Water Challenge - a blog by Peter Brabeck-Letmathe

Jyotigram Yojana – a step towards more sustainable energy and water management

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India is running out of water fast. "Competitive drilling for water has led to the destruction of our groundwater tables. Some aquifers in central India that took 10,000 years to accumulate water have dried up in the past 30 years," said Mihir Shah, a member of the Indian Planning Commission in a recent interview. According to a study by the U.S. National Aeronautical and Space Agency (NASA), India lost 109 cubic kilometres of groundwater between 2002 and 2008 because of indiscriminate use. This groundwater, which should only really serve as a buffer during years of drought, was moreover withdrawn in a period when rainfall was actually above 'normal'.

As a result, the country seems to be heading towards a major social crisis, a crisis that will only be made more acute by the associated economics of the situation: agriculture, heavily dependent on freshwater, accounts for close to 20 percent of the USD1.7 trillion Indian economy and close to 50% of employment.

Worldwatch Institute describes some of the reasons for the growth in excess water withdrawals. One of these is heavily subsidised electricity: *"The number of electric tube-wells in use in India has increased dramatically, from less than 1 million in 1980 to 12 million by 2001 and more than 15 million in 2010".* Given that the water supply is often precarious and unreliable, it is often better for a farmer to over-extract and flood his fields when electricity is available than to risk lacking energy and thus water when irrigation is actually needed.

Subsidies for electricity were only partly a political decision. Again, Worldwatch Institute explains what happened: *"Most electric companies switched to flat tariffs to avoid the increasing challenges of metering. These tariffs are usually based on the horsepower of the pump, regardless of water use, i.e., how long it runs".*

"As water tables drop, consumers (farmers and others) must extract water from greater depths, which increases dependence on energy subsidies to power tube-wells even more." The total amount of energy needed to obtain the water required for the irrigation of one hectare of land has increased five- to six-fold . This has led to a vicious cycle, as the increased generation of thermal energy will also consume ever higher amounts of freshwater.

The subject was also discussed at this year's gathering of The Growth Net in Delhi. Many ideas exist on ways to phase out subsidies for energy and irrigation, but the political barriers are very high. There is, however, one success story from Gujarat, namely Jyotigram Yojana (which stands for "lighted village"). The approach taken here consists of making energy more reliable by separating between different types of usage.

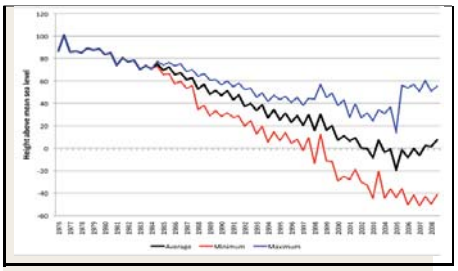
The scheme is currently a subject for debate in the ongoing and intense Indian election campaign, making it sometimes difficult to evaluate the information presented. But there are external organisations that have described several aspects of the scheme which are, for the most part, positive. Amongst these: the International Water Management Institute, a leading intergovernmental water research body headquartered in Sri Lanka (actually, the power separation scheme was based on research by ITP, a Gujarat-based partnership between the International Water Management Institute (IWMI) and the Sir Ratan Tata Trust), and Worldwatch Institute, founded by Lester Brown. Together with the Public Utility Board of Singapore, the scheme received this year's UN Water for Life Best Practice Award.

So, what is Jyotigram Yojana all about? Piloted in 2003 and completed in 2006, the Indian state of Gujarat under Chief Minister Narendra Modi separated power supply for irrigation from the power supplied for daily life in villages. Availability of the former is restricted to eight hours a day of uninterrupted, full-voltage power (still provided at a 75 percent subsidy). The timing of this supply alternates weekly between day and night, with different cycles followed in different villages. Balancing out usage across villages has reduced the overall cost of generating power. Meanwhile, the – unsubsidised - energy required for households is available 24/7.

"The high-quality, predictable and reliable power supply for tube-wells incentivised farmers to grow crops with high returns and cultivate all land they owned". The International Water Management Institute further reports that farmers were now "able to keep to their irrigation schedules, conserve water, save on pump maintenance costs, and use labour more efficiently". And, according to reports presented by the Gujarat government to UN Water, most farmers "welcomed Jyotigram for limiting competitive pumping of water and addressing the common property externality inherent in groundwater irrigation."

UN Water reports that "the average depletion of water levels in north Gujarat before the launch of this massive programme was around 3m per year, which by now would have cumulatively declined almost 20-26m – but there has been a reported average water level rise of about 4m during recent years." Government data suggests that farm power use for tube-wells has declined from more than 15.7 billion kWh7year in 2001 to 9.9 billion kWh in 2006. (T. Shah et al.; Groundwater governance through electricity supply management; Agricultural Water Management 95.2008; pp 1233-42).

An independent study (see chart below) from Columbia University seems to indicate that the decrease in water tables has at least slowed, albeit not everywhere across Gujarat.



Water tables in 170 tube-wells in Mehsana and Gandhinagar districts of Gujarat, 1976-2008. Click to download chart (39KB)

There are several elements that I find fascinating and worthwhile in this particular case study when addressing water issues elsewhere in the world.

One is that the water-energy-food nexus was understood and turned into a constructive solution. A second is that intelligent water rationing for irrigation led to market signals, with the price of water traded on the informal market soaring by 30-50 percent. A third and somewhat remarkable element: it seems that what is known as the “tragedy of the commons” can be at least partly overcome with better policies. If farmers see that the solutions proposed and provided are not just symbolic and make-believe but comprehensive and strategic, they can become powerful drivers of sustainability.

Overuse of groundwater is not strictly limited to India, but is a reality in more and more countries across the globe. One of my last posts was on drought and the falling groundwater table in the Great Plains of the US. The Stockholm International Water Institute estimates that about a fifth of water used globally comes from under the ground and that this share is increasing rapidly despite the fact that it is either not renewable at all or that withdrawals today have already extensively exceeded natural renewal.

I am looking forward to comments – first from my Indian readers, but also from other regions where ground water tables keep falling.