



International Association of  
**Hydrogeologists**

# IAH Commission on Management of Aquifer Recharge

Plenary Session  
Krakow, 13 Sept 2010

\*\*\* All are Welcome \*\*\*

# ATTENDEES

- 19 people from 11 countries
- Peter Dillon (Chair) Thomas Grischek, Cornelius Sandhu, Emelio Custodio, Hans Kupfersberger, Kyle Horner, Steve Holysh, Russell Martin, Robert Hoogween, Thomas Walter, Thomas Himmelsbach, Konrad Miotlinski, Annette Moore, John Moore, Boris David, Michael Rustler, Marek Kachnic, Shivendra Nalh Rai, Makoto Nishigaki.



# IAH-MAR Plenary Agenda

1. Opening and Welcome (Co-chairs, Peter Dillon and Ian Gale)  
Purpose of IAH Commission on MAR  
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Synopsis of last plenary Hyderabad, 8 Sept 2009  
*International Review*
2. 2009 IAH-MAR Annual Report – see [www.iah.org/recharge](http://www.iah.org/recharge) + Spanish and Chinese sites
3. UNESCO-IAH MAR-NET & Side Event at Stockholm Intl Water Week Sept 2010 – Peter D
4. Email and web site - Peter Dillon / Ian Gale
5. ISMAR7 – Abu Dhabi 9-13 October 2010 – Peter Dillon/ Ian Gale  
  
*National Activities of International Interest*
6. Arid and Semi Arid Development through Water Augmentation Conference  
13-17 December 2010, Valparaiso, Chile
7. Managed Aquifer Recharge Symposium, 25-26 January, 2011, Irvine, CA, USA  
Water Research Foundation (WaterRF), Orange County Water District (OCWD), and NWRI
8. European Geosciences Union, General Assembly 2011 Vienna, Austria, 3 - 8 April 2011  
incl.. 'recent advances in the spatial and temporal modelling of groundwater recharge'
9. OzWater Conference, Adelaide, Aust. May 2011  
Workshop on indirect potable reuse of water via aquifers
10. Australian policy development to get most out of MAR – Peter Dillon
11. Information of international importance in MAR – from the floor  
  
*Suggestions for Commissions Work*
12. Discussion on gaps and needs and actions that IAH-MAR could take – from the floor
13. Conclusion and outcomes

# Purpose of IAH Commission on MAR

- To facilitate *improved management of groundwater resources* through managing aquifer recharge to improve security and quality of groundwater supplies and dependent ecosystems
  - To encourage development and adoption of *improved practices* for management of aquifer recharge so that all new MAR projects are appropriate, environmentally sustainable, technically viable, economical, and socially desirable.
  - To increase awareness of MAR by:
    - facilitating international exchange of information (conferences, web site, email list and publications)
    - disseminating results of research and practical experience
    - undertaking joint projects and activities with partners such as UNESCO
- [IAH has 3700 members in 130 countries]

# Purpose of Plenary

- Share information on MAR activities of international interest
- Identify useful new activities for the commission in achieving its mission
- Seek groups of volunteers to undertake actions agreed as priorities

# IAH-MAR Plenary Hyderabad 8 Sept 2009

1. Opening and Welcome (Co-chairs, Peter Dillon and Ian Gale)

## *International Review*

2. Launch of 3Rs book (by Frank Vansteenberghe and Albert Tuinhof) - Willi Struckmeier
3. UNESCO MAR activities and announcement of MAR-NET – Bhanu Neupane
4. Communications and web site - Ian Gale
5. ISMAR7 – UAE October 2010 – Ian Gale
6. International inventory of MAR – Sophie Vermooten, IGRAC
7. Outcomes of actions agreed at IAH MAR Plenary, Phoenix 2007 – Peter Dillon
8. Riverbank Filtration Network – Cornelius Sandhu

## *National Activities of International Interest*

9. Indian activities in MAR – Dr Jha, CGWB
10. Spanish activities in MAR – (from Enrique Fernandez Escalante)
11. USA activities in MAR – Victor Heilweil
12. South African Activities in MAR – Yongxin Xu
13. Australian Guidelines for MAR – Peter Dillon
14. Information of international importance in MAR – from the floor

## *Suggestions for Commissions Work*

15. Discussion on gaps and needs and actions that IAH-MAR could take – from the floor
16. Conclusion including reminder of MAR-NET inaugural meeting 10 Sept 5:15pm

# Hyderabad #14 - Information of international importance in MAR – from the floor

- Bahrain developing water recycling via aquifers – Pradeep Naik, Bahrain
- UNESCO has produced a book:  
P.K. Singh (2009). Rainwater harvesting: Low cost Indigenous and Innovative Technologies. Macmillan India Ltd. – Bhanu Neupane, UNESCO, New Delhi
- UNESCO will run an African Workshop on MAR 26-29 Oct at University of Western Cape, Cape Town, South Africa, convened by the UNESCO Chair, Prof Yongxin Xu.
- China Network being developed by Weiping Wang, University of Jinan – Chinese language MAR website is now up
- IWA Reuse'09 Conference Brisbane, 21-25 Sept 2009  
Theme of 10 papers on Water recycling via aquifers  
Workshop 25 Sept Intl research linkages in water recycling via aquifers  
[www.reuse09.org](http://www.reuse09.org)

# Hyderabad #15. Discussion on gaps and needs and actions that IAH-MAR could take – from the floor

1. Wastewater recharge – agric & drinking? Need to exchange info - Didier Pennequin  
– *IAH-IWA collaboration initiated, workshop planned, Adelaide May 2010*
- 2.1 Need standards for MAR – averting dangers – Rao
- 2.2 Use of MAR for water quality improvements – what are constraints and how to address – Pavelic
- 2.3 Remove misconceptions with RBF (contamination, attenuation capacity of aquifer) and policy (preference for s/w for treatment?) have info to be convincing – CS  
– *Aust MAR GLs now applied internationally, disseminate*
3. Saline intrusion barriers investigate use and publish experience – name? – ***ACTION? \*\*1***  
What is best suited structure/methodology for recharge at local scale – feed into publication being developed by UNESCO and post on web site – Bhanu Neupane  
*-CGWB have produced*
5. Much knowledge from Indian experience would be of great benefit to Africa- need to find mechanisms to transfer – Ian Gale – *R.C.Jain (CGWB) invited speaker at UNESCO MAR-NET workshop in Cape Town Nov 2009*
- 6.1 Need information on performance of porous pipes etc for long term recharge operation – Wendy Timms
- 6.2 Simple evaluation techniques (eg chloride method) with consequences for, operation and maintenance of recharge facilities and feedback into design –Dillon
- 6.3 Pilot experiments for dug well recharge to know effectiveness and costs – name?  
***- ACTION? \*\*2***

We ran out of time to sift through these ideas and form working groups to produce targeted outputs – *carry over to next plenary (Krakow)..*



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# MAR-NET

- UNESCO-IAH partnership to address UN MDG for drinking water supply
- Aims to facilitate development of demonstration projects and capability building at national level where MAR can contribute to UN MDG
- Workshops Jinan, China (2008); Hyderabad, India (Sept 2009); Cape Town South Africa (Nov 2009); Abu Dhabi, UAE (Oct 2010)
- Side event Stockholm (Sept 2010) – resourcing organisations and governments

# UNESCO-IAH Workshop on Managed Aquifer Recharge

## *“Inaugural Meeting of MAR-NET”*

### *Lessons from MAR experiences in India*

Hyderabad 10 September, 5:15PM to 8:00PM

- Excellent talks on Indian MAR experience were given
- 3Rs book described
- Agreed to establish MAR-NET Indian sub-network
- CGWB willing to convene and Dr JC Jain agreed to coordinate
- India progressing MAR fastest in world. There are high expectations of how it will perform.
- Three concerns identified to be addressed by various means...
  - Water quantity was well covered but water quality is not being well addressed in relation to drinking
  - Identification of effectiveness and operational performance and maintenance warrants consideration
  - Identification of impacts of MAR within whole of catchment context

# Recommendations for IAH-MAR arising from UNESCO-IAH Side event on MAR-NET at Stockholm International Water Week 8 Sept 2010

1. Benefit-cost analyses of MAR projects need to be systematically documented and compiled
2. Show the range of water supply, storage and treatment options for developing new safe water supplies, identifying niches where MAR has potential alone and in combination with other methods
3. Institutional capability building is vital for MAR to progress
4. Need to integrate health risk assessment and hydrogeology for MAR water safety plans
5. Need to explore and facilitate development of groundwater users associations to assist MAR to take a role in groundwater management

# IAH-MAR web sites and email list

- [www.iah.org/recharge](http://www.iah.org/recharge) - English
- [www.dina-mar.es/](http://www.dina-mar.es/) - Spanish
- <http://china-mar.ujn.edu.cn> - Chinese
- Info: Symposia, workshops, publications, annual reports, email list subscription
- Thanks for hosting sites to BGS (Ian Gale and Sam Jones), Tragsa (Enrique Fernandez), Uni Jinan (Weiping Wang and Sun Xiaobin)
  
- Email list has ~300 members in 33 countries – about 12 emails sent in last 12 months
- Thanks to IAH Aust Chapter and Flinders University of South Aust for maintaining list (Joel Pillar)

# www.ismar7.org



## THE 7TH ANNUAL INTERNATIONAL SYMPOSIUM ON MANAGED AQUIFER RECHARGE ABU DHABI, OCTOBER 9-13, 2010

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# International 'Arid and Semi Arid Development through Water Augmentation' (ASADWA) Conference 13-17 December 2010, Valparaiso, Chile

■ The ASADWA International Conference is a joint activity of the UGent based [UNESCO Chair of Eremology](#), the UNESCO Center [CAZALAC](#), the Global Network on Water and Development Information for Arid Lands (G-WADI), and The Catholic University of Valparaiso ([UCV](#)), and is supported by the Chilean National Committee of the UNESCO International Hydrological Programme ([CONAPHI](#)) and the Flemish Government (VLIR-UOS).

ASADWA is a recognized activity within the [Universal Forum of Cultures](#), organized from October 22 2010 until January 7 2011 in Valparaiso, that promotes sustainable development, as well as knowledge, peace and cultural diversity. As a result, the conference will be enhanced with activities that encourage interaction with all sectors affected by water management and sustainable development.

## **Conference Topics:**

Development, efficiency assessment, design, implementation, impact, constraints and social, economical and cultural aspects of:

- 1: **Rainfall-Runoff Water Harvesting**
- 2: Fog harvesting
- 3: **Aquifer Recharge**
- 4: Desalinization for rural development
- 5: Water Reuse
- 6: Water Use Efficiency

Please visit conference web site for further information: [www.asadwa.ugent.be](http://www.asadwa.ugent.be)

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9

# Managed Aquifer Recharge Symposium

## 25-26 January, 2011, in Irvine, CA

Water Research Foundation (WaterRF), Orange County Water District (OCWD), and NWRI

### Managed Aquifer Recharge Symposium: Abstract Submission Deadline Is September 15

The deadline to submit an abstract for an oral or poster presentation at the 2011 Managed Aquifer Recharge Symposium is **Wednesday, September 15, 2010**.

The purpose of this symposium is to discuss and exchange information about managed aquifer recharge issues. The focus will be on technical and policy issues regarding augmenting aquifers through **recharge basins** with surface waters, including river water, recycled water, and storm water.

The symposium will be held on January 25-26, 2011, in Irvine, CA. It is being organized by the Water Research Foundation (WaterRF), Orange County Water District (OCWD), and NWRI.

Abstract topic areas include:

- Recharge Basin Performance.
- Recharge Basin Operations.
- Modeling of Recharge Basin Performance.
- Basin Optimization.
- Facility Planning and Engineering.
- Innovative Recharge Ideas.
- Research.
- Operational Experience.

Student posters are also welcome.

More information about the abstract submittal process (including the downloadable "Abstract Submittal Form") is available at [www.regonline.com/rechargesymposium](http://www.regonline.com/rechargesymposium).

## European Geosciences Union

General Assembly 2011 Vienna, Austria, 3 - 8 April 2011

'recent advances in spatial and temporal modelling of groundwater recharge'

The session proposal is at:

<http://meetingorganizer.copernicus.org/EGU2011/provisionalprogramme/HS#HS9>

Dr. Ulf Mohrlök, Karlsruhe, Germany

Email: [ulf.mohrlok@kit.edu](mailto:ulf.mohrlok@kit.edu)

.. The study of recharge is inherently a multi-disciplinary field where experts in catchment hydrology, vadose zone hydrology, and groundwater hydrology need to work together. The purpose of this session is to bring these different groups together and to discuss recent advances in the spatial and temporal modelling of groundwater recharge. Relevant issues include:

- different sources of recharge: rainfall, leaking pipes and canals, ephemeral streams, etc.;
- signature in head fluctuations; alternatives for Richards equation;
- methods for estimation of recharge rates
- residence times in relation to solute transport and transformations;
- regionalization of local information
- predictive modelling

## OzWater Conference, Adelaide, Aust. 9-11 May 2011

### 'Water for Health: Towards Sustainable Practices' Workshop on indirect potable reuse of water via aquifers

- Proposed combined workshop of IAH-MAR and AWA special interest group on water recycling and reuse working group on MAR
- Involves a field trip to Parafield stormwater ASTR site – intended for indirect potable reuse
- Info: <http://www.ozwater11.com.au/>
- contact: [Peter.Dillon@csiro.au](mailto:Peter.Dillon@csiro.au)

## Italy supports Vietnamese MAR project

In April 2010 the Government of Italy announced Euro 15.6M support of a water supply development in Binh Thuan, Vietnam, based on a UNESCO-supported MAR pilot project investigation, orchestrated by Guiseppe Arduino, UNESCO's Regional Hydrologist and Vietnamese scientists and leaders at national, regional and local level.

# European Union projects on MAR

The European Union 7th Framework Program announced two calls for proposals that are highly relevant to IAH-MAR.

The first was advised by Gesche Grutzmacher (KompetenzZentrum Wasser Berlin gGmbH):

*ENV.2011.3.1.1-2 Natural water systems and treatment technologies to cope with water shortages in urbanised areas in India*

The Second was pointed out by Christian Kazner (RWTH University of Aachen):

*ENV.2011.3.1.1-1 Technologies for water scarcity mitigation in Latin American context*

These requests for proposals are in part a response to a wider ranging report assembled by Gesche Grutzmacher at the request of the European Union to inform FP7. Gesche, together with her co-authors, deserve our thanks for the great effort she put into this consequential report.

## 12. Australian Policy Development to get most out MAR

**Australian Guidelines for MAR (Aug 2009)** posted at:  
<http://www.ephc.gov.au/taxonomy/term/39>

The Guidelines follow the WHO and Australian risk management approach to water quality guidance. They allow for iterative development of information by offering a staged approach to risk management in concert with project development. They cover hydrogeological / geotechnical and greenhouse gas hazards as well as water quality hazards. They also address operational issues including clogging and recovery efficiency, as well as risk management plans and monitoring. Now applied internationally.

**A policy framework that maximises the value of MAR to water resources management** in Australia was produced in June 2010.

Workshops were run in May 2010 giving demonstrations of risk assessments and to finalise input to the water resources policy framework. To be published as a Water Lines document by National Water Commission (Aust). Contact: [Peter.Dillon@csiro.au](mailto:Peter.Dillon@csiro.au)

# Other information of international importance in MAR

- Competence centre in India for Bank Filtration in process of establishment –
  - 5 new RBF sites with 2.5 yrs monitoring
  - RBF conference mid 2011 Uttah Pradesh (Thomas Grischek)
- Clogging – what resources are available ? (Robert Hoogween)
- Concern that small MAR projects may not provide adequate public health protection, and operation and maintenance may not be adequate with no one following up and monitoring (Boris David)
- Operation and Maintenance – what info is available and how do we build capacity? (Russell Martin) NGO's working on this in India (Dr Rai)
- Diluting FI in hard rock areas by MAR. 10,000 people now have low FI drinking water (Dr Rai)
- Documentation of MAR projects ? Dr Rai is confident that many projects have been well documented but not sure if these are in public domain. NGO projects have good implementation. Need to integrate NGOs researchers and communities.
- Benefit cost evaluation of MAR projects in Adelaide have been produced for National Stormwater Harvesting Program but it may be several years before these become in public domain (Russell Martin)



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# Discussion on gaps and needs and actions that IAH-MAR could take –

- **Clogging (Russell Martin) from the floor**
  - Biofilm activities of sediments
  - Clay mineralogy -zeolites
  - Confer with oil companies re clogging issues and their management with secondary recovery
- **Water quality improvements (Dr Rai)**
- **Scientific demonstration of recharge schemes first to stakeholders (Thomas Grischek)**
- **Combined impact of small scale MAR schemes to be examined for water safety**
- **How to talk with planners and regulators to get MAR integrated in urban areas? – handy rules, what to look for.. Finding pathways (existing ones and co-ord across orgs), present as part of a broader system**
- **Communication / perceptions.. Implementation of policies? Media.**
- **India- why is MAR progressing so rapidly, what lessons for other countries?**

# Discussion on gaps and needs and actions that IAH-MAR could take – from the floor

## Conclusion and outcomes

- For 3 topics with names the volunteer has offered to produce a one paragraph discussion on this with a proposal for what should be done to be presented in Abu Dhabi Plenary as a discussion starter towards formation of an action plan and possibly a working group.
- Other topics to be put forward as dot points in Abu Dhabi to gauge interest, along with Hyderabad unactioned items.