Mon, 13 September 2010
10:58

Nitya Jacob

You can download the PDF version of this consolidated reply from ftp://ftp.solutionexchange.net.in/public/wes/cr/res-15051001.doc (Word, 200 KB)


Solution Exchange for the Water Community

Consolidated Reply

Query: An Approach to Participatory Groundwater Management

Compiled by Nitya Jacob, Resource Person and Sunetra Lala, Research Associate

Issue Date: 13 September, 2010

From Amitangshu Acharya, Arghyam, Bangalore

Posted 14 May 2010

I work with Arghyam in Bangalore. For the past three years, we have engaged with organizations with expertise in implementing participatory ground water management (PGWM) projects in 3 states in the country. These organizations have worked with local communities to adopt participatory approaches to groundwater management. The lessons and experiences emerging from these programme areas have been very insightful and fascinating. These are captured in the document, An Approach for Participatory Groundwater Management (ftp://ftp.solutionexchange.net.in/public/wes/cr/res-15051001.doc, Word, 200 KB).

However, there is a need to broad-base such institutional leanings beyond the projects. This process started when Dr K. A. S. Mani, then with the Andhra Pradesh Farmer Managed Groundwater Systems (APFAMGS), initiated a discussion on the need for a Paradigm Shift in Groundwater Management on the Water Community (You can view the consolidated reply at http://www.solutionexchange-un.net.in/environment/cr/cr-se-wes-food-12030801.pdf, PDF, 400 Kb) and followed it with an action group.

Realising the importance of groundwater governance in the country, the Water Community initiated a series of discussions at its Annual Fora in Bangalore in 2008 and Kolkata in 2009. To follow up on this, in September 2009, Arghyam convened a brainstorming session involving Dr Mani, Dr. Himanshu Kulkarni of Pune-based Advanced Centre...
for Water Resources Development and Management (ACWADAM) and Dr. Yogesh Jadeja from Kachchh-based Arid Communities and Technologies (ACT). The meeting highlighted the need to document the processes and resources required for an approach to PGWM. We drafted the above document based on these discussions and it was discussed informally at the Water Community meeting in Kolkata in October 2009.

Subsequently, the Water Community's resource team and I met Dr P S Rao from the Food and Agriculture Organization in Delhi, who suggested incorporating a desk review of the existing legal framework on groundwater management. This would pinpoint the institutional and legal challenges in the way of scaling up PGWM.

The purpose of this approach is to assist organizations (NGOs, international and national donors, and the government) to initiate and scale up PGWM. We envisage it to be a flexible and practical set of suggested activities for PGWM. The document can also be used for assessing/monitoring large projects on groundwater development initiated by the government. The approach is sensitive to the geographic, cultural and hydrologic diversity of India. However, to develop it further, we require your inputs on the draft. Kindly read the document and the earlier discussion on this issue. We request your inputs and suggestions specifically on the following and generally on the entire document:

1. The principles of PGWM listed on Page 5
2. The PGWM components are broken down into social, institutional, scientific and communication & advocacy. Are most components needed? Also, within each area already listed, is there a need to incorporate any other essential activities?
3. Are there any existing desk reviews of the legal framework of groundwater management?
4. How do we modify this approach for conjunctive use of water for irrigation within a hydrological unit?

We will incorporate your comments into the document and set up a core group to work on it. Once this is complete, we will hold a consultative workshop with all stakeholders concerned with groundwater to finalise the approach suggested in the document.

Responses were received, with thanks, from

1. Shrikant. D. Limaye, Ground Water Institute, Pune (Response 1) (Response 2) (Response 3)
2. Ajit Seshadri, The Vigyan Vijay Foundation, New Delhi
3. A Raja Mohamed, Coastal Energy Private Limited, Chennai (Response 1) (Response 2)
4. Amitangshu Acharya, Arghyam, Bangalore
5. S. V. Govardhan Das, Andhra Pradesh Farmer Managed Groundwater System Project, Hyderabad (Response 1) (Response 2)
6. Sacchidananda Mukherje, National Institute of Public Finance and Policy (NIPFP), New Delhi
7. Krupa Dholakia, Sahjeevan, Bhuj
8. Sukhpal Singh, United Youth Federation, Mohali
9. Shashikant Kumar, Green Eminent Research Centre, Vadodara
10. Arunabha Majumder, Jadavpur University, Kolkata
11. A. Raja Mohamed, Coastal Energy Pvt Ltd, Chennai
12. G Misra, Zilla Parishad, Port Blair
14. Tapan Kumar Padhi, National Institute for Development, Bhubaneswar
15. Dinesh Kumar, Institute for Resource Analysis and Policy, Hyderabad

Further contributions are welcome!

Summary of Responses
Related Resources
Responses in Full
Participatory groundwater management (PGWM) may be loosely defined as groundwater management by communities for themselves. One of the underlying principles is people do not consider themselves as the sole owners of all water under their land (as embodied in the Indian Easements Act 1882). Another is accurate and up-to-date information on rainfall, local hydrology, pollution and other factors that affect the health of aquifers. The third is institutional – apart of Central and State ground water boards, there are no local-level institutions concerned with managing groundwater in a sustainable way. The fourth is recharging aquifers by restoring and managing watersheds.

Following from the first point, the main action farmers have to take collectively is voluntarily restricting groundwater withdrawals. The counter-argument here is, if industry has prospered in the absence of external checks, there is no justification to place limits on agriculture including the access to groundwater. This is ignores the over-use of groundwater, the myriad ‘incentives’ farmers get for accessing this resource and the fact that it is a limited resource; groundwater is forms part of the long-term storage of the hydrological cycle unlike rain, rivers, snow and seas that are in constant circulation. Also, voluntary restrictions anticipate any future reductions in income by changing the cropping mix. By their nature, they cannot be called external checks.

It appears from the discussions that farmers’ decisions to reduce groundwater extraction are driven by economics. Either their yields start to fall or fail, or the cost of accessing this resource skyrockets (as happens when the water table sinks very low). These limit the over-use of groundwater to an extent. However, this only postpones a possible solution to the problem of depleted aquifers.

One suggestion is to tap only shallow aquifers to a depth of 70 feet for irrigation and deeper ones to a depth of 150 feet for drinking water. This spares the ‘fossil’ water, accumulated over millennia, from any disturbance.

Central to PGWM is the necessity of accurate and current data. As groundwater is an invisible resource, its dynamics are poorly understood. Even if state governments impose restrictions on groundwater extraction, as several have done, these remain ineffective owing to a lack of reliable on the number and depth of tubewells, fluctuations in aquifer levels and correlation with rainfall, and other factors that influence the health of aquifers. It is also hard to convince a farmer to reduce his water withdrawals if information is sketchy. Data can include aquifer mapping, the socio-political dynamics and the institutional structures in the aquifer area.

Quality data is essential to mobilizing farmers, the first step towards executing PGWM. This comes out strongly from the experiences of several NGOs and projects – the Andhra Pradesh Farmer Managed Groundwater System, Arid Communities and Technology, the Advanced Centre for Water Resources Development and Management and several others. There is a consensus that communities have to play the lead role, and that reliable data is critical in motivating people to get involved in PGWM.

The data can include water quality parameters as this of increasing concern. Groundwater is the main source of drinking water and several hundred million people live in areas where it is polluted. Arsenic, fluoride, iron, pesticides, nitrates and faecal matter are the common pollutants; PGWM becomes much more meaningful if it includes data on water quality since this affects users directly when they drink the water. Farmers in large part are both the agents and victims of groundwater pollution but they have a poor understanding of the pollution cycle and continue to use polluting chemicals or dump garbage in surface water bodies.

There are some institutional arrangements in place for managing groundwater such as the Central Groundwater Board and its units in different states. However, there is no such institution at the village or even district level, whose administrations are responsible for local planning. While Panchayats are the institution of choice to implement PGWM, non-government organisations can catalyse the process given their expertise. A partnership between CGWB, NGOs and panchayats can start PGWM and build the capacity of the latter; they can then take it over in the long term as they comprise of local people and leaders. Panchayats can work through water user committees or associations that include all water users and not just farmers. Even though the 73rd Constitutional Amendment empowers panchayats to manage water for drinking and minor irrigation works, this has panned out differently in reality.

The water users associations that have been set up as part of the new regulatory regime (under which states set up an ‘autonomous’ water regulator to allocate water and decide tariffs, among other things) are limited in scope and may not have the mandate to manage groundwater. Their role seems to be confined to more downstream functions of water distribution and revenue collection rather than watershed management or over-extraction of groundwater.
Thus, the panchayats emerge as the local institution to take up PGWM. Given the invisible nature of the resource, panchayat committee responsible for groundwater management needs training on the entire project life-cycle. This is a combination of technical, social, political and economic topics to develop local water resource management experts. People in villages usually put the same source of water to multiple uses; conversely, they also have multiple sources of water for the same use. For example, ponds are used for irrigation, watering animals and bathing. Conversely, irrigation water comes from ponds, wells and rivers. They tap groundwater through handpumps or tubewells and wells when neither is available. In the training for panchayats, in addition to the above-mentioned components, it then becomes necessary to include sessions on integrated water resources (allocation and) management to they begin to see water as part of a larger whole. It follows that panchayats will learn to manage water at the watershed level, with the aquifer as the ‘reserved storage’ and surface water sources as the ‘active storage’ facilities. The analogy that presents itself here aquifers is somewhat like fixed deposits while surface water sources are like current accounts.

One of the prerequisites, suggested elsewhere, is to consider groundwater as part of the local natural resources base and manage it as such. This is possible if there is a suitable rights framework and the institutional mechanism is part of a decentralised form of governance of all natural resources. The institutional mechanism has to give equal representation to all water users – farmers, women, landless and other excluded groups – by regulation. It has also to have a fast and transparent process of redressing disputes and managing conflicts. In other words, a groundwater law has to provide a framework of rights, institutions, mechanisms and processes to enable a management paradigm (M S Vani and Rohit Asthana, Development Centre for Alternative Policies, New Delhi). However, the nine states that have enacted groundwater-related laws have not enforced them sufficiently to reduce over-draft of groundwater. Thus, the suggestion of societal control of ‘private’ groundwater (as it is considered to be) may be the only solution to the growing groundwater crisis. This mechanism necessitates a strong and well-informed institution of local governance, usually the panchayats rather than creating a new parallel mechanism.

A watershed-based approach is necessary for conjunctive use of all sources of water for different purposes. This also ensures equal access to water among upstream and downstream users, different user groups (women, the poor and SCs/STs). Starting with a micro-watershed that may cover a single village or habitation, water resources management plans can be concatenated to the basin level. This approach also helps to allocate water of the appropriate quality to different uses while determining how many future users can be accommodated. If the watershed is fully committed, it can serve as a planning tool to prevent new water-dependent projects from coming up, or farmers from expanding the area under water-intensive crops.

This approach has a few basic steps. The physical map of the watershed is overlaid with a groundwater resources map. This helps chart the surface and ground water resources, as well as other natural resources, and a survey of their quality can establish how much water is available and of what quality. The next step is to map the users by location and socio-economic parameters and determine their water needs, followed by a user or stakeholder analysis. Each one gets a clearly defined right to water covering his/her requirements. This is matched to the water available in terms of quantity and quality and ease of access. If the exercise shows more water is needed, or will be shortly to cover the projected population growth, watershed planning can help augment local water availability through rainwater harvesting and storage or tapping existing water sources. Thus, groundwater becomes part of the local water plan and, being managed holistically, is less prone to over-exploitation.

There are several PGWM initiatives across India and this discussion attempted to distil the experiences of some of them (since it is not practical to cover all of them) into a set of guidelines that others can use while starting their own PGWM work.

**Related Resources**

**Recommended Documentation**

From **Ajit Seshadri**, The Vigyan Vijay Foundation, New Delhi

**Initiatives by Community Participation on Ground Water Management — A NGO Experience.** Paper; by Ajit Seshadri; The Vigyan Vijay Foundation; New Delhi; Permission Required: No


This study in association with CGWB Delhi, NIH Roorkee and others has revealed an alarming scenario of rapid depletion of sub-soil water in many parts of the country.

Book; by Planning Commission, Government of India; New Delhi; 2007; Permission Required: No.

Discusses the groundwater scenario in the country, the legal position, experiences at the state level and suggests a way forward

Factors Influencing Farmers’ Willingness To Protect Groundwater from Nonpoint Sources of Pollution in The Lower Bhavani River Basin, Tamil Nadu, India (from Sacchidananda Mukherjee, National Institute of Public Finance and Policy (NIPFP), New Delhi)

Paper; by Sacchidananda Mukherjee; National Institute of Public Finance and Policy; New Delhi; 2009; Permission Required: No
Available at [http://www.wepa-db.net/activities_2008_10forum.htm](http://www.wepa-db.net/activities_2008_10forum.htm)

This study attempts to understand the factors influencing farmers’ willingness to adopt agricultural Best Management Practices to protect groundwater from pollution

From S. V. Govardhan Das, Andhra Pradesh Farmer Managed Groundwater System Project, Hyderabad; [response 2](http://indiawaterportal.org/node/11265/)

Springs of Life

Book; by Ganesh Pangare, Vasudha Pangare and Binayak Das; Academic Foundation; Pune; 2006; Permission Required: Yes, please order book.
Available at [http://books.google.co.in/books?id=twCEugMSbggC&pg=PA13&ots=_3DAYkKFFR&dq=s%20v%20govardhan%20das&ppg=PP1#v=onepage&q=s%20v%20govardhan%20das&f=false](http://books.google.co.in/books?id=twCEugMSbggC&pg=PA13&ots=_3DAYkKFFR&dq=s%20v%20govardhan%20das&ppg=PP1#v=onepage&q=s%20v%20govardhan%20das&f=false)

Takes a journey through India’s water resources, describing both natural and manmade processes in detail

For Want of a Drink

Article; by John Grimmond; The Economist; 22 May 2010; Permission Required: Yes, Paid publication.

Provides a bird’s eye view of the global water crisis with economic, political and social perspectives

Chasing a Mirage: Water Harvesting and Groundwater Recharge in Naturally Water scarce Regions

(from Dinesh Kumar, Institute for Resource Analysis and Policy, Hyderabad)

Article; by Dinesh Kumar; Institute for Resource Analysis and Policy; Hyderabad; August 2008; Permission Require: No
Available at [http://indiawaterportal.org/node/11265/](http://indiawaterportal.org/node/11265/)

Paper refers to the plans by the Government to undertake artificial recharge of groundwater in over-exploited areas of the country to meet the demands for water

Related Consolidated Replies

Paradigm Shift in Groundwater Governance, from K. A. S. Mani, Andhra Pradesh Farmers Managed Groundwater Project, Hyderabad,


The first discussion on participatory groundwater management brought out the need to move away from the command and control mechanism to one led by farmers

Urban water supply from water impounding and aquifer recharging, from Rahul Banerjee, Aarohi Trust, Madhya Pradesh (Comparative Experience). Water Community, Delhi,


Explores relevant potential experiences in the context of water impounding and aquifer recharging system

Improving irrigation efficiency for crops using groundwater, from K A S Mani, APFAMGS. Water Community, Delhi,


Provides experiences on improving efficiency of water use for agriculture with suggestions on appropriate measures to improve groundwater efficiency in growing crops
Gender Equity in Participatory Irrigation Management, from M.S. Prakash, DHV-MDP, New Delhi. Water and Gender Communities, Delhi, Issued 28 July 2006. Available at http://www.solutionexchange-un.net.in/gender/cr/cr-se-gen-wes-28070601.htm

Deliberates on legal, political, socio-cultural & capacity building constraints that prevent women from being active members of Water Users’ Associations


(PDF, 200 KB)

Experiences of environmental and social impacts of industrial effluents on groundwater and agricultural production, along with technical, legal and social mitigation measures

Responses in Full

Shrikant. D. Limaye, Ground Water Institute, Pune (response 1)

On page 33 of the document available under http://www.solutionexchange-un.net.in/environment/cr/cr-se-wes-food-12030801.pdf, there is a comment by Prof. Jagadiswara Rao that the policy of "Reserving deep groundwater for drinking purpose only and using shallow groundwater for irrigation" is difficult to implement.

However, this has already been implemented in a few villages with beneficial results. Due to watershed restoration, re-forestation and 'soil and water conservation' activities in these villages, the water table has come up from about 65 ft to about 20 ft. So, the farmers use dug wells of depths ranging between 30 to 70 ft for irrigation and deeper water up to 150 ft for drinking. The Gram sabha has a resolution passed unanimously that no one should use a bore well for irrigation and no one should grow high water-demand crops like bananas and sugarcane.

In watersheds where even the deep dug wells dry-up in summer and bores must be used for irrigation, a limit could be set, depending upon local conditions, for using bores up to 200 ft depth for irrigation and 'reserving' deeper groundwater for drinking. Efforts should, however, be made in these watersheds for rainwater harvesting and recharge augmentation so as to elevate the water table. It should be remembered that only high yielding wells and bores are effective in recharge augmentation as they accept large quantities of water over a short period of Monsoons.

Societal control of 'private' ground water would be the way in future. Why? Suppose a farmer having 1 Ha of land in a watershed of 1000 Ha, has luckily a very good well in his land. Should he pump maximum quantity of water and irrigate sugarcane & bananas in his farm? His equitable share in the groundwater resources of the watershed is only 0.001% But God has favoured him with a high-yielding well so to what extent should he increase his share? 10 times? 20 times? Or would he agree that 50% of the well yield is for him and 50% for others? Would he allow his well to be used by Gram panchayat for recharge augmentation in monsoons? This would be a revolution in groundwater management.

Ajit Seshadri, The Vigyan Vijay Foundation, New Delhi

I am sending you a report by Expert Group on Ground Water Management and Ownership issued on September 2007 by Planning Commission. This also has a reference to: Initiatives on communities’ participation on ground water management – A NGO Experience Ajit Seshadri - The Vigyan Vijay Foundation. The Planning Commission report is attached as a pdf file at ftp://ftp.solutionexchange.net.in/public/wes/cr/res-15051002.pdf (PDF; Size: 3.87MB). Also the referred Community-NGO initiative is attached as a word file at ftp://ftp.solutionexchange.net.in/public/wes/cr/res-15051001.doc (DOC; Size: 64KB). The noting bears relevance to the query.

A Raja Mohamed, Coastal Energy Private Limited, Chennai

I have very recently joined this group and feel I have missed a lot. Regarding the PGWM, I have gone through the 39 pages narration and the mails received recently and I would like to respond to the 3 points.
In the first point on page 5 refers to many activities. I feel the farmers are more concerned with tapping ground water from a site for getting the maximum returns. They are not really bothered about the long-term effects as long as they get their groundwater supplies. It is only when their yield is affected that they start thinking about sustainability. APFAMGS strategically chose one such chronically drought-prone belt and provided what the farmers really wanted and have done very appreciable work after initial struggles.

But based on this or other case studies, can a community recommend measure for enacting a law. I would like to get into the fundamentals. First, let us analyse the different situations prevailing in India. Can the regulatory agencies or NGOs carry forward the different models or a typical model to the farmers? These are some case studies and may not be applicable to deeper groundwater bearing rocks or close to the perennial recharge sources.

Let us analyse past behaviour. In Coimbatore and other north-western parts of Tamil Nadu, the water level has continuously fallen from just 50 feet to 300 feet and during drought years many bore wells go dry. But people drill up to 2,000 feet and get their supply. Are there any studies that link the fall in ground water to the area cultivated? I am sure there will be only a marginal correlation. Take, for example, drinking water bore wells in Bangalore; borewells were just 300 feet deep but now they have gone as much as 1200 feet. In Gujarat, farmers are also going as deep as possible. It is all depends on the necessity and survival of the farming community.

While water scientists have tried to restrict boring to depths of 300 feet in hard rock areas, these people have gone as deep at 2000 feet to discover water. This and the need for their survival have promoted innovations in pumping efficiency. Instead of trying to curtail the farming community, we must try to help them. We should focus on recharging groundwater. If business has prospered in the absence of curbs, we must not impose curbs on farmers to enable them to prosper. We should not aid the regulation of groundwater by imposing laws in the name of protecting the system.

Instead, we should take up measures for recharging groundwater and protection of these systems. Though the policy says utmost attention should be paid to recharging aquifers, little has happened. Has there been any study on the per capita investment on recharge and what has been achieved so far. Where are the lacunae – with the people concerned or the technology? Can anybody in the Community provide information on this? I feel that by creating a law to protect groundwater, we will again get into the license raj. Farmers will resist this as groundwater accounts for 65 per cent of the water for irrigation in total, and 40 per cent in command areas.

A Supreme Court says the government is the trustee to manage society's resources, while another says it is the owner. Whatever the case, groundwater is the lifeline of farmers. How is this managed? Do the bureaucrats who have the responsibility to do so have sufficient knowledge or exposure in understanding the behaviour of groundwater and the remedial measures to sustain it? Are they ready to work with the farmers to work out ways of sharing this resource equitably?

I feel the Community should analyse the decision making processes and work with the government to improve groundwater management. APFAMGS has been successful since it has been headed by a professional. The government can launch a recharge mission headed by similar professionals to protect the farmers and the environment.

Amitangshu Acharya, Arghyam, Bangalore

It's a pleasure to hear from Govardhan Das. His suggestion of involving farmers into debates on Participatory Groundwater Management is in sync with the future PGWM consultative plans. Unfortunately, the Water Community, being email based doesn't allow us to engage with users and practitioners without access to the internet. Hence, we plan to involve farmers and other direct users in consultation session after we receive inputs from the Community's members. We plan to invite representatives from Pani Panchayats in Maharashtra, Pani Samiti members from Gujarat and APFAMGS. Additionally, we will identify and invite people working on the issue from other parts of the country.

We had met Dr. Rao at FAO in New Delhi to get his inputs to take the groundwater initiative further, which he was gracious enough to give. At one of these meetings, we also met Dr. Govardhan Das and farmers associated with APFAMGS as they were in town for a meeting with the World Bank. Dr. Das had suggested we work with farmers' and other groups to develop guidelines to help others implement PGWM, something we were already working on.

Regarding the document up for discussion, we request Dr. Das to review it and give his comments. We will duly acknowledge all inputs once this discussion is completed in the next draft of the document. We also request Dr. Das to let us know what specific
inputs in this document from the APFAMGS team have not been acknowledged so we can correct the same. As per the meeting in Delhi, we look forward to further interactions with Mr Paul from BIRDS and we are looking forward to his inputs when the consultative process starts sometime in July.

This document is going through several rounds of peer reviews, and the peers we value the most are end users, i.e., farmers in dryland areas. We would like to emphasise the approach has to get further inputs from people at the cutting edge. We would be happy if members can share these inputs so they can form part of the document.

---

**S. V. Govardhan Das**, Andhra Pradesh Farmer Managed Groundwater System Project, Hyderabad (response 1)

I invite, whoever is concerned with this debate to the area where APFAMGS Project is (was) implemented successfully. I urge once again to talk to farmers rather than few individuals who have right contacts at the the right place. I also advice you that, be pragmatic and invite farmers to all your workshops/debates scheduled in near future.

The document should incorporate inputs from farmers who have been bold enough to take groundwater budget based farming decisions. I and a team from APFAMGS had met the Resource Person from Solution Exchange and Arghyam in Dr. P. S. Rao's chamber in Delhi (FAO Office). Their inputs should be incorporated in the document.

For further inquiries, please contact Mr. V. Paul Raja Rao, Executive Director - BIRDS, Nodal Agency for implementation of FAO Next Project - APFAMGS Project. Call him at: 09849765862

---

**Sacchidananda Mukherjee**, National Institute of Public Finance and Policy (NIPFP), New Delhi

My comments on the draft paper are as follows-

The draft paper is silent on participatory approach in the protection of groundwater quality. The protection of groundwater quality is important as it is a source of drinking water for more than 71 per cent of rural population. To make APFAMGS a role model of participatory groundwater management in India, I think it is also important to consider the issue of groundwater quality protection. The growing stress on groundwater and increasing pollution load from point and nonpoint sources has caused groundwater pollution in different regions in India (Mukherjee and Nelliyyat, 2007; Mukherjee, 2008). Growing energy-intensity (both electricity and fossil fuels) of Indian agriculture, choice of crops (water intensive crops like paddy, sugarcane etc.), change in cropping pattern are the major causes of groundwater depletion. Whereas, growing chemical intensity (both nitrogenous fertilisers and pesticides) of Indian agriculture and unlined and open storage of livestock waste has caused nonpoint source groundwater pollution. Growing incidence of using municipal wastewater in agriculture and discharge of industrial effluents in land for agriculture has also caused groundwater pollution (Mukherjee & Nelliyyat, 2007). Therefore, our farmers are both victims and polluters of groundwater pollution. Farmers' understanding of agricultural impacts on environment is poor, and poor infrastructure in the provision of basic agricultural extension services are the major hindrances which put obstacles before willing farmers to adopt agricultural Best Management Practices (BMPs) to protect groundwater from nonpoint sources of pollution (Mukherjee, 2009). It is preferable to adopt precautionary approach in the protection of groundwater quality as *ex ante* costs of protection of groundwater quality is lower than *ex post* treatment.

The costs of adoption of agricultural BMPs will be lower than the incremental benefits that the farmers will accrue due to adoption of agricultural innovations (BMPs). The government could provide incentives by providing training, demonstration and giving basic agricultural extension services (like soil testing, water testing facilities) to the farmers.

References

- Mukherjee, S. and P. Nelliyyat (2007), “Groundwater Pollution and Emerging Environmental Challenges of
Krupa Dholakia, Sahjeevan, Bhuj

I am from a Kutch-based organisation working on a groundwater legislation model that will establish in two different types of geohydrology aquifers. We are just thinking about the drinking water protection point of view. From our experience, I think participatory ground water management is a very important need today and will be even more in the future. It is related to both drinking water and irrigation water, and also water for industrial purposes. It is not limited only to one use of water and cannot be view in a limited manner.

It is true that all areas have different geohydrological aquifer zones available, but they need some disciplinary steps, that are the same. I am giving some of the steps for participatory ground water management below:

1. Aquifer mapping. The parameters to be considered are depth, length, width, quality of water, how many villages are dependent on this, the cropping pattern of this area, water requirements for agriculture, drinking, and other uses and how much population falls into these categories?
2. Socio-economic-politics dynamics in this aquifer area
3. Social-legal institutional structure

I think in our country, Panchayati Raj Institutions (PRIs) have a very important role play in this approach. I see the Panchayati dharas in Gujarat have the responsibility and power or authority to manage and maintain their water resources. However, there is lack of clarity over which institution has the authority to control ground water so in addition to advocating for a law on ground water, we have to decide which institution will implement it?

Sukhpal Singh, United Youth Federation, Mohali

I am posting this article about groundwater management problems in Punjab, hoping that by bringing this up and discussing it we can bring in enforcement groundwater management and resolve the problem of Groundwater exploitation in Punjab by farmers, industrialists and domestic users.

Groundwater exploitation is not just an economical problem but also a moral problem. People seem to have lost their love for earth, country, their state and even their town or village, else why would they pollute or allow pollution of groundwater knowing well enough that water is the source of life. Plants, animals and even humans will die due to lack of water or by using polluted water. Why then they still carry on polluting the ground water?

It is because of their "I Don't Care" or "Who Cares" attitude that no major movement has taken place for groundwater management. It would be an excuse to say that people are ignorant or they don't know any better because plenty has been said and talked about water pollution and everyone knows about it. So why don't they do their part to help in groundwater management.

I know it is easy for someone to throw tonnes of waste material, pollutants, toxic waste and other industrial and domestic waste into rivers or canals than dispose off it in a proper way by treating it. Everyone knows that these rivers flow for the replenishment of our groundwater. Why would you mix poison in the very water that you and your children drink?

The Punjab Government and the Central Government should make it mandatory for all villages, towns and industries to have water treatment plants and impose heavy fines on those who do not follow the rules and offer bribes to get away with the wrongs they are doing.

I know the next reason would be that the government does not have funds to do this, so then I suggest they should look into grants and loans from World Bank, U.N. and other such organizations.

Water treatment plants should be set up to treat ground water in areas where it is already polluted and then it should be injected back into the earth by drilling into the ground. We should focus on recharging groundwater. Utmost attention should be paid to recharging aquifers. The government can launch a recharge mission headed by similar professionals to protect the farmers and the environment.
"Reserving deep groundwater for drinking purpose only and using shallow groundwater for irrigation" is difficult to implement. Watershed restoration should be enforced all over Punjab. However, this has already been implemented in a few villages with beneficial results. Due to watershed restoration, re-forestation and 'soil and water conservation' activities in these villages, the water table has come up from about 65 ft to about 20 ft. So, the farmers use dug wells of depths ranging between 30 to 70 ft for irrigation and deeper wells of up to 150 ft for drinking. The Gram Sabha has passed unanimous resolutions that no one should use a bore well for irrigation and no one should grow water-intensive crops like bananas and sugarcane.

In watersheds where even the deep dug wells dry up in summer and bores must be used for irrigation, a limit could be set, depending upon local conditions, for using bores up to 200 ft depth for irrigation and 'reserving' deeper groundwater for drinking. Efforts should, however, be made in these watersheds for rainwater harvesting and recharge augmentation so as to elevate the water table. It should be remembered that only high yielding wells and bores are effective in recharge augmentation as they accept large quantities of water over a short period of Monsoons.

Societal control of 'private' ground water would be the way in future. I feel the Community should analyse the decision-making processes and work with the government to improve groundwater management. Only then will Punjab, The Land of Five Rivers, once again have clean water for drinking and irrigation.

**Shashikant Kumar**, Green Eminent Research Centre, Vadodara

Thanks for initiating the effort at the grass root level on Participatory Ground Water Management. I think there are broad issues concerning this document:

(a) Legal Sanctioning - Ownership of groundwater needs to be specified in the relevant acts to be proposed by the state governments. Change of ownership - collective ownership, should be so defined that it should allow the owner other than the community to manage and operate the GW sources. The state is the existing owner and GW is managed under the Irrigation department which otherwise should be the stakeholder of the PGWM.

(b) Groundwater management requires lots of technical inputs and existing structure support would be required in order to manage this even at the Panchayat or community levels. What new institutional mechanism can we evolve?

(c) NGOs are very good for community mobilisation, monitoring and checks on the GWM projects, but they cannot be upscaled at the block or district level. Thus there is a need to rethink the role they can provide on groundwater improvement apart from the mentioned items.

(d) The legal framework for such activities is still unclear i.e. regarding the sharing of water and conflict with state departments. This would also incorporate the commercial cost, exploitation, management of resources and ownership conflicts that might emerge if expanded beyond few controlled villages.

(e) Why and which type of PGWM system needs to be evolved which is technically more competent than state departments? This parallel system would confuse the state as well as community (multiple stakeholder management issues). We all also know the reasons of failure of existing GWM in states like Gujarat, Rajasthan where micro GWM projects does not take into full confidence the people and community except on paper.

(f) Community rights and access in groundwater management needs to be ensured if possible with the existing framework of the GW in the states. Similar experiences can be learnt from the forest department since community ownership and sharing of resources is also done by them.

(g) Any approach involving the parties/stakeholders including the community, NGO, experts, Governments (departments) should require a proper modification in GWM Acts in the state. The present exercise is a welcome step and should be deliberated upon seriously by concerned agencies.

I would be happy to support any such group which can take the initiative forward in the near future.

**Shrikant D. Limaye**, Ground Water Institute, Pune (response 2)
1. PGWM is founded on farmers’ cooperation and action. Even if the Gramsabha takes decisions on recharge augmentation or pumpage control or change in the cropping pattern, the farmers should follow the decisions.

2. Amitangshu has rightly pointed out that the farmers who are not in the 'internet coverage' would be left out from our discussions. But the NGOs with strong linkages at the farm level could give valuable inputs. We may invite some active sarpanches (Heads of Village Council) on recommendation from such NGOs.

3. Take this example. Suppose in a watershed of 1,000 hectares, a farmer has a farm of only 1 hectare. But luckily, this farmer has got a good borewell or dugwell on his farm, on which a pump can run whole day. Should this farmer cultivate all his land under water-intensive crops like banana or sugarcane? His equitable right or share in the ground water resources in the watershed is only 0.001 per cent i.e., (1/1000). But because he has been favoured with a very good well, to what extent he should increase his equitable share of water? 10 times, 20 times...50 times? This question is difficult to answer. If through social pressure he agrees to pump 50 per cent for his use and give 50 per cent share to his neighbours, this would be a "revolution" because all farmers have a strong feeling of complete ownership of water under their farms.

4. Furthermore, as only a high yielding well would accept a good amount of recharge, the same farmer could allow his well to be used for 'recharge augmentation' during the rainy season. This would be another "revolution". Only a selfless and charismatic sarpanch could start such a revolution, with the help of a NGO.

5. Putting surface water runoff during the monsoon season into the ground so as to recharge groundwater reservoir, involves a change in the ownership domain. Surface water is mostly government (public) owned and ground water is privately (farmer) owned. In PGWM, if the augmentation of ground water recharge by farmers in several watersheds reduces the surface water runoff coming into a major reservoir behind a large dam, the farmers could be in trouble, because the major reservoir is often designed by government engineers as a source for canal irrigation and city water supply. The PGWM should therefore cover both supply management and demand management.

---

**Arunabha Majumder**, Jadavpur University, Kolkata

It is reported that groundwater management has been implemented in nine states helping 475 users at 191 sites across the country to effectively compile, visualize and analyze hydro-geologic and allied attributes to groundwater resources (Ref : World Bank Funded Project : Gems, CGWB).

Groundwater is an invisible resource and as a result both the dynamics of the resource base and the services it produces are often poorly understood. Over-extraction of groundwater is still continuing in many risk areas of the country. Many state governments have imposed regulations on groundwater extraction. The regulations did not affect land-owners who were able to install bore-wells early for pumping groundwater for irrigation. Regulations restricted the entry of latecomers - particularly the poor, many of who are economically and politically powerful bypassing the regulations and restrictions. This raises many questions about the right applications of the groundwater regulations.

Equity consideration is an important issue of groundwater management. Without a participatory approach, groundwater management cannot be formulated. Panchayati Raj Institutions (PRI) can play a big role in this regard. Area specific approaches may be considered for water resource management. The Gram Panchayat, Panchayat Samity and also Gram Sabha must be involved with the management process. The interest of poor farmers should not be ignored. Surface water management as well as rain water harvesting need to be addressed while formulating groundwater management. Area specific water budget should be drawn in consultation with the water-users with the objective of achieving sustainability of water resources.

---

**A. Raja Mohamed**, Coastal Energy Pvt Ltd, Chennai

This has reference of the response submitted by Shrikant. D. Limaye and some other points of the discussion that may not match the situation on the ground. Let me discuss it point wise:

1. When PGWM gets into the books or is enacted, what institutional shape will it take? It is going to have the same structure as primary cooperative banks or something new, or will an NGO form it. My point is how it will be established in the villages. It may function well where a good NGO is already working and motivation has already taken place. In other areas, it will be very difficult.

2. It is a monumental task to create awareness, elucidate opinions and get representation on behalf of the other farmers. It is practically possible? Even if it is, how long will it take? If we decentralize and ask the local NGOs to conduct such exercises can we get a correct picture of the situation on the ground?
3. Is it possible to get the same kind of cooperation at the macro level as we get at the micro level? More over, this entire concept may hold good for areas that are low yielding and may not be true in other areas, say, for example, in many artesian or semi-artesian aquifers. In such a case can we curtail pumping? Is this not detrimental to agriculture production in places where farmers are solely depending on ground water?

4. In watersheds situated in rain shadow or low rain fall areas, PWGM is essential. These may cover about a quarter of the total area, but should we take up PGWM in the remaining areas as well? It is not justified unless there is an analysis by independent experts based on fresh data. Can this community indicate whether such data or statistics are available?

5. By asking a farmer to share his water resources with others, and allowing for groundwater recharge using his well; will PGWM interfere with his freedom to use his land and water as he pleases? How will these issues be resolved? Will the farmer be compensated if he is reluctant to do so? Will the social Force Majeure be affected?

6. The last suggestion, of recharge, is a good one. By conducting studies and locating highly fractured or favourable areas and areas of high transmissivity, we can recharge groundwater with rainfall run off. We can also use technology to help trap evaporation from reservoirs during the summer months and use it for groundwater recharge.

It can be pointed out that the agency that measures and develops methods for recharging ground water is most important given the highly heterogeneous character of the resource. At the same time we have to be careful to prevent pollution of the aquifer. We have to motivate farmers to adopt PGWM, and not force them through laws.

Shrikant D. Limaye, Ground Water Institute, Pune (response 3)

With reference to comments by Raja Mohamed I would like to point out that:

1) PGWM is voluntary at the scale of a village or watershed and not through any legal binding from Government. NGO acts like a facilitator.

2) Groundwater laws cannot be very precise in nature as ground water is a hidden resource flowing through a complex matrix of rocks. Any fresh data or statistical analysis by experts would not reduce this uncertainty.

3) However, at the field-level in over-exploited watersheds, farmers have realized that they cannot continue to go deeper and deeper to get more ground water, just because the technology has made it possible to drill deep. They have realized that there must be a co-operative effort to limit pumping, promote recharge and to use ground water economically to get more crop value per cu. m of ground water pumped from the aquifer. Comments made in my previous note are based on my experience at village level where the Sarpanch and Grampanchayats are coming close to PGWM based on the decisions taken by Gramsabha. Some villages have already banned irrigating sugarcane or bananas using groundwater and have also banned use of bore wells for irrigation. This decision, along with the work of watershed development and forestation, has affected a rise in water table by 10 to 12 meters.

4) Some Gramsabhas have also taken decisions such as, not to allow ‘free grazing’ of cattle, no cutting of trees, ban on liquor, etc. In villages, community pressure and mutual surveillance is much more effective than that in urban environment. When the precious resource is at stake, either with quantity or quality aspect, unlimited ‘freedom’ is an unaffordable luxury.

G Misra, Zilla Parishad, Port Blair

I have gone through some of the replies to the query. I liked the one where the member asks whether it is useful to think about ground water management in isolation. In my opinion, there should be a single body to look into all the aspects of water management. At national level a water management board should be set up with a well-defined role under the constitution, with full legal powers over state governments; as we have already seen with river water conflicts among state, they fights over river water looks like a conflict between two nations.

I suggest that the water management board should have components like river water, surface water, and/or under ground water. The important thing is it should manage all aspects of water. This approach to water management is lost when we see irrigation aspects are handled by the agriculture ministry, that does not coordinate with the engineering department, or PRIs, rural development department, urban local bodies, revenue department, etc. etc.

The agriculture department makes a plan for irrigation canals or check dams/weirs etc.; the rural development
department wants the land for some other use, while PRIs feel the check dams/weirs should be made elsewhere. Similarly, the public health engineering department (PHED) wants another source of drinking water to supply the village. Thus, there is no coordination between agencies at the village level working on water.

If the panchayat makes a drinking water supply structure in a village, but the PHED fails to provide a water source, the project’s aims are defeated. This happens only when all the departments fight and say it is not in their jurisdiction. Hence, the need of hour is to have an all-encompassing water board with members from all the departments and having defined roles and responsibilities.

There are many other issues: rainwater harvesting, surface water bodies, ownership of rivers, rivulets, canals, etc., there are also issues pertaining to disposal of waste water that have to form part of the water management strategy. Thus, a comprehensive participatory approach is needed.

---

S. V. Govardhan Das, Andhra Pradesh Farmer Managed Groundwater System Project, Hyderabad (response 2)

The recent issue of The Economist has carried a special report on water management (http://www.solutionexchange-un.net.in/public/wes/cr/res-15051002.zip, Zip, 997 Kb). The author has spent a day with the farmers of the Andhra Pradesh Farmer Managed Groundwater System (APFAMGS) Project. The article mentions BIRDS as the nodal agency, the Food and Agriculture Organisation as the funding agency. Please have a closer look at pages 11 and 12. The content of the article will be useful for the present topic of discussion. I am sending this article for your info and additional understanding of PGWM.

---

N. I. Wickremasinghe, National Water Supply and Drainage Board, Sri Lanka

I wish to share Sri Lanka’s experience on the maintenance of public hand pumps in rural areas through the 3-tier maintenance system. The extensive utilization of ground water resources to provide drinking water to rural communities in Sri Lanka began in late 1970s. During the International Drinking Water Supply and Sanitation Decade (1981 – 1990), Sri Lanka tapped assistance from various donors including GTZ, DANIDA, FINIDA, NORAD & UNICEF, to implement the Hand Pump Tube Well (HPTW) programme all over the island. As a result, there are several tube wells installed to meet the issue of drinking water in the communities in the dry zone of Sri Lanka.

However, in later years, the maintenance of these wells became a problem. The problem relating to the maintenance of these HPTW was more visible at the beginning of decade. Considering this situation in 1995, the Government of Sri Lanka passed a cabinet paper to cover the following aspects.

- Prioritization of requests for tube HPTW
- Resources allocation for HPTW drilling programme
- Provision with HPTW
- Maintenance of HPTW.

**Policy on maintenance of HPTW**

HPTW involved in periodic maintenance due to wear and tear of parts during the operation. Hence, a properly organized setup at the community level was necessary to maintain the HPTW in order to render its intending services to the community and to ensure the sustainability. It is named Three Tier Maintenance System (3TMS). This system looks after the maintenance of each HPTW and each of the tiers in the system is as follows:

**First tier – Consumer societies**

The local community should organize a consumer society to assist the local authority in the maintenance of HPTW. The foundation on which the 3TMS organization rests is that the consumers themselves, represented by consumer societies (societies intended for maintenance of facilities). The voluntary caretakers are selected from the community to look after the smooth functioning of the facility. At the initial implementation stage, the caretakers are given basic classroom training as well as on the job training on the aspects of preventive maintenance of the HPTW. Supplementary training for replacements has to be done by the Technical Officer of the Local Authority [Pradeshiya Shabha (PS)] who is also trained in the same discipline. The most important duty of the caretaker is to keep the PS water mechanic informed when the underground component of the pump is malfunctioning.

A voluntary contribution of SLR 500 (US$ 5) per well from a family is collected as a basic annual maintenance cost for
the users out of which SLR 200 (US$2) should be paid annually to the respective PS as maintenance funds. The balance of SLR 300 (US$ 3) is to be deposited in the society bank account to spend for replacing the spare parts such as chain, cup washer, and handle bearings whenever they are required.

**Second tier – Local authority (Pradeshiya Shabha, PS)**

PS acts as a divisional level maintenance body and it has direct links with the two tiers in the integrated maintenance system. Each PS has been provided with the following basic facilities to maintain the system under the institutional strengthening programme of the project.

- Mini workshop.
- Basic tools for hand pump repairs.
- Transport facility for HPMU.
- Classroom and on the job training for Technical Officers and Hand Pump mechanics.
- One year stock of essential spare parts.

However, it has been realized that the local authority doesn’t have capacity to undertake major improvements, major repairs or installation of new facility (e.g., well flushing, new drilling for dry wells, etc). On the other hand, bulk purchasing of spare parts from manufacturers is not feasible at this level, since the annual requirement is limited. Even though, the PS is the key administrative body at the divisional level, its manpower and financial resources are limited and at the same time as the local authority, it has to carry out multi-disciplinary activities according to its legislations. Hence, it has certain limitations to pay a high priority to drinking water supply. However, PS has been vested with responsibility (by law) to provide drinking water supply for the incumbents of the respective division.

**Third tier – The National Water Supply and Drainage Board (NWSDB)**

The NWSDB (National authority of drinking water supply in Sri Lanka) acts as the third tier under this system. The NWSDB has a decentralized set up for maintenance even at the district level. Attending for major breakdowns, cleaning of wells, installation of new facilities, and bulk supply of spare parts of HPTWs, monitoring and evaluation and feed back, research and development are key functions which come under the responsibility of the third tier. However, a strong link is vital between the second and third tier in order to implement the system effectively. The PS uses its funds for purchasing spare parts from NWSDB. NWSDB purchases spare parts in bulk from manufacturing companies annually to meet the requirement of all the PSs. NWSDB provides spare parts at cost to the Local Authority and it provides spare parts at cost to the consumer societies.

---

**Tapan Kumar Padhi, National Institute for Development, Bhubaneswar**

Thanks a lot for reopening the exchange on participatory ground water management. I have gone through ‘An Approach for participatory groundwater management’ and also the discussions by the learned members. An approach for participatory ground water management is a very well drafted document and takes into account many aspects. And there also have been a lot of best practices as well as concerns put up by the other participants. I have a few concerns regarding the PGWM.

Should we think of ground water management in isolation or as a part of the integrated approach?

Through PGWM we are thinking of ground water sectorally – talking of only the reserve storage part of the hydrological cycle. Surface water is the sources of ground water (other than the old storage). So, ideally management of the surface water also should be a function of the PGWM. Efficient management of surface water only helps reduce the pressure on the ground water. Without getting into efficient management of surface water if we get into the management of ground water in isolation, it may lead to successful demand side management, but at the cost of development only but it may not take care of the development demand of the locality. But, again if the PGWM incorporates surface water management aspects into it, then there also is the apprehension of diluting the objectives as well as the functions of PGWM.

PWGM uses the principles from the integrated water resources management approach for stakeholder analysis and assessing total water availability. But are we not missing the basic – integration or a holistic management.

Linkages with multiple institutions mandated for water management - PGWM institutions will be an addition to the number of institutions those have been mandated to be into water management like the Pani Panchayats, Watershed Committees, River basin organizations, Village Water and Sanitation committees, Panchayatiraj Institutions etc. etc.
We need to develop proper interface/linkages and delineation of responsibilities among these institutions and the PGWM institutions at the appropriate levels. Could the PGWM be a part of the RBO institutions at the appropriate level, or the watershed organizations?

May be a part of the RBO or Watershed committees that specifically looks into GW management but also has a say in the other aspects of water management that has a bearing on ground water. Very clear and strong linkage has been articulated to the Gramsabha, the PRI at the village level with well delineated roles and responsibilities. We also need to do the same thing for other institutions.

How do we look at the interface between PGWM and other water management bodies like the watershed, river basin organizations etc?

The Pani Panchayats, in different names in different parts of the country are into surface water (canal irrigation) as well as ground water management (in case of PPs around the lift points). And can we take the existing PPs around the lift points as PGWM institutions (may be converted to one) and what is the linkage of these with the PGWM or we consider that all the PPs around the GW are seen as the PGWM? And what about the PPs having a mixed source.

A model for the areas where GW is abundant I just wonder how far successful this model will be in the state like where the ground water utilization is in the order of only 20%. Here the interventions in terms of augmenting ground water utilization for drinking water and irrigation through cooperatives or any community institution along with proper recharge mechanism could be the answer.

In the state of Orissa the Steel plants run with ground water in some places. Any PGWM initiative may not be effective here as the corporates will not bother a hoot for such community initiatives. And with the contract farming and ground water markets making an inroad into the hinterland – the challenges posed to the PWGM also increases.

Here the whole ownership issue of GW that has been flagged by different persons becomes very important. PWGM is a nice framework. But we also need to strengthen it further.

A. Raja Mohamed, Coastal Energy Pvt Ltd, Chennai (response 2)

1. When the PGWM, gets into the books or enacted, who are going to form it, will it have the same scenario of the Primary cooperative Banks or some newly going to come NGO will form it, My point is how it will be established in all most all the villages of India. It may be function well where already a good NGO is working and pre-motivation has already taken place. In other areas it is very difficult.
2. It is a monumental task to brief and elucidate opinion and get representation on behalf of the other farmers. Can we practically do it? Even if we do how long it will take. If we decentralize and ask the Closer NGO to conduct such exercises can we be able to get a correct representation.
3. It may be true in typical watershed prevailing areas, what can we do in the area of coastal plains and micro and macro basins, that are non typical watershed. No doubt all the areas do come under some kind of watershed. But when we see mega watersheds or macro level, can we get such kind of cooperation as that we get in small areas with lesser population. More over this entire concept will hold good for areas that have low yielding nature and may not be true in other areas. Say for example in many artesian or semi artesian aquifer bearing area. In such a case can we be able to curtail pumping is it not detrimental to the agriculture production where the farmer is solely depend on the ground water for his well being.
4. Where ever mini or micro watershed prevailing rain shadow areas and low rain fall areas the PWGM is essential. If we take a gross study of such areas it may farm about 25% of the other groundwater utility area. Why to trouble this 75% majority. Unless we do some analysis by an expert with the available data it is not justified. Any such publication or statistics available with us. If this group through some line on this it will be great help.
5. Are you not going to interfere with the freedom of land and water management by asking the farmer to share the god given location favour of the particular farmer asking him to share his water with others and asking to allow recharge using his well? What compensation you are going to provide him, if he is reluctant. Will the social Force Majeure will be affected.
6. Very good suggestion. By conducting studies and locating highly fractured / or favourable areas and high transmissivity bearing areas, we can recharge the excess run off from the rain fall. Even by adopting some kind of set up the water form the reservoir that gets evaporated from the surface reservoirs during the summer months can be recharged into the ground water regime by some kind of slugging arrangements.
It can be pointed out that measures and methods for recharging the ground water is most important in the today's Indian context as it is highly heterogeneous character in all domain and events. At the same time care has to be taken in guarding the pollution to the aquifer. Motivation of farming community in the PWGM concepts need acceleration but not the law to enact for this effect

Dinesh Kumar, Institute for Resource Analysis and Policy, Hyderabad

Excellent points are raised by Shrikant; the problem with local recharging of wells is not only the negative down-streams impacts in the basin and aquifer contamination (see Chasing a Mirage: Water Harvesting and Groundwater Recharge in Naturally Water scarce Regions, Economic and Political Weekly, August 2008), but also serious legal issues as water moves from common property regime to a private property regime (as pointed out by Mr. Limaye).

It won't be a bad idea to put in some serious thinking before we come out with simple, quick fix solutions to tackle groundwater problems. In lay man's terms, using local surface water to recharge groundwater in over-exploited area is almost like "catching the crane using butter". The reason is: over-exploited areas are those which have extremely limited surface water; or where the aquifer cannot hold much water.

I can't think of the Panchayats from isolated villages taking a decision in the larger interest of the basin communities (looking at the upstream-downstream trade-offs) in the foreseeable future, be it “supply augmentation” or “demand reduction through voluntary cuts”, in the absence of a larger institutional regime. While the first approach would go against the interests of downstream users, the second one would only allow the downstream people (or other villages tapping water from the same aquifer) to use more water.

What we need is practical solutions which help us align the private interests (of farmers who want to raise the net farm returns) and societal goals (of reducing groundwater use). Sometimes, technological solutions (like water-efficient crops, and efficient irrigation devices) help, but sometime they also would be inadequate, and we need to look for institutional interventions.

Many thanks to all who contributed to this query!

If you have further information to share on this topic, please send it to Solution Exchange for the Water Community in India at se-wes@solutionexchange-un.net.in with the subject heading "Re: [se-watr] Discussion: An Approach to Participatory Groundwater Management - Additional Reply."

Disclaimer: In posting messages or incorporating these messages into synthesized responses, the UN accepts no responsibility for their veracity or authenticity. Members intending to use or transmit the information contained in these messages should be aware that they are relying on their own judgment.

Copyrighted under Creative Commons License "Attribution-NonCommercial-ShareAlike 2.5". Re-users of this material must cite as their source Solution Exchange as well as the item’s recommender, if relevant, and must share any derivative work with the Solution Exchange Community.

Solution Exchange is a UN initiative for development practitioners in India. For more information please visit www.solutionexchange-un.net.in