water thematic issue)
4. Enhance governance capacities and institutional and legal frameworks to aid effective MAR implementation. (*WG2*, MAR GLs India,WG3, WG9, China Network)
5. Develop a scientific basis for the prevention and management of clogging (WG1)

3. Reports and Plans of Working Groups

Reports from current Working Groups are given next. These are listed under seven active groups; 1,3,5,6,7,8,9 (the last two commenced in ISMAR9) and two groups that have disbanded having completed their tasks: 2,4.*WG2* – MAR policy and economics – led by Sharon Megdal, and *WG4* – Adaptive strategies for climate change (jointly with Climate Change Commission)-led by Brigit Scanlon, have completed their tasks (special issues of journals: www.**mdpi**.com/journal/**water**/special_issues/MAR and http://iopscience.iop.org/1748-9326/focus/Water%20Storage%20for%20Managing%20Climate%20Extremes%20and%20Change) and wound up as reported at the Plenary in Mexico City, June 2016. Bridget subsequently advised that one further WG4 paper has been published in this special issue: Scanlon, B.R, Reedy, R.C., Faunt, C.C, Pool, D. and Uhlman, K. (2016). Enhancing drought resilience with conjunctive use and managed aquifer recharge in California and Arizona. Environmental Research Letters, 11 (3) http://iopscience.iop.org/article/10.1088/1748-9326/11/3/035013

WG1. Monograph on clogging and its management – Russell Martin

Monograph on clogging and its management (ed:– Russell Martin (Aqueon Pty Ltd) was mounted on IAH-MAR web site before ISMAR8, Oct 2013: www.iah.org/recharge/clogging.htm

However more contributions are needed, particularly on management of clogging and synthesis of data from multiple sites and standardization of investigation methods. Russell intends to edit a sequel monograph on these topics. **Please contact Russell if you wish to contribute, or are aware of relevant open access material**: russell.martin@aqueon.com.au

WG3. MAR for Development – Yan Zheng

Summary of activities and outcomes of UNESCO-IAH Workshop, 20 June 2016, ISMAR9, Mexico City:

Decision makers, especially those in low and middle income countries, are generally unaware of MAR, let alone the economic and ecological benefits of MAR, resulting in a lack of enthusiasm in including MAR as part of the water resources management portfolio. Dissemination of information on selected successful MAR projects in all countries may help. However, the metrics for measuring success MAR project are not well defined and could vary. At ISMAR9 this working group had a survey with 18 responses that had consensus that this Working Group should work on developing metrics to help identify successful MAR projects in low, middle and high income countries.

Action Items for working group:

- Place MAR within the framework of groundwater storage, conjunctive groundwater management and sustainability.
- Help individual hydrogeologists
  - Identify long running MAR projects with a goal of developing a common metrics of measuring success for MAR professionals
  - Develop factsheets in multiple languages for decision makers
- Raise awareness among decision makers locally and globally
  - Work with IAH and others to promote the concept of groundwater storage/sustainability during Stockholm water week at global level
  - Identify volunteer at country/local government level

- Educate civil engineers through online courses such as “Groundwater for Civil Engineers” (Sth Africa-Ricky Murray; UNEP-Saroj Sharma)

Proposed Output: Products (factsheets, online course) available on IAH website, peer reviewed publication for success metrics development. These could complement outputs of two other working groups WG6 Global MAR Inventory and WG8 Economics of MAR.
Anyone with a case study or interested in joining please contact: yan.zheng.unicef@gmail.com

The working group also convened a Chinese Workshop 7 Sept 2015 at Peking University on forming MAR Guidelines for China had unanimously agreed to proceed to offer to the most appropriate Ministry, to form a technical group of members of China MAR Network to develop the guidelines. This work is being led by Yan Zheng and Weiping Wang. It is also proposed for comprehensive monitoring of selected demonstration / research sites.

WG5. MAR to MARket – Enrique Fernandez Escalante

Widening MAR applications with European Innovation Network (& other communications activities) (commenced ISMAR8, Beijing 2013) – To Identify and communicate effectively with a wide range of water users and water managers to explain MAR and its benefits. Main case study site- Arenales aquifer (c y l, Spain). Engaging with: Agro-industry, Water supply industry, Waste water treatment plants (SAT), Desalination companies, Bottled water companies, Golf courses, Public administration, Balnearies & spas *(sallus per aquam),* Hotels and tourist facilities (market uptake). **Contact: Dr. Enrique Fernández Escalante**, Department Research and Development (Tragsa Group), E-mail: efernan6@tragsa.es, dinamar@tragsa.es, Tel. +34 91322 6106

WG6. Global MAR Inventory – Catalin Stefan and Nienke Ansems

Working group commenced Sept 2015 at IAH-MAR Plenary, IAH Congress 43, Rome.
1200 case studies have been identified from literature. These are already available via IGRAC MAR Portal: marportal.un-igrac.org The Group is seeking to input more sites. See this web site.

The working group held a workshop on 20 June 2016 at ISMAR9, Mexico City. Andreas Antoniou (IGRAC) presented on behalf of this working group and reported on improvements to the MAR Portal based on outcomes of the workshop. The database has been updated since June with complete references and revised data for Europe, new sites from New Zealand, and corrected and new data for Australia. More contributions are expected from the Australian MAR Hub. A manual with functionalities was implemented as well as an improved “search” functionality.

The portal/inventory was presented during the INOWAS Summer School on MAR and during environmental management courses at the universities of Dresden and Helsinki. The MAR portal helped “convincing” policy makers in New Zealand on MAR benefits, as reported by Bob Bower, Principal hydrologist at Golder Associates. The original newspaper article is available here.

More MAR sites and suitability maps are soon expected to be added (Costa Rica, Australia, Botswana, Mexico) as well as additional background maps (e.g. groundwater stress).

A better dissemination of results from successful projects could help stakeholders to understand the benefits of MAR and adopt the methodology on a larger scale. **Those with successful projects are urged to download the template from the MAR portal and fill in basic information and return it to Nienke Ansems at IGRAC to load onto the data base.** For more information on this working group please contact its leader: catalin.stefan@tu-dresden.de

WG7. 60 years history of MAR – Peter Dillon and Pieter Stuyfzand

A working group has formed convened by Peter Dillon and Pieter Stuyfzand to contribute national and technology perspectives on this topic, for presentation as an international summary in Montpellier IAH Congress, Sept 2016 and for subsequent publication intended for Hydrogeology J, as a Commission's contribution to the celebration of IAH's 60th year. To date draft precis for Australia, China, Germany, India, Israel, Netherlands, Spain, Sth East Asia, and for ASR in USA have been received, others are in progress. Anyone interested in contributing their national history in MAR, or for a specific methodology, we have some vacancies. Please contact Peter: pdillon500@gmail.com

WG8. Economics of MAR – Andrew Ross

Andrew Ross spoke to the motivation for the establishment of this working group at ISMAR9, to document the economics of MAR in relation to alternative water supplies or storages, to assist with providing decision makers information where it is currently scarce to allow MAR to be more easily accounted for, and to inform development banks and governments on the value of investing in MAR, and identifying scenarios where MAR may produce the least cost water supply, and be examples of integrated water management or conjunctive use of groundwater and surface water. Further depth of analysis could be achieved depending on the abundance and quality of data provided**. Volunteers are needed to furnish economic information on MAR projects to enable robust and locally relevant data and information.** Sites from Africa, India and China would be particularly welcome. These sites may also furnish information useful to WG3 MAR for Development Working Group, and meta data also be mounted on the WG6 Global MAR Inventory site. Please contact Andrew a.ross@anu.edu.au if you can help.

WG9. Call to Action on Groundwater Management – Tim Parker

Tim Parker presented a brief summary of the motivation for, method of producing and outcome of an exercise developed at ISMAR9 to develop policy principles for sustainable groundwater management. Adriana Palma Nava circulated copies that are available at www.ismar9.org In briefest summary form these are:

Sustainable Groundwater Management Policy Directives

I. Recognize aquifers and groundwater as critically important, finite, valuable and vulnerable resources.

II. Halt the chronic depletion of groundwater in aquifers on a global basis.

III. Aquifer systems are unique, need to be well understood, and groundwater should be invisible no more.

IV. Groundwater must be sustainably managed and protected, within an integrated water resources framework.

V. Managed Aquifer Recharge should be greatly increased globally.

VI. Effective groundwater management requires collaboration, robust stakeholder participation and community engagement.

This working group's target is now achieved. For all who have the opportunity to participate in discussions on groundwater management, this is a valuable resource. It will be included in the Fall Newsletter https://wrrc.arizona.edu/publications/awr in an article by Sharon Megdal on the Invisible Resource. Tim has developed a concept for an IAH Commission/Network that addresses these matters on an ongoing basis. See item 6.2 later in these notes.

4. Other outcomes of ISMAR9

1. Scientific Publications – Pieter Stuyfzand, Jim Lamoreaux

Recognising that many do not have access to library services, ISMAR9 followed the trend for journal publication set in ISMAR8, and received offers from two open access journals to produce thematic issues based on papers presented at ISMAR9 in two themes without author charges. Papers will be reviewed by the editorial team and selections made and offers made to authors to submit their papers by the journal web-based systems.

Special Issue: **Water Quality Considerations for Managed Aquifer Recharge Systems**
Journal: **Water (MDPI)**
Special Issue Editor: Prof. Pieter J. Stuyfzand and
Deadline: 31 October 2016
Pieter has advised that 20 ISMAR9 authors had been invited, 11 have replied positively, some with manuscripts, 9 have not yet replied. There are also 4 authors who intend to submit manuscripts which were not presented at ISMAR9. By 14 Oct the first paper was published.

Thematic Issue: **Integrated Water Management Incorporating Managed Aquifer Recharge**
Journal: **Sustainable Water Resources Management (Springer)**
Thematic Issue Editor: Peter Dillon, Weiping Wang, Paul Pavelic and Adriana Palma Nava
Deadline: Papers presented at ISMAR9 and received in full by 22 October 2016
Jim Lamoreaux advised that following editors recommendations, 53 papers were being invited; 37 were in response to full papers requesting revised full papers by 21 October and for 19 of these editors comments had been passed on to authors. The remaining 16 invitations are goning to authors of significant abstracts with a deadline of 12 October for receipt of a full paper. ISMAR9 Scientific Committee members and others will be contacted to assist with reviews of full papers.

2. Poster repository – Enrique Fernandez

Enrique advised that all poster papers for whom authors had given permission had been published in the P-ISMAR series in the resources section of the Spanish IAH-MAR web site. http://www.dina-mar.es/

3. Other comments – Adriana Palma Nava

The Proceedings containing all Symposium abstracts are on the ISMAR9 web site www.ismar9.org along with some of the powerpoint presentations in a pdf, and photographs. Discussions are underway concerning papers that are unsuited to journal publication that contain high value data or are otherwise meritorious. Case studies could for example be reviewed for possible inclusion in fact sheets or case study stories by MAR for development working group, and to ensure capture in the global MAR inventory. Adriana said that the ISMAR9 symposium hosts CONAGUA, had been very pleased with the Policy principles statement (call to action).

4. IAH MAR Plenary outcomes at ISMAR9 –

Antonio Chambel presented Certificates of Appreciation from IAH to : Mario Lluria, Paul Pavelic, Weiping Wang, Albert Tuinhof and Gabriel Pérez de los Cobos. – citations are listed in notes of that Plenary.

Antonio acted as returning officer, for election of co-chairs of IAH-MAR. The three incumbents had expressed a desire to continue in office and as there were no other nominees and in the absence of dissent or abstinence Antonio declared Peter, Weiping and Enrique elected for a

three year term, until ISMAR10. Adriana Palma Nava expressed her willingness to stand for the position of co-chair at the next election, and this notice was willingly received. Peter advised he would stand down at the next election.

5. ISMAR10 Announcement – Madrid, Spain, May 2019 – Enrique Fernandez Escalante

Enrique invited all present to come to Spain for ISMAR10 in May 2019. The Symposium Organizing Committee includes experts from Spain, Netherlands and Portugal. There are a constellation of European Commission Projects with results to be presented at ISMAR10. Enrique will Chair the Organizing Committee. This is a great follow up to ISMAR9 and we hope many from Latin America will come beside the Symposium receiving strong support from Europe, USA and around the world.

6. Information Sharing

1. GRIPP - GW Solutions Initiative for Policy & Practice – Karen Villholth (IWMI South Africa)
Karen was an apology so Peter presented basic information on this major initiative with multiple partners that picks up from the Global Groundwater Governance Program to see implementation of policies and policy reform in managing systems with unsustainable groundwater use particularly for agriculture. IGRAC and IAH have agreed to partner GRIPP. MAR has a role within this Initiative. For more information on objectives, activities and participation there is a workshop next morning in Conference Program or see : http://www.iwmi.cgiar.org/issues/groundwater/gripp/ or contact Karen Villholth K.Villholth@cgiar.org or Paul Pavelic P.Pavelic@cgiar.org (who presented on GRIPP in ISMAR9 Plenary).

2. Groundwater Management – an IAH MAR Commission? – Tim Parker
Tim advised all that he had prepared a proposal for an IAH Commission or Network on Sustainable Groundwater Management (SIGMA) for IAH executive. This had created some feedback and he was further developing the proposal. Anyone interested please contact Tim at tim@pg-tim.com

3. Making MAR information accessible/potential for MAR? – John Chilton

John Chilton raised a discussion he had with David Grey concerning whether there was enough known and available on conditions for successful MAR applications *eg.* a suitable water source, a receptive aquifer system with available storage, aquifer characteristics that allow economic exploitation, local demand for the water and other institutional, social and economic factors. Is there a global assessment of MAR potential and maps of the places where the right conditions come together? Is developing such resources an activity that the commission could consider?

Some work has progressed in this area, for example the IGRAC MAR Portal contains maps of suitability for MAR: https://ggis.un-igrac.org/ggis-viewer/viewer/globalmar/public/default for North Kenya, Jordan, South Africa and Pajaro Valley, California. Enrique has also published one for mainland Spain in WG2 output: www.**mdpi**.com/journal/**water**/special_issues/MAR. (**IGRAC**- perhaps include a link from this part of MAR Portal?) There is also documentation of aquifer suitability for MAR in Dillon (2016) MAR in Integrated solutions to groundwater challenges. Ch 2 in Vogwill R. (ed) Solving the Groundwater Challenges of the 21st Century. Book 22 in IAH Selected Papers on Hydrogeology.

Jana advised that tools for such mapping are in the considered scope of INOWAS group's plans, including a possible web-tool for generation of maps for site selection. INOWAS is currently working on integrating GIS and such a web-based site selection tool. It will include data on previous site selection projects of MAR (Which data has been used? Which methods? etc.) Thus it is intended to be very user friendly and guide inexperienced users through the process. What we probably can't provide are the maps to do the actual site selection. Publically available remote sensing data likely is too low in resolution to generate sufficient results. There could however be a future link to the IGRAC information system, so that users that generated site selection maps with our webtool could be provided with an easy option to upload them in the IGRAC portal in a collection of publically available maps.

Beyond tools developed by INOWAS, a role for the the Commission could be (a) to facilitate review of methodology for mapping MAR potential at various scales, and (b) to promote the concept of mapping suitability of aquifers for MAR as an integral part of groundwater management plans for aquifer systems. Peter thanked John for raising this idea as it appears to be an area where the commission could add value, and it is encouraging that INOWAS is already active in this area. **Action: Peter to follow up with Catalin Stefan and Andreas Antonio/Nienke Ansems and get back to John. ..** Postscript- Catalin advised (a) is underway, and a MAR suitability map for Costa Rica has just been published http://www.mdpi.com/2073-4441/8/9/391 Andreas advised IGRAC willing to display more MAR suitability maps on the MAR portal. Together these activities provide a platform from which to advance (b).

4. Upcoming open meetings by the EU MAR Projects – Enrique

MARSOL final meeting Leipzig, Germany, 17-19 October 2016

The project MARSOL: Demonstrating Managed Aquifer Recharge as a Solution to Water Scarcity and Drought will finish in December 2016. 21 partners are going to share the information gained over three years in our three days MARSOL final workshop. The program is at: http://www.dina-mar.es/file.axd?file=2016%2f10%2fAgenda_MARSOL_Leipzig_final+meeting_vs7_.pdf

5. INOWAS MAR activities- Jana Sallwey

Jana described the 1st INOWAS Summer School on MAR in Dresden, Germany, 4-9 September 2016. This had 26 participants from 18 countries. This was to:

- promote managed aquifer recharge worldwide
- create a network of junior researchers on MAR
- introduce INOWAS project objectives
- test and evaluate the INOWAS web-based DSS platform.

A book of proceedings (ca. 700 pages) was produced and there is now a MAR Junior Research Network on LinkedIn: https://www.linkedin.com/groups/8209154
The 2nd Summer School is planned for September 2017.
Antonio Chambel suggested that this be connected with IAH Early Career Hydrogeologists Network which is also planning a training activity for 2017. **Action: Jana** to inform ECHN of INOWAS Network and discuss 2nd Summer School with ECHN. Possible synergies warrant exploration. – Jana has contacted Viviana Re and is awaiting a response.

6. Status of web site and email list – Peter

Peter apologised for lack of updating of English web site over last 2 years and the web site was now being rebuilt in WordPress and soon would be available. The email list hosted by Flinders University is still operating and those wanting to join can do so via the MAR web site. Enrique has maintained the Spanish web site and the publications and resources repository is located on that site, for English and Spanish language resources. http://www.dina-mar.es/

7. Suggestions for new activities – anyone

We were out of time to discuss. However there are opportunities for participation in all of the working groups listed above. Please contact the relevant working group leader.

Peter offered to facilitate a community of practice that may consist of national groups. If anyone is willing to lead a national group to improve the operation of MAR systems through sharing data, information and experiences, and to inform groundwater management in a coordinated way at a level above site-specific issues, please contact Peter.

8. Volunteers to participate in activities – anyone

All working group leaders had expressed a willingness to have additional volunteers to contribute to their tasks. **If anyone is interested please contact the relevant working group leaders.**

9. Information sharing on MAR– anyone

We ran out of time in the meeting, but **if anyone has information to share, please let Peter know for inclusion in an email to email list or for the website**.

10. Close of Plenary (Next Plenary at IAH Congress, Dubrovnik, Sept 2017)

There will also be an IAH-MAR plenary at Aust. Groundwater Conf, Sydney, July 2017.
Peter declared the Plenary closed, as it was time for buses to leave for the Congress dinner.