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IWMI-TATA
Water Policy Program

Water Policy Research
HIGHLIGHT

How Sustainable are Rural Water Enterprises?

Synthesis of ITP-INREM Studies from Six States

Rural Drinking Water Enterprises (RDWE) have emerged as a response to water scarcity and quality problems in villages. Initially limited to pockets, now they are widespread in some states of the country. Different government policies have encouraged such enterprises as part of rural drinking water programs. Mostly using reverse osmosis technique, the enterprises are of varying nature, with some entirely community owned, some privately driven and most in the middle with a mix of social and business objectives. Our field studies found that many of these enterprises are unviable without external funds, and unsustainable without additional measures to manage their water source. No wonder most of them are performing poorly, if not folding up or lying defunct.

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How Sustainable are Rural Water Eenterprises? *†

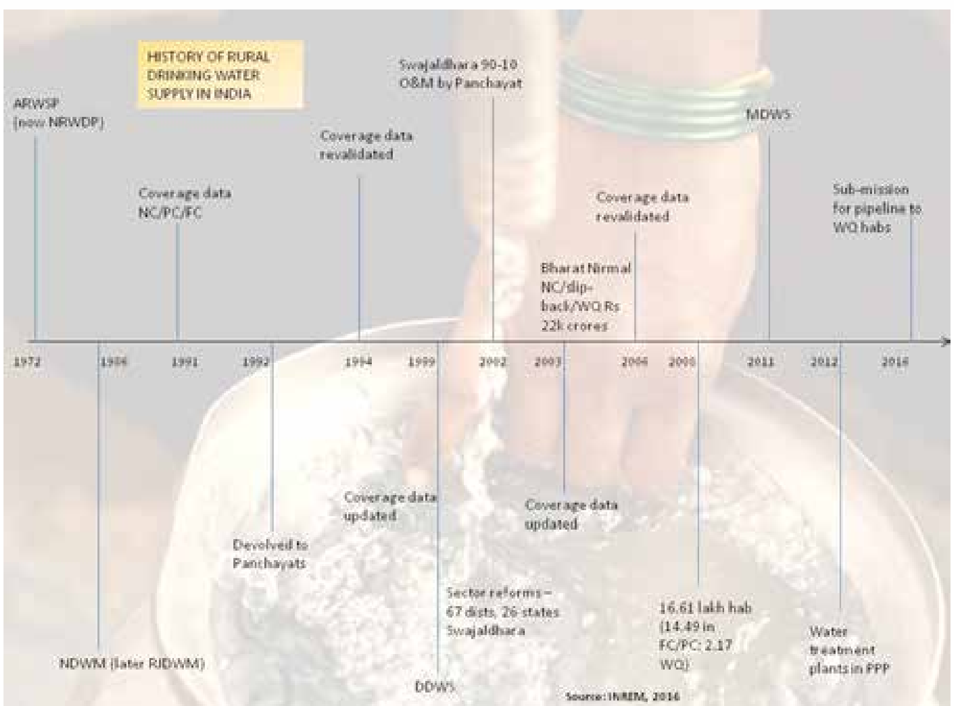
Synthesis of ITP-INREM Studies from Six States

Research Highlight based on ITP-INREM case studies of Rural Drinking Water Enterprises by Bharti (2016); Chekuri (2016); Krishnan and Indu (2016); and Krishnamurthy (2016).

1. Background

Rural Drinking Water Enterprises (RDWE) have emerged in India in a unique way over the past two decades. Active encouragement from government policies as well as community and private enterprise have led to the current state of the RDWE sector. However, one cannot ignore the history of how rural drinking water has developed in (Figure 1). Rural drinking water policies can be formally traced back to the early 1970s when the Accelerated Rural Water Supply Program (ARWSP) was initiated (MDWS 2011). A lot of focus in the initial days was on creating new water sources, mostly in the form of borewells and hand pumps, and in some cases, surface water based schemes. By the mid-1980s, the National Drinking Water Mission (NDWM) was formed which later morphed into the Department and then the Ministry of Drinking Water and Sanitation (MDWS) in 2011. A critical watershed point was in 1992 when the 72nd Constitutional Amendment devolved drinking water to the *Panchayats*, in principle. Since then, several reform initiatives have been attempted, mainly *Swajal* and *Swajaldhara*, starting from late-1990s.

Figure 1: History of rural drinking water supply in India



Within all of this, the tracking of rural water supply and it efficacy started from mid-1990s, and it was realized that quite often there is a slip-back in habitations i.e. going from a well-performing water supply to a poorly functioning or defunct one. Also, water quality problems emerged, and at last count, 2.1 lakh out of 16 lakh habitations face water quality issues. Several initiatives such as Bharat Nirman and others were attempted, but this critical gaps of water supply quantity and quality have remained. Sustainability of sources in the face of groundwater over-exploitation, and quality of drinking water are the two main challenges that face the sector.

2. Development of RDWE

As a response to failing rural water supply systems, water quality issues, and rising aspirations of people, drinking water enterprises started emerging from (Figure 2). Studies in rural Gujarat showed that Reverse Osmosis (RO) plants in Mehsana district of north Gujarat were operating since 1996. However, such development of RDWE was limited to certain pockets, mainly in western and peninsular India. In villages, some 2-3 per cent of the population consumed such water with payment (Indu and Shah 2002).

The real growth of this sector started happening around 2003 with several medium scale formal enterprises starting their activities across India, such as Naandi, Byrraju Foundation, Bala Vikas, Water Health International, and a few others. Most of these were located in Andhra Pradesh and Hyderabad became a hub for RDWE. Meanwhile, Gujarat government, after observing the growing demand from rural areas, went ahead with Pani Samiti based community RDWE in 2003, with programs such as Swajaldhara. Such

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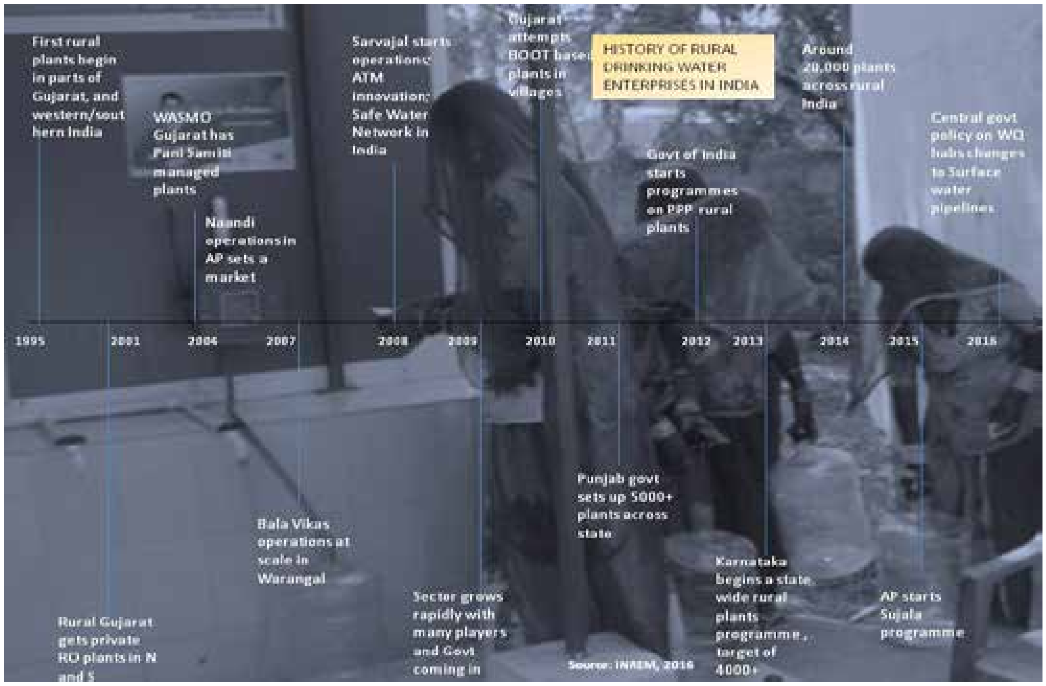
policies encouraged the spread of RDWE in Gujarat, and helped them reach a larger population. Field studies showed that these plants had reached around 20-25 per cent of the population in areas where they operated; and were successfully running for more than 5 years (Krishnan and Indu 2007). The Gujarat experience encouraged many state governments to look seriously at Public-Private-Partnerships (PPP), and Punjab went ahead with a Build-Own-Operate-Transfer (BOOT) model in 2008. Gujarat followed with its own BOOT model in 2009. The central government came with its own policy in 2012 in which it encouraged PPP-led RDWE for fluoride and arsenic affected habitations across India. This led Karnataka, AP and later Telangana and Rajasthan to have their own policies for promoting RDWE.

Figure 2: History of rural drinking water enterprises in India



Rajan's analysis for Unitus Seed Fund (Rajan 2014) identifies 3 types of models: [a] Outright sale of water through a joint partnership with the *panchayat*; [b] sale and maintenance model, in which the entity maintains the system for a fee, but ownership is with the government or *panchayat*; and [c] franchise-based model, in which a local entrepreneur also contributes part of the cost of the system, and there could be a tripartite arrangement with the *panchayat*.

A review by the Safe Water Network (SWN) of formal social enterprise models estimated that around 7,000-12,000 RDWE operated across India (SWN 2014). With new state government initiatives, we estimate this figure to be close to 20,000 now. The SWN study observed 3 types of models: [a] Public-Private model; [b] Community manages services; and [c] Private model. They identified several challenges to scaling up RDWE; primary among them were poor recovery of even operating expenses (Op-Ex), lack of consumer demand, skill gap among operators, environmental issues of wastewater disposal, source sustainability, and policy issues such as tendering process, and role of local governing bodies.

3. ITP-INREM Case Studies

Given this backdrop, in 2016, ITP-INREM undertook 11 case studies of RDWE covering a range of institutional types across six western and peninsular states – Punjab, Rajasthan, Gujarat, Karnataka, Andhra Pradesh and Telangana. The broad objectives of the case studies were:

- To observe and identify the diversity in landscape of RDWE across India;
- To bring out key concerns centered around these enterprises , with respect to safe water provision to rural people; and
- To look for ways forward for the RWDE Sector in the larger context of national and regional rural drinking water policies.

Each ITP-INREM RDWE case study focused on the following research questions / aspects:

- What institutions run the RDWE model and their partnerships
- Technology type and size description
- Financing models for the model
- Type of users , their profiles, and how it is promoted, pricing
- Services offered by the model
- Performance in terms of financial sustainability, resource sustainability and users' water security

The case studies were discussed in a authors' workshop in October 2016. Besides researchers, the workshop also invited industry representatives from Sarvajal, Cairns India CSR and the Safe Water Network.

4. Key Issues from ITP-INREM Case Studies

The key concerns raised by the ITP-INREM case studies are:

- **Lifeline Water and Equity:** Drinking water, being a basic human right, the question that is often asked to RDWE, especially when they are promoted by government policies, is what about '*lifeline water*' that cannot be afforded by the poor and marginalized. By putting a price to this basic need, issues of equity within the community are raised. These issues are countered by RDWE with the argument that at the very least, maintenance costs have to be borne by the community. But the debate continues.
- **Water Reject and Source Sustainability:** The primary technology being used is RO, which rejects 30 to 90 per cent of the total water used, based on the original mineral composition. Mostly, this raw water is let out into drains and ponds, raising the concentration of salts and toxins in them. These are directly consumed by cattle and other animals, and such wastewater also goes back to the aquifer, raising questions of hyper-concentration in

shallow aquifers. Second, the contracts of RDWE do not, except rarely, take into account sustainability of the water source, mainly borewells. Drying up of borewells leads many plants becoming unviable; making it difficult for the operator to deliver acceptable level of service.

- **Choice of Technology and Overkill:** It has been reported widely, even by apex government institutions such as NEERI, that RO as a choice of technology represents an overkill for most of the problems of rural water supply. However, even when alternatives have been presented, they have rarely scaled up like RO, owing to a big market push for the technology. The issue however remains a concern. Historically, there are many reasons for RO to be widely adopted in India. A large part of western India lies in a high salinity region and some solution was sought for since the 1960s to desalinate and make water supply possible. Agencies such as the Bhabha Atomic Research Centre (BARC) and Central Salt & Marine Chemicals Research Institute (CSMCRI) have been doing research on desalination technologies since late-1960s. RO was a product of this research and there has been very high promotion of this technology by the government as there was no perceived alternative during that time in some areas. With cost becoming affordable and policies favoring import of membranes, many enterprising and community-oriented NRIs (Non-Resident Indians) starting installing RO plants in villages of erstwhile AP and Gujarat. This triggered the spread of RO technology and gradual support through government programs such as *Swajaldhara*.
- **Power Availability for Operations:** The need for 3-phase regular connection in villages is a big constraint especially for RO-based solutions. Now, single phase innovations are coming up, but still erratic power supply becomes a big problem for many RDWE in remote areas.
- **Demand for Treated Water:** The basic constraint for RDWE is the lack of sufficient demand for treated water among rural populations. Except in some pockets, this is a major bottleneck that prevents RDWE from becoming viable enterprises. Even when willingness to pay studies indicate high interest, the reality of people repeatedly accessing water from RDWE is quite bleak. Thus, demand generation is key, or else RDWE are having to do their own marketing/communication as much as is possible.
- **Viability of Recovering Op-Ex:** The basic premise of water enterprises is that once they are setup, there is high possibility that they run forever without any external support. The additional expectation is that they also give birth to new enterprises. However, in practice, even recovering Op-Ex is difficult for many RDWE. Attribute it to low coverage or price (₹2 per 20 litres – low from the RWDE viability perspective but perhaps too high from the perspective of the rural poor).

5. Key Learnings from Case Studies

5.1 Community Engagement and Participation

One important learning from our case studies is that either there is an inherent demand within the community for good quality drinking water, or it needs to be generated through different forms of community engagement. Within our case studies, we have come across two very different, but interesting, examples of such involvement that have helped improve RDWE viability and sustainability.

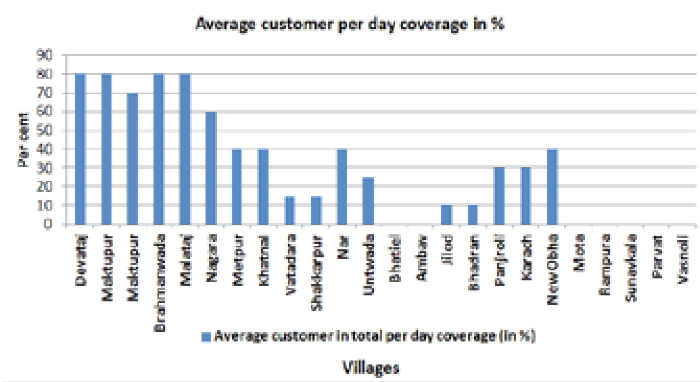
- **Water and Sanitation Management Organization (WASMO), Gujarat:** The WASMO-supported *Pani Samitis*, a sub-committee of the *Gram Panchayat*, represent devolution of drinking water planning responsibility to the village-level in spirit and practice. Activities undertaken by *Pani Samitis* were demand-based and with community participation. The RDWE were one such activity which went ahead with full community participation. As figure 3 shows, even 5-10 years after installation, these plants still operate and some with very high coverage of 70-80 per cent. The quality of community engagement is rare; we observed that government of Gujarat plants set up much later in 2008 under BOOT model were performing with much lower coverage and efficiency. The key difference seems to be the engagement of community and empowering them to manage their own drinking water through the *Pani Samitis*.

- **Bala Vikas, Telangana:** Bala Vikas RDWE model in and around Warangal is unique. It is a multi-stakeholder participation model in which the community plays an active role. Even capital expenses are met with community contributions, with around ₹200-500 contributed by each family. Further, it follows a subscription model of ₹100 per month which ensures constant use throughout the year (see Table 1). More than 700 such RDWE are in operation and they are managed through a federation with elected representatives from community members. The level of community participation is such that even Cap-Ex is recovered in some of these plants within few years.

5.2 Expansion of Reach is Possible

Reach within the target community and coverage statistics collected across case studies show varying numbers. There are some exceptions, such as community run plants in central Gujarat, where water reaches to 100 per cent of community members. Also, in the Bala Vikas RDWE, reach is very high because of initial contribution and subscription model. Apart from this, coverage figures reach a maximum of 25-30 per cent, and that too not consistently across seasons. In order to expand coverage and increase the number of people consuming safe water, two models come out significantly:

Figure 3: Coverage with community of surveyed panchayat plants in Gujarat (%)



Cairns' Hub-and-Spoke Model: Cairns India CSR operates a RDWE model in highly water scarce and quality affected areas with low population density in Barmer of western Rajasthan. The challenge here is in generating demand and interest among the community as well as reaching out to remote communities. Cairns achieves this through a Hub-and-Spoke model in which it partners with Tata projects and *Sarvajal*. There is separate civil society organization initiative for community engagement, and a formal partnership with government water supply agency for assured and good quality water. After this Cairns has a central hub in a large villages or town bases along with water ATMs which operate with solar power. These are remotely monitored via *Sarvajal's Soochak* tool. As shown in Figure 4, the model creates its own economics, different from individual RDWE and achieves greater efficiency. A single plant is able to serve 6 villages with hundreds of cans in each village, thereby achieving greater reach and financial viability.

- **The Chittoor-Kuppam Model:** The Andhra Pradesh government is now promoting a model popularly known as the Chitoor-Kuppam model, managed by the *NTR Sujala Trust*. The similarity with the Cairns' model is that this too is a Hub-and-Spoke model, but the difference is in scale. The focus here is not just rural, but also urban; serving mainly to Kuppam town. A single plant of 18,000 litres per hour capacity has 22 spokes which are ATMs located at different town and villages places. The model reaches out to a wide area, and is hailed for its financial viability, supposedly generating surplus of ₹70,000 per month.

5.3 Capital Cost Recovery is Difficult; Even Op-Ex Recovery is Rare

The high capital costs of RDWE is one entry barrier for installing them in areas where such investment is most needed and is hard to get by. On a large scale, the initial investment is fully or partially covered by different government programs. For example, in case of Punjab, ₹15 lakhs as an initial sum, and in case of Karnataka, ₹8 lakhs (in fluoride affected areas), are capital cost subsidies offered by the state.

Table 1: Economics of one of Bala Vikas' RDWE

Cost / Revenue Head	Fixed	Recurring	TOTAL
FIXED COSTS			
Machinery	₹350,000		
Plant Shed	₹75,000		
Borewell	₹75,000		
TOTAL			**₹500,000**
OPERATING COSTS			
Operator's Salary		₹36,000	
Electricity Bill		₹72,000	
Treatment Chemicals		₹6,000	
Filter Beds		₹7,200	
TOTAL			**₹121,200**
REVENUES			
Proceeds from Subscriptions		₹450,000	
Other Sales		₹5,000	
TOTAL			**₹455,000**
ANNUAL PROFIT (Revenue – Op-Ex)			**₹333,800**
Payback Period			**~1.5 Years**

However, Op-Ex are expected to be recovered from the revenue generated through people's contribution as safe water fee. Since the fee is now standardized at close to ₹2 per 20 litres, the expectation is that of at least 100 cans will be sold per day to maintain viable operations. The only example of this being achieved was in Bala Vikas villages, where even Cap-Ex is recovered within 2-3 years because of complete community contribution and subscription-based model. We found another example of 100 per cent privately owned RDWE in Bharuch, Gujarat which offers piped water supply to homes at a relatively premium cost of ₹0.35/litre. In this case, the chances of Cap-Ex recovery are high, but the plant is serving a very premium clientele.

Difficulties in Op-Ex recovery were highlighted in two models:

- **The Punjab PPP model:** The Punjab government has implemented around 2000 RDWE as a response to the growing water contamination problems in the state. Several agencies, such as Naandi, operate these plants under an O&M contract from the government, after the Cap-Ex has been provided by the government. Our analysis shows that even after full Cap-Ex subsidy and reasonable O&M contracts from the government, the Naandi-operated plants (which operate at much higher efficiency than those with other operators in Punjab) are barely able to make ends (see Figure 5). If the O&M contract is withdrawn, these operators would not be able to sustain the plants.
- **Kolar Government and CSR Model:** In Kolar district of Karnataka, there are two different RDWE models current operating at scale. There are 256 plants installed by the Government with a ₹7.5 lakh Cap-Ex subsidy, which provide water through direct sales and ATMs at ₹2 per 20 litres. The Canara Bank CSR model is installing 217 RDWE with Cap-Ex subsidy of around ₹8 lakhs and water fee of ₹5 per 20litres. Given that these two different pricing models are operating in the same district, their economics of breakeven for Op-Ex is entirely different. The installation of these plants vary from less than 2 years to even just months. But the breakeven number of cans per day of around 90-100 seems to be barely reaching for most plants. As projected, in the first 3 years, there would be losses incurred on Cap-Ex and it remains to be seen how the operators would run these. Caution is borne by similar government-run model in Raichur (Karnataka) where our study focused on why more than 300 plants are failing to operate even few months after installation. Our case study cites lack of demand, drying up of wells, and lack of ownership among operators and community as the key factors responsible. The same can happen in Kolar too.

5.4 Water Source Sustainability is Important

Critically, while trying to produce high quality water, the basic question is that of water resource sustainability itself.

Figure 4: Economics of Hub and Spoke Model of Cairns India CSR in Barmer

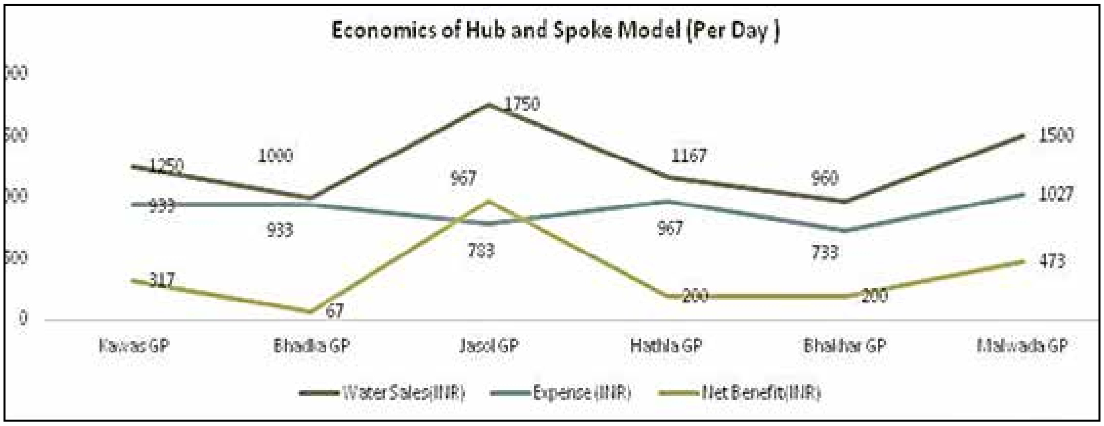
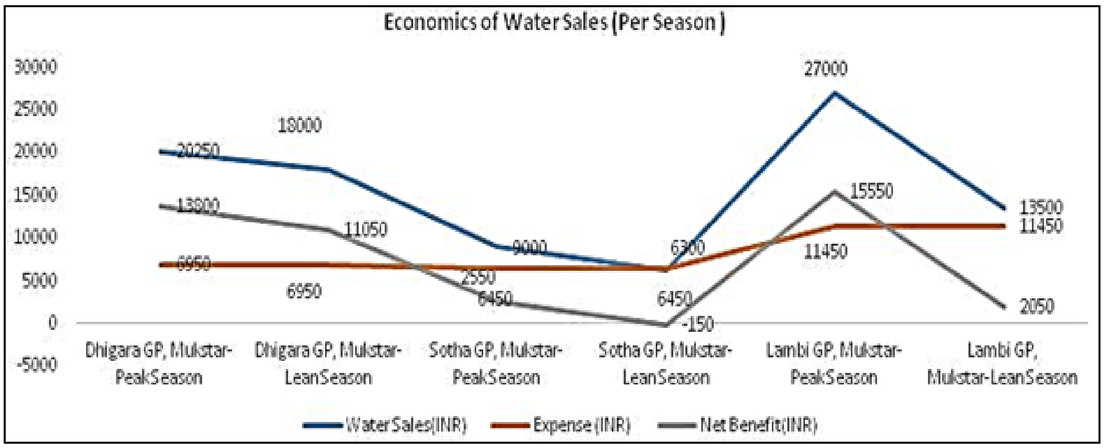


Figure 5: Economics of Punjab government model operated by Naandi



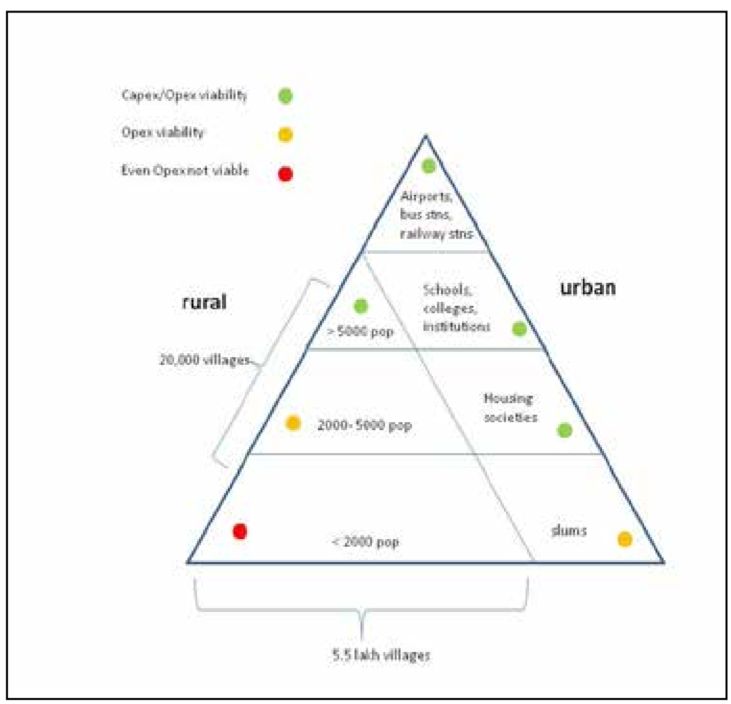
Though there are some attempts to manage the reject water in activities within some of our ITP-INREM case studies, as a whole, the reject water is simply let out. Sporadically, this water is reused for other purposes. The larger question for RDWE operators is that of source sustainability. Lack of source sustainability and no water in the wake of a severe drought were among the key reasons why more than 300 RDWE in Raichur have failed within months of installation. This reality hits RDWE plants very hard, especially when their water wastage is high. We found two examples where positive attempts are being made:

- **The Kuppam model from Chittor:** Source of water drying up in dispersed RDWE plants is one major concern expressed, especially from drought-prone and water-scarce areas. One way to address this is by co-locating the plant with an existing watershed project check dam, as done in Chittor. This offers assured groundwater recharge and improved water quality.
- **IWMP RDWE from Telangana:** Likewise, in Nalgonda, several IWMP (Integrated Watershed Management Program) projects have incorporated RDWE as part of their activities. The Cap-Ex is supported as part of entry point activities and planning for water source for the plant is done as part of overall watershed planning. Several such examples have been implemented by Dhan Foundation.

6. Summary and Way Forward

Are RDWE really working for the BoP (Bottom of Pyramid) population? How do we benchmark RDWE to make them accountable? How can ITP-INREM case studies help better design future RDWE? Before we address these questions, we must make a note of an inherent bias in our study sample. Our case studies have included only functional RDWE; not the defunct ones as it is difficult to obtain data and insights on plants that are not in operation. In Raichur, where we studied 265 RO plants, several of them were defunct due to non-availability of electricity, lack of involvement of vendors in maintenance, and low demand for water services. Similar factors have also been cited in Punjab.

Figure 6: Viability of water enterprises at 'Bottom of Pyramid'



6.1 Are Drinking Water Enterprises viable for Bottom of Pyramid (BoP)?

Our case study workshop led to an interesting discussion. Sharma (2016) presented an interesting analysis on Cap-Ex and Op-Ex recovery in RDWE (Figure 6). Sharma argued that in the urban segment, one could expect even Cap-Ex recovery, except in slums. However, in the rural segment, based on size of the village, Cap-Ex recovery can only be expected in large villages with population of more than 5,000. It is therefore valid to ask, if the plants are not recovering Cap-Ex and most are also struggling to recover Op-Ex, *are these really enterprises*? Is it justified to subsidize Cap-Ex and Op-Ex of such plants to deliver safe drinking water or should we look at other options including piped water supply.

While we think of RDWE as part of a larger response to the country's drinking water woes, we must keep in mind that most RDWE operate in mid-sized villages, 2,000 – 5,000 population, where Op-Ex recovery is possible. In the critical BoP segment, villages with less than 2,000 population, *viability gap funding* is required; or O&M contracts, as offered by Punjab government.

6.2 Benchmarking for Improved Accountability and Performance

As of now, there exist no benchmarking standards for RDWE performance; there is no expectation on how well these enterprises should be performing with respect to their coverage, financial viability and environmental responsibility. The Safe Water Network is trying to address this need by undertaking a performance benchmarking exercise covering multiple sets of parameters – Social, Operational, Financial, Institutional support and Environmental (SOFIE). This is enabled by a digital open source tool which can be used to make the assessment. At present, the tool is in initial stages of development and is being adopted by the rural drinking water programs and urban development ministry for use in assessing drinking water enterprises.

6.3 Designing Future RDWE: Learnings for Decision Makers

Small water enterprises are a way to scale-out water solutions to reach the BoP. They create local jobs and offer incentives for the community to maintain the solutions. However, the current emphasis on promoting capital-intensive solutions, particularly RO technology, has led to limited reach, poor financial viability and limited opportunities for entrepreneurs to build on government programs.

In order to change this trend, we propose the following 'design elements' for future RDWE:

End RO Obsession: The choice of technologies for use need to be such that it can be easily handled under local constraints of water availability, energy access, and maintenance. For this, area and problem specific, co-creation of solutions is needed at the right scale, which possibly could be that of a few families, say 20-30 family based solutions, instead of the current scale of few hundreds.

Innovate to Reduce Capital Cost: The current unit capital cost of installing plants is around ₹5-8 lakhs, based on scale and technology being used. Offering much of this as government subsidy prevents manufacturers from innovating in product design to reduce cost. This needs to change; and solutions are needed that require significantly lower capital investment, say ₹20,000- ₹30,000, something that a women's SHG can afford. This would widen the number of potential entrepreneurs and open up newer avenues for implementation.

Focus on Job Creation and Livelihoods: As of now, the focus remains on technology-intensive and large plants. If the focus were instead to be on livelihoods, especially that of women, the opportunities for small water enterprises would be entirely different. Small scale individual household-run enterprises would be piloted; these can lower the scale at which enterprises become financially viable, improve reach, and better resolve sustainability issues that currently plague the RDWE sector.

Engage Communities: It is clear that more community-driven models such as WASMO and Bala Vikas have shown better results. With specific efforts needed for such community oriented efforts, they haven't scaled beyond the few hundred successful example villages.

References

Bharti (2016). *Rural drinking water enterprises in Rajasthan and Punjab: ITP-INREM Case Studies*. Draft report submitted to ITP and INREM Foundation, Anand: IWMI-Tata Program.

Chekuri, S. (2016). *Rural drinking water enterprises in Telangana and Andhra Pradesh: ITP-INREM Case Studies*. Draft report submitted to ITP and INREM Foundation, Anand: IWMI-Tata Program.

Indu R. and Shah, T. (2002). *Fluoride free drinking water in north Gujarat: The rise of RO plants*. Unpublished report. Anand: IWMI Tata Program.

Krishnamurthy, A. (2016). *Rural drinking water enterprises in Karnataka: ITP-INREM Case Studies*. Draft report submitted to ITP and INREM Foundation, Anand: IWMI-Tata Program.

Krishnan S. and Indu R. (2016). *Rural drinking water enterprises in Gujarat: ITP-INREM Case Studies*. Draft report submitted to ITP and INREM Foundation, Anand: IWMI-Tata Program.

Krishnan, S. and Indu, R. (2007). *Reverse osmosis plants for rural water treatment in Gujarat*. Unpublished report. Anand: IWMI Tata Program.

MDWS (2011). *Rural water supply sector: Background note*. Ministry of Drinking Water and Sanitation (MDWS), Government of India.

Rajan, S. (2014). *Creative business solutions to India's drinking water problems*. Unitus Seed fund.

Sharma, A. 2016. Experience of Sarvajal in promoting rural water enterprises. Presentation at ITP-INREM Workshop on "Rural Drinking Water Enterprises". Anand: Institute of Rural Management, Anand. 8th October.

SWN (2014). *Community safe water solutions: India sector review*. Safe Water Network (SWN).

About the IWMI-Tata Program and Water Policy Highlights

The IWMI-Tata Water Policy Program (ITP) was launched in 2000 as a co-equal partnership between the International Water Management Institute (IWMI), Colombo and Sir Ratan Tata Trust (SRTT), Mumbai. The program presents new perspectives and practical solutions derived from the wealth of research done in India on water resource management. Its objective is to help policy makers at the central, state and local levels address their water challenges – in areas such as sustainable groundwater management, water scarcity, and rural poverty – by translating research findings into practical policy recommendations. Through this program, IWMI collaborates with a range of partners across India to identify, analyze and document relevant water management approaches and current practices. These practices are assessed and synthesized for maximum policy impact in the series on Water Policy Highlights and IWMI-Tata Comments.

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