India:
bare essentials of groundwater management

India

India's need for water is enormous. The United Nations' millennium development goal – to halve the proportion of people without sustainable access to safe drinking water – will help to meet it. But safe drinking water is not the only need; in large parts of India there is also a major demand for irrigation water.

In those areas, water shortages mean loss of income or even famine. Water supply projects try to deal with water scarcity, often by sinking wells and exploiting groundwater. However, providing a water supply is not in itself the same thing as managing water resources. Effective groundwater management is essential to safeguard the long-term supply of sufficient good-quality water for human consumption and irrigation. Marijn Kuijper, Deltares adviser on groundwater systems, and Frank van Weert, IGRAC groundwater management consultant, talk about their involvement in groundwater management projects in the Indian states of Orissa and Gujarat.

In India, local NGOs frequently play a major role in providing village-level water supplies. Such bodies are usually involved not just with water and sanitation, but also with livelihood development, microcredit schemes and women's education. Gram Vikas is one such organisation. Its name means, literally, 'village development'. Gram Vikas is active principally in the state of Orissa and has already helped many rural communities to create water and sanitary facilities. "But the number of wells and water connections is not the only thing that counts", says Marijn Kuijper, "maintenance is equally important, if not more so. And what happens if the well develops salinity problems or dries up? The local community won't have the necessary knowledge to carry out water management tasks". This realisation has led to the development of the 'barefoot hydrologists' concept. Kuijper explains: "By 'barefoot hydrologists' we mean people capable of carrying out basic water management in their own communities. Working in partnership with Gram Vikas, we train one person in each village to take measurements of the water level and water quality and to advise on the best location for new wells. We have developed a special 'toolkit' of elementary tests, for example to spot the presence of chloride and nitrate in the groundwater. We teach the people to carry out the tests and interpret

left: Training people • right: Local water pump

the results so that they can take action if there is any danger to health."

Capacity building

Data on water levels and chemical substances in the groundwater should lead to a better understanding of the water system as a whole. The presence of substances like nitrate, chloride, bi-carbonate, calcium and magnesium is an indication of the quality of the water but can also provide clues about its provenance; whether the substrate is clay or granite, for example. Kuijper: "All this information helps us understand the water system better and explain better how it works. We are also working on a geohydrological map of the region. Gram Vikas staff will input the measurement results into a database and actively monitor the status of the village water supply."

Together with Gram Vikas, project staff visit local research institutions, universities and government bodies with the aim of strengthening the contacts between them and Gram Vikas and seeing where they can cooperate. As part of the capacity building effort, Gram Vikas staff are being trained to become trainers for the next generation of barefoot hydrologists.

Successful strategies

Whereas the project in Orissa is primarily about practical groundwater management, in Gujarat Frank van Weert's task is to develop a groundwater model. "In the parched coastal zones of Gujarat, there is a lack of groundwater of sufficiently good quality to irrigate crops", he explains. "Salt intrusion as a result of the over-pumping of groundwater is a major problem and one that is expected to increase as time goes on. Our first priority is to produce a model of an area of Saurashtra measuring about 1,200 km^2. We can use this to analyse the effectiveness of the measures taken to combat salinization over the last thirty years and so to identify the most successful strategies. We are also calculating the effects of a number of future scenarios drawn up in partnership with Indian experts. Later on, we'll compare the area we're looking at now with other coastal areas in Gujarat, to see whether we can use the same research methods there."

"We teach the people to carry out the tests and interpret the results so that they can take action if there is any danger to health"

Indirectly relevant data

However, as Van Weert admits, this research methodology first has to be developed. "The data we expected to use as input for the model, like water levels in rivers and irrigation figures, proved to be unavailable. We had to think again. We're used to working with sophisticated models, which are very data-dependent. How >>>

>>> could we construct models for data-poor areas? We solved the problem by using indirectly relevant data, like what crops grow in an area and how much water is needed to cultivate them." This input was collected by partner organisation ACF, which was also responsible for local project coordination. "ACF stands for Ambuja Cements Foundation. It's an NGO set up by a major cement company. You see that a lot in India: big money-making firms re-investing a proportion of their profits in the community."

Mutual learning

To what extent is the project's experience applicable elsewhere? "Gujarat is not the only part of India where coastal areas face the problem of salt intrusion", says Van Weert. "For that reason, we've invited other states to attend a multi-day conference this autumn. We plan to present our research results there and hope in turn to learn from water management strategies in other areas. That's what it's all about: mutual learning. After all, I'm involved in the project on behalf of IGRAC and the IGRAC motto is 'sharing groundwater information and experience'." IGRAC, the International Groundwater Resources Assessment Centre, works under the auspices of WMO and UNESCO and is hosted by Deltares. (See www.igrac.net)

"You demystify groundwater knowledge for us"

The possibility of up-scaling is also part of the Orissa project, as Kuijper confirms: "Together with our Dutch partner ICCO, the Interchurch Organisation for Development Cooperation, we're now looking to see whether similar projects could be run in other parts of India or elsewhere. The success of a project like this depends on the presence of an organization like Gram Vikas, big enough to adopt our approach and perpetuate it later." Kuijper stresses that an essential part of that approach is the popularisation of knowledge. "We are making hydrology and groundwater management accessible to people at grassroots level. 'You demystify groundwater knowledge for us', as the director of Gram Vikas puts it."

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Delft-FEWS pilot in Australia

Deltares is working together with the Australian Bureau of Meteorology (BOM) to investigate whether Delft-FEWS could be used as an upgrade to their current hydrological forecasting environment.

A pilot project has been set up, within which a combined Deltares and BOM project team has implemented an experimental forecasting system for the Brisbane basin combining Delft-FEWS with the current BOM operational hydrological model URBS.

The system uses the new interactive forecasting paradigm added to Delft-FEWS for the National Weather Service in the USA. The first phase of the pilot has now been successfully completed and a second phase will be launched to look at possible implementation strategies for the whole of Australia.

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