



IHP-IAH MAR WORKSHOP

**Evaluation of recharge
enhancement projects in arid and
semi-arid areas**

Adelaide, 21-22 Sept 2002

Discussion focus on arid & semi-arid developing countries

1. How much recharge at how many MAR sites? How to assemble this information for your country?
2. What types and proportion of sites are evaluated for recharge effectiveness? What types of data?
3. What types and proportions of sites fail, have problems or issues? ..and what are the problems?
4. Are current evaluation methods adequate to determine effectiveness, sustainability, health, economic B/C ?
5. What are the barriers to improving the performance of MAR operations? –technical, policy, economics, social, human capacity....?
6. What can IAH-MAR and others do to advance improvements in MAR?

1. How much recharge at how many MAR sites? How to assemble this information for your country?

- Information on MAR sites available at regional and national level with a range of agencies
- Size of country and number of agencies involved will determine how easily data can be collected. Co-ordination of agencies needed.
- Database of MAR sites needed.
- Albert Tuinhof to prepare a simple questionnaire and distribute to attendees before end of ISAR4. Return by end of October.

Country	Alluvial Basin & Inj.	Fractured	Limestone
Australia		2	3-4
China			20
Egypt			1
India		1xe4's	
Indonesia			plans
Netherlands			1
S. Africa		3	
Thailand			0
Uganda	1-4		
UK		0	several
USA	1000's	100's	20-25

2. What types and proportion of sites are evaluated for recharge effectiveness? What types of data?

- Evaluation variable and schemes have different objectives – storing water, quality improvement or both.
- Evaluation and monitoring very variable –
 - Uganda in initial stages
 - S Africa elaborate monitor at most sites
 - India uses rise in water table to assess effectiveness
- Monitoring information is vital regardless of size of site. If careful, simple information can be very valuable.

3. What types and proportions of sites fail, have problems or issues? ..and what are the problems?

- Lack of knowledge and understanding of hydrogeology
- Abstraction and monitoring well design
- High As and F in fractured systems in India and S Africa
- Loss of water injected
- Dual porosity effects.
- Transition from small to large scale difficult; large scale needs to be tried.
- Social and religious acceptability
- Difficulty in obtaining information on other MAR activities
- Positive promotion of successful schemes. Too much focus on problems will lead to dropping scheme rather than addressing problems.

4. Are current evaluation methods adequate to determine effectiveness, sustainability, health, economic Benefit/Cost ratio?

- Not addressed directly but partially covered in other questions.

5. What are the barriers to improving the performance of MAR operations? –technical, policy, economics, social, human capacity....?

- **Technical**
 - o GW contamination with As prevented recharge (Solution – Use surface & GW for different uses)
 - o Evaporation rate higher than infiltration
 - o Clogging of basins due to poor design as well as through good operation (solution - Change ownership for better management).
 - o Types of clogging of wells - air entrapment, biological growth, sediment load etc.– pre-treatment using bank recharge etc prior to injection. Much work has been done so learn from others experience/mistakes. Need to exchange information but not rely on what happens one place will work elsewhere.
 - o Better information on technology needed to aid in selecting appropriate systems.
 - o Availability of suitable water and suitable sites, both at the surface and subsurface structures.
 - o Are abandon mines suitable AR schemes?

- **Policy**

- o Policy & perceptions of community on viability (Solution– Have demo sites and push during advantageous times, eg drought)
- o Lack of coordination in Government depts. (Solution– 1 dept. to take lead)
- o Water allocation for AR compared to other uses – AR using surplus water.
- o Policies and regulations often not well established to cope with concept of AR and thus make decisions based on non-adequate regulations – get regulators involved from beginning in many countries. USA not good model.

- **Human capacity**

- o Villages have water associations to help disseminate information and educate others
- o Exchange of information between developing and developed countries
- o Training is adequate for authorities but need to transfer to grass root level.

- **Economic**

- o Lack of comprehensive economic studies. Example economic viability studies would be useful but can come from different sources in different countries.
- o Need correct economic studies – including costs of population, environmental changes – not just cost of injecting and recovering water
- o Source money from international foundations but need to recover money (loan) Paper trail for money from bank to user.

- **Social**

- o Water users association helps in policy formulation.
- o Selected area in Tanzania is in populated area – needs resettlement program including compensation
- o Social structures such as caste system in water equality. Some paying for water when benefits many
- o Social and education problems. Present in appropriate forms depending on education and religious beliefs.

6. What can IAH-MAR and others do to advance improvements in MAR?

- www.iah.org/recharge Subscribe and join e-mail list for unfacilitated news group
- Make list of names and areas of interest and contact details to develop online network for all to use to facilitate network.
- Database of MAR sites needed.
- Dissemination of research, conference and symposium results to developing countries in form apart from journals. Place information on internet
- Checklist useful for providing complete information – eg site information
- Checklist of benefits of MAR helps in proving benefits.
- Workshops allowing interactions and exchange of ideas.
- Training and education impedes development and needs fixing.

Possible areas for action?

- Training
- Regulation and management
- Demonstration and research projects - dissemination of outcomes
- Investigations and monitoring guidance
- Research coordination
- Inventory of MAR
- Compilation of references
- Networking (web, email list, newsletters)
- Publications

Wise Strategies for Recharge Enhancement (a publication)

- Demand management and MAR
- Decision tree for type of MAR
- Operating and maintenance costs
- Monitoring of performance of MAR
- Case studies of good practice
- Checklist of planning, investigation, design and operating functions
- Community information and involvement
- Benchmarking of MAR
- References