MARVI

Managing Aquifer Recharge and Sustaining Groundwater Use through Village-level Intervention

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CSIRO

dsc Development Support Centre

IWMI International Water Management Institute

WESTERN SYDNEY UNIVERSITY

Australian Government
Australian Centre for International Agricultural Research

THE AUSTRALIAN WATER PARTNERSHIP

Partnership

- Nine organisations:
  - Western Sydney University
  - Development Support Centre
  - Arid Communities and Technologies
  - MP University of Agriculture and Technology
  - Vidhya Bhawan Krishi Vigyan Kendra
  - CSIRO Land & Water
  - International Water Management Institute
  - Mekong Region Futures Institute
  - Carnegie Melon University, South Australia Campus

32 Researchers + 34 Farmer Researchers (BJs)

Project team during the visit to the Meghraj Watershed.

Australian Government

Australian Centre for International Agricultural Research

MARVI project

1. Participatory data collection: groundwater - agriculture, attitudes, (villagers, schools)
2. Sharing information, building understanding
3. Engaging with policy makers, government agencies and other stakeholders.

… see Maheshwari *et al* (2014) MDPI J Water

Challenges

- **GW is invisible resource: ‘out of sight – out of mind’**
- **Inadequate knowledge – flow dynamics, hydro-geologic parameters**
- **Limited qualified, trained human resource at different levels.**
- **Working at grassroots' level and achieving positive change is hard.**
- **We need to change ‘hearts and minds’ of people about GW.**
- **We need to involve women and children in GW sustainability.**

Prevailing Myths

- **Only highly technically qualified people can understand and manage groundwater.**
- **GW is unlimited and there is a river or stream feeding it; so deeper we drill, better it is.**
- **Villagers cannot understand GW dynamics**

The MARVI Approach

MARVI =

Local management of groundwater; Improved livelihood and sustainability

Aquifer Recharge

- Understand recharge dynamics with rainfall and pumping
- Effective planning and design of recharge structures
- Performance of recharge structures, maintenance needs

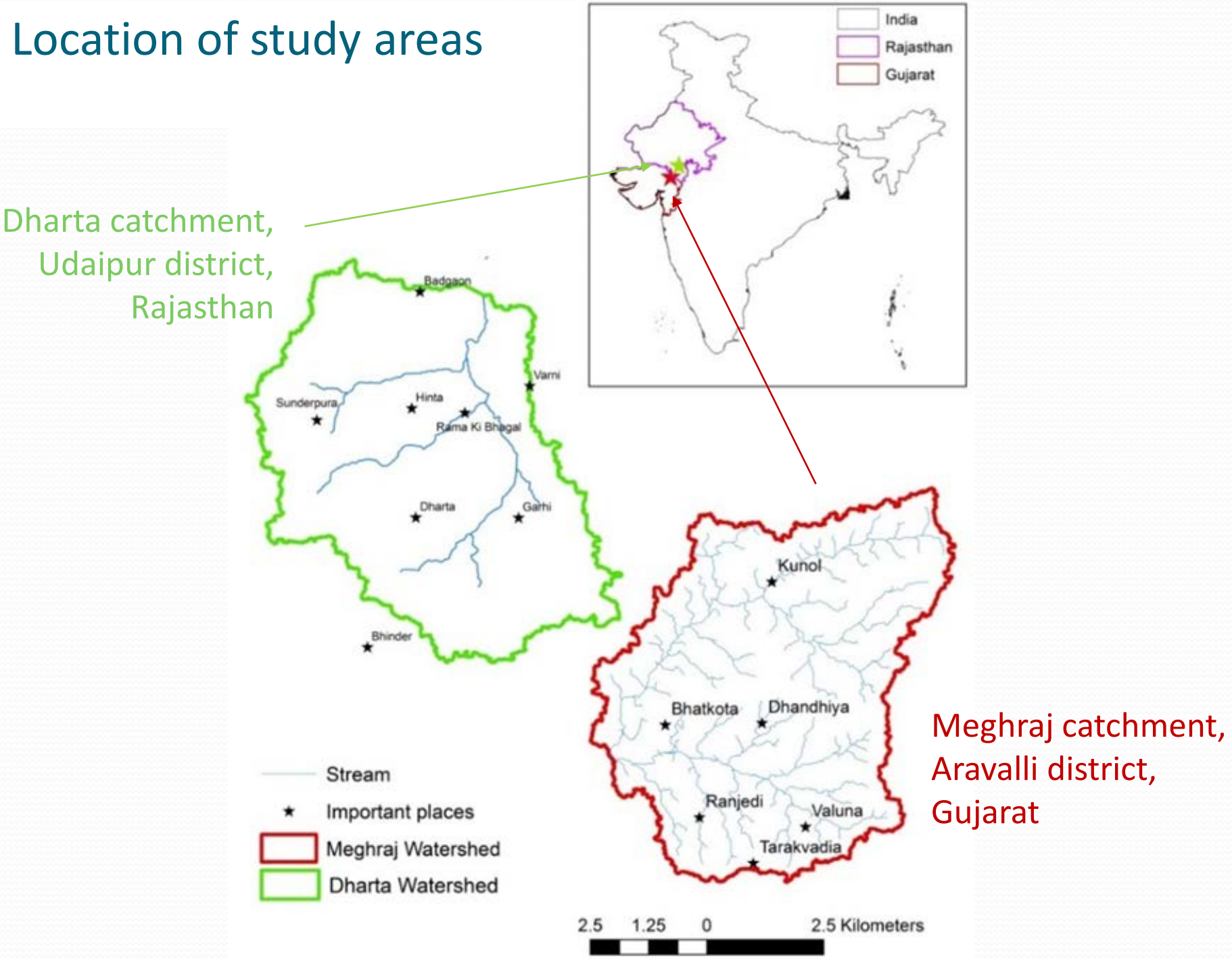
Groundwater Use

- Demonstrate agronomic practices that save water
- Select crops that use less water
- Irrigation methods that use less water (e.g., drip)

Village Engagement and Ownership

- Involve farmers and schools to monitor rainfall and water levels in well and check dams
- Village groundwater cooperatives (VGC)

Location of study areas



MARVI project - An experiment to give villagers the ownership of GW management

- Bhujal Jankaars (BJs) ‘Groundwater Informed’ (25 +10)
- Depth of water level in wells (weekly) and check dams (daily)
- Water quality and rainfall
- 250 wells in Rajasthan watershed and 110 wells in Gujarat watershed
- Giving ownership by increasing capacity and understanding of GW
- Trainings: mapping, watertable and water quality measurements.
- Exposure to basic hydro-geologic concepts

MARVI project - contd

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- Trainings: mapping, watertable and water quality measurements.
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Knowledge Transformation Processes for BJs

Base Map

- Beginning of understanding of village
- Superimposing of topographic and revenue information on one map
- Identification of land mark on map with villagers

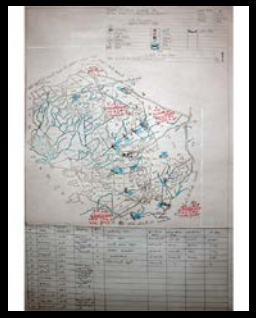
Land Use Map

- Mapping of grazing land, source wise irrigation etc.
- Area calculation form the map

Surface Geology Map

- Identification of rocks especially aquifer rocks
- Mapping of surface exposures of aquifer rock

Water Resource Map



- Mapping of existing surface water resource development
- Well inventory
- Beginning of sub-surface
- Understanding of water depth and quality (TDS pH)

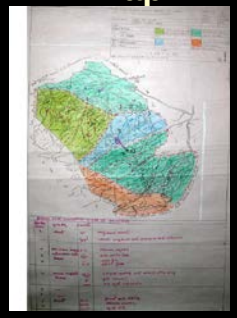
Land Foam Map

- Identification of land foam conducive for water resource development

Watershed Map

- Mapping of micro-watershed
- Water demand in each micro-watershed
- Run-off calculation

Strategic Planning Map



- Specific strategy for each micro-watershed
- Identification site and activit

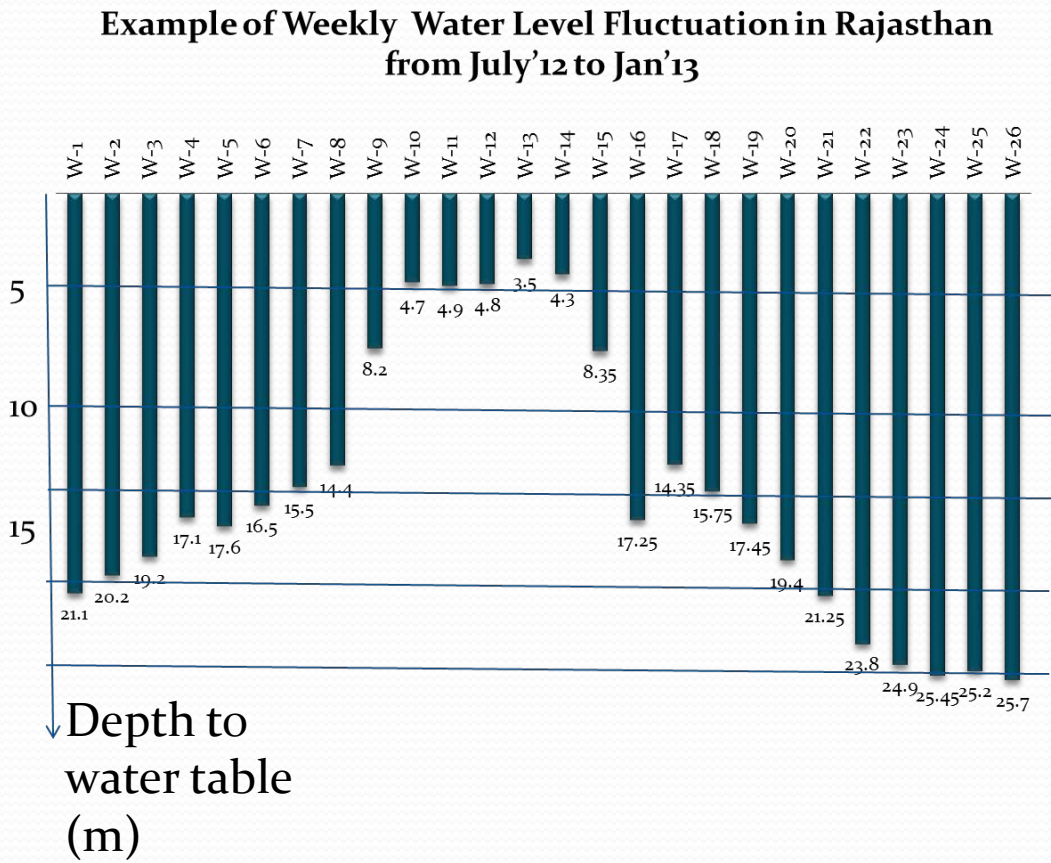
Tasks Performed by BJs

Resource Mapping

Bhujal Jaankars (BJs) were trained in making field measurements and in reporting back to communities

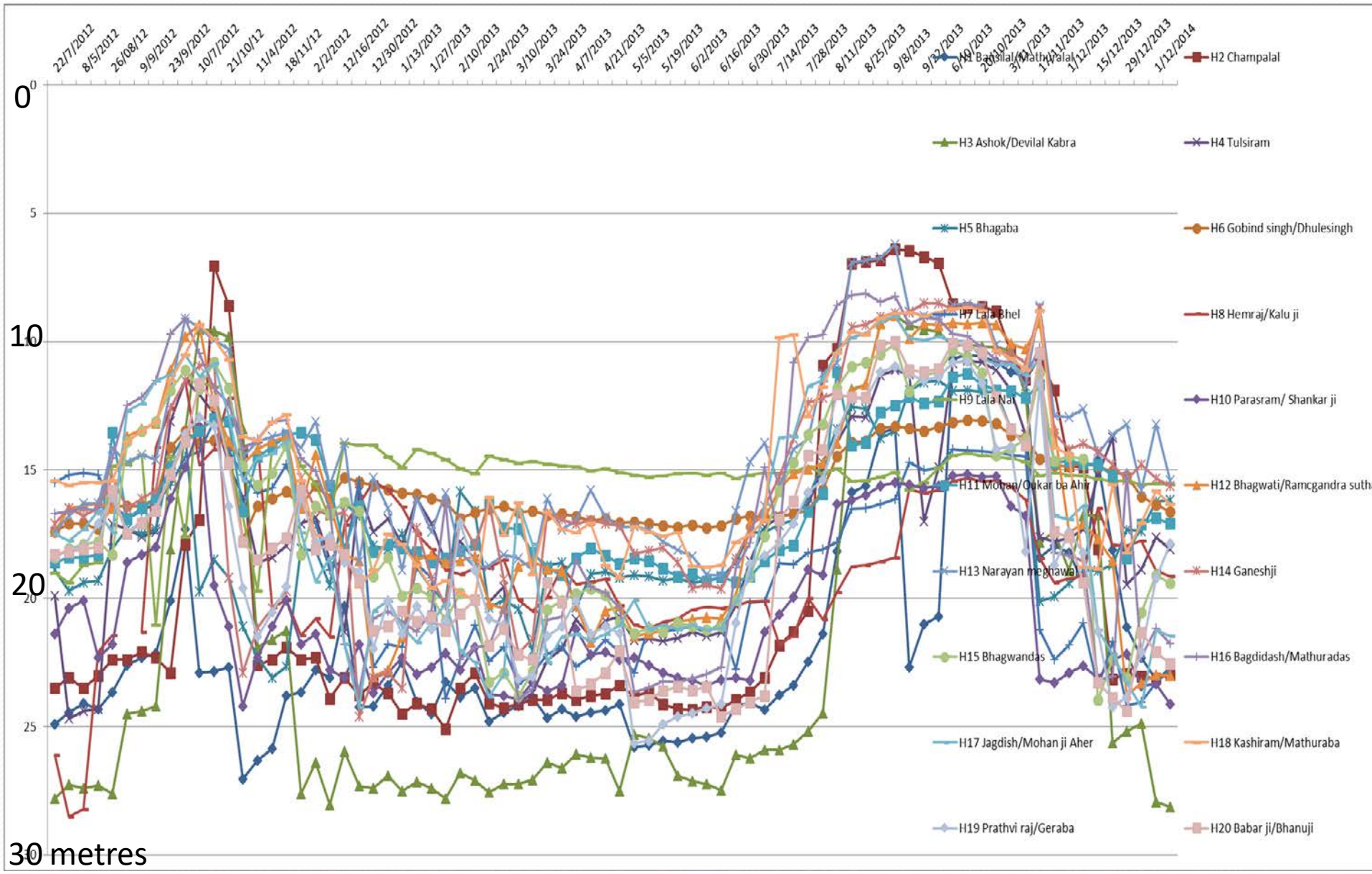
Kookana et al (2016) – gender and education; Packam et al

Groundwater monitoring by BJs

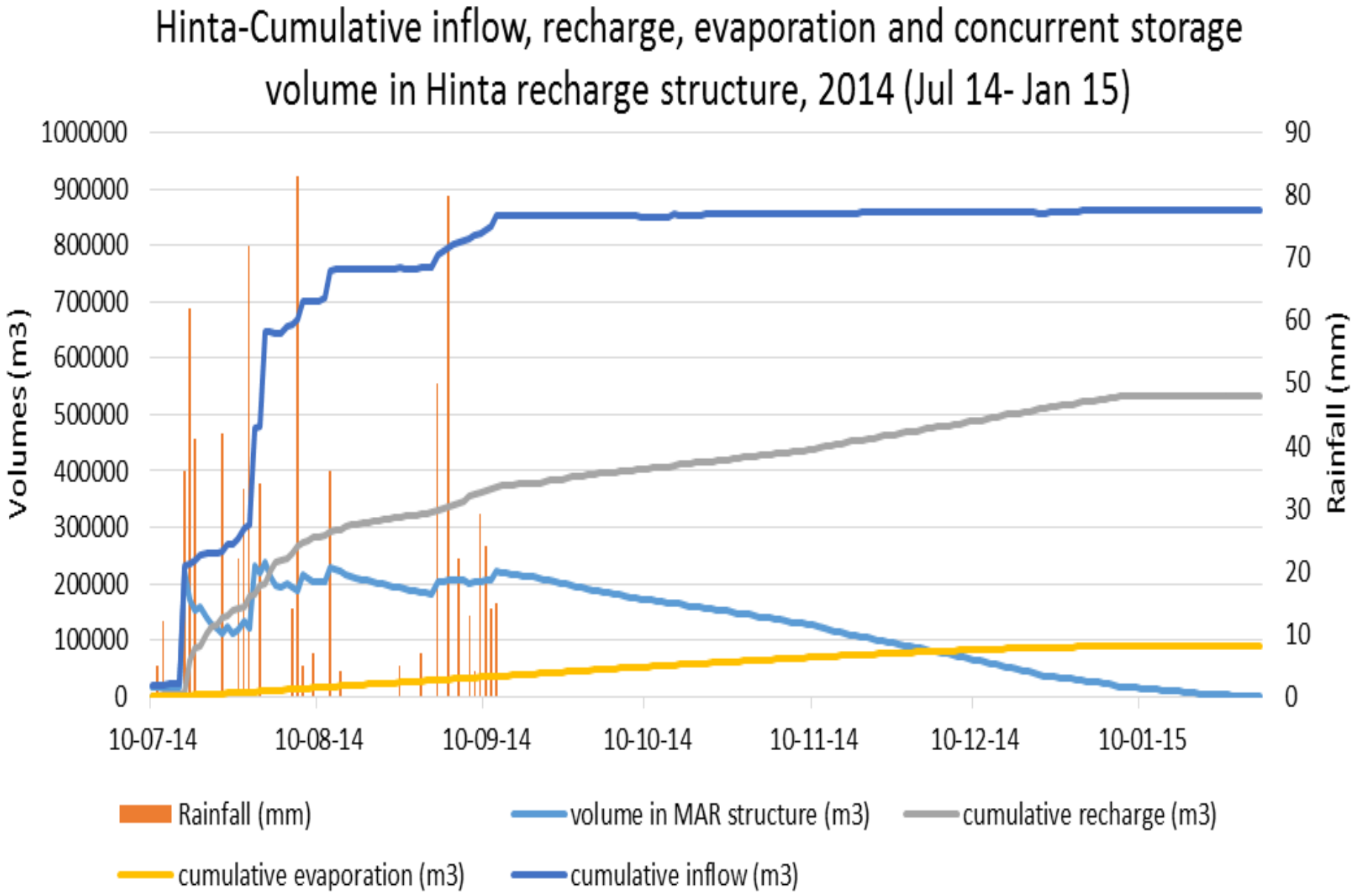


Hinta village hydrographs -20 wells

Depth to watertable in 20 wells, July 2012-Dec 2014



Checkdam monitoring and recharge analysis

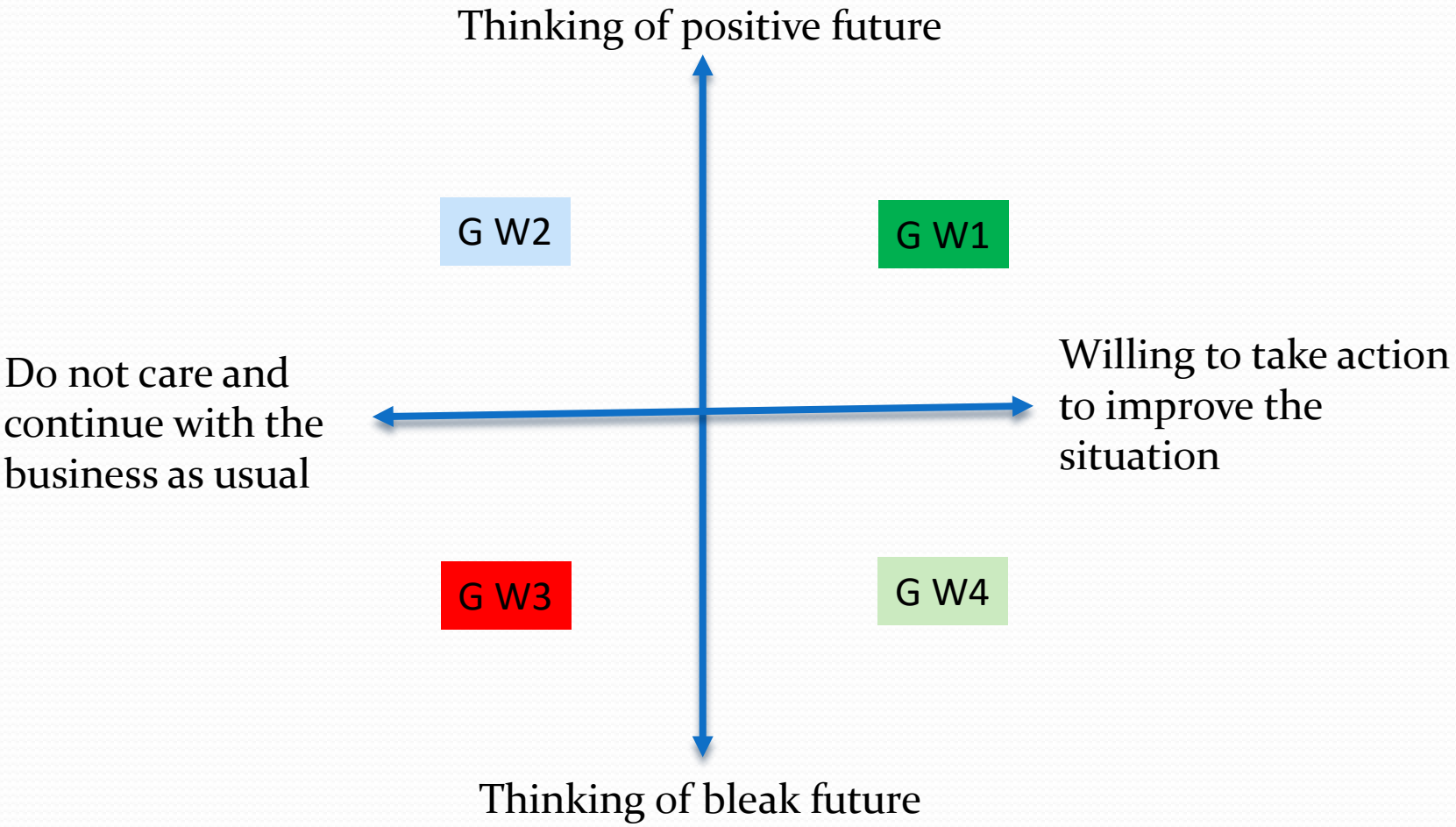


… from Dashora *et al* (2016) IGC Conf, Chennai (PhD student, MPUAT)

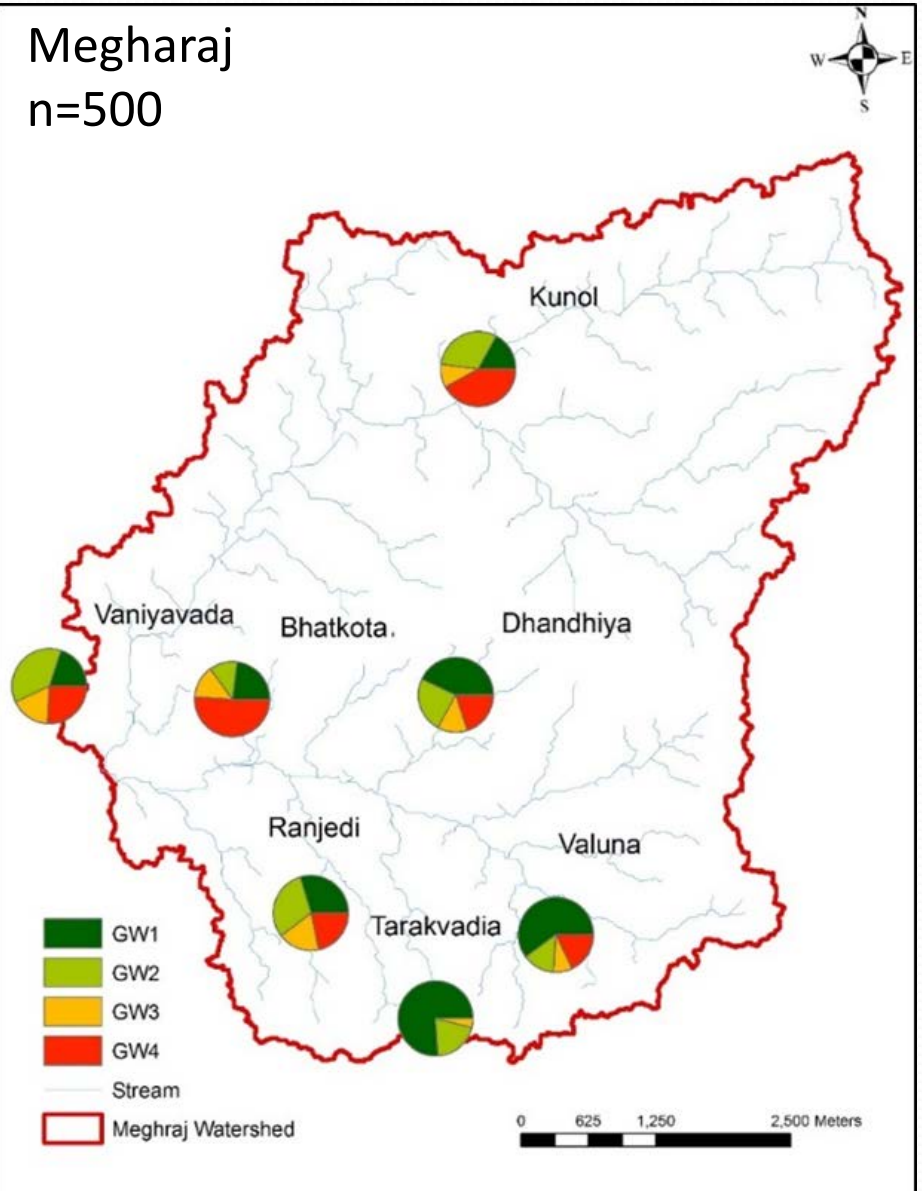
Understanding groundwater attitudes

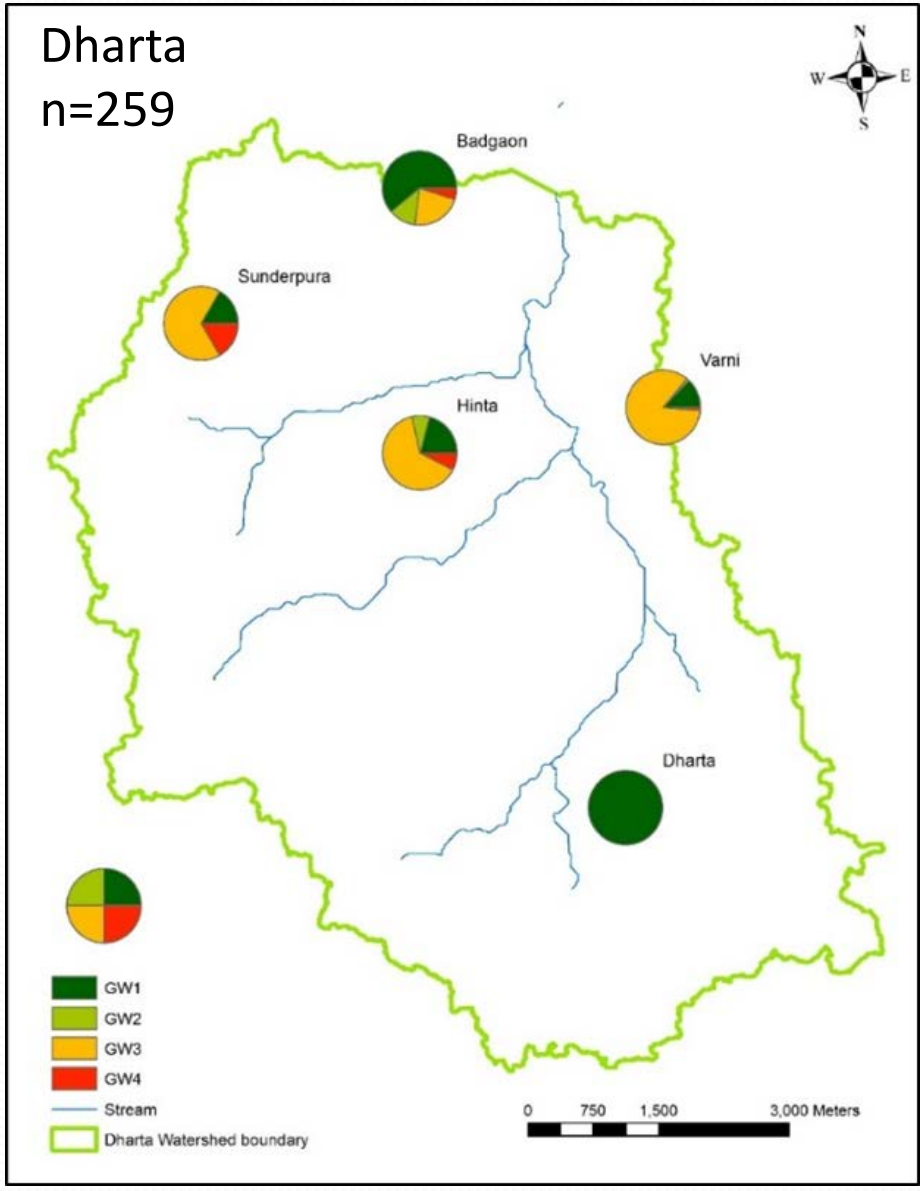
- Do you think that increasing the depth of your well has had an impact on your neighbours?
- Would you be willing to share the water and costs of a recharge scheme with other farmers close to you?
- Would you be willing to reduce the number of watering if it meant that water will be available in the future?
- If your neighbours drill deeper and your well dries up, should they compensate you?
- If you drill deeper and neighbours' wells dry up, should you compensate them?
- Would you be willing to adopt a new groundwater management scheme that shared water and costs fairly?

Four groundwater attitudes



Community attitude cluster proportions in surveyed villages in Megharaj and Dharta catchments (from Varua *et al* 2016)



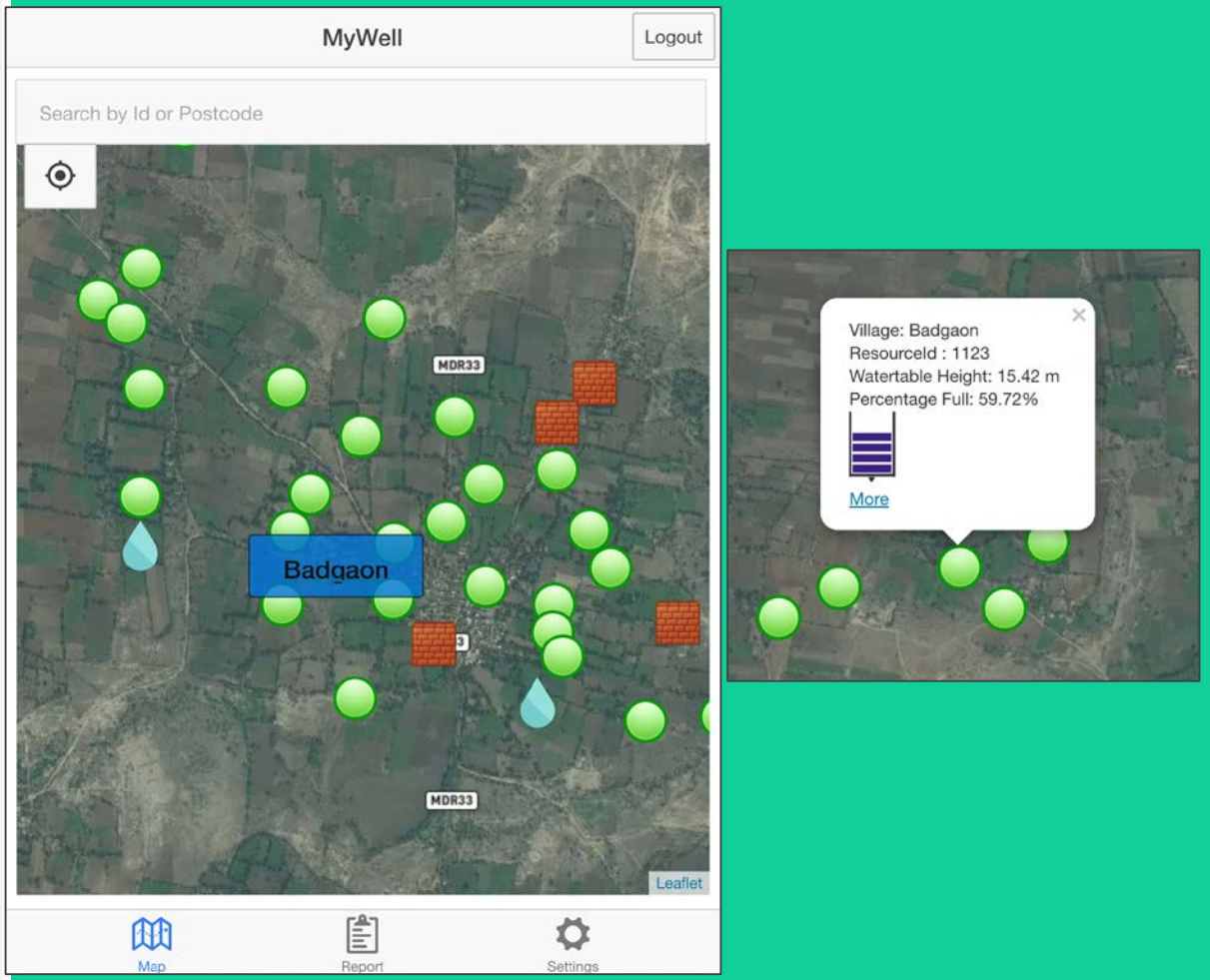


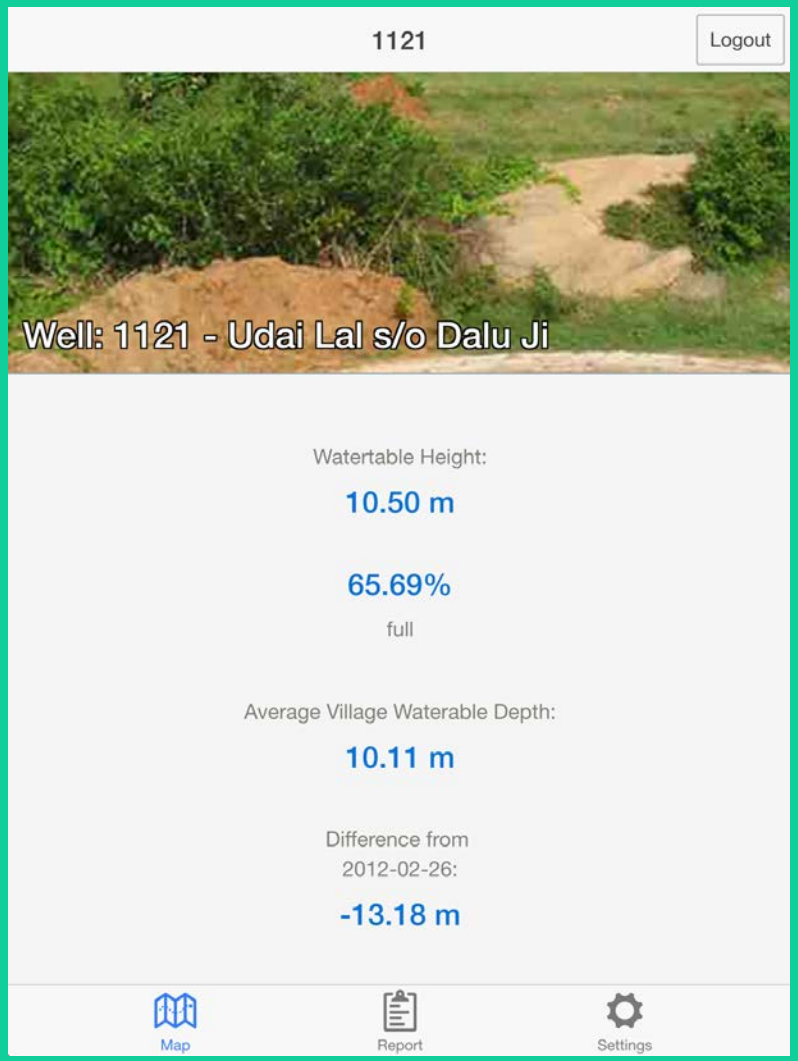
MyWell

A Well tracking app for iOS, Android & SMS

Developed by Lewis Daly under project MARVI

Map Page


MyWell
Logout
Search by Id or Postcode
Badgaon
MDR33
MDR33
Leaflet
Map
Report
Settings
Village: Badgaon
ResourceId : 1123
Watertable Height: 15.42 m
Percentage Full: 59.72%
More



Well Details

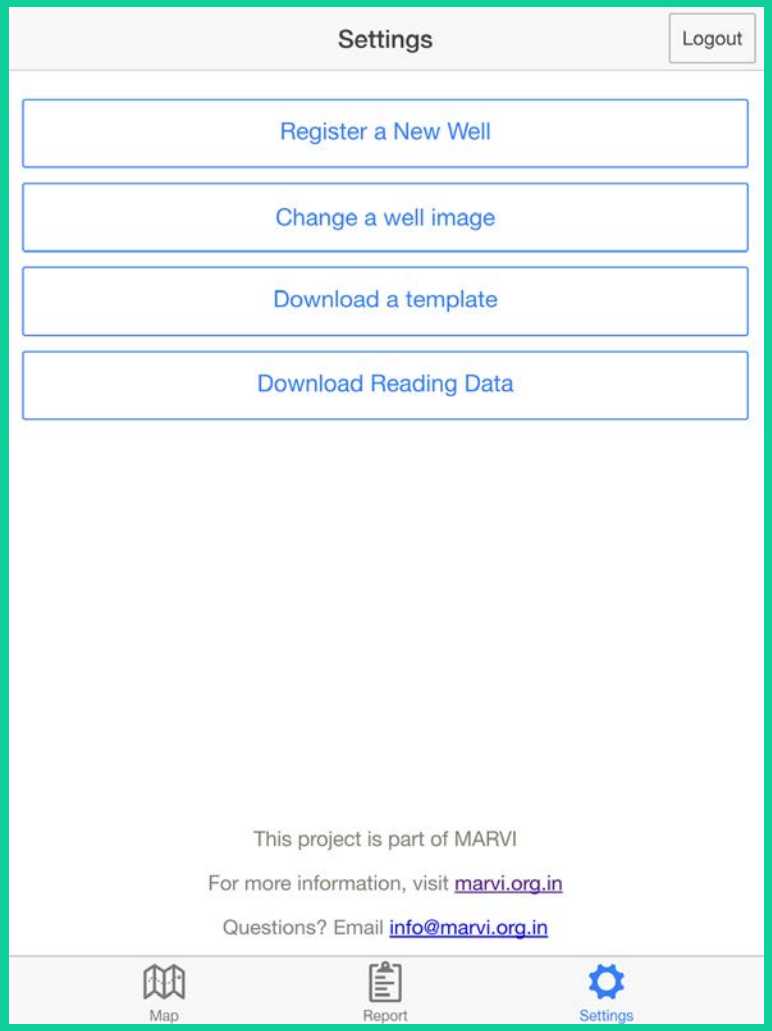
Pictures of the well

Crowdsourced information

Measured and well statistics

Historical Graphs

- Historical readings for 1 month, 3 month, or year long intervals
- Compare today's readings with the trends over the last 2 years

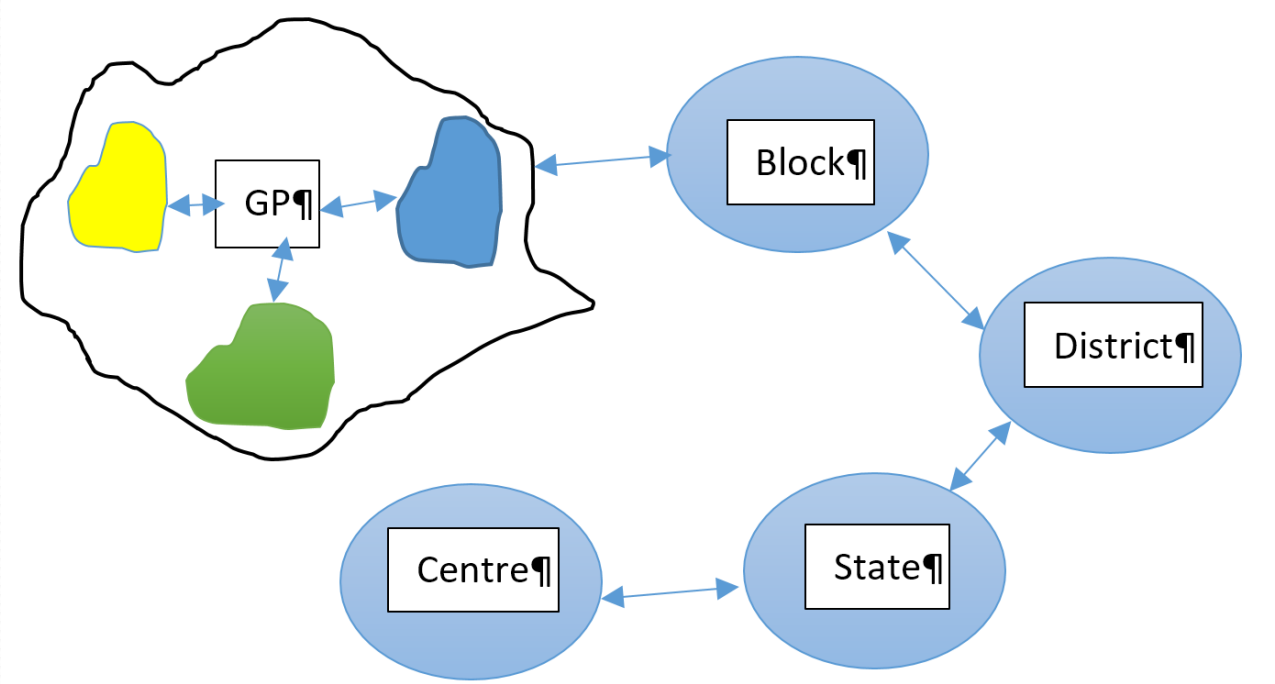

Settings
Logout
Register a New Well
Change a well image
Download a template
Download Reading Data
This project is part of MARVI
For more information, visit marvi.org.in
Questions? Email info@marvi.org.in
Map
Report
Settings

Management

Giving ownership of groundwater management to the locals

- The idea of 'village groundwater cooperative' (VGCs) emerged with the role of BJs, Gram Panchayats, NGOs and state agencies.
- Five groups in Rajasthan and six in Gujarat have in principal agreed to form these cooperatives
- Detailed dialogue is currently happening to develop the sharing mechanism and protocol (building on APFAMGS experience)

Village Groundwater Cooperatives



What can the MARVI offer?

- A village level engagement model to involve farmers and Gram Panchayt to have a meaningful dialogue about their groundwater situation and actions and help monitor watertable depths around their villages.
- A training program and resources Bhujal Jankaar (BJs) through basic hydrogeology and water management training.
- Analysis of social, economic, cultural and gender factors that impact on groundwater management, livelihood and overall well-being of village communities.

What can the MARVI offer?

- Excel based tools to estimate seasonal recharge from data collected through regular monitoring of watertable depth in wells, rainfall in villages and water level depths in check dams.
- An App, called 'MyWell', for collecting data on watertable depth, rainfall, checkdam water level and water quality with the help of BJs and other volunteers (crowdsourcing).

The way forward….

- Three Es of achieving groundwater futures
  - **Engage**
  - **Educate**
  - **Empower**

- Thank you!