



## Environment

### Water Community


[Logout](#)
[My Communities](#)

Login: India Water Portal

#### Solution Exchange: An Initiative of the UN Country Team in India


[Search](#)

[se-wes](#) » [\[se-watr\]\[se-clmt\]](#) **CONSOLIDATED REPLY: Water Harvesting for Adapting to Climate Change. Experiences, Advice**



[\[se-watr\]\[se-clmt\]](#) **CONSOLIDATED REPLY: Water Harvesting for Adapting to Climate Change. Experiences, Advice** [message #46965] Mon, 23 August 2010 13:47

Nitya Jacob

You can download the PDF version of the Consolidated Reply at <ftp://ftp.solutionexchange.net.in/public/wes/cr/cr-se-wes-clmt-15061001.pdf> (499 KB)



## Environment

### Water Community and Climate Change Community



## Solution Exchange for the Water Community Solution Exchange for the Climate Change Community Consolidated Reply

**Query: Water Harvesting for Adapting to Climate Change - Experiences, Advice**

Compiled by [Nitya Jacob](#) and [Ramesh Jalan](#), Resource Persons and [Sunetra Lala](#) and [Kirtiman Awasthi](#), Research Associates

Issue Date: 23 August 2010

From [Om Prakash Sharma](#), Wells for India – India Office, Udaipur

Posted 15 June 2010

I am working with Wells for India, a UK-based organisation working in India for last 23 years. Being water professional I am engaged in water management, livelihoods and natural resource management for the last 21 years. Our major focus is to bring water security and dignity to the poorest communities living in drylands.

Changes in rainfall pattern both spatially and temporally have increased the risk and uncertainty in water availability for drinking, agriculture and livelihood needs. The analysis of rainfall data in drylands indicates that drought occurs once every 2 to 3 years which is leading to promotion of the idea of transportation of water from large distances by Government and other agencies.

Poor families living in drylands are already struggling to cope with changing and unpredictable weather patterns and this will be accentuated by climate change. Groundwater recharge may reduce if

infiltration decreases. Ponds, tanks and reservoirs are not filling up enough to support agriculture and drinking water demands of human beings and livestock. Similarly, many are at risk of damage from floods. Larger, more intense floods could also cause damage to large dams.

The poor, erratic monsoon and the frequent droughts highlight the need for a **revival of small scale water harvesting structures** in dryland regions. It is to be noted that these structures in many dryland areas were developed as an adaptation measure to climate change. In my opinion efficiencies of traditional water harvesting systems can be improved by revisiting physical water storage options, managing water demand, increasing water productivity and transforming water governance.

Keeping the above in view, I would request members to share their experiences on:

- What are the experiences on improvisation of Small Scale Water Harvesting Systems in order to best adapt to climate change or variability?
- How can they be made more efficient as a means to adapt to climate change?

The inputs provided by members would strengthen our projects in drylands as these areas are highly vulnerable to water scarcity and climate change. Contribution of members would be suitably acknowledged.

## Responses were received, with thanks, from

1. [Asit Sahu](#), Rainwater Digest, Bhubaneswar
2. [DSK Rao](#), Gyantech Information Systems Private Limited, Hyderabad ([Response 1](#)) ([Response 2](#))
3. [Ajit Seshadri](#), The Vigyan Vijay Foundation, New Delhi ([Response 1](#)) ([Response 2](#))
4. [K.A.S.Mani](#), Water Resources Consultant, Hyderabad
5. [Muhammad Mukhtar Alam](#), Centre For Ecological Audit, Social Inclusion and Governance, New Delhi
6. [Hirudia Raj](#), Consultant – Water, New Delhi
7. [N Lakshmi Narayana](#), Geo Rehab Centre, Hyderabad
8. [Sarita Mehra and Satya Prakash Mehra](#), Rajputana Society of Natural History, Bharatpur
9. [Rohit Prakash](#), i- dream, New Delhi
10. [S.D.Umrikar](#), Jalswarajya Project, Mumbai
11. [Ramling Gujare](#), Agriculture Land Valuer and Consultant, Pune
12. [Suresh Kumar](#), National Institute for Interdisciplinary Science and Technology, Thiruvananthapuram
13. [Arunabha Majumder](#), Jadavpur University, Kolkata
14. [Ashwani Wanganeo](#), Barkatullah University, Bhopal
15. [Basavaraj. K.H.](#), Prawarda, Bidar
16. [Prabhjot Sodhi](#), Centre for Environment Education, New Delhi
17. [Anand Ghodke](#), Water and Sanitation Program – South Asia, Shimla
18. [Ashish Gupta](#), Farming Association of India, New Delhi
19. [Debasish De](#), Society for Natural Resource Management and Community Development, Ghaziabad
20. [Manju George](#), Evangelical Social Action Forum, Bangalore
21. [Shibesh Das](#), Rajadighi Community Health Service Society, Malda
22. [Pon Ananth](#), water.org, Trichy
23. [Nitin Bassi](#), Institute for Resource Analysis and Policy (IRAP), Hyderabad
24. [Raghu Menon](#), Pondicherry Science Forum, Pondicherry
25. [Amitava Basu Sarkar](#), Society for Rural Awareness and Development in Himalayan Area (SRADHA), Dehradun ([Response 1](#)) ([Response 2](#)\*)
26. [R. Jagadiswara Rao](#), Sri Venkateswara University, Tirupati
27. [G. Bhaskara Rao](#), APMAS, Hyderabad
28. [Yogesh Jadeja](#), Arid Communities and Technologies\*
29. [Jency Samuel](#), Independent Consultant, Chennai\*

\* *Offline Contribution*

**Further contributions are welcome!**

## [Summary of Responses](#)

## [Comparative Experiences](#)

### [Related Resources](#)

### [Responses in Full](#)

---

## Summary of Responses

Rainwater harvesting (RWH) has been used widely across India in both water-scarce and water-rich regions for centuries. People and planners have recently evinced renewed interest in its utility as a means of helping communities in adapting to climate variability as climate change is expected to affect fresh water availability. Broadly speaking, RWH systems are a decentralised means of catching surplus rainwater that would otherwise flow to the sea or cause floods and storing it for use during the dry season, recharging aquifers and increasing soil moisture. There are many climatic, geographic, hydrological and factors that influence the design and choice of RWH systems as well as their efficiency as a means of adaptation.

Institutions promoting RWH need to understand their potential and take a systematic approach to planning at the micro-watershed level to optimize the use of RWH structures. The danger is, over-use of RWH structures can lead to the degradation of the watershed, defeating the purpose of the project. For watershed planning, institutions need to carry out specific investigations on rainfall patterns over the past 30-50 years, recurrence interval for days of heavy rain, estimates of daily evaporation rates, hydrological parameters, catchment area and soil conditions. This helps to calculate the RWH potential and develop a watershed management plan in which RWH is a major component, as has been done for some hydrological units in Chittoor, Andhra Pradesh. The rule of thumb is a third of the water evaporates, a third percolates into the ground and a third is available for use.

Desirable as it is, one school of thought advocates caution while implementing RWH systems. Unscientific RWH Systems especially in water-scarce regions can lead to negative economic, social and environmental effects in downstream areas. The most visible effect is a reduction in water availability downstream, leading to conflicts between people in upstream and downstream areas. Further, those implementing RWH systems can consider treating surface water before using it for aquifer recharge.

Another school, that supports RWH as a sustainable solution to water shortages, advocates its large adoption. The efficacy of small RWH structures is evident in Saurashtra, Gujarat. The aquifers in north and central parts of the state were either critical or over-exploited as recently as 2004. The state government and several NGOs have constructed over 100,000 check dams and nearly 2 million farm ponds depending upon the topography of the region. People have contributed 10-15 per cent of the cost as labour. A satellite survey by the Central Groundwater Board in 2009 indicated that half of the blocks where aquifers were critical or over-exploited have regained their normal levels. It was not just the structures; the government incentivized more efficient irrigation methods and farmers adopted them.

The Society for Promotion of Wastelands Development took up a large tank restoration programme in Rayalseema, Andhra Pradesh, in the mid-1990s. Research on its impact emphasized that it had immense potential for poverty alleviation, empowerment of women, better agriculture and equity in development. Another study in Anantapur highlighted the local peoples' coping strategy for drought.

There are many fine examples of watershed management programmes – Ralegaon Sidhi and Hiware Bazar from Maharashtra, Sukhomajri in Haryana and the Arvari River in Rajasthan. These began with social mobilization; the technical interventions followed the social process. In [West Bengal](#), an organization has worked with local people to dig shallow wells (20-30 feet deep) to store rainwater and provide water for vegetable farming. In Chennai, RWH is mandatory and since it was legislated, the groundwater quality and quantity have improved. In urban areas, the approach is different and can be channeled through resident welfare associations, schools and colleges. In Bhuj, Gujarat, Arid Communities and Technologies, an NGO, has estimated reviving two lakes can more than meet the city's water needs even though rainfall is scanty and erratic.

Along with the structures, the institutions working on RWH projects can, through a process of 'social engineering', develop village committees (variously called water user associations, tank farmer associations, village development committees, water and sanitation committees) to manage the structures. These become necessary given the sheer diversity of the country, climate and geology and since most of RWH structures are remotely located, local people are best placed to maintain them, as has been tried out in [Bharatpur](#), Rajasthan. This process usually takes several months and involves painstakingly building a consensus among the local villagers about the need and utility of RWH, the approach and finally the planning. The organizations can use participatory micro-planning techniques to mobilize local people, organize them into small affinity groups and build their skills especially of women.

Simultaneously, it is critical to reduce water demand. As agriculture is the biggest consumer of water, farmers have to become more efficient in how they use water. They can do this without sacrificing their standard of living by changing to less water intensive crops. For instance, they can start using the system of rice intensification (SRI) in paddy-growing areas to cut water use by half. They can reduce or eliminate sugarcane and replace it with horticulture, herbs or another cash crop. Farmers can start using newer irrigation techniques such as drip or sprinkler systems instead of the usual flood system. These also help to reduce water demand.

To make RWH systems more efficient, watershed planning can include catchment area treatment. This involves demarcating the catchment area, soil conservation measures to reduce siltation, planting appropriate trees or shrubs, and removal of all encroachments. If the catchments have been completely encroached, as is often the case in many towns and even villages, it may be necessary to develop alternative water channels.

Other efficiency measures depend on the objective of RWH. These structures are multi-purpose –storing rainwater for use in the dry season for drinking and farming, and aquifer recharge. Thus, deep RWH structures are more suited for aquifer recharge or if they are built underground, should have honey-combed walls. If they are to provide water for drinking and farming, tree plantation along their bunds can reduce evaporation. Arranging them in a cascade, where the overflow of one fills the next, can help maximize their potential for capturing excess rainwater. As mentioned earlier, a watershed approach can maximize benefits from RWH systems.

Poor and remote communities benefit significantly from RWH systems since they are inexpensive to construct and maintain. Most are low-technology and local people can quickly learn to look after them. Nearly all RWH programmes have a strong component of 'social engineering' that includes provisioning for socially deprived groups; thus they benefit the poor. Existing RWH can help adapt to climate variability and climate change if they are well-maintained and owned by local communities by providing them water for their various needs.

---

## Comparative Experiences

### Rajasthan

**Participation in Community-based Rainwater Harvesting ensures Water conservation, Bharatpur District, Bharatpur** (from [Sarita Mehra and Satya Prakash Mehra](#), *Rajputana Society of Natural History (RSNH)*, Bharatpur)

To ensure groundwater recharge in the area, RSNH facilitated community-based water harvesting. This work was taken up by ensuring community members were actively involved in planning and constructing the rainwater harvesting structures. The village representatives are now less dependent on the government schemes and joined hands to come up for reviving the traditional approach used by the arid land of Rajasthan to conserve water.

### West Bengal

**Construction of Rainwater Harvesting structures helps in increasing groundwater levels, Puruliya, Bankura and West Midnapur Districts** (from [Debasish De](#), Society for Natural Resource Management and Community Development, Ghaziabad)

West Bengal suffers from acute water shortages both for irrigation and drinking. In some of these districts one well irrigates about 0.4 acre of land and helps the local people in vegetable farming. The Society for Natural Resource Management and Community Development has dug about 8-10 wells per village. It has also constructed water harvesting tanks. The once fallow land is now under cultivation and the groundwater level has increased in these areas.

---

## Related Resources

### Recommended Documentation

**Rebuilding Groundwater Dependent Economy through Managed Aquifer Recharge (MAR)** (from [K.A.S. Mani](#), Water Resources Consultant, Hyderabad)

Report; by Grama Vikas Samstha and Andhra Pradesh Farmer Managed Groundwater Systems Project; January 2006

Available at [http://www.apfamgs.org/upload/pdf/RE4406\\_40122.pdf](http://www.apfamgs.org/upload/pdf/RE4406_40122.pdf) (PDF; Size: 3 MB)

*Assesses runoff potential for 3 Hydrological Units in Chittoor District of Andhra Pradesh and need and ways to improve groundwater recharge at the basin level.*

**A Green Rising** (from [DSK Rao](#), Gyantech Information Systems Private Limited, Hyderabad)

News Article; by Mr. Uday Mahurkar; India Today; June 2010

Available at <http://indiatoday.intoday.in/site/Story/100211/STATES/a-gree-n-rising.html>

*Throws light on the depleting groundwater across country; emphasizes that blame go to over exploitation and lack of water conservation measures at the micro level.*

**National Action Plan on Climate Change** (from [Muhammad Mukhtar Alam](#), Centre For Ecological Audit, Social Inclusion and Governance, New Delhi and [R. Jagadiswara Rao](#), Sri Venkateswara University, Tirupati)

Plan Document; by Prime Minister's Council on Climate Change; Government of India; June 2008

Available at [http://www.pmindia.nic.in/climate\\_change.htm](http://www.pmindia.nic.in/climate_change.htm)

*Outlines policies and programs to address climate mitigation and adaptation and identifies eight national missions running through 2017 to implement this plan.*

**Managed Aquifer Recharge** (from [R. Jagadiswara Rao](#), Sri Venkateswara University, Tirupati)

FAQ; by The Commonwealth Scientific and Industrial Research Organisation; Australia.

Available at <http://www.csiro.au/files/files/pvuu.pdf> (PDF; Size: 291 KB)

*FAQ on Managed Aquifer Recharge- a vital tool in the sustainable management of the world's underground water resources.*

**Power of Creativity for Sustainable Development** (from [Suresh Kumar](#), National Institute for Interdisciplinary Science and Technology, Thiruvananthapuram)

Magazine; by UNESCO New Delhi; Vol. 4, December 2009;

Available at <http://unesdoc.unesco.org/images/0018/001872/187208e.pdf> (PDF; Size: 10.9 MB)

*Fourth issue of the Power of Creativity Magazine, the Natural Science and Culture Sectors of UNESCO New Delhi join to explore the heritage of India's water management systems.*

**Stabilization of Ravines along River Mahi in Vadodara, Gujarat** (from [Prabhjot Sodhi](#), Centre for Environment Education, New Delhi)

Project Brief; by Government of India-UNDP-GEF Small Grants Programme;

Available at [ftp://ftp.solutionexchange.net.in/public/wes/cr/res-15061001 .pdf](ftp://ftp.solutionexchange.net.in/public/wes/cr/res-15061001.pdf) (PDF; Size: 7.4 MB)

*Gives details of the project that aimed at stabilizing ravines to slow down soil erosion and improve water conservation and vegetation cover.*

From [Nitin Bassi](#), Institute for Resource Analysis and Policy (IRAP), Hyderabad

### **Background: The Water Component of Ecosystem Services and in Human Well-being Development Targets**

Report; by Jennie Baron; Stockholm Environment Institute, York, UK/ Stockholm Resilience Centre, Stockholm; in Rainwater Harvesting: A Lifeline for Human Well-being; United Nations Environment Programme/ Stockholm Environment Institute; pp 4-13; 2009.

Available at [http://www.unep.org/Themes/Freshwater/PDF/Rainwater\\_Harvesting\\_090310b.pdf](http://www.unep.org/Themes/Freshwater/PDF/Rainwater_Harvesting_090310b.pdf) (PDF; 2.36 MB)

*Highlights the link between rainwater harvesting, ecosystems and human well being and draws the attention to both the negative and positive aspects of using this technology.*

### **Rainwater Harvesting in India: Some Critical Issue for Basin Planning and Research**

Research Article; by M. Dinesh Kumar, S. Ghosh, A. Patel, O.P. Singh and R. Ravindranath; Journal Land Use and Water Resources Research; Vol. 6, 2006

Available at <http://ageconsearch.umn.edu/bitstream/47964/2/paper06-01.pdf> (PDF; Size: 993 KB)

*Identifies critical issues in rainwater harvesting efforts like lack of data on hydrological regime, water demand, poor integration between surface water & groundwater systems.*

### **Chasing a Mirage: Water Harvesting and Artificial Recharge in Naturally Water-scarce Regions**

Research Article; by M. Dinesh Kumar, A. Patel, R. Ravindranath and O.P. Singh; Economic and Political Weekly; Vol. 43, No. 35; Aug-Sep 2008.

Available at <http://www.epw.in/epw/uploads/articles/12606.pdf> (PDF; Size: 413 KB)

*Shows that in water-scarce regions of India, run-off harvesting does not offer any potential for groundwater recharge or improving water supplies at the basin scale.*

### **Evaluating Performance of National Rural Employment Guarantee Act**

Report; by National Council of Applied Economic Research/ Public Interest Foundation; New Delhi; 2009.

Available at <http://www.ncaer.org/downloads/Reports/NCAER-PIFStudyNREGA.pdf> (PDF; Size: 2.6 MB)

*Examines how well the Act is being implemented in various parts of the country; what are the main difficulties; and what should be done to make the Act more effective.*

### **Upstream vs Downstream: Groundwater Management and Rainwater Harvesting**

Research Article; by S. Ray and M. Bijarnia; Economic & Political Weekly; Vol. 41, No. 23; June 2006.

Available at <http://www.epw.in/epw/uploads/articles/2193.pdf> (PDF; Size: 133 KB)

*Analyses status of groundwater availability in three villages of Alwar district in Rajasthan where a large number of communities have constructed rainwater harvesting structures.*

From [G. Bhaskara Rao](#), APMAS, Hyderabad

### **Oases of Rayalaseema: SPWD's Tank Restoration Program in Southern Andhra Pradesh, India**

Report; by G. Bhaskara Rao; Presented at IWMI-TATA Annual Partners' Research Workshop; Anand; January 2009.

Available at <ftp://ftp.solutionexchange.net.in/public/wes/cr/res-15061003.pdf> (PDF; Size: 228 KB)

*Summarizes experience of tank restoration program in Andhra Pradesh; Highlights potential of tank restoration in poverty reduction, development & environment protection*

### **Household Coping and Survival Strategies in Drought Prone Regions**

Report; by G. Bhaskara Rao; Society for Promotion of Wastelands Development; New Delhi; January 2009.

Available at <ftp://ftp.solutionexchange.net.in/public/wes/cr/res-15061002.pdf> (PDF; Size: 664 KB)

*Investigated traditional coping & survival strategies during drought in Anantapur district, Andhra Pradesh and analyzed the changes in household's socio-economic conditions.*

**National Water Mission under National Action Plan on Climate Change** (from [Kirtiman Awasthi](#), Research Associate, New Delhi)

Draft (Revised); by Ministry of Water Resources, Government of India; New Delhi; April 2009.

Available at [http://mowr.gov.in/writereaddata/linkimages/MissionDocument8\\_395131900.pdf](http://mowr.gov.in/writereaddata/linkimages/MissionDocument8_395131900.pdf) (PDF; Size: 719 KB)

*Focuses on water conservation and equitable distribution through citizen & state action, basin-level water resources management with greater emphasis on water harvesting.*

### Recommended Contacts and Experts

**Mr. Anupam Mishra, Gandhi Peace Foundation, New Delhi** (from [Muhammad Mukhtar Alam](#), Centre For Ecological Audit, Social Inclusion and Governance, New Delhi)

221/223 Deen Dayal Upadhyaya Marg, New Delhi-110002; Tel: 91-11-23237491/ 23237493; <http://www.gpfindia.org/>; <http://www.indiawaterportal.org/node/7354>

*Works on environment and water conservation; has documented the community led traditional water harvesting in Rajasthan; Does not hold any copyright over his writings.*

### Recommended Organizations and Programmes

**Wells for India, Rajasthan**(from [Rohit Prakash](#), i- dream, New Delhi)

1135, Sector No. 4, Hiran Magri, Udaipur 313002, Rajasthan; Tel: 91-294-2464617/2464618; <http://www.wellsforindia.org/>; Contact Mr. Om Prakash Sharma; Director India Office;

*A UK charity working on water related projects in Rajasthan with a focus on provision of sufficient clean water for drinking, cooking, washing, the animals and for irrigation.*

**Society for Promotion of Wastelands Development (SPWD), New Delhi**(from [G. Bhaskara Rao](#), APMAS, Hyderabad)

14-A, Vishnu Digamber Marg, Rouse Avenue Lane, New Delhi-110002; Tel: 91-11-23236440/23236387; [spwd\\_delhi@yahoo.com](mailto:spwd_delhi@yahoo.com); <http://www.spwdindia.org/>; Contact Mr. Viren Lobo; Executive Director; [vlobo62@gmail.com](mailto:vlobo62@gmail.com)

*Took up a large programme on Tank Restoration in Rayalaseem, southern part of Andhra Pradesh under the wasteland development programme.*

From [Kirtiman Awasthi](#), Research Associate, New Delhi

### Barefoot College, Ajmer

Tilonia-305816, Via Madanganj, District Ajmer, Rajasthan; <http://www.barefootcollege.org/>; Contact Coordinator, Rain Water Harvesting Section; Tel: 91-1463-288210; [barefootclouds@gmail.com](mailto:barefootclouds@gmail.com)

*Started rainwater harvesting in remote villages in 1984 and in schools in 1986; All water related initiatives of the Barefoot College are for and executed by rural communities.*

### Tarun Bharat Sangh, Alwar, Rajasthan

Bheekampura- Kishori, Thanagazi, Alwar 302022, Rajasthan; Tel: 91-141-2391092; [info@tarunbharatsangh.org](mailto:info@tarunbharatsangh.org); <http://www.tarunbharatsangh.org/>; Contact Mr. Rajendra Singh; Chairman; [rajendra@tarunbharatsangh.org](mailto:rajendra@tarunbharatsangh.org)

*Mobilises communities on the issue of water & supports them in reviving the traditional systems of water management through construction of 'Johads' for rainwater harvesting.*

### Recommended Communities and Networks

#### Movement for Transforming Ecologically Hostile Habitats, Center for Ecological Audit,

**Social Inclusion and Governance, New Delhi** (from [Muhammad Mukhtar Alam](#), Centre For Ecological Audit, Social Inclusion and Governance, New Delhi)

<http://transitionurbanindia.ning.org>; Contact Dr. Muhammad Mukhtar Alam; Executive Director; [ceasig@gmail.com](mailto:ceasig@gmail.com)

*A citizen based movement with the objective of creating carbon neutral urban habitats through awareness generation, particularly in schools.*

## Recommended Portals and Information Bases

From [R. Jagadiswara Rao](#), Sri Venkateswara University, Tirupati

### **IAH-MAR Managed Aquifer Recharge, International Association of Hydro-geologists, USA**

<http://iah.org/recharge>;

*A forum for information on the management and enhancement of aquifer recharge, a vital tool in the sustainable management of the world's underground water resources.*

### **3R Valve**

<http://www.3rvalve.com/index.php?page=22>;

*Shows how small-scale water harvesting systems could be used for large-scale groundwater recharge*

From [Kirtiman Awasthi](#), Research Associate, New Delhi

### **The Global Rainwater Harvesting Collective, Barefoot College, Ajmer**

<http://www.globalrainwaterharvesting.org/>; [bunker1945@gmail.com](mailto:bunker1945@gmail.com)

*Aims to build on the rainwater harvesting knowledge, technology and skill that has existed with rural communities across the world.*

### **rainwaterharvesting.org, Centre for Science and Environment, New Delhi**

<http://www.rainwaterharvesting.org/>

*An information and data base on rain water harvesting and various water conservation initiatives.*

### **Rainwater Harvesting-India Water Portal, Arghyam, Bangalore**

<http://www.indiawaterportal.org/channels/rainwater-harvesting>

*Information and database on case studies, research papers, courses, policies and laws related to rainwater harvesting.*

---

## Responses in Full

### **[Asit Sahu](#), Rainwater Digest, Bhubaneswar**

I request you to do the following:

- 1) Catch the water where it falls-it will help in recharging open well. In villages where you work, dig concealed small soak pit along the path of rainwater overflow.
- 2) Recharge all dried up well and water bodies with rainwater.
- 3) Grow trees around water bodies to reduce water evaporation from water bodies-consider *shisham* trees for this purpose. It will provide very cool shade even in very hot days.

I had visited Jhunjhunu for rainwater harvesting. The forest department there is doing a lot of work on watershed management.

---

### **[DSK Rao](#), Gyantech Information Systems Private Limited, Hyderabad (response 1)**

The posting is interesting and thought provoking as it contemplates on bringing 'Water Security' to the marginalized communities living in dry lands. Water has a natural path based on the rainfall and catchment areas and flows as per the natural paths established over long periods of time. Unfortunately, in the recent past due to large scale urbanization and changed lifestyles, large scale landfilling is taking place (by unscrupulous land sharks) in the delicate water path thereby throttling natural feed to rivers, ponds and wells and drying them. Coupled with this is large scale silting of these natural water bodies. Few years ago, I had studied both Udaipur and Jodhpur districts and found ancient distinct water ways in Jodhpur which unfortunately were disjointed at many places. Local

folklore talk about plenty of water availability few hundreds year ago which was diverted for a failed love story by the father of a princesses. Large empty ancient water tanks and dry water channels are mute testimony to this.

It is essential that comprehensive efforts are undertaken to understand the 'Water Cycle' and not let precious the rain and sweet river water run into drainages and seas.

---

**[Ajit Seshadri](#), The Vigyan Vijay Foundation, New Delhi (response 1)**

This is the right time, for the community to feel the importance of rainwater in communities and the associated upgradation it does for the environment-land, soil, flora, fauna and atmosphere.

First we wish to bring to your attention that RWH systems are implemented, but the concerned do not operate and maintain them diligently. If a RWH system and their sub-units are not cleaned, desilted and made-good, periodically, say annually, it is like not having one. On the contrary, if a poorly maintained RWH system is rejuvenated by apt O&M principles and practices, the total environment becomes alive. We have seen this happening whenever RW is harvested, and encourage communities to apply O&M practices well enough to reap the benefits.

### **What are the experiences on improvisation of Small Scale Water Harvesting Systems in order to best adapt to climate change or variability?**

Here we wish to point out that in order to optimise Rain Harvesting, the systems should not be too small, it ought to be large enough to get more rainwater harvested i.e. cost to benefit is optimised enough. Also O&M practices should be followed regularly and diligently. IEC drives would ensure that the communities, get good awareness, and also ensure their participation,

### **How can they be made more efficient as a means to adapt to climate change?**

The RWH mechanisms established in communities, ought to be used, be it store and use, or consolidate, and sent for aquifer recharge. Many areas where water supply has been provided by piped water supply, these old set ups are neglected and in despair.

This is a different occurrence/observation happening at Delhi/NCR as detailed:

- 1) Delhi NDMC- Lutyen's Delhi areas in the year 1950-55, had ground water at around 0 to 10 Feet bgl- below ground level. There were instances of pumps being installed, in Government colonies, to pump out water from say under-ground level, and clearing it above at open land levels. As it was reported that the main NDMC areas of Parliament House, Rashtra Pathi Bhavan South Block, North Block had ground water levels very high nearly at ground level and threatening the foundations of these important buildings etc.
  - 2) Now at present 2010, the same areas have groundwater at 60 to 70 Feet bgl, i.e about 50 feet lower down than the ground water levels that existed in early 1950s,
  - 3) This 15 to 20 metre strata of soil has become very dry and has less soil-moisture-water in the aquifer zones.
  - 4) Now consider the land surface in the city strata - 0 to 15m bgl, has less soil moisture than it had previously.
  - 5) It is now considered that the subject area being devoid of this soil- moisture could have more adverse effects on its flora and fauna and of weather- climate change, etc.
  - 6) At present some tell-tale signs that have been observed are that the large trees get up-rooted and due to varied reasons viz., roots not anchored well and have lost their grips on the soil, due to lesser moisture,
  - 7) Also at every occurrence, whenever there are heavy winds, these wind pressures added with retained water in the branches, at extreme peripheries provide cantilever loading, increasing the nature's power to tilt. And then this uproots the whole tree itself.
  - 8) Previously, moist soils had better property of retaining moisture in their pores, and trap water in soils, thus increasing the water content etc.
  - 9) Things could have been better if groundwater aquifer levels were sustained, using RWH in the respective areas.
  - 10) The above indicated may be read keeping in mind the total perspective of the environment.
- 

**[K.A.S.Mani](#), Water Resources Consultant, Hyderabad**

Institutions that are promoting Water Harvesting Structures need to adopt a systematic approach to clearly understand the potential for such structures based on which systematic planning needs to be

taken up. Investments in water harvesting do not come cheap especially to the poor farmers (even if it is fully subsidized) as they have to make available certain portion of their productive farm land for harvesting rainwater. The current experiences of such structures are not very encouraging as they have poor inflows during lean periods, siltation is very heavy and evaporation losses are at un-acceptable levels. Demystification of water harvesting technology has actually led to dilution of the science of hydrology leading to degradation of the micro-watershed.

The specific investigations to be carried out should include study of the rainfall pattern (for the selected drainage unit area) using historical data of at least 3-5 decades. The recurrence interval (T also known as return period) for various rainfall intensities of rainfall in 24 hours is to be understood.

Such analysis would help in understanding the deviation of annual rainfall from the normal. Most importantly this will give a clear understanding of the return period of various rainfall intensities and the number of years where the annual rainfall greater than normal (number of years when the harvesting structure is likely to get good filling). This analysis helps in computing the potential run off from the catchment. After allocating the available runoff to the existing water harvesting/micro-irrigation structures the additional structures that can be constructed should be determined.

Good understanding of the daily evaporation rate for different months is also critical. Good understanding of the Hydro meteorological parameters will help in taking the critical decision of the suitability of water harvesting as compared to artificial recharge that will allow the storage of water in the subsurface space for later use.

It is indeed a great tragedy that while new structures are being constructed several old structures are lying in different stages of disuse. Revival of such abandoned structures as a means of harvesting the runoff should be explored as a priority. Linkage to Rural Employment Guarantee scheme should be looked at.

Kindly use the Link to access a systematic study I had guided for assessing the runoff potential for 3 Hydrological Units in Chittoor District of Andhra Pradesh:

[http://www.apfamgs.org/upload/pdf/RE4406\\_40122.pdf](http://www.apfamgs.org/upload/pdf/RE4406_40122.pdf).

---

**DSK Rao, Gyantech Information Systems Private Limited, Hyderabad** (*response 2*)

I have come across this article, which I felt should be shared as it is relevant to the current discussion. Please note that the content is not independently authenticated, but cursory checking with friends in Gujarat has confirmed some truth in the claims.

**India's water crisis**

Mon, Jun 14 07:18 PM

That India is on the verge of a serious water crisis is a foregone conclusion. So much so that the possibility of water riots in the future can't be ruled out. And it's not that the farmers of Vidarbha in Maharashtra or Bundelkhand in Uttar Pradesh are the only casualties of depleting groundwater level. In satellite townships like Gurgaon and state capitals like Hyderabad, the situation is much worse than the rest of the country. And the blame doesn't go to bad monsoons alone.

More than indifferent monsoons, this scarcity of water has been caused by over exploitation of groundwater and lack of water conservation measures at the micro level. The answer to this monumental challenge that stares at an otherwise resurgent India comes from Gujarat. The state shows the way in the form of a unique government-people partnership model for water conservation. The results are here to see.

In 2004, the water table of 112 tehsils of the total 225 tehsils in Gujarat was in semi-critical to over-exploited condition. But a satellite based survey done last year by the Central Ground Water Board (NGWB) found that as many as 60 of these 112 tehsils have regained their normal water table. What's more, the water table is rising further in many of these tehsils. Most of these tehsils are in

Saurashtra and Kutch where the farmers and the government together have started a unique check dam revolution.

In the mid-90s, large parts of Saurashtra used to get water through train tankers from water-abundant areas of central and south Gujarat. Today it is a thing of the past. Earlier, many small rivers and rivulets in this region used to go dry by the end of monsoon. Now they have become almost perennial and several villages have become self-sufficient in water.

In the past 10 years, 1,05,000 check dams costing Rs 1,480 crore have been built in Gujarat under the government-people scheme. The villagers have contributed between 10 and 15 per cent of the cost in the form of labour while the Government has done the rest. Around 70,000 of these dams have been piloted by the state irrigation department and the rest by the state rural development department. These dams have a cap of Rs 15 lakh in terms of investment.

The mechanism for these check dam scheme is very simple. As and when a village committee wants to make a dam, it takes the local irrigation engineer to the selected spot. After seeing the spot, the engineer helps them select one of the six technical designs for a check dam. The six designs are finalised by the Government depending on the local geological conditions. Once that is done the department releases funds and the work on the dam begins.

The changes are less evident in north Gujarat where the topography for building check dams is not as conducive and the farmers here are also not very enthusiastic. But in this region also the water level, barring some tehsils where it is falling due to local factors, has been rising for the past two years. Says R.C. Jain, Regional Director of the cgwb and in-charge of Gujarat, "Gujarat has shown that where there is a will there is always a way. This experiment can inspire people in many water starved areas of India."

Interestingly, the check dam revolution was triggered in 1999 by Mansukh Suvagiya, a Rajkot-based social worker in Jhamka village of Junagadh where the villagers collected money and constructed 52 check dams in a span of two months on small rivulets in and around the village. Today, Jhamka is a symbol of water and agro self-sufficiency.

To get something from mother earth you have to give something back. If you don't, it will stop giving you. It's not a one-way cycle.- Narendra Modi, Chief Minister, Gujarat. In the same year, the Saurashtra Jaldhara Trust, an NGO run by diamond magnate by Mathurbhai Savani built 213 check dams on rivulets in and around Khopala near Bhavnagar to turn the village's fortune. As the success of this experiment travelled to other areas of Saurashtra with the trust's help, the then chief minister Keshubhai Patel took interest in it and launched the ambitious Sardar Patel Water Recharging Programme in 2000 to build check dams in partnership with the people.

When Chief Minister Narendra Modi took over in 2001, he laid emphasis on creating farm ponds in areas like north and central Gujarat where building check dams was not very feasible. As a result 1,81,00,000 farm ponds have been built till date at a cost of Rs 181 crore. Farm ponds are built in that part of a farm where rain water collection happens in natural course.

In 2003, the Gujarat Government launched the Gujarat Green Revolution Company to propagate sprinkler and drip irrigation technology among farmers by giving them hefty incentives. Rated as the best in the country by the Union Agriculture Ministry for last three years, this initiative is one of the reasons why the groundwater level is getting recharged in the state.

But it was not easy for the Government to convince the farmers, who were agitating for more power, to participate in the project. The agitating farmers were told to take to water conserving farming techniques and tapping surface water through indigenous methods which could end their dependence on power. "To get something from mother earth you have to give something back. If you don't, it will stop giving you. It can't be a one-way cycle," Modi told the farmers. The agitators understood the logic of his appeal and the rest is history.

Then there are other big irrigation schemes which have helped in enhancing the water table in Gujarat. For example, in north and central Gujarat, the mud canal of the Sujalam Sufalam Yojana played a key role in bringing up the water level. The project targeted at pumping 'excess' water from the Kadana canal into north Gujarat dams by laying pipelines; building an unlined canal across 21 rivers in north Gujarat, and building two lakh farm-ponds. In another initiative, the state government has partnered with NGOs to build over 40 bigger-sized check dams costing up to Rs 1 crore.

Besides these long-term projects, certain short-term initiatives have also worked wonders. Last year, Gujarat had a bad monsoon but when the Government realised that rains could hit the state in the last leg of monsoon, it launched a quick water conservation drive by building boribunds (very small dams made by blocking small rivulets with the help of sand bags). In 20 days, over 2,50,000 boribunds came up as a result of a joint effort by the departments of rural development and forest management, NGOs and village committees.

When the rains did come, these boribunds conserved a lot of water. Says Ram Kumar, CEO of the State Watershed Management Agency: "Our resolve is to ensure that not a single drop of water is wasted." The success has not resulted in complacency in the Government which launched another innovative scheme three months ago to tap surface water on the hilly slopes of the tribal regions of south, north and east Gujarat by making terrace talavis-small ponds dug on hill slopes.

In 2009, Gujarat registered 9.06 per cent agricultural growth rate while the nation's growth rate was less than three per cent. The total cultivable area in Gujarat has increased by a phenomenal 15 per cent in the past 10 years. During that period, Gujarat's agro production has jumped from Rs 18,000 crore to Rs 49,000 crore. The state increased its cotton yield six-fold from 175 kg per hectare to 798 kg, more than the world average of 787 kg.

"Gujarat has set the finest example of groundwater management through indigenous and modern methods and through people's participation, " says Tushaar Shah, senior fellow at the International Water Management Institute. When Jhamka and Khopala did it, the rest of Gujarat wondered why not they. It's time the rest of the country asked the same question.

---

### **Muhammad Mukhtar Alam, Centre For Ecological Audit, Social Inclusion and Governance, New Delhi**

A couple of days ago, I traveled to Noida, Indirapuram via the new bridge that has replaced Pontoon bridge and connected habitations across the river. On the way, I talked to Kanan, the daughter of my friend Sanjay Kumar and informed her about the condition of Yamuna. I told her that it is no longer the river known for pure water but it has turned into a 'ganda nala'. She said no it is still a river. I told her that quality of water has to be good for river to be called a river. May be, she would realize this when she grows up as she is going to nursery now. Further, I told her how the river bed has been looted for creating infrastructures like Akshardham Temple and Commonwealth village. More roads are being creating looting the river bed assuming that it can be managed for ensuring creation of infrastructures. Red fort continues to have structure that used to get water through carbon-neutral facility for Nehre-Bihisht. If one wishes to restore this, one would not get clean water from Yamuna River.

Ajit Seshadri has shared how ground water level has gone down along with other indicators and this shows a degradation of the water resources and if one has to ensure ecologically safe groundwater supply systems for the city, a lot of policy change will have to be made. Permission for constructing high rise would have to be assessed for ensuring that carbon-neutral energy supported water supply systems are available. The way NOIDA is planned up to Hindon river, I am sure ecologically safe water supply system has not been looked into and permissions have been granted without recognizing the mission for Green India and ecologically safe habitats that are envisaged with through the eight missions of National Plan of Action on Climate Change [http://pmindia.nic.in/climate\\_change.htm](http://pmindia.nic.in/climate_change.htm)

We will have to ensure halting the expansion of ecologically hostile habitats and apply this to urban

development policy urgently. Rainwater harvesting structures such as ponds would have to be protected in Delhi and around the city. An old Mughal time garden in Ashok Vihar has a pond that does not have water and children use that for playing cricket. In village Mubarakpur there are good ponds that are live and some of these ponds that had been created for irrigation purpose across the acquired region need to be rejuvenated. Baolies in Delhi are another sign of the ground water level and when I last visited Purana Qila and Mehrauli, I found those baolies had dried.

Movement for Transforming Ecologically Hostile Habitats <http://transitionurbanindia.ning.com> communicates for creating ecologically safe habitats especially in the urban areas that are too much dependant on the non-renewable energy based support systems. Nothing short of retrofitting cities and making these carbon-neutral would ensure ecologically safe scenarios for water supply and mitigation of climate change. Wells India's work for revival of small scale water harvesting structures in dry land regions is very much needed but these need to be supported with simultaneous action for making urban habitats survive within ecological limits as contrary to what Wells India that thinks that these structures in many dry land areas were developed as an adaptation measure to climate change, these structures were part of ecologically safe sources of irrigation created before we learned about the impacts of climate change. Working at Terre des Hommes (Germany), I had the opportunity to read the work of Anupam Mishra way back in 1995 that focused on the revival of ponds that exist in Rajasthan and other parts of the country. They have been with us for centuries and even the villages of Delhi like Mubarakpur now are a testimony to this with two-three ponds that can be seen even today.

With warmest regards and best wishes for simultaneous action on climate change synergizing the policy formulations across the departments for ensuring that the ecologically safe Delhi survives for children of 40<sup>th</sup> century with secure water supply systems. If we can ensure this, we would indeed be able to ensure that expansion of dry land and drought prone region gets halted too.

---

#### **Hirudia Raj, Consultant – Water, New Delhi**

According to analysis of rainfall data over 100 years, the quantum of rainfall is more or less the same till date. The increase in population/users and disturbing the natural system is creating imbalances.

The traditional system are forgotten or ignored, for example, Water Users Associations in the past traditionally used to desilt the tanks and inlets and out-lets. The water bodies need to be protected and repaired including the tanks and streams. Earlier people used to worship water bodies which have been now disturbed.

In terms of climate change it is a slow process which we should study, including the local variations in a given basin/watershed. These needs to be recorded analyzed and disseminated to inhabitants. Awareness need to be built on these aspects and develop plans for adaptability/preparedness. Skills need to be imparted to community in analyzing the hydrometric data.

Finally all the water harvesting structures old or new need to be restored so that rainwater can be tapped to the maximum. And the other aspect may be diverting storm water into existing open dug wells to increase recharge of groundwater.

---

#### **N Lakshmi Narayana, Geo Rehab Centre, Hyderabad**

I am happy to meet you on this most significant and an effective forum. Congratulations for the information contributed by you which should be an eye opener for all of us.

#### **What are the experiences on improvisation of Small Scale Water Harvesting Systems in order to best adapt to climate change or variability?**

The process of RWH is simple, it just needs change in attitude and dedication for the implementation. There exists several simple ways to minimize the present water crises both in urban and rural environments.

For example: a simple measure of RWH can help transform dry borewells into a productive one without going for deeper zone. This was well practised by our ancestors including in the most difficult states like Gujarat and Rajasthan. Now the situation/environment in these areas is improved significantly and contributes to the development of the people as well as the area.

On the contrary, in all the cities in general, and particularly Hyderabad the situation is alarming and the experts are trying to find solutions. The result is not very encouraging as still we are not efficient in simple ways like RWH. This should be made mandatory and linked up with other benefits or permissions or other suitable channels. Participatory planning among the professionals, users and policy makers will certainly improve the situation and certainly can avoid conflicts.

#### **How can they be made more efficient as a means to adapt to climate change?**

Water controls everything and links everything: health, poverty and development. Each one is a cause and consequence of the other. This clearly reflects the centre point that water is a primary resource. Once water is properly harvested, stored, and managed, I am positive to look for better solutions for global warming, climate change, etc.

With this information, I am looking forward to work with the team for planning for better tomorrow with a healthy, friendly and sustainable environment and thus a better quality of life.

---

#### **Sarita Mehra and Satya Prakash Mehra, Rajputana Society of Natural History, Bharatpur**

We work out of Udaipur in the drylands of south-western parts of Rajasthan (Sirohi) and north-eastern parts of Rajasthan (Bharatpur). They are completely different in terms of their hydrology, geography and climate. We have found most people in Sirohi are used to living in water-scarce conditions but in Udaipur and Bharatpur, the situation is quite different. I think this is due to the approach to planning that excludes most people; people feel the government and NGOs are responsible to provide water. Thus, raising consciousness of water harvesting in mind of every person as well as their hearty association in conservation works, are of utmost importance for adapting to CC. We would like to quote one success story from Bharatpur:

Bharatpur lies in the Yamuna Flood Drains, once used to be the flooded every year resulting into the formation of Bharatpur Irrigation System formed in 18th century by the then rulers. With the pace of development and the climate variations, the draining sources (three rivers - Rupa rail, Banganga & Gambhiri and general water flow from catchments areas) dried off. Today the region is facing drought conditions. Water politics could be best seen in north-eastern parts. This is simply because the local people were unaware of the water conservation. They didn't know how to save water as it was not the need of that time and this attitude continues even now.

Whenever we have discussed the problem and asked about the solution, their first response is to drill deeper bores or petition PHED for pipeline supply from outside sources.

Under Project Boond, our youth team from the Rajputana Society of Natural History (RSNH) surveyed the area and found that people feel water conservation is a priority for the area to provide potable water and augment surface water sources. We organized several motivation camps and encouraged the people from few villages. Another challenge is the deep-seated caste-ism that also affects water availability. With the motivation camps, we also planned the natural solutions of water problems of the villages through traditional methods of recharging the ground water and harvesting rainwater.

In addition to these activities, we executed plans to augment surface water availability in two villages in 2008-09 and one village in 2009-10 under Project Boond. In the first year we had limited success in terms of motivating common man. In the second year, we could measure success through participation of representatives of more than 50 villages and their eagerness to implement the ideas in their respective villages.

They formed Village Development Committees (VDCs), start contributing on their own, involving at least one person from every family of the village to contribute to resolve the water problems of their village. The conservation techniques are now taught by the village people on their own rather than by RSNH team. The village representatives are now less dependent on the government schemes and joined hands to come up for reviving the traditional approach used by the arid land of Rajasthan to conserve water.

---

### **Rohit Prakash, i- dream, New Delhi**

The study as mentioned by [Hirudia Raj](#) is slightly surprising. There is not doubt in the fact that population rise has caused a lot of imbalance and is therefore one of critical reasons of rise in global warming. As I understand, climate change has certainly brought about a certain imbalance in the patterns of the rainfall. Even if the quantum of rainfall is same, there has been a considerable change in the distribution patterns with several states suffering from floods and at the same time several others from drought.

I am sure our scientific fraternity and organizations like Wells for India have a lot of data and information on the current state of water harvesting projects, sites, feasibility etc. As I see it, the focus should shift from studies to actions. In my experience as an environment educator, I have seen the focus is far too much on studies, data generation/ publication and very less on actions whereas the former should be seen as a first step towards actionable initiatives. The need of the hour is to prepare a plan of action for the next two years, implement it and ensure that the systems are set right and the project is a success. A successful implementation can then be used to educate/ create awareness amongst the local communities with the intention to maintain the system.

I would request Omprakash Sharma from Wells for India that based on the inputs received from this forum and his knowledge about working in this field to please create a plan of action for the next two years. If he wishes, he can share the same with the Community members, it can be refined if needed and then ensure its successful implementation with strict deliverables. This might be the first step towards initiating a change.

---

### **S.D.Umrikar, Jalswarajya Project, Mumbai**

It is good that we are thinking seriously about rainwater harvesting. Better late than never. But there is a bigger menace than not doing it and it is sand mining from rivers/streams. Can you relate revenue generated against environmental degradation? It is perhaps the greatest threat to mankind. I think these (doing rainwater harvesting and stopping sand mining) must be simultaneous activities. Otherwise, when all is said and done, all actions will go to waste. All the water that is harvested ultimately/partly leads to streams and rivers. If there is no sand, it just runs off. The earlier activity becomes useless, then. The local communities must come together, protest and stop sand mining. As the area belongs to them and by virtue of the 73<sup>rd</sup> Amendment to the Constitution of India, communities can stop the Government from allowing such degradational activities. After all who signs off the authentication of sand lifting? Have they consulted local PRIs? Do they have the feedback of the certificates they have issued? Can they count what was allowed and what is done? Sand mining is simply killing the hydraulic system.

---

### **Ramling Gujare, Agriculture Land Valuer and Consultant, Pune**

Om Prakash Sharma has requested us to add some inputs on improvement and making old water harvesting structures more efficient for improving the livelihood of poor people in dry land area and combating climate change. Based on my experience and learnings, I would like to suggest that the technology adopted for water harvesting and conservation should be planned by considering the local geographic situations, soil type and many more factors. Secondly active participation of the local people in planning and implementation is also important. Also emphasis should be given on harvesting of water underground.

---

**[Ajit Seshadri](#), The Vigyan Vijay Foundation, New Delhi (response 2)**

Another phenomenon to be studied, while studying the effect of climate change on groundwater in aquifers and rain harvesting would be a link between hydro-geology groundwater in aquifers and seismology earth quake tremors:

1. Data given earlier, Delhi NDMC-Lutyen's Delhi areas in the year 1955, had groundwater at around 0 to 10 Feet bgl- below ground level, Now at present 2010, the same areas have groundwater at 60 to 70 Feet bgl, i.e about 50 Feet lower down, than the groundwater levels that existed in early 1950s,
2. This 15 to 20 mtr. strata of soil has become very dry and have lesser soil- moisture- water in the aquifer zones.
3. Delhi being in the seismic zone 4, experiences seismic shocks from below the ground say at 3000 mtr. Bgl and these shocks travel upwards, now consider the land surface in the city strata – 0 to 15m bgl, has less soil moisture than it had previously.
4. Here a hypothesis to be considered is that these strata of soil, having less moisture would have lesser cushioning effect and would presumably have a greater possibility to transmit more shocks due to the harder nature of the soil, etc. Also resilience in soil due to lesser moisture content evidently absorbs less shocks tremors, etc.
5. It is now considered that the subject area, being devoid of this soil moisture could have more effects from seismic tremors, shocks clubbed with adverse effects on bio-diversity, flora, fauna, weather, climate change, etc.

Hence, rain harvesting with recharge to ground aquifers would be required to be done with more intent at all locations.

---

**[Suresh Kumar](#), National Institute for Interdisciplinary Science and Technology, Thiruvananthapuram**

The UNESCO New Delhi team has brought out a special issue on Heritage of Water Management in The Journal Power of Creativity [VOL4, December 2009] where I have also contributed an article on traditional water management practices that existed in different parts of the country, and which were quite effective, and would be so with appropriate scientific modifications/adaptations for the present times too. It is very important that philanthropic companies contribute towards this as part of their corporate social responsibility, like what prosperous individuals used to do in the past. The Government can also help such initiatives through financial support and other incentives based on policy and financial instruments.

---

**[Arunabha Majumder](#), Jadavpur University, Kolkata**

Rain water can be harvested in ponds or impounding reservoirs. There must be a defined catchment for harvesting rain water. The water sources need to be kept free from contamination. The village must have 100 per cent sanitation. The thumb rule indicates  $1/3^{\text{rd}}$  water evaporation and  $1/3^{\text{rd}}$  water percolation. Rest  $1/3^{\text{rd}}$  can be used for water supply. The pond water can be treated by installing Horizontal Roughing Filter and Slow Sand Filter. Fish culturing is prohibited in the said ponds but fish must remain in the ponds. The system can be maintained by the community through participatory approach. We carried out R&D study to develop the above model with the support from UNICEF and ICEF. We did the study in West Bengal under All India Institute of Hygiene and Public Health.

---

**[Ashwani Wanganeo](#), Barkatullah University, Bhopal**

It is good to talk about water harvesting; however, it is more important to get it implemented timely. In order to understand the imbalance created on account of high rise in water usage, both surface and groundwater, attention should be focused to adopt a multidimensional approach towards water harvesting techniques. The housing board should, in consultation with water works department and other related departments, decide about the location of housing colonies. The water to be used for consumption should be stored in the upper reaches of geological planes. This will serve two purposes a) Help in meeting the required quality of water at cheaper rates. b) Help in recharging the groundwater. Pressure should, in the meantime, be mounted towards reducing the population growth. This can be

achieved by public awareness. More utilization of any resource leads to its contamination at the same scale. This phenomenon needs to be explained thoroughly.

---

### **Basavaraj. K.H., Prawarda, Bidar**

Wherever we see floods we are worried of water and when ever we see shortage we agitate for it. This is all about the availability of water in a particular place in a particular time. I am working in the field of Natural Resources Management from the last 22 years. Whenever there is extreme shortage then people will understand its value. It is only awareness and showing the alternatives that can solve the problem.

---

### **Prabhjot Sodhi, Centre for Environment Education, New Delhi**

Let me share some of our experiences in the small grants program projects. In all our projects we focus the '**participatory micro planning, (PMP) approach**', (e.g. village entry, informal regular-periodic village meetings, record keeping of the agreements in the meetings at the SHG levels, discussions, Participatory Rural Appraisals (PRAs) and related participative methodologies using the problem analysis tool with communities, discussing and negotiating community priorities). The micro planning approach needs to be taken up in the context as 'local area based exercises' which clearly lead to developing '**village work plans, (VWPs)**'. These VWPs, are prioritizing the **community needs** with special focus to poverty, gender and livelihoods.

The **project strategy** to develop mutual respect, community ownerships and sustainable actions, will have a three-phased approach namely:

- **Phase I:** Mobilize the community through the use of '**participatory micro planning (PMP)**' techniques to identify, analyse and prioritize the needs of the community. The Community needs will then help to develop into comprehensive Village Work Plans (VWPs) as the outcomes. (2-3 months, they will be clearly documented in the local language by the communities, promoting reflections over time during the project period).
- **Phase II:** Facilitate and promote informal, kinship based-common interest self help groups (SHGs) for increasing self-help, collective bargaining, community negotiations and for implementation of the program according to the VWPs. (1-6 months, regular meetings, record keeping and book keeping at the local levels, link to local rural and commercial banks).
- **Phase III:** Enhance the skills and capacities of a range of local community volunteers and local resource grass root persons, (including both men and women) to plan, implement, manage and monitor resources and activities according to the VWPs. (1-6 months in the program, continual in nature and regularly enhancing during the project period). This will be done on a range of areas etc.

The local people therefore are involved at all levels-steps in the project development (VWPs), monitoring and implementation. Village level meetings shall be held, with proper record keeping and all the modalities for all activities agreed with communities. This will also try to bridge the gaps in minds of the local people, in terms of support and cooperation to the program. A stepwise program will be followed as in laying the 'systems approach'. For more information please read [ftp://ftp.solutionexchange.net.in/public/wes/cr/res-15061001 .pdf](ftp://ftp.solutionexchange.net.in/public/wes/cr/res-15061001.pdf) (PDF, Size:7.4 MB)

---

### **Anand Ghodke, Water and Sanitation Program – South Asia, Shimla**

Someone had pointed out that it is the increased population and increased water usage that had essentially disturbed the balance in last few years rather last few decades. All of us should primarily agree with it but at the same time the frequency and distribution of rainfall over the so called monsoon period June to September (in most part of the country) had also made a huge difference. Water scarcity as such is no longer an issue in the drylands but has become a hot topic everywhere. I want to share few of my thoughts on water harvesting as such be it through smaller or larger structures.

1. At times when we have floods we do not have means to trap the excess water flow; the situations do exists from the experiences that heavy downpour after filling the small water harvesting structures runs of as RUN-OFF. Hence, I am of the opinion that somewhere we need to work out a mechanism where this type of heavy RUN-OFF is trapped by means of relatively larger structures in every micro-watershed catchments. This can only be

suggested to the Government; but can very effectively implemented by the NGOs or PRIs under the various works undertaken through watershed management programs, NREGA or other water conservation schemes. The finest examples of small trapps have been demonstrated by the Ralegaon Sidhi and Hiware Bazar experiences from Ahemadnagar district of Maharashtra. Other good examples are Sukhomajari near Chandigarh in Haryana, parts of Gujarat and Madhya Pradesh etc. I remember in one of the National level workshop held in 2000-01, National Rain Water Harvesting Workshop organize by CGWB at Vigyan Bhavan in Delhi, Social Worker Anna Hazare saying "Water can be a cause for the Third World War".

2. Water is an entity which does not have any kind of boundary; either administrative or political. Though the geological boundaries can be created but in extreme situations it is beyond anybody's control. One of the critical issues which the water conservationist should vouch for is the judicious use of water, addressing the over-extraction of ground water, practicing water friendly agriculture rather than crop production friendly usage. I am sure there are pockets in water scarce states like Rajasthan, Gujarat, Maharashtra, Madhy Pradesh where some of the big farmers use all kinds of ways and methods to go for crop production including borewells going much below the shallow aquifers and penetrating the deep aquifers where water is stored hundreds and thousands of years ago. This calls for effective enactment of the Ground Water Regulation Acts and Recharge of the Ground Water. Water Governance issue should be taken up across all the legislatures and at National level. The Government has a major role than the communities as the powerful lobby will always enjoy the liberty of the voracious water users.
3. The climate change issue seems seriously affecting the agriculture pattern in the country. I have observed that in parts of Vidarbha, the cotton and orange growing belt showing extreme changes in replacement of crops. We need to look at these issues as well. The irrigation practices especially the flood and sprinkler irrigation helps more evaporation process resulting in heavy water losses. The farming community is less concerned about the Crop-Water Requirement and actual application of irrigation technologies. Mass awareness drives and sensitization of the farmers on these issues are the immediate requirements.
4. Another area where one needs to look at is the water scarce situations in rural, semi-urban and urban settlements. Gradually the water scarce situations over the years have reached to the semi-urban areas and may hit the urban areas where the water demand and supply are not calculated. In Maharashtra and many parts of the country nowadays 'load-shading' is a common phenomenon in the context of electricity supply. We may soon hear the water shading if the demands are not cut-off and supplies are not controlled. The communities in all kinds of settlements now should be forced to adopt the water saving attitudes. There should be effective bans on borewells, handpumps, etc.
5. The water use in the industrial belt has always been a conflicted issue. New terminologies like virtual water use and requirements are chipping in which should be used to sensitize the communities. One should make the communities aware about how much water is used while manufacturing non-farm products like clothes, papers, plastics etc.
6. Government, NGOs and Water conservationist should promote the concept of Roof Top Rain Water Harvesting when new constructions are taken up; information on what area of rooftop results in capturing how much amount of water, every farm should have at least one rain water collection pond (the depth is preferred over larger surface area to avoid evaporation loss but should be fenced to avoid any accidents to human and livestock), school buildings should be targeted to promote the roof top rain water harvesting, farmers associations should be sensitized to adopt for rainwater harvesting and one-village - one RWH should be promoted on priority basis by conducting the water budget and water audit calculations. In fact every PRI should be asked to do these calculations and ensure at least drinking water safety in initial phase.
7. No doubt the small scale water harvesting is a key to resolve the current water scarcity issue; medium to large water harvesting structures should also be constructed. We should not forget that sufficient damage had already been done and it will take years to replenish the ground water. Therefore, we should focus equally on water harvesting and water saving. Hence, lastly I would suggest that instead of saying Small Scale Water Harvesting AND Climate Change should be termed as Water Saving and Climate Change

---

### **Ashish Gupta, Farming Association of India, New Delhi**

We are attempting an initiative in reviving a dry water tributary in a village in rural Himachal Pradesh. As we go along we will experiment with a lot of traditional techniques of water conservation, however, we currently require inputs from members who have had any experience in working on Hilly terrain and reviving water bodies. Specifically some of the problems we foresee are -

1. One size fits all approach does not work - we keep getting suggestions on concrete this and concrete that! We do not want solutions that involve cement to begin with, traditional water harvesting methods in the hills include

slow dam-ing using *Kufirs* which are particular to the hills and not too different from the *Johads* of Rajasthan. However most Kufirs are now dry too!

2. It is recommended that certain types of vegetations be planted along the slopes so that most water conserved by the mountain shed keep replenishing this flowing water in the valley below. Here again we are interested on native varieties of grass/trees etc, which are naturally present in the slopes of the mountains without having to import new varieties which are not available on the mountains.
3. Some experiments of a similar kind are of the *Sahastradhara* in *Dehradun* , however that too has been spoilt by unbridled tourism.

The key goal is to improve the livelihood of the villagers and thereby creating a conducive environment for the village folk to dwell in. However a large number of solutions that we foresee today are not in tune with what will be considered a sustainable solution for water harvesting in the hills/mountains. The region of Himachal we are working in receives about 1800mm of rain a year, which by a national average will be considered excellent, however since the force of water is not tapped, most of the hill dwellers face acute water shortage throughout the year.

---

### **Debasish De, Society for Natural Resource Management and Community Development, Ghaziabad**

I worked in the drought prone areas of Puruliya, Bankura and West Midnapur districts of West Bengal which has acute water shortages both for irrigation as well as drinking. The area has lateritic soils and high percolation. The farming is totally rain-fed. During Rabi, there is hardly any farming.

We have started with digging small wells in the fields (locally called *Math kuyas*) having only 20-30 ft depth. This well stores water from rains. One well irrigates about one and half bighas of land (roughly 0.4 acre) and helps the local people in vegetable farming. We have dug about 8-10 wells per village. One well belongs to one beneficiary and the maintenance of the well is his responsibility. This is well documented in Santuri Block, Raghunathpur Subdivision of Puruliya district.

Apart from these field wells, we have water harvesting tanks, at least one in each village. This helps in irrigating wheat, vegetables and plantations. Some WHTs are also used for time-bound fish culture. As result shows, the once fallow land is now under cultivation. One can watch green spreads over a vast area. The Divisional Forest Officer, Puruliya Territorial also admits that due to this initiative the groundwater level has increased and natural vegetation in the nearby hills, which are inside the forest lands, has come back. One can find the deer and monkey in the hills. To summarize the issue, small water harvesting structures can help in order to mitigate the climate change problems.

---

### **Manju George, Evangelical Social Action Forum, Bangalore**

Although I do not have direct work experience in the water harvesting, few examples that had happened while I was staying in Chennai would help these small initiatives to be more popular.

#### **What are the experiences on improvisation of Small Scale Water Harvesting Systems in order to best adapt to climate change or variability?**

Chennai was facing severe water shortage during the year 2002 and across the city water was supplied in tankers on alternative days where you had to fight with your tooth and nail to get your quota. During that time, our colony representative had taken the initiative of rain water harvesting in all the houses under his personal and direct supervision (the government has also taken the initiative to make RWH mandatory for new connections and encouraged the existing connection holders to cooperate with the program).

Within one year of implementation, we could see the groundwater level increasing, quality of hard water had improved to the extent where you notice the difference and all the dried wells had water. Next year when all the other colonies were fighting for the same tankers, we had to fight only on very few occasions. Hence this as an excellent initiative in terms of improving the groundwater level and water quality.

**How can they be made more efficient as a means to adapt to climate change?**

1. Creating awareness in each and every community and holding resident welfare associations (RWA) responsible for this initiative
2. Similar awareness programs in schools and making it possible through their clubs at least in their school and gradually venturing out to their locality
3. Involving local NGOs for the same
4. Honouring the people who have been a part of the process and citing their examples and improvements in other parts of the city

Even though it is a small initiative, every small drop counts on that matter easily would help us to make a big ocean!

---

**Shibesh Das, Rajadighi Community Health Service Society, Malda**

We need to rethink our traditional rain water harvesting practices. Due to the pressure of human settlements thousands of RWH structures have been destroyed. It is perfect time to identify such water harvesting structures that are dysfunctional today and put a query before those settlements to reach a solution to fill the gap.

---

**Pon Ananth, water.org, Trichy**

In the case of vast dry land area, Ridge Furrowing will help a lot to harvest rainwater and there by help agricultural activities.

---

**Nitin Bassi, Institute for Resource Analysis and Policy (IRAP), Hyderabad**

Climate change has virtually become a buzz word globally. We scholars too have contributed to this by mixing terms such as climatic variability and climate change. Indian experience interlinking climate change and water is still in nascent stage. One can see plenty of popular articles appearing in national dailies, magazines, weeklies etc. attempting to bring in forefront the issue of impact of climate change on water resources. But what is lacking is concrete scientific basis for the same.

Coming back to the query, small scale local water harvesting (WH) is a great option for augmenting water supplies in water rich areas (like the north east, western Ghat area in Kerala etc.,). But it naturally water scarce areas having limited runoff potential and experiencing high inter-annual variability, a lot of caution has to be exercised in building small WH structures. Scholars, from empirical research have concluded that rainfall and runoff harvesting in water scarce regions does not offer potential for augmenting the supplies at basin level; would be economically unviable (Kumar et al., 2006; Kumar et al., 2008) and would creates huge negative economic, social and environmental externalities downstream (see Ray and Bijarnia 2006; Kumar et al. 2008). Unplanned water harvesting in these regions would result in severe and irreversible reduction in access to water for downstream users (see Baron 2009) and damage to eco-system. Our field experiences in Rajasthan and Gujarat further authenticate this point. Even the experiences of WH in water scarce regions under NREGA suggest that WH structures have come at areas with scanty rainfall, and without conceptualization of factors such as catchments area & sources of recharging (see NCAER-PIF report 2009).

Thus planning of WH structures must be guided by technical inputs from water professionals, ecologists, hydrologists and economists, and can be implemented by state government agencies and local institutions in partnership. We need to find better ways of using charity. Let us bear in mind that water management is not about digging pits and dumping concrete.

What one sees in regions like Saurashtra or western Rajasthan or Madhya Pradesh is nothing but anarchy, where there are no rules or norms exercised on the number of structures to be built in a basin and where they should be built. If the impact of climate change on hydrology is negative, in the form of

reduced mean annual flows, increase in its inter-annual variability and temperature rise, then small water harvesting structures in upper catchments of water-scarce areas would actually create too much negative consequences for the society in terms of drying up of local streams and downstream reservoirs, with overall reduction in basin's utilizable water supplies.

Our submission here is that we should first understand hydrological regimes adequately in different regions and its implications for water harvesting, and then analyze climate change impacts on hydrology to come to a conclusion on whether small water harvesting solutions help mitigating CC impacts or not.

#### References:

- Baron, J (2009): "Background: The Water Component of Ecosystem Services and in Human Well-being Development Targets" in Baron, J(ed) Rainwater Harvesting: A Lifeline for Human Well-being (Sweden: United Nations Environment Programme/Stockholm Environment Institute) 4-13.
- Kumar, MD, S Ghosh, A Patel, OP Singh and R Ravindranath (2006): "Rainwater Harvesting in India: Some Critical Issue for Basin Planning and Research", Land Use and Water Resources Research, 6: 1-17.
- Kumar, MD, A Patel, R Ravindranath and OP Singh (2008): "Chasing a Mirage: Water Harvesting and Artificial Recharge in Naturally Water-scarce Regions", Economic & Political Weekly, 43(35): 61-71.
- National Council of Applied Economic Research/Public Interest Foundation (2009): "NCAER-PIF Study on Evaluating Performance of National Rural Employment Guarantee Act", National Council of Applied Economic Research, New Delhi.
- Ray, S and M Bijarnia (2006): "Upstream vs Downstream: Groundwater Management and Rainwater Harvesting", Economic & Political Weekly, 41(23): 2375-2383.

#### **Raghu Menon, Pondicherry Science Forum, Pondicherry**

It is true that the rainfall data over the last 100 years have more or less the same. The state of disrepair of the water harvesting structures was a process which started some 50 years ago. It all started with the drastic changes to the land use pattern and the bringing in of the green revolution crops which demanded higher water usage. Governments which would have maintained these wonderful water bodies did not do so and the technology of extracting groundwater gave way for the need to harvest the rainwater when it fell and started exploiting the groundwater with absolutely no planning or with scientific assessment of the quantity of groundwater that was pumped out. Irrational and unscientific bore well licensing systems have created huge problems of salt water intrusion and the need to go deeper aquifers when the shallow aquifers got exhausted. With the bore well technology misused by chemical industries which pumped their effluents into the aquifers polluting the groundwater sources, this resulted in groundwater pollution as well. Even today, there is no effective state control on the extraction of groundwater. When water bodies which were a common property got privatized due to the boring of wells, water became a private property which is sold with no regard for the future, with the authorities appeasing big water lords with free electricity and huge subsidies only to benefit the rich farmers where the poor small and marginal farmers had to buy the water at exorbitant rates. This also showed a shift from landlords to water lords. In South India, you see big water lords having only half an acre of land with three to four bore wells selling ground water to hundreds of acres and that too subsidized by the state.

Specifically, for Tamil Nadu which depends on the low depressions in the Bay of Bengal for its rainfall, even as early 2000 years ago, water bodies were created when and where the rain fell. There is a huge network of system tanks which store rainwater and supply it during the post monsoon months and there used to be well laid out rules and systems to maintain these water bodies. The climate change which we see today is an accelerated climate change due to anthropogenic reasons and there is going to be too much variation in the rainfalls, floods and droughts etc. and it is going to have huge impacts on the agricultural patterns, disease patterns, and the very livelihood of small and marginal farmers.

One option for mitigating the negative impacts of the accelerated climate change would be renovate the water bodies which used to be there. Many of them have been converted to bus stands, medical colleges, hotels and encroached by big companies and even the state resulting in huge drainage issues

and related public health problems. We also need to have newer water bodies to be created, designed on the basis of watersheds. Above all, the government should switch over the community based rehabilitation of water bodies (not contractor-PWD engineer based rehabilitation process which is not owned by the communities). A very successful tank rehabilitation programme in Pondicherry was abandoned when the ministry changed and it is high time the state and the central governments rise to the occasion to have a larger, holistic, community friendly policy on water bodies, on groundwater management, declaring ground water as a common property and stop subsidizing the rich. As for climate change, the rich is hiding behind the poor people who have a neutral or even negative carbon foot print, while the rich in India have equal or even more emission levels compared to the developed countries.

---

**Amitava Basu Sarkar, Society for Rural Awareness and Development in Himalayan Area (SRADHA), Dehradun** (*response 1*)

Household rainwater harvesting has been very successful in Uttarakhand. In this state, in villages/communities without access to any perennial, adequate source Rooftop rain water harvesting have been used successfully for nearly a decade now. These tanks constructed in the land provided by each beneficiary households are made in ferrocement to reduce cost, ensure quality, water-tightness and ease of construction. These tanks are of different capacities (2.0 - 7.0 KL) depending on the intended use of water and all are constructed over ground.

For the purpose of drinking - the number of people in each beneficiary household, the average annual rainfall, the total number of dry days in a year - decides the capacity of the tank. The tank could be of PVC, Brick, Stone, Ferrocement - as per local conditions and the economic condition of the beneficiary households. In higher altitude PVC tanks are not suitable due to exposure to UV rays, thus we use ferrocement. Annually the inside of the tank needs to be washed with chlorine solution before the first rain and PVC pipes are used to carry the water from the catchment roof to the RWHT. In sloped roofs semi-circular GI sheet is fixed to collect water and in concrete roofs the periphery is raised and pipe fixed. For irrigation and ground water recharge - the tanks should be underground - to reduce evaporation losses. The inside of the tank will be watertight for irrigation and it could be honey-combed for GW recharge. To manage and harvest rain water in a watershed we need to study the geo-hydrology of the watershed. The options provided by rain water harvesting is stupendous - it can be used for all our water needs with specific alteration in the harvesting system.

---

**R. Jagadiswara Rao, Sri Venkateswara University, Tirupati**

It is clear from [http://pmindia.nic.in/climate\\_change.htm](http://pmindia.nic.in/climate_change.htm) that the Government of India recognizes that climate-sensitive sectors such as agriculture, water and forestry may face a major threat because of the projected changes in climate and increase in greenhouse gases in the atmosphere and air temperature in the coming years. Extremes of climate can lead to increased damage to water-harvesting structures due to high intensity floods and inadequacy of groundwater recharge due to scanty and delayed rainfall. In addition, there can be substantial reduction in the storage volume of water harvesting structures owing to increased siltation and substantial loss of stored water due to increased evaporation.

One way to overcome these vagaries is to construct large-sized sturdy water harvesting structures at surface that can withstand the fury of severe floods. A cost-effective alternative to this would be to take up Managed Aquifer Recharge (MAR) (also called as Aquifer Storage and Recovery (ASR) in USA) advocated by agencies such as the International Association of Hydro-geologists (<http://iah.org/recharge>) and American Ground Water Trust (<http://agwt.org/>) and practiced in several countries including Australia, USA and Arab countries. This consists in improvising the small-scale water harvesting systems to become more efficient to adapt to climate change or variability by constructing within them deep wells that allow sizeable quantities of treated floodwaters into the large storage space available within confined aquifers. The wells so constructed can be used both for recharge of groundwater during floods and discharge of groundwater during lean season. To maximise recharge, floodwater may be injected under pressure. These wells may be used even for recharging treated

wastewater under expert supervision.

One example of how small-scale water harvesting systems could be used for large-scale groundwater recharge can be viewed from the work of 3RValve, LLC at Echo, OR, USA in Madison Farms at <http://www.3rvalve.com/index.php?page=22>.

---

### **[G. Bhaskara Rao](#), APMAS, Hyderabad**

Om Praksh needs to be complemented for this highly useful query and their programs. In 1990s and early 2000s, SPWD (<http://www.spwdindia.org/>) taken up a large program on Tank Restoration in Rayalaseem (Southern part of Andhra Pradesh). The experience was very good. Impressed by the process and impact of the project, the donor of the project invested significant amount in filming and documenting the project. I am providing a paper entitled "Oasis of Rayalaseema", outlining the project, please read <ftp://ftp.solutionexchange.net.in/public/wes/cr/res-15061003.pdf> (PDF; Size: 228KB). This paper summarizes the decade long experience of Society for Promotion of Wastelands Development in tank restoration program in Rayalaseema, Southern Andhra Pradesh. The paper highlights the potential of the tank restoration in the region in the areas of poverty alleviation, equity in development, gender equity and environment protection. It also discusses the potential benefits of the people's participation in natural resources management. It also discusses the conditions for effective people's participation in development programs.

SPWD has conducted a study of "Household Coping and Survival Strategies in Drought Prone Regions in collaboration with Natural Resources Institute of University of Greenwich and Gujarat Institute of Development Studies. The study was funded by the DFID. Hard copies of the study report could be obtained from SPWD, Delhi. I am providing the Case Study of Anantapur District. For more details please read <ftp://ftp.solutionexchange.net.in/public/wes/cr/res-15061002.pdf> (PDF; Size: 644KB). Though natural calamities like droughts are not new to Anantapur district, farmers' suicides are recent phenomenon in the district. The study investigated the households' traditional coping and survival strategies in drought prone conditions in Anantapur district, Andhra Pradesh, India. The study analyzed the changes in social and economic conditions of five categories, viz. small and medium farmers, wage labor, women, small ruminant rears and dairy farmers. The socio economic conditions of the all groups studied have improved over the years. At the same time, the vulnerability of different sections also increased over the years for all sections. But the degree and nature of vulnerability varied for different groups significantly. Among all the groups studied, the vulnerability of small and marginal farmers' is deeper and complex. Each group's gains and losses are described in the study.

---

### **[Yogesh Jadeja](#), Arid Communities and Technologies\***

Arid Communities and Technologies is working in Bhuj - Kachchh (Gujarat) we are also working on revival of Urban lakes of Bhuj City main objective of this activity is to make city self dependent on their own water resources. The main idea behind is that if a city can manage its own water resources than its dependency on outside water resource becomes decreases and it gives more sustainability to surrounding rural areas.

The Bhuj city has main two lakes (01) Hamirsar lake system it has integration of three lakes (Chataradi, Dhobi and Hamirsar); and (02) Deshalsar lake. We have carried out geo-hydrological studies including water budget of the entire watershed area that inflow water to these lakes. The interesting findings are that the cumulative catchment system of the Hamirsar lake itself can provide 75,000 MCM water against 9000 MCM domestic water need of the city. We have also studied water supply system planned by Bhuj municipality with respect to sources and supply units. The major findings came out from these studies are (01) Municipality is drawing water from 30 bore wells located 11 KM far from the city in village Kukma. (02) The daily supply by municipality is about 17.5 MLD including 2.5 MLD from Narmada supply (03) The total population covered under this municipal supply system is about 42 % of the City while remaining population is managing their water from local sources all these sources are located within Hamirsar lake catchment area. Most of these people have their dual

water management system at their home i.e. R.O. for drinking water and local groundwater for other domestic purposes.

Both the studies have clearly indicated that if a watershed in balanced condition can fulfill the water requirement of the city. Another important aspect in this regard is its interesting catchment linking. The natural catchment of the lake is about 6 sqkm. But to fulfill the requirement three more catchments have linked with the original catchment and now it is 40 sqkm. The water balance study has clearly pointed that with this catchment only 8 to 10 inches rainfall is required to fulfill the lake and to maintain ground water level within its recharge area. It is well known that arid region has always erratic rainfall and due to this characteristic it has flood risk also associated with this. Here this case nicely explains risk management by its flood control mechanism.

Above findings and personnel experiences leads towards the conclusion that revival of such small scale water harvesting structures in dry land areas can make people self dependent. Here we need to change our attitude of planning and equally important to keep faith in such system. Also such initiative requires large awareness among urban communities and education to authorities.

- To carry out this agenda successfully one need to do following
- To held details hydro-geologically assessment of such systems
- Spread this knowledge among the community and authority
- Needs to build pressure groups
- Revival plan based on present land use and future water requirement (this can include technological interventions like roof water harvesting, groundwater recharge, swage water reclining and reuse etc.)
- To frame protection and management guideline according the geo-hydrological characteristics that include demarcation of the various zones like submergence area, recharge area, catchment area, channel / stream area, tail channel area etc. Along with this demarcation regulatory principles are also needs to be define accurately and authority for its implementation/monitoring etc.

\* *Offline Contribution*

---

#### **Jency Samuel, Independent Consultant, Chennai\***

Although rain fall patterns started changing decades ago, only now it has been attributed to climate change. Every few years the state of Tamil Nadu and its capital Chennai face water scarcity. The RWH system was made mandatory for all commercial and residential buildings by the Tamil Nadu government. Even skeptics changed their views when the ground water position improved and salt water intrusions in the coastal areas were arrested. But no one undertakes regular maintenance of the structures and hence the efficiency is lost. So, as a member suggested maintenance of RWH structures is essential.

Also water bodies are being indiscriminately encroached upon by private players and in some cases even by the government, thus removing precious water recharge systems. This has not only resulted in depletion of ground water level but flooding during rains as the water's path to the recharge ponds are blocked by constructions. It is essential that whatever is left of our water bodies are preserved.

The trend of extracting ground water has resulted in the closing up of open wells and /or ponds in many villages. Earlier they were regularly desilted. The practice has to be revived.

\* *Offline Contribution*

---

**Amitava Basu Sarkar, Society for Rural Awareness and Development in Himalayan Area (SRADHA), Dehradun** (*response 2*)\*

I would like to call for a pragmatic approach. Although I can not agree more with the idea that mere studies will not be of any help. We must go for grass root level action which will benefit the communities. Now, coming to the issue of rain water harvesting: the technology option for different water usage from rainwater harvesting will be different.

For drinking and other domestic water usage proven technology is available. The size of the tank only needs to be adjusted depending on the demand, mean annual dry period of any specific site, material of the roof etc. A lot of material is available in the net on these. Ferrocement tanks are the most economic solution.

Regarding ground water recharge of either a watershed or a specific surface water source, we must first undertake geo-hydrological study to establish the catchment area and accordingly finalise the plan of action. Hope this clarifies the situation further.

\* *Offline Contribution*

---

**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\\_se-clmt@solutionexchange-un.net.in](mailto:se-wes_se-clmt@solutionexchange-un.net.in) with the subject heading "Re: [se-watr] [se-clmt] Query: Water Harvesting for Adapting to Climate Change - Experiences, Advice. 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](https://creativecommons.org/licenses/by-nc-sa/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](http://www.solutionexchange-un.net.in)



[\[Message index\]](#)



[\[se-watr\]\[se-clmt\] CONSOLIDATED REPLY: Water Harvesting for Adapting to Climate Change. Experiences, Advice](#)

By: Nitya Jacob on Mon, 23 August 2010 13:47

Previous Topic: [\[se-drm\]\[se-watr\] Query- Urgent!- Seeking expertise for handling Oil Spillage in Mumbai- Referrals, Advice. Reply by 20 August 2010](#)

Next Topic: [\[se-watr\] QUERY: Improving water and sanitation services in Bihar. Examples, advice. Reply by 6 August, 2010](#)

-=] [Back to Top](#) [=-