Safe Drinking Water for All:

a sector review of the opportunity for

Community-Scale Social Enterprises

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Background and Purpose of this Report

In 2007, Santa Clara University's Global Social Benefit Incubator decided to pilot a sector strategy. Based on extensive discussions between the GSBI faculty team and Dr. Allen Hammond, then the leader of BoP (base of the pyramid) research at the World Resources Institute, the concept involved recruiting a cluster of social enterprises in the business of providing safe drinking water to communities for the 2008 GSBI class and conducting research about the sector that could help inform water enterprises and allow them to benchmark their practices. The concept also included both opportunities for cross-learning among the cluster during the GSBI, and efforts to learn from the enterprises so as to "ground-truth" assessments of the sector arrived at during the research. The intent was to create intellectual capital about business models, best practices, technology options, water quality challenges, and related areas that would be sharable with community-scale water enterprises worldwide and on which the GSBI could build for future sector classes.

Business model admissions competition involved in the selection process for the GSBI and events that caused one enterprise to drop out at the last minute resulted in a sector cluster of four enterprises, three from India and one from Africa. As a result, some of the research (such as water quality challenges) was localized to focus on India. One of the enterprises (WISH/ PumpAid) operates in areas in rural Africa, where water supply from ground sources and appropriate sewage management are the primary concern, not water treatment (although additional treatment could be added if necessary). One of the Indian enterprises, Riverbank Filtration Technologies, provides water treatment of surface waters with an approach that improves water quality but may not—depending on local conditions—remove all pollutants in some instances. Here, too, additional treatment could be added as needed. Both WISH/PumpAid and Riverbank Filtration Technologies in some sense constitute "primary stage" water operations, and both are able to provide water at low prices, compared to other local options.

The other two enterprises (Naandi Foundation and Environment Planning Group Limited – EPGL, both from India) provide supply and more intensive treatment of either ground or surface waters. These "secondary stage" water operations are primarily focused on communities that have no source of safe drinking water—in India, a very large number of communities.

Thus the four enterprises that inform this report span a wide range of conditions, types of treatment, and business models—including a nonprofit leveraging a corporate social responsibility royalty revenue stream, a NGO that works closely with government, a hybrid business model incorporating both a social enterprise and an NGO, and a fully commercial operation. The purpose of this report is to highlight these four examples as a benchmark for other actors to compare themselves to, as a starting point of a comprehensive assessment of best practices, challenges and opportunities in the sector (which is described in the last section of this document). By summarizing the lessons learned about the technologies, business models and policies that characterize these four ventures, we begin to identify the elements that can encourage the participation of the private sector and social entrepreneurs in addressing the challenges of water quality and sanitation at the base of the economic pyramid. Thus the findings presented are the first element of what we expect will become a path that can be followed by companies and governments around the globe.

Acknowledgements

The authors wish to acknowledge the intensive collaboration of all four enterprises in generating the overview presented here—we salute their energy, social commitment, and savvy entrepreneurship. They are: WISH, in partnership with Pump Aid, operating in Zimbabwe and Malawi; Clean Water Through Riverbank Filtration, India, a project of the Tata Energy Research Institute and Rhode Island University; the Naandi Foundation, India; and Environmental Planning Group Limited, India.

The authors also wish to acknowledge Katie Vann, Nick Pearson, and Shabnam Karimi who assisted in early research on the water sector; the mentors for the water enterprises, who provided crucial insights to both the enterprises and to this sector overview: Bob Dench, John Van Dyke, Hardika Shah, Jeff Miller, Tim Haley, Paul Meissner, and John Micek and the comments and advice of a number of industrial and academic water experts, including leaders in Water for People, Acumen Fund, and California Water.

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Safe Drinking Water for All:
Community-Scale Social Enterprises

I. Introduction

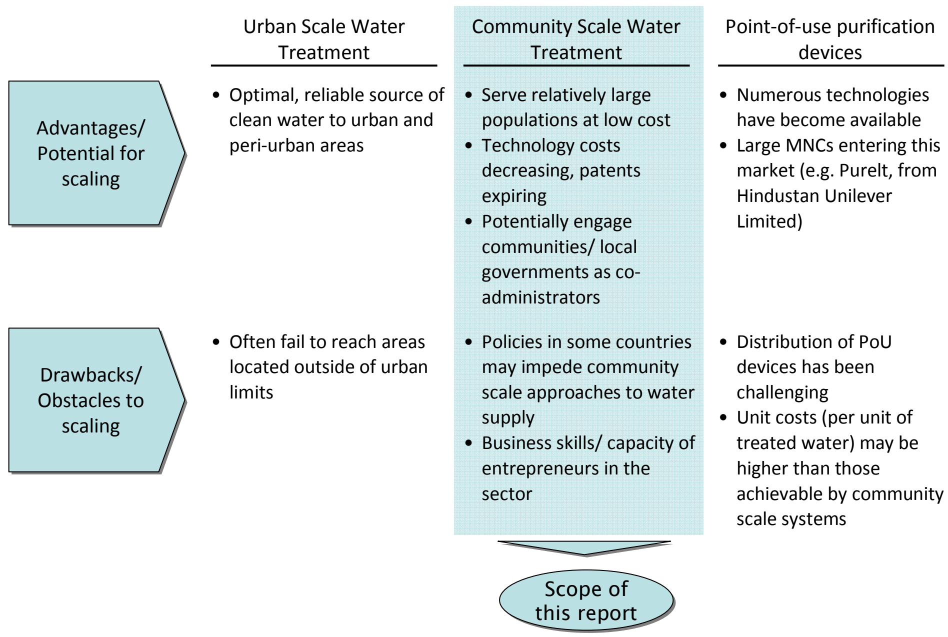
Close to 1 billion people in developing countries do not have access to safe drinking water, and more than 2 billion lack access to adequate sanitation. Global trends suggest that both ground and surface water sources, especially in developing countries, are becoming more, not less, polluted. These conditions constitute an enormous social challenge that has persisted despite significant efforts by governments and international agencies.

Another way of looking at this problem, however, is to observe that it constitutes a large unmet demand and hence a potential business or social enterprise opportunity. In fact, while commercial approaches to urban-scale water treatment have encountered well-known difficulties to reach beyond the city limits, a new wave of social entrepreneurs has not been discouraged from tackling the problem at a smaller, community scale. Their efforts in bringing down technology-related costs, working closely with local governments and with communities to influence the way they relate to this resource, have resulted in willingness to pay for clean water (and, in some cases, sanitation services) even in very poor communities, as experiences in India and rural Africa have shown. Indeed, we believe—and this report documents—that community-scale water treatment is potentially ready to take off and spur truly transformative change. The reasons for this include:

- Less expensive treatment technology and equipment, as patents for specialized equipment like membranes have begun to expire and manufacturing has moved to Asia;
- Rapid evolution of more sophisticated and potentially still cheaper treatment technologies;
- Novel business models being pioneered by social enterprises, which show significant potential for scaling; and
- Increasing interest of the investment community in emerging market infrastructure businesses such as water and sewage treatment, as shown by the numerous funds that have been announced recently.

By community scale, in the context of this report, we mean that water provision and treatment facilities are sized to serve all or part of a community or village (e.g. populations that fluctuate around 5,000 individuals). We distinguish these from point-of-use water treatment devices designed to serve an individual or a household—of which there are many, all of which face significant distribution challenges both for the devices and for replacement filters; and we distinguish these from systems designed to serve an entire urban area, usually with water piped to individual houses.

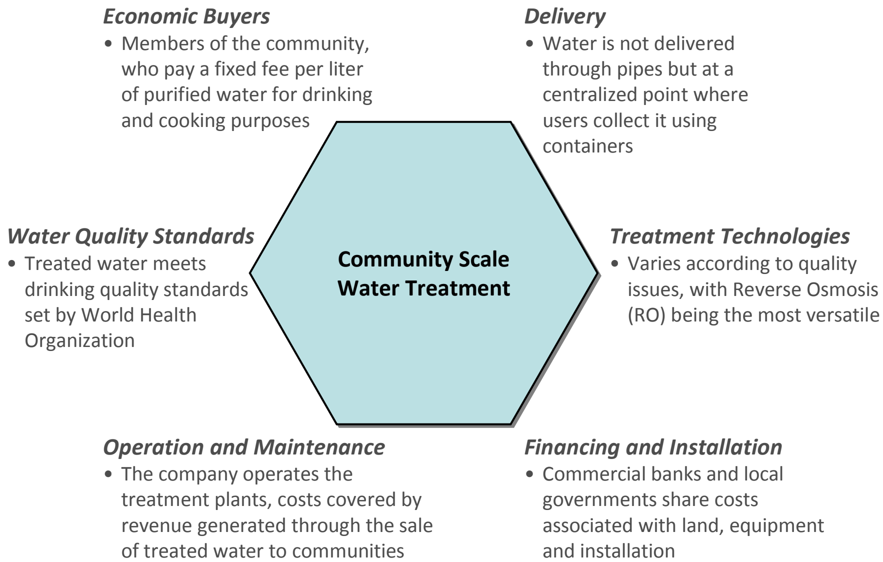
Figure 1: Treatment of Contaminated Waters for Human Consumption
Overview of alternatives



Community-scale social ventures, unlike public systems, typically do not provide piped water; rather they provide water at a central point, from which community members can fetch water in containers, which reduces the capital expenditures associated with these approaches.

While the treatment systems are community scale, the social enterprises that install and sometimes operate these units are larger in scale, serving hundreds of communities and aspiring to reach thousands of them in the coming years. There appear to be significant potential economies of scale inherent in these business models that suggest still larger service networks are possible and perhaps even likely. By way of example, two of the water enterprises analyzed in this report—if the scenario where they are able to fulfill their projections—will together provide clean water to as many as 30 million people in rural India by 2013.

Figure 2: Key Elements of Community-Scale Water Treatment Systems

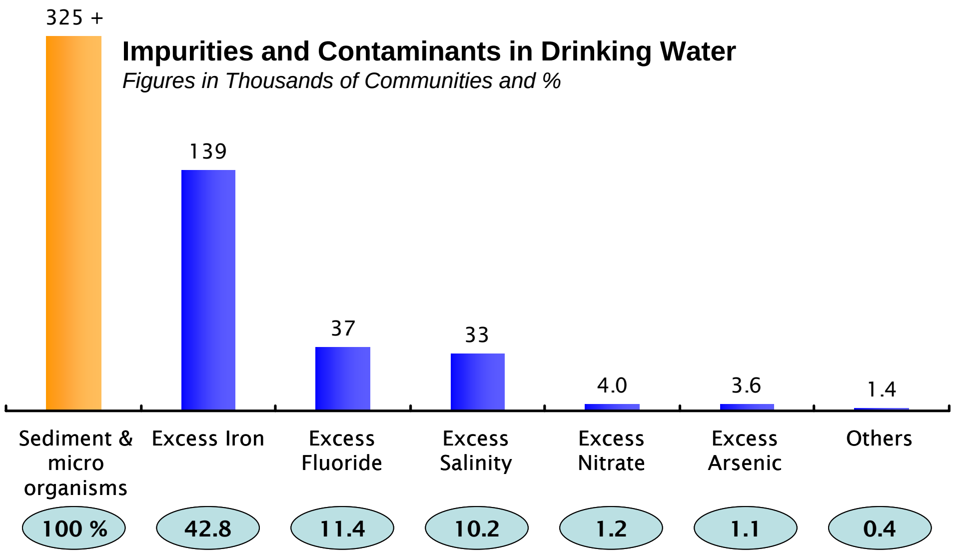


Water Quality Challenges

In India, where three of the four companies that inform this report operate, virtually none of the public water supply for rural communities is treated to remove bacteria, viruses, or other pathogens, and such contamination is widespread in both surface and ground waters. Moreover, large numbers of communities have water supplies that contain large amounts of iron, while smaller but still significant numbers face arsenic or other inorganic contaminants, pesticides or other organic toxics, dissolved solids, or saltwater intrusions.

These conditions are summarized for India as a whole in Figure 3. Thus, water treatment systems face widely varied challenges and must be adapted to meet local conditions—adding an ion exchange unit to remove iron or manganese, combining UV or ozone treatment to ensure elimination of micro-organisms, and typically using reverse osmosis membranes to remove most other contaminants, as explained in more detail in the next section.

Figure 3



(Source: EPGL)

Beyond India, water quality conditions vary significantly across countries and regions, but the diversity of quality challenges found in this country are likely to be present in many other geographies as well.

The scale of the unmet need is even larger for sanitation, but unlike water treatment, the nature of the challenge is quite similar everywhere. Nonetheless, a wide variety of solutions are being attempted. One example of such a solution, operating in rural Africa, is represented among the enterprises described in this report.

II. Technology Options and Performance Benchmarks

Human settlements have been providing and treating drinking water for a long time. Many different technologies for improving water quality are available, and their general effectiveness is well understood. The options include:

- Treatment by natural geological processes—such as filtration through sand, gravel, and layers of soils—that can remove many contaminants; wells that tap groundwater sources depend, in effect, on geological filtration to maintain the quality of that groundwater.

- Physical or chemical treatment processes such as coagulation and sedimentation or treatment with lime, which can remove many inorganic contaminants, or chlorination, which can kill biological contaminants such as bacteria and viruses;

- Adsorption by activated carbon or other materials, which is particularly useful in removing pesticides and organic contaminants;

- Ion exchange processes, often used to remove iron, manganese, or calcium (hardness);

- Treatment by ozone or ultraviolet light, typically used to kill biological contaminants;

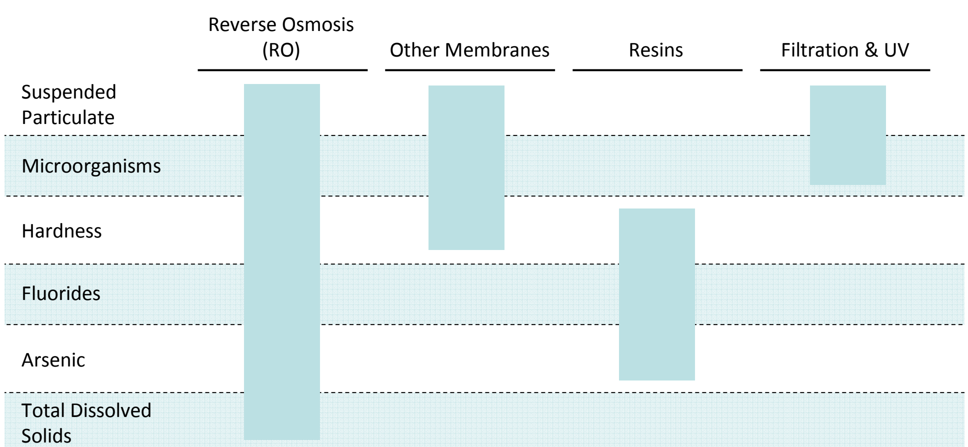
- Membrane processes such as reverse osmosis, that can be effective against virtually all contaminants, including saltwater intrusions;

The costs of these treatment options vary widely and depend to some extent on the scale, context, and purpose of treatment. Of the four social enterprises reviewed in this document, two depend entirely or largely on geological filtration. WISH/ Pump Aid helps rural African villages dig improved wells for drinking water and seal the wells so the groundwater on which they draw is not contaminated by village activities. The River Bank Filtration (RBF), a project of The Energy Research Institute (TERI) in India and the University of Rhode Island in the United States, is testing a process that drills wells to tap water from rivers that has been filtered through 100 meters or more of riverbank soils. Both are able to provide inexpensive water. However, both are dependent on local geological conditions and the extent of source contamination, so the water must be tested to assess the need for additional treatment.

The other two enterprises, Naandi Foundation (Naandi) and Environment Planning Group, Limited (EPGL), use water from both ground and surface sources and treat it with reverse osmosis technology, sometimes in combination with ion exchange to remove iron. They also sometimes use ultraviolet light to ensure complete control of biological contaminants during storage. Reverse osmosis has long been known as the most complete treatment process, but it was also usually more expensive, because water must be pumped through a specialized membrane that filters out the contaminants. However, in recent years, the patent on the membrane technology has expired and production of membranes and other components has moved to Asia, so that costs have dropped dramatically. Thus both Naandi and EPGL can use reverse osmosis in every village they serve—and additional treatments where necessary—to provide a family's drinking and cooking water needs for an entire year for less than $20, and do so profitably incurring in capital expenditures close to $1 per customer.

It seems clear that reverse osmosis is emerging as a key technology for community-scale water treatment, both because it can deal with the largest range of potential contaminants and because it is increasingly inexpensive. At the Capex range typical for both Naandi and EPGL, these units might well find broad applicability in many communities worldwide. Moreover, both Naandi and EPGL have shown that they can train local community members to operate and maintain the units with appropriate oversight.

Figure 4: Effectiveness of Most Commonly Used Treatment Technologies



III. Business Models

The previous chapter showed how community scale treatment schemes are surfacing as a private sector led response to the challenges of water quality and sanitation for poor communities in rural areas. Hence there are two components that are critical for the success of this approach: business models for achieving social impact and financial sustainability at scale and an enabling environment (which is explained in detail in the next chapter).

The description and analysis of the business models implemented by these social enterprises has the four following components:

- *Legal structure:* Are the social enterprises operating under for-profit, not-for-profit or hybrid structures?
- *Financing:* What mechanisms are being employed by these enterprises to finance the investments required for their growth (i.e. commercial finance, grants, government subsidies)?
- *Revenue streams:* What are the revenue streams that make these business models sustainable?
- *Partnerships:* What kind of partnerships are these enterprises employing? How do these partnerships --or the lack thereof-- translate into risks and opportunities for their models?

Legal structure

The four enterprises analyzed in this report share a common mission of making safe drinking water accessible to the poor in their countries but vary in the profit motive used to fulfill it, ranging from the purely charitable to fully commercial models. This influences their ability to access different forms and sources of financing.

Naandi Foundation and EPGL both operate their programs under fee based approaches that allow them to be sustainable. Naandi's "Safe Drinking Water" program, like all of those operated by the foundation, does not intend to realize a profit. Its business model, however, has been designed to cover all costs and produce a surplus, which is then re-invested in community development programs in the villages in accordance to agreements made with village governments. Environment Planning Group Limited (EPGL), on the other hand, shares much of Naandi's program (in terms of technology used, operations, maintenance, costs and fees charged) but works under a fully commercial structure, offering a return to potential investors.

WISH is a good example of a non-profit model exploring ways to transition into a commercial, market-based model. The social enterprise has its beginnings in Pump Aid, a corporate social responsibility supported charity that operates a water pump technology called “Elephant Pump” that has been successfully rolled out in many African countries over the last six years. It has also developed a sanitation solution labeled “Elephant Toilet”. Since its inception in Malawi, Pump Aid has seen growing demand and willingness to pay amongst various communities. This led Pump Aid to explore the possibility of engaging with Microfinance institutions and offering a comprehensive solution – consisting of water pumps, toilets for sanitation and gardens for nutrition – to these communities, under a partially-subsidized commercial model, whose subsidy portion is expected to decrease gradually over time, thus making WISH a fully commercial venture.

Given its experimental nature (the technology has not yet been rolled out in India) and the character of the organizations backing the project (an NGO in India and a University in the United States) Riverbank Filtration operates under a not-for-profit structure.

Financing

The financing models available for community-scale water treatment vary according to the legal structure and business model, and are evolving as the sector moves from a non-profit or charity-based model into commercial approaches that are able to become not only self sustainable but also profitable.

Again, Naandi Foundation and EPGL are examples of this trend. Naandi partners and works closely with state governments, who provide a large source of financing for its water activities at present. However, Naandi has also been able to tap into commercial sources of finance, which it expects will become more central to the growth of the water business. In contrast to this public-private model, EPGL is exploring commercial capital as its main source of financing. Both organizations have received financing from local banks in India like ICICI, as well as financial support from Acumen Fund, a non-profit venture fund based in New York City. However, international financial institutions are still wary of investing in water businesses, especially those designed to serve low-income communities. Business plan strategies to mitigate perceived risks will be key to accessing commercial capital.

Riverbank Filtration and WISH are examples of charitable models in which philanthropic capital is still the main source of financing. WISH has secured corporate royalties from Pump Aid, a CSR initiative of Thirsty Planet bottled water, which will subsidize a significant portion of the materials, labor required to install the pumps and toilets. The remaining portion will be financed through Microfinance Institutions that will provide loans for communities to provide the matching funds required by the model. Riverbank’s experimental phase has been funded by the leading organizations TERI and University of Rhode Island, while the capital expenditures related to the installation of the technology on site are expected to be financed through grants of multilateral institutions and, ultimately, from user fees.

Revenue streams

The sources of revenue for these social enterprises varies according to the profit motive and the costs associated with operating the different technologies. Both Naandi Foundation and EPGL derive 100% of their revenue from the sale of treated water in containers, charging a fixed amount per liter to final users. Neither Naandi nor EPGL derive any revenue from the sale of water treatment equipment (to local governments, for example). As an aside, it is interesting to note that the distribution infrastructure (kiosks) developed by both Naandi and EPGL has the potential to offer other services to communities and thus generate additional streams of revenue in the future. In fact, the centers where water is treated and collected could potentially be used to provide low-cost healthcare, Internet access and other valuable services to local communities.

WISH, on the other hand, doesn't contemplate deriving its revenue from the sale of water but from the sale, installation and recurring maintenance of water pumps and toilets. Corporate advertising on the surface of the pumps and toilets is another potential revenue stream being explored. However, this model is still not able to cover all of WISH's costs and expenses. Thus it will continue to rely on non-earned sources of revenue like grants and corporate royalties from Pump Aid, its parent organization.

Lastly, Riverbank Filtration projects that the recurring costs and expenses at the treatment plants will ultimately be covered by revenues generated by the sales of treated water (per liter) to nearby communities, although it is seeking donor funds to help launch the business. In this instance, a hybrid model with capex start-up funding from grants and fee-based earned income from operations may serve to achieve scale.

Partnerships

Although partnerships are not formally considered part of a company's business model, it is important to make a specific note on this issue and signal ways in which it could be seen as a source of risks and/ or opportunities for the long term sustainability of the models described above.

The first type of partnership that can be found in the four models analyzed relates to technology development. Naandi Foundation and Riverbank Filtration have employed this kind of partnership to incorporate specific technologies into their fundamental mission of providing safe drinking water to the poor. The case of Naandi shows the value of partnering with different technology providers (Naandi is not a manufacturer of water treatment technologies itself). Instead, it has developed skills in social marketing and other abilities critical to work closely with communities and local governments, leaving the technology end of its solution open to work with vendors that are able to deliver tailored solutions.

For instance, the company recently began using Reverse Osmosis technology after using Water Health International's UV chlorination technologies, mostly due to it being able to solve a wider range of water quality issues, thus proving to be more versatile and economically viable. Unlike Naandi, EPGL is directly in charge of every step in the value chain, from the development of community and local government relationships to the manufacturing, deployment and operation of water treatment technologies.

This makes Naandi's "technology flexibility" an interesting component of its business model, which can be viewed both as a competitive advantage (being able to adapt its solution and best of breed technologies depending on the specific context and water quality issues) as well as a strategic risk. With respect to the latter, there is the risk that manufacturers of water treatment technology move on to operating the models on their own. To turn this into a competitive advantage, it would be advisable for Naandi to keep developing skills that are key to the success of its business model, like the closeness to communities, local governments and, eventually, strategic allies that would be able to provide other services through its infrastructure.

Under this perspective, EPGL's model could be viewed as more vulnerable than that of Naandi, making partnerships a recommendable option to look into in the future –either for the technology development portion of its model, the community development activity, or any other step of the value chain.

Partnerships are also key in the case of both WISH and Riverbank Filtration, especially for funding and technology development purposes. However, there is one crucial partnership for all of the models described in this document, and it is one with the local governments and the regulating authorities. The next chapter describes the regulation that has enabled the successful participation of the private sector in the purpose of providing rural villages with safe drinking water.

IV. The Role of Policy

The five elements of nature in Hinduism include earth, water, fire, air, and sky. In graphical depiction water is represented by a circle, symbolizing fullness. In India water has been an object of worship since the beginning—representing the non-manifestation from which all arises. It is hardly surprising, then, that struggles and views around water are highly polarized.

The diversity of the bio-physical as well as political and religious aspects within India creates a tendency toward fragmentation and polarization rather than synthesis in solving water problems. The problems are exacerbated by rapidly rising population, bringing increased requirements for drinking water and sewage treatment, among other things. At the same time there is a growing awareness of environmental issues among both the public at large and industry.

In 1991 the Indian government launched a New Economic Policy, which tried to lead to market based approaches and privatization of urban water. At the same time the government has continued to invest in both drinking water and sanitation. Today, drinking water investments constitute about 3% of the national budget. Currently the Government sector contributes about 50% of the financing for water projects, primarily in the area of sewage treatment. The remaining 50% is provided by the private sector, primarily in the area of clarification, sludge treatment, aeration, disinfectant, and filtration.

The legal landscape

In order to understand the government policy role in water, it is necessary to understand privatization. The basic premise is that water is a commodity. While it is also a public good, it becomes a commodity once an investment is made in it. Therefore, rights over water do not preclude private investment. All surface water in India is a public or social good owned and controlled by the state. Groundwater, on the other hand, is a private good. The right to charge a price for it accrues not because of the intrinsic value of the water, but because value has been added in some way: cleaner, more reliable, impounding, etc. The crux of the issue is that the state doesn't transfer the ownership of water; rather it is the ownership of the service provisions that might be more efficiently managed by private companies rather than public systems. These service provisions are costly. They include the collection, cleaning up, storage, distribution from source to end user, and drainage of used and dirty water.

The government of India has a Ministry of Water Resources, which formulates and updates a National Water Policy. The policy sets forth, albeit sometimes without enough specificity, the role of the state in this area. It notes "Water is a prime natural resource, basic human need, and precious natural asset. Planning, development, and management of water resources need to be governed by national perspectives." From a policy standpoint the government role includes:

1. Providing guarantees against foreign exchange fluctuation and political uncertainty;

2. Ensuring privatization proceeds with public scrutiny and smooth functioning of private investment;

3. Encouraging water projects financed by combining public funds with private financing in transparent and acceptable ways;

4. Integrating water management for poverty reduction;

5. Planning and implementing water resource projects which involve complex socio-economic, equity, and social justice issues;

6. Fostering a national focus on science and technology training in water resource development and management in general;

7. Using IT advances for coding, classifying, and processing water related data as a precursor to resource planning;

8. Reorganizing existing institutions at various levels under the water resources sector with a view to effective management on a hydrological unit basis;

9. Organizing appropriate river basin organizations for planned development of river basins or sub basins;

10. Planning projects that pay special attention to needs of scheduled castes and other weaker sections of society;

11. Regulating the exploitation of ground water resources so as not to exceed the recharging possibilities.

Within a skeletal national policy, the Indian government directs the states to manage many of the water-use, land use, resettlement and rehabilitation policies for their sectors. The policy directs Water Users' Associations (WAPs) and local bodies such as municipalities and gram panchayats to be involved in the operation, maintenance, and management of water infrastructures and facilities with a view to eventual transfer of management to local bodies. Finally, the government has roles in zoning, flood control, land erosion, drought prone area development, monitoring, and distribution among the states.

Constraining/enabling factors in encouraging private sector participation

Water conflicts have now percolated to every level in India. These have been aggravated by the paucity of detail in the government frameworks, policies, and mechanisms to govern the use of water resources. Generally, the areas of conflict can be summarized in eight categories, all of which have the potential to be constraining factors. These include: contending water use; equity, access, and allocation; water quality; sand mining; micro level village disputes; dams and displacement; and transboundary water conflicts between large individual states since water is seen as a state subject. The last area is privatization. This area, particularly, could also become an enabling factor for policy development.

The government itself recognizes that private sector participation may help in introducing innovative ideas, generating financial resources, introducing corporate management and improving efficiency. They also see a role for building, owning, leasing, and transferring water resource facilities.

Privatization has potential if the constituent players can move beyond a "for or against" mentality to see water as both a social and economic good. Therefore, there would be implications for ownership rights, allocation, pricing, cost recovery, and regulatory frameworks. If one can accept the principle of price differentiation and also accept that the poor should be given water at a price they can afford, the issue of privatization is perhaps easier to incorporate in solving the complex Indian water challenges.

Additionally, the World Bank appears to be shifting its stand on advocating privatization as the only solution for providing water solutions. A more pragmatic approach of public-private investment is now seen as a viable third alternative. With a population expected to reach 1 billion 390 million by 2025 and the UN Millennium Goal which seeks to halve the 1.2 billion people in the world without water and 2.4 billion without sanitation by 2015, multiple models that provide viable, transparent solutions are imperative.

Summary

Several factors lead us to believe that the examples presented in this report are only a modest sample of the transformative revolution that is fast approaching in the sector.

i. *Commercial viability and returns on investment:* The business projections developed by these four enterprises in the course of GSBI 2008, if they are accurate, suggest that at least two of the enterprises (Naandi and EPGL) will be fully able to offer an attractive return on investment while achieving their social mission of making clean drinking water accessible and affordable even for the poorest of the poor; a third one (WISH) is likely to provide water and sanitation to large numbers of people with a very modest subsidy. As commercial capital and interest of the mainstream financial system grows, similar models will likely arise and additional capital will become available to invest in the sector, multiplying the potential scale of this activity.

ii. *Alternative sources of capital are growing rapidly.* Recent announcements signal a growing interest in water and sanitation projects around the globe. Just to name a few, the Global Water Challenge announced investments for a total US$ 25M for clean water projects identified through Ashoka's Changemakers platform; Pepsi announced an additional $4 M of investment in partnership with WaterCredit, a program that is delivering clean water and sanitation solutions in partnership with Microfinance institutions; a $30 M Global Sanitation Fund was announced by the Water Supply and Sanitation Collaborative Council and Calvert Foundation has also announced the creation of an investment fund focused solely on water-related projects.

   By these measures, and assuming these investments succeed and generate an impact per dollar invested roughly comparable to that observed in the business projections studied here, the recent commitments could potentially impact the lives of 150 million people worldwide.

iii. *Technology is evolving rapidly.* Already, reverse osmosis equipment is so inexpensive in Asia that it astonished U.S.-based water experts and has created interest among social entrepreneurs in Latin America, Africa, and other parts of Asia. Newer, potentially less-expensive filtering technologies are also appearing: indeed, one of the water cluster enterprises is already evaluating a newer technology not discussed in this document.

iv. *Demand will continue to grow.* The authors believe that the challenges associated with water scarcity, water quality and access to sanitation will only continue to grow, making private sector involvement critical. For that reason, and realizing that knowledge sharing, business skills and capacity building are critical for these approaches to achieve scale, the GSBI and its partners, including water experts, venture capitalists, and others involved with promoting social entrepreneurship expect to continue working on promoting private sector investment in community-scale solutions to these challenges. A follow up summit of GSBI's water sector companies and additional water sector social enterprises is expected to take place in India in early 2010. GSBI, World Resources Institute, Ashoka, Acumen Fund, and other organizations are expected to be involved.