Sector reform impact on rural drinking water schemes - A case study from Raigad district in Maharashtra

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Abstract: *This paper analyses the ground level impact of the national rural drinking water policy in Maharashtra. We observe that compared to what is reflected in the national rural drinking water programme (NRDWP) database, the drinking water coverage status is poorer on the ground and scheme failures are more widespread. Our case studies show that the causes of scheme failures have largely remained unchanged in spite of the changes in policy regimes. We find that poor capacity and expertise of state agencies is the main cause for poor outcomes and building these will require infusion of new knowledge and practices. National policy can assist state agencies by creating avenues for educational and research institutions to work with state agencies in various monitoring, evaluation, design and validation roles.*

The subject of national policy is often thought of as the primary instrument which will deliver positive change at a scale unmatched by individuals, NGOs and even state agencies. This makes the design of national policy an important and much-debated activity. The centre typically has more access to intellectual or analytical resources and also financial strength, while the state is closer to ground reality and is exposed to ground politics. This study explores various facets of the faith in national policy from the specific viewpoint of rural drinking water supply. In particular, we look at the mechanics of a Government of India (GoI) policy and its influence on a subject, viz., water, which falls within the state's purview.

There has been a series of policy reforms in the drinking water sector over the past two decades with the intent of achieving greater sustainability and coverage. This has been accompanied by increased investments by the GoI over the last several years. The budgeted allocation for rural drinking water has increased by 32% in the last 2 years to Rs. 11,000 crore for 2013-14. An important component of policy has been a big push towards piped water supply (PWS) in rural areas. The goal set by the Ministry of Drinking Water and

Sanitation in its strategic plan for 2011-2022 is to ensure that at least 90% rural households are provided with PWS by the year 2022. In spite of this commitment, the rate of increase in coverage status has been gradual and slip-back of covered habitations has been a serious problem (NRDWP Background Note, 2012).

The objective of this study is to understand the effectiveness of policy changes in bringing about the stated objectives at the ground level. A basic unit of our analysis is the PWS scheme[1] which is a tangible and quantifiable entity and whose objective is to deliver a concrete physical resource, viz. drinking water, to its beneficiaries. The failure of a drinking water scheme is a technical failure, and to varying degrees, a socio-economic, an administrative and finally a policy failure. Thus, it is important that we analyse a scheme failure and correctly attribute the "blame" and also evaluate the extent to which national policy could have had an influence on the failure.

Our methodology follows the above approach and is informed by our extensive field analysis in Thane, Raigad and Sangli districts of Maharashtra and others in Gujarat[2]. For concreteness, we restrict this study to two adjacent gram panchayats (GPs) of Karjat taluka, Raigad district and the 29 habitations within these GPs and their PWS schemes. This covers a span of about 30 years ranging over several policy regimes. We investigate each PWS scheme, both technically and socially, by field observations, stakeholder interviews and detailed analysis of the case files available in the taluka office. The 29 habitations are small, within the same or adjacent microwatersheds and fairly similar in most socio-economic and cultural attributes.

Using these case studies we analyse the interactions between policy and the processes followed by stakeholders such as the state administration, technical departments, local officials and finally, the beneficiaries themselves. We bring out the technical, social and other constraints within which policy instruments must operate and outline the limitations of policy as a change agent when unaccompanied with efforts in alleviating these constraints. Foremost, we find knowledge formation and development of good practices to be essential in achieving better outcomes.

The paper is arranged as follows. In Section 1, we summarize the history of the rural drinking water policies by the GoI including the current National Rural Drinking Water Program (NRDWP). We outline the basic instruments and formats which drive the NRDWP and monitor its execution at state level. In Section 2, we review the history of Maharashtra's adoption of these policies. We then outline the life-cycle of a typical drinking water scheme

and correspondence between NRDWP requirements and Government of Maharashtra (GoM) processes. We also set up the framework for reporting our field study. In Section 3, we report a detailed study of two GPs from Raigad district of Maharashtra state. We see that contrary to the NRDWP database, the two GPs show a high failure rate of schemes and largely common reasons for failures in spite of the fact that the schemes span different policy regimes. In Section 4 we discuss in detail the failure modes and the social, technical and institutional issues behind these. This analysis brings out the difficulty of policy interventions in reaching issues which are deeper and closer to the ground. In particular, we point out deficiencies in the translation of policy measures to implementable procedures and the lack of knowledge systems and capacity at various levels to implement them. Finally, we provide our concluding remarks in Section 5.

1. Drinking water sector reforms

Provision of rural drinking water supply is primarily the responsibility of the states, yet the GoI has had a significant role in guiding sector reforms by creating incentives and making significant financial contribution. A key milestone was the start of the Accelerated Rural Water Supply Program (ARWSP) in 1972 which expected to achieve 100% drinking water coverage by the end of the 8th plan period (1992-97). However, in spite of increased outlay, the number of problem habitations did not decline proportionately (Planning Commission, 2010). In 1999 the GoI introduced the sector reform projects (SRP) on a pilot basis which championed the so called "demand driven" approach as a departure from the previous top-down service delivery model. In December 2002, these were extended to the entire country with the introduction of the Swajaldhara guidelines. These guidelines recognised the transformation from a target based "supply driven" approach to a "demand based" approach in which users would get the service they wanted and were willing to pay for. Full cost recovery of operation and maintenance (O&M) and replacement costs were expected from the users to ensure financial viability and sustainability of schemes (Swajaldhara Guidelines, 2002). In 2005, the GoI launched the Bharat Nirman program. As part of its drinking water agenda it targeted a total of 6 lakh habitations. While the coverage reported is significant, slip-back of villages continues to be a concern (NRDWP Background Note, 2012).

In April 2009, the National Rural Drinking Water Programme (NRDWP) guidelines brought in a new wave of sector reform by replacing the ARWSP guidelines. These latest guidelines have mainstreamed the demand-responsive community participation based approach. A key

change is the shift from “habitation” to “household” as the basic unit for defining coverage. Based on this, a habitation cannot be termed fully covered unless 100% households have drinking water security. (NRDWP Guidelines, 2010)

The NRDWP is implemented via a Memorandum of Understanding (MoU) between the Ministry of Drinking Water and Sanitation (GoI) and the state government and is enforced through a detailed set of guidelines for scheme initiation and hand-over, formation of village committees, reporting of coverage and so on. While some are mandatory, others are recommended. The mandatory aspects include commitment to the decentralized approach through PRI and community involvement, building of data repository, use of MIS and reporting of financials under various NRDWP heads such as coverage, quality, sustainability etc. Support activity forms 5% of the total funding and allows the states to engage in recommended activities such as IEC (Information, Education and Communication), research, monitoring and evaluation and use of advanced technology. It also allows for the formation of independent Knowledge Resource Centers (KRCs).

2. Maharashtra’s adoption of sector reforms

Maharashtra was the first state in the country to adopt the demand driven policy state-wide in 2000. In the early 1990s, a large number of villages in Maharashtra depended on tankers for drinking water supply, especially in summer. In 1995 the GoM published a white paper, the first of its kind in the country, on the water situation in the state. It stated that massive capital investments were needed to develop infrastructure to meet the drinking water needs of the state and embarked on a mission to free villages from tankers (Yashada, 2006). A master plan was created with a large number of water supply schemes with an emphasis on rural regional schemes. These were to be implemented by Maharashtra Jeevan Pradhikaran (MJP), a state level agency. However, there was much delay in the completion of these schemes due to financial troubles in funding them and many of them are incomplete till date (see Sangameswaran, 2010 and Sugave Scheme Report, 2011).

Meanwhile, four of Maharashtra’s districts including Raigad district were covered in the SRP pilots that were implemented in 1997-2002. In July 2000, the GoM passed a resolution to adopt the GoI guidelines of community participation and demand-led service delivery. It transferred decision making power to the beneficiary communities and issued operational guidelines on community involvement at all stages. In 2003, the World Bank funded

Jalswarajya project was kicked off in 26 districts with the goal of propagating the reform approach. The NRDWP guidelines were formally adopted by the state in August 2009 and all previous initiatives such as Swajaldhara, Jalswarajya, Bharat Nirman etc. converged into it.

The allocation of NRDWP funds to the state is based on various factors such as rural population, tribal population etc. Under the MoU, states are required to match the fund on 50:50 bases for most components of NRDWP. For the year 2012-13, Maharashtra received Rs. 832 crore as NRDWP allocation from the GoI and the matching GoM contribution was about 503 crore. The investment in Raigad district for the same year was 39.79 crore.

It is remarkable that the funding arrangement has tied up substantial amount of GoM finances to GoI modalities on a state matter, viz., drinking water and sanitation. Whence, unless the state has significant funds to invest in the sector beyond matching the central fund, it has very little flexibility in guiding its own plans and formulating new initiatives in policy and its implementation (see also Rath 2013). Not surprisingly, the state has added no new significant capacity to its line departments. For example[3], Raigad district currently has 50 engineers in the rural drinking water department and a total of 4 geologists including geologists from Groundwater Development and Survey Authority (GSDA). This translates to roughly one engineer for every 16 GPs and for every 100 habitations. In spite of the increase in central funding for rural drinking water over the years, the staffing at the state level has remained practically unchanged since the *Zilla Parishad* (ZP) was created in 1981, except for a shuffle of engineers from MJP to ZP. Even with the limited positions, 10% are vacant at any time. The state thus functions under severe capacity constraint. On the knowledge front, through Jalswarajya I and II, the state has had access to World Bank funding (with its own modalities) to develop research capacity within GSDA and MJP via pilot projects. The launch of a research and training academy (Maharashtra Environmental Engineering Training & Research Academy or MEETRA) in 2012 has also come through such funding.

Scheme life cycle

We now look at the current government procedures followed in Maharashtra for the sanction and implementation of PWS schemes. These procedures are communicated by the state government using frequent government resolutions (GRs) to the line departments.

Schemes are sanctioned to habitations on the basis of expression of demand. On paper, this is

in the form of a resolution passed by the GP gram sabha and a village action plan which is to be developed by a village water supply and sanitation committee (VWSSC) in a participatory manner. This documentation is submitted to the ZP engineers who verify the design and prepare technical estimates. Schemes require technical and administrative sanction from the ZP executive engineer or higher level depending on the scheme size. The schemes must be within the GoM mandated per-capita capital investment norm to receive approval. Approved schemes are included in the district and state plan. Habitations are prioritized within the action plan as per the NRDWP guidelines and state guidelines. For example, in Maharashtra, highest priority is given to completion of on-going schemes followed by habitations which have been continuously tanker fed in the past three years (GoM GR, 9 Jan 2012). The number of habitations to be targeted for the first year is decided based on the available budget and the remaining habitations are rolled over to the following year. A state level committee approves the plan after which the ZP can begin implementation.

In Maharashtra, once a habitation is accepted in the action plan, its coverage status is downgraded to partially-covered (PC) on the NRDWP website which implies that less than 100% of the habitation population has access to at least 40 litres per capita per day (LPCD) of drinking water within a distance of 500m[4]. The categorization of the PC habitation as 0-25%, 26-50%, 51-75% or 76-99% covered status is done by correlating the average LPCD available to percentage population covered data (for example, habitations with less than average 10 LPCD water available are mapped to the 0-25% category etc.). Once the scheme is implemented, the habitation status is changed back to Fully Covered (FC) in the NRDWP database. This, in our opinion, is inappropriate, since (i) it is contrary to the spirit of achieving 'household level drinking water security' as per NRDWP guidelines, and (ii) all habitations are considered to be FC by default unless they demand for a scheme *and* are taken up on the action plan. NRDWP guidelines are silent on the exact process of the labelling of PC and FC and it is not clear that GoM has violated any NRDWP norms.

Beneficiaries of all rural schemes are expected to contribute at least 10% to the initial capital investment. The remaining 90% sanctioned funds are devolved directly to the VWSSC in a phased manner. The role of ZP engineers is to monitor the implementation. Once the scheme is implemented, the VWSSC is responsible for operating it and making it financially sustainable by levying a water cess on the beneficiaries.

The above process places much of the responsibility of demanding, planning, implementing

and operating a scheme at the VWSSC level. There is a tacit assumption that there is sufficient capacity at this level to carry out this role. Recently block resource centres (BRCs) have been created to assist in the social mobilization and training of VWSSCs. In Raigad district there are roughly 3 BRC resource persons allocated for each block and for about 100 habitations, so the problem of capacity continues.

3. Case Study

We use the example of two adjacent GPs in Raigad district to illustrate the ground level manifestation of water sector reforms. The issues are representative of the problems faced at large in the state since the policy directives and procedures are largely homogenous across the state. This is also borne out by our study in other districts such as Thane and Sangli.

The two GPs are Mograj GP and Tembhare GP located in the Shilar river watershed in Karjat taluka of Raigad district in Maharashtra. They lie in the western foothills of the Western Ghats. This area is hilly and has shallow aquifers with limited groundwater potential. Thus, despite annual rainfall of more than 3000 mm there is water scarcity from January to the onset of monsoons, and tanker water is needed in many habitations. All habitations have access to public wells and some also have handpumps though most of these sources are seasonal. Tembhare GP has a small dam which stores water all through summer and is an important source for many habitations of the GP. Both GPs have many private borewells, most of them owned by farm-owners from Mumbai, a few of which allow access to the villagers during scarcity.

Mograj GP has a total population of 3765 (2001 census) of which 77% is tribal population. According to government data, ten PWS schemes have been implemented across its 13 habitations. Out of the ten, four were sanctioned under supply-driven policy, five were implemented in the post-reform era and one scheme is a government funded *ashramshala* scheme[5]. The neighbouring Tembhare GP has 16 habitations with a total population of 2917 (2001 census) and 31% tribal population. According to government records, Tembhare has seven PWS schemes. Out of this one scheme was supply driven and six were demand driven. Of the six demand driven schemes, three are currently under construction with expected completion in 2013. Table 1 provides a list of habitations in the 2 GPs.

In spite of the drinking water schemes, six habitations out of 13 in Mograj GP received tanker-water from the government in summer 2012 (April – June), due to water scarcity[6]. No

habitations in Tembhare GP received tanker water in the past year.

Table 1: Habitation level data (Habitations in PC status are on the annual action plan)

S. No.	Gram Panchayat	Village Name	Habitation Name	Tanker-fed in 2012?	NRDWP MIS Coverage Status
1	MOGRAJ	AMBIVALI	AMBIVALI	No	FC
2	MOGRAJ	DHAMNI	CHOUDHARWADI	No	FC
3	MOGRAJ	DHAMNI	DHAMNI	No	FC
4	MOGRAJ	DHAMNI	MECHKARWADI	No	FC
5	MOGRAJ	KHANAND	BHALAYACHIWADI	Yes	FC
6	MOGRAJ	KHANAND	KHANAND	Yes	FC
7	MOGRAJ	MALEGAON	JAMBHULWADI	Yes	PC
8	MOGRAJ	MALEGAON	MALEGAON	No	FC
9	MOGRAJ	MOGRAJ	ANANDWADI	No	FC
10	MOGRAJ	MOGRAJ	BHAKTACHIWADI	Yes	FC
11	MOGRAJ	MOGRAJ	MOGRAJ	Yes	FC
12	MOGRAJ	PIMPALPADA	PIMPALPADA	No	FC
13	MOGRAJ	PINGLAS	PINGLAS	Yes	FC

S. No.	Gram Panchayat	Village Name	Habitation Name	Tanker-fed in 2012?	NRDWP MIS Coverage Status
1	TEMBHARE	JAMBRUNG	DUKKARPAD	No	FC
2	TEMBHARE	JAMBRUNG	HIREWADI	No	PC
3	TEMBHARE	JAMBRUNG	JAMBRUNG	No	PC
4	TEMBHARE	JAMBRUNG	KAMATPADA	No	FC
5	TEMBHARE	JAMBRUNG	SARAIWADI	No	FC
6	TEMBHARE	JAMBRUNG	SOLANPADA	No	FC
7	TEMBHARE	JAMBRUNG	THOMBARW	No	PC
8	TEMBHARE	PETH	DHANGARW	No	FC
9	TEMBHARE	PETH	AKWADI	No	FC
10	TEMBHARE	PETH	PETH	No	FC
11	TEMBHARE	RAJAPE	KATKARWAD	No	FC
12	TEMBHARE	RAJAPE	RAJAPE	No	FC
13	TEMBHARE	SHINGDHOL	KATKARWAD	No	FC
14	TEMBHARE	SHIGDHOL	SHINGDHOL	No	FC
15	TEMBHARE	TEMBHARE	KATKARWAD	No	FC
16	TEMBHARE	TEMBHARE	TEMBHARE	No	FC

Habitations in Mograj GP have a mix of tribal and non-tribal population with most habitations dominated by tribal communities. On the other hand, Tembhare GP has more segregated communities with some habitations being completely tribal and others non-tribal and very few habitations with a mix of both. This area, and Raigad district in general, does not face a water quality problem and hence, the discussion in this paper is limited to considerations regarding access to water.

Findings

Tables 2 and 3 provide a summary of all PWS schemes implemented in the two GPs and the prevailing policy regime at the time of implementation. The scheme data is sourced from NRDWP MIS data and Karjat Minor Irrigation office records according to which all of the schemes are in functional status. However, ground level surveys show a different reality which has been summarised in the last two columns of Tables 2 and 3.

Scheme status has been categorized as functional, partly functional or failed. A failed scheme is defined as one that does not operate, has a disconnected electricity meter and may have broken or missing assets. It also includes schemes that have been completed based on government records but do not exist on the ground. Functional schemes are those which are operational for all habitations that they were originally designed for according to the official documentation. Functional schemes may be seasonal which operate at a low frequency in summer months due to scarcity of ground water. A partly-functional scheme is one which has

stopped working (or was never operational) in one or more of the original beneficiary habitations.

Table 2: PWS schemes in Mograj GP

S.No.	Scheme Name	Beneficiary Habitations	Implementing Agency	Sanction Year	Year of completion	Pre/post reform program	Source	Capital Cost Estimate (lakhs)	Scheme status as of Dec 2012 (determined through field surveys)	Notes
ograj GP										
1	Ambivali PWSS	Ambivali	Zilla Parishad	2008-09	2010	Post- reform - Bharat Nirman	Groundwater	25	Functional	Functional
2	Mechkarwadi PWSS	Mechkarwadi	Zilla Parishad	2002-03	2005	Post- reform - SRP	Groundwater	13.32	Partly functional	Failed in 2005 and revived in 2010 for one part of habitation
3	Khandan PWSS	Khandan	Zilla Parishad	2008-09	2010	Post- reform - ARWSP	Surfacewater	12.61	Failed	Scheme does not exist on the ground
4	Malegaon Pimpalpada PWSS	Malegaon, Pimpalpada	Zilla Parishad	1997-98	2000	Pre-reform - ARWSP	Groundwater	8.5	Failed	Failed for both habitations within a year. Scheme repaired in 2007 but failed
5	Mograj Anandwadi PWSS	Mograj, Anandwadi	Zilla Parishad	1997-98	2000	Pre-reform - ARWSP	Groundwater	12.35	Failed	Failed in 2000 for Mograj and failed for Anandwadi in 4-5 years
6	Bhaktachiwadi PWSS	Bhaktachiwadi	Zilla Parishad	2002-03	2006	Post- reform - SRP	Groundwater	8.26	Failed	Failed in 2006
7	Pinglas WSS	Pinglas, Bhaktachiwadi, Ambivali, Tembhre (Tembhre GP), Shingdol (Tembhre GP)	Maharashtra Jeevan Pradhikaran	1998-99	2010	Pre-reform - Master Plan	Groundwater	43	Failed	Failed within 1 year
8	Choudharwadi PWSS	Choudharwadi	Zilla Parishad	2004-05	2005	Post- reform	Surfacewater	4.48	Failed	Failed
9	Bhaktachiwadi Ashramshala PWSS	Bhaktachiwadi Ashramshala	Zilla Parishad	2005-06	2007	Post- reform	Groundwater	11.09	Functional	Functional except summer (school holidays)
10	Dhamni PWSS	Dhamni, Jambhulwadi, Choudharwadi	Zilla Parishad	1986-87	1988	Pre-reform	Groundwater	0.94	Failed	Failed in 1989

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Table 3: PWS schemes in Tembhare GP

Tembhre GP										
S.No.	Scheme Name	Beneficiary Habitations	Implementing Agency	Sanction Year	Year of completion	Pre/post reform program	Source	Capital Cost Estimate (lakhs)	Scheme status as of Dec 2012 (determined through field surveys)	Notes
1	Tembhre Shingdhol PWSS	Tembhre, Tembhre-Katkarwadi, Shingdol, Shingdol - Katkarwadi	Zilla Parishad	2010-11	2011	Post- reform - Bharat Nirman	Groundwater	25.09	Partly functional	Functional for 3 habitations but was never operational for Tembhre-Katkarwadi
2	Rajpe PWSS	Rajpe, Katkarwadi, Dhangarwadi, Pachkhadakwadi	Maharashtra Jeevan Pradhikaran	1998-99	2000	Pre-reform - Master Plan	Surface	22.91	Partly functional	Operational for Rajpe and Katkarwadi.Stopped working in Panchkhadakwadi and never operational in Dhangarwadi
3	Dukkarpada PWSS	Dukkarpada, hirewadi	Zilla Parishad	2002-03	2006	Post- reform - SRP	Groundwater	8.49	Functional	Functional for Dukkarpada. Scheme design did not include Hirewadi.
4	Saraiwadi PWSS	saraiwadi, jambrung	Zilla Parishad	2002-03	2006	Post- reform - SRP	Groundwater	5.67	Failed	Failed . Scheme design did not include Jambrung
5	Jambrung PWSS	jambrung	Zilla Parishad	2012-13	2013	Post- reform - NRDWP coverage	Groundwater	25	To be completed in 2013	No construction started yet. Villagers unaware of the scheme. Local politician claims he has paid the public contribution
6	Solanpada PWSS	Solanpada, Kamatpada	Zilla Parishad	2008-09	2013	Post- reform - ARWSP	Groundwater	20.58	To be completed in 2013	Scheme under construction
7	Thombarwadi PWSS	Thombarwadi, Hirewadi	Zilla Parishad	2012-13	2013	Post- reform - NRDWP coverage	Groundwater	25	To be completed in 2013	No construction started yet. Villagers unaware of the scheme. Local politician claims he has paid the public contribution

Table 4 summarizes the findings of the scheme status. Overall, out of the 17 PWS schemes sanctioned for the two GPs, 14 have been completed till date. Of these, eight schemes have failed, three are partly functional and three are functional.

Table 4: PWS scheme status summary

Mograj GP	Pre-reform	Post-reform	Ashramshala scheme[5]	Total
Total # schemes	**4**	**5**	**1**	**10**
Failed	4	3	0	7
Partly functional	0	1	0	1
Functional	0	1	1	2
Under construction	0	0	0	0

Tembhre GP	Pre-reform	Post-reform	Total
Total # schemes	**1**	**6**	**7**
Failed	0	1	1
Partly functional	1	1	2
Functional	0	1	1
Under construction	0	3	3

Out of the five schemes sanctioned prior to sector reforms, one is partly functional while the

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others have failed. Out of the eight completed post-reform schemes, two are currently functional and two are partly functional. It is important to note that by definition pre-reform schemes are older than the post-reform schemes and hence the two categories are not directly comparable.

Table 5: Observed failure modes in study area

Failure mode (note: a scheme may have multiple reasons for failure)	No. of schemes effected	# Pre-reform schemes effected	# Post -reform schemes effected
Insufficient source strength	4	2	2
Electricity bill arrears	4	2	2
Poor operations and maintenance	5	3	2
Exclusion of certain beneficiary habitations in scheme implementation or operation	4	1	3
Scheme non-existent on the ground	1		1

Table 5 provides the statistics that were observed in the study area. It can be said for the study area that by and large, failure modes such as insufficient source strength, poor O&M and electricity bill arrears have remained as problems regardless of the changes in policy. It may also be said that exclusion of beneficiary habitations from PWS schemes has seen a rise as a result of community-led scheme implementation and management. In the next section we examine the causes for the same.

4. Analysis

This section analyses the failure modes in greater detail and presents the problems in current state level procedures and national policy in addressing them.

Sources

Insufficient source strength is one of the biggest reasons for failure of schemes. Policy guidelines ask for source strengthening measures to address the source yield issue, but in practice such measures are routinely ignored during PWS design. Only two of the schemes in the study area (Mechkarwadi PWSS and the *ashramshala* scheme) include recharge structure as part of the PWS scheme design. Currently 20% of the annual NRDWP funding is set aside for sustainability measures. In Maharashtra, GSDA owns the responsibility for approving schemes under NRDWP-sustainability but its communication with the implementing agency for PWSs (ZP in most cases) is unclear. Also unclear is what guidance a habitation can realistically have to demand for a recharge structure. None of the habitations in the two GPs

being studied have expressed demand for such measures. GoI has introduced some handbooks and guidelines for the design and implementation of sustainability measures[7] but these appear to be "do-it-yourself" guides, perhaps to be used by NGOs. There is no scientific treatment on assessments or performance predictability. In fact, the study area is replete with watershed structures built by various implementing agencies but their impact is unclear. The quality of construction of such structures is often suspect as is the design, location and appropriateness.

A related reason for PWS scheme failures is the mismatch of source strength with demand. The NRDWP guidelines are silent on the need for conducting source yield tests but GoM guidelines[8] make it mandatory to conduct yield tests and obtain certification from GSDA before building a PWS scheme on a source. In spite of this, there have been no yield tests conducted in Raigad district for PWS at least in the past 2 years and none of the 17 schemes studied here have had a formal yield test conducted before scheme implementation[9]. Sources have been certified by geologists on the basis of visual inspections. The entire district of Raigad has only 4 geologists (2 ZP geologists and 2 GSDA geologists) and the staff claims that it is practically unmanageable to meet this GoM guideline. At the same time, these geologists depend on many possibly outdated procedures such as the current well yield test procedure.

Expressing demand for a scheme

The current policy framework assumes that all habitations are FC unless they demand for a scheme. The fault in this assumption can be clearly seen if we compare the list of notified water scarce habitations (as per Maharashtra Groundwater Act 1993) and the list of PC habitations under NRDWP as described below (also see Table 1).

Every year district collectors put together a list of expected water scarce villages based on inputs from the GSDA. The list is usually incomplete due to insufficient data and tools available with the GSDA. However, habitations can add themselves to this list by passing a resolution in the GP gram sabha and documenting a scarcity prevention plan[10]. In Mograj GP, a local NGO conducted a gram sabha and facilitated the documentation process after which 6 habitations (Pinglas, Mograj, Bhaktachiwadi, Jambhulwadi, Bhalyachiwadi and Khandan) were notified by the Raigad district collector. This qualified these habitations to receive tanker water from the government from April to June 2012. While these six tanker-fed habitations are clearly water stressed, they (all except Jambhulwadi) appear on the NRDWP

database as FC habitations. We look at this in more detail.

Drinking water coverage is tracked at the habitation level, yet we find that the rights of a habitation are comparatively diffused. Demand for a new scheme requires a resolution to be passed in the gram sabha of the GP. A habitation level resolution is currently not recognized as expression of demand. In GPs such as Mograj and Tembhare, the gram sabha comprises of villagers from a large number of habitations (13 and 16 respectively). Habitations such as Choudharwadi, Bhalyachiwadi, Khandan and Panchkhadakwadi- socially disadvantaged tribal Thakar communities with little or no landholding- may have limited political voice to demand a scheme in the gram sabha. It was found that people from these habitations rarely attended the gram sabha or spoke up in one if they attended it.

In fact, the format for expressing demand for a scheme requires detailed plans, which in turn requires collective action, leadership and access to technical capacity. It requires documentation that maps out available sources, their seasonality, history of prior schemes, reason for their inadequacy and details of the proposed scheme. It is unrealistic to expect all habitations to have the capacity to go through these steps in order to demand a scheme without significant facilitation from a government agent or an external agent (NGO or local college). More curiously, due to the poor convergence of GoM processes and the NRDWP protocols, there are currently different procedures to express i) demand for a tanker during scarcity period, ii) demand for a drinking water scheme and iii) demand for a sustainability structure. Qualification for tankers does not automatically qualify the habitation for a scheme. In fact, we see that while six habitations managed to demand tankers (assisted by an NGO), only one of them could go through the process of demanding a drinking water scheme (a dug-well in this case).

Exclusion of habitations during implementation or operation

This problem is closely related to the lack of mainstreaming of habitations in the drinking water processes. After completion, a scheme is handed over to the VWSSC which is a standing committee of the GP and must be representative of the beneficiary population. The scheme handover document requires the VWSSC president and secretary as signatories along with the GP sarpanch and the ZP engineer. However, no sign-off is required from representatives of individual beneficiary habitations. This is a problem when the VWSSC does not represent all beneficiaries. This is seen in the Tembhare-Shingdol PWSS where officially the scheme was designed for four habitations – Tembhare, Tembhare-Katkarwadi,

Shingdol and Shingdol-Katkarwadi. But when the scheme was implemented, the Tembhare-Katkarwadi habitation was excluded from it. The scheme was handed over to the VWSSC in December 2010 and official records incorrectly indicate that the scheme is operational in all four habitations.

The same problem is seen in pre-reform schemes where the handover was done from the ZP rural drinking water department to the GP with sarpanch, gram sevak and ZP engineer as signatories. Here too, representatives of individual beneficiary habitations were not part of the handover. The consequences are seen in the case of Rajape PWS, a pre-reform scheme designed and implemented by MJP. The scheme was designed for four habitations (Rajape, Rajape-Katkarwadi, Panchkhadakwadi and Dhangarwadi) but was implemented by MJP in only three of them. Dhangarwadi was excluded in the scheme implementation and yet the GP accepted the scheme handed over by MJP.

The problem of insufficient recognition of a habitation's rights continues in the post-implementation phase. In the pre-reform era, GPs were responsible for scheme maintenance though for major repairs they could approach the ZP. Daily operations were managed by beneficiary habitations. For repairs outside their means or for help with electricity bill arrears, the habitations requested the GP for fund allocation since the GP was ultimately responsible for the scheme. The extent of support that a habitation received from the GP's funds depended on the influence of the habitation in the GP gram sabha. For example, the Rajape scheme stopped operating in Panchkhadakwadi (a tribal *Thakar* community) after a few years of operation and was never revived in this habitation. The same scheme continued to be operational in Rajape and Rajpe-Katkarwadi until recently when it temporarily became non-functional for want of major repairs. At this time, the scheme was able to get a large fund approved from the GP and was revived for Rajpe and Rajpe-Katkarwadi. It helped that Rajpe is a powerful Maratha habitation of the GP and some important local politicians and an ex-sarpanch also reside in Rajpe.

In the current demand driven paradigm, the VWSSCs no longer have access to the GP funds for maintenance and are therefore more limited in their resources. With the absence of a formal role for the GP in O&M, the schemes now have one less layer of accountability than before. Moreover, few schemes have VWSSCs that continue to be functional after scheme implementation (as also noted in other reports such as Planning Commission, 2010). Only one of the habitations in the study area (Mechkarwadi) has an active VWSSC. In other

habitations with PWS schemes, VWSSCs only exist on paper and decisions regarding the PWS are made by respected individuals or by certain informal groups. Even in Mechkarwadi, the VWSSC includes representatives from only one part of the habitation and is led by a powerful person from that habitation. In fact, this scheme now operates for only this part of the habitation and no longer extends to the entire habitation as per the original scheme design.

O&M related failures

The "demand-driven" policy requires all beneficiaries to make a 10% public contribution towards the capital costs. This single act is taken as an indication that the community desires the scheme (i.e., it is not a "supply-driven" scheme), is willing to pay for it, maintain it and has the capacity to manage it. There are no separate indicators or a community assessment by which this judgement is made. As is commonly known, the public contribution is rarely paid by the people themselves and is instead paid by the contractor or a powerful leader from the area. This compromises the fundamental objective of the "demand-driven" policy and its consequences have been reported by other authors (Cullet 2009). In our study area too, this subversion is observed with the expected outcomes. In case of two schemes in Tembhare GP (Jambrung and Thombarwadi-Hirewadi schemes) the public contribution has been paid by a local leader. Construction is yet to start (schemes are due to be completed in 2013) and in both cases, people from the beneficiary habitations do not have any knowledge that schemes have been sanctioned. On the flip side, for the Dukkarpada scheme, even though the public contribution was paid by the contractor, the villagers paid the contractor back in kind through donation of labour during the scheme construction. The scheme has been operating successfully for past many years and the villagers have since taken initiative to extend the scheme to a 24x7 operation with 100% home connections.

A related policy feature is the reduced contribution of 5% for tribal dominated schemes. It was seen in the Tembhare-Shingdol PWSS that the original design included tribal *katkari* habitations of Tembhare and Shingdol as beneficiaries. This increased the beneficiary population to more than 50% tribal and hence, as per guidelines, reduced the public contribution for all beneficiaries to 5%. But when the scheme was implemented, the distribution network was not extended to the Tembhare-Katkarwadi habitation.

Another important issue is the mismatch between estimated O&M expenses, the actual O&M expenses and the community's ability to pay. Beneficiaries often refuse to pay for a scheme because of reasons such as dissatisfaction with scheme performance, seasonal nature of the

need for PWS and inability of women to persuade their husbands to pay. Poor scheme design causes increased recurring operational costs such as high energy and maintenance costs which may be unaffordable by beneficiaries. Thus bad scheme design is frequently masked as a failure due to "social" causes.

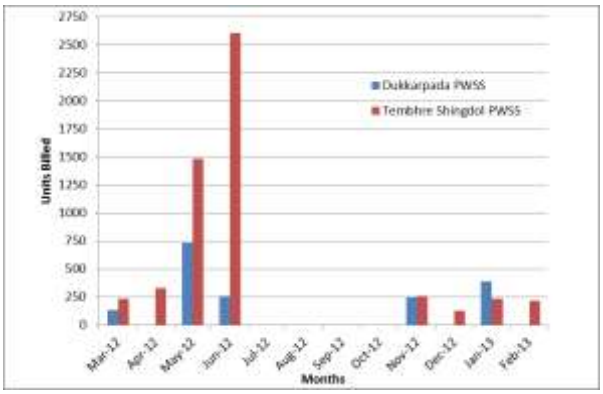
As an example, in the Tembhare-Shingdol scheme, the storage tank has not been designed at an appropriate elevation due to which the scheme operator needs to bypass the tank and pump water directly to standposts. This causes high energy costs and pump maintenance cost for the scheme. In the case of Mechkarwadi scheme in Mograj GP, one part of the habitation refused to pay water cess citing unequal quality of supply. The scheme was thus permanently disconnected from electricity supply due to high arrears. A few years later, with strong leadership and financial support from an NGO, a different subset of the habitation paid off the entire electricity arrears and revived the scheme for their community alone leaving out the other households of the habitation. They subsequently extended the network to a 24x7 operation with 100% home connection within their part of the habitation.

There is usually a cost trade-off between the one time capital cost of scheme implementation and the monthly recurring cost. Since the beneficiaries are responsible for 10% of the capital cost and 100% of the O&M cost, appropriate design decisions may be taken to ensure that the recurring costs are lowered especially for those habitations where people have poor ability to pay. For example, using GI or HDP/MDPE pipes instead of PVC pipes may cause the upfront capital cost to be higher, but it reduces the scheme maintenance cost by preventing leakages and pipe breakage especially during the monsoon season. Similarly, introducing bulk flow meters at the habitation level can reduce conflicts between habitations which share a PWS scheme.

Another common reason for scheme failure is financial instability. Most schemes only collect taxes sufficient to pay off their immediate bills and do not have any buffer stored for large unexpected expenses such as pump repairs. Moreover, habitations often face large variation in their electricity bills. It is commonly acknowledged that Maharashtra State Electricity Distribution Co. Ltd. (MSEDCL) officials do not visit PWS electricity meters every month to read the meters. This is attributed to resource constraints and the inaccessibility of PWS electricity meters (which can be in remote locations and are almost always located inside a locked pump-house) especially during the monsoon months[11]. In absence of a true reading either an average amount or a zero amount bill is prepared by MSEDCL. In a later month

when the actual (cumulative) meter reading is read by an official, MSEDCL issues a bill with a large amount to catch up with actual usage. Villages are often unable to pay this large bill due to lack of a financial buffer. Figure 1 shows the variation in the units billed by MSEDCL for the Dukkarpada PWSS and the Tembhare-Shingdol PWSS.

Figure 1: Units billed by MSEDCL for two schemes



The above examples clearly show that the payment of public contribution does not in any way assure ability to pay and maintain. In order to predict these factors for better outcomes, an evaluation needs to be done by developing indicators such as number of educated youth, presence of community leaders, presence of active NGOs, success of other initiatives such as SHGs etc. A start-up team at the taluka level should be responsible for conducting these surveys through community meetings and filling out these formats to develop an understanding of a habitation's ability to operate a scheme and the people's willingness to pay. By doing this, specific handholding measures or subsidies can be targeted to habitations which need more assistance. In fact the GoM has a program in certain districts to reimburse half of the monthly electricity bill once it is paid by the scheme beneficiaries.

5. Conclusions and recommendations

Over the years, the government has invested more than Rs 250 lakh in Mograj and Tembhare GPs for PWS schemes alone. In spite of this, the outcome has been dismal and there continue to be habitations needing tanker water in this area. The study illustrates that in spite of changing policy guidelines in the drinking water sector there has been little change in the outcome of scheme success and it is now time to seek alternatives.

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At the state level

To begin with, the implementation agency must see scheme design as a **two-step interdisciplinary process**, viz., (I) measurement of key parameters (such as population, social map, ability to pay, capacity to maintain, source yield), and (II) the design and implementation of key procedures. The completion of Step I should be an important point to pause and think of technical and socio-economic options. The correct execution of both steps require either interdisciplinary teams or engineers with interdisciplinary training and a robust protocol with clear outcomes. Such a process would have yielded the right PWS option for all habitations in the Tembhare-Shingdol and Rajape schemes in the study area. However, much of this is at variance with current practices[12].

Secondly, technical design of schemes now needs a wider set of skills and resources, viz., designing for different techno-economic scenarios, access to technical experts, and the ability to escalate the problem when technical facts seem to indicate the need. All this calls for a development of a **regional knowledge and practice** base which can assess current outcomes, develop best practices and templates, and also design for difficult situations.

Thirdly, at the administrative level, we make two recommendations. The first is a correct ***assessment of the staffing need and its provisioning*** at the district and taluka level. This will need an overhaul of the current methodology for labelling coverage so that the correct magnitude of the problem is understood. The second recommendation is the ***mainstreaming of the habitation*** as a unit for handover and tracking coverage in GoM processes and an alignment of GoM processes with the NRDWP guidelines.

Fourthly, there must be an endeavour to develop a ***regional planning approach*** for drinking water. This will involve systematic use of tools such as GIS, consideration of surface water reservoirs, location of drinking water sources and their seasonality, watershed boundaries, tanker fed habitations, habitations targeted on annual action plan, types of interventions planned, functional and failed schemes, etc. This will bring to the table both the demand side issues of scarcity and coverage, with various supply side alternatives such as large surface water schemes and single village groundwater schemes. Tembhare GP offers a clear example where a regional planning approach would have provided better solutions due to the presence of a small reservoir.

Finally, an important learning for the state is to recognize the problem of drinking water as a hard technical and socio-economic problem, requiring ***greater research and practice*** and a greater participation of professionals at both the regional as well as the state level. It must create avenues for such participation without diluting its commitment and accountability to the people of Maharashtra. We recommend the the public-public university partnership (or ***PuPuP***), or a convergence between the state agency and a few key public research institutions[13], regional engineering colleges, NGOs, and CSOs. One mechanism could be the creation of standard templates in the space of monitoring, evaluation and practice research at the district level. Regional institutions or teams of professionals may be invited to provide their services through these templates. This would provide accurate feedback to the stakeholders, i.e., to beneficiaries, administrators and policy-makers, and at the same time, bring new knowledge and accountability to the sector. It would also reduce the gap between ground reality and the NRDWP MIS as we see in the study area. The PuPuP should certainly be a pre-cursor and pre-condition to public-private-partnership or privatization for it will develop the role of the university as an important watchdog.

Bigger challenges in areas such as ground water, yield test design, design of tariff and O&M for multi-village schemes, metering, grid supply design etc. need to be understood and formalized as research problems. These problems and the creation of template case-studies should be offered to state/national institutions of excellence so that innovative tools and protocols may be developed to solve these problems. In the long term, innovation, knowledge creation and development of best practices at the state-level will be most crucial in bringing better outcomes. For Maharashtra, the ***institution of MEETRA*** holds great promise as a seat and a nodal agency for developing the research and practice base for the knowledge needs of the state. We should add that NRDWP does provide some avenues and funding for R&D but the state must be pro-active and innovative in this matter.

Broader issues of national policy making

Firstly, for the GoI policy-makers, it must be recognized that only so much can be achieved by designing policy at the national level. A comprehensive MIS and overall transparency does make it easier for ordinary people to see what GoI believes is the picture of their habitation. However, by itself, it does not improve outcomes. In fact, unless the implementation agency and the state administration have processes as suggested above, failure of any policy, however good, is certain.

Next, the rationale from GoI's viewpoint for a national program may be that it provides much needed funding, and through its modalities, better internal accountability and focus on normative concerns such as sustainability, efficiency and equity. It may also be thought to prevent the states from embarking on misplaced unilateral and potentially politically motivated missions or targets (referred to as the "supply mode") which are technically or socio-economically unsound. No such supply-driven excesses were found in the study area. Out of the five supply driven PWS schemes in the two GPs, four were implemented in Mograj GP which faces more water scarcity compared to one in Tembhare GP which is better endowed with a small reservoir. On the normative concerns such as techno-economic efficiency or sustainability, the NRDWP has little to offer to the engineer or the planner. It has no technical guidelines for measuring groundwater sources, or of representation, design and simulations of schemes or of geological interventions, and no case-studies which are of academic quality. It has no guidance on design, simulation and optimization tools (such as EPANet or MODFLOW) and their standard set-ups and input conditions. For a program of such a large financial outlay, there is little technical or economic data which can be used by engineers or researchers to improve practices. On the whole, the policy does seem to propagate a "consultant" approach to drinking water, stressing more on management rather than on knowledge formation and practice. Thus, it over-reaches in the management aspect and under-reaches on the technical or socio-economic front.

Thirdly, drinking water and sanitation is a state subject for a good reason, viz., that the problem requires region-specific solutions. Whence, national programs in the area essentially divert common pool funds to ear-marked funds with attached modalities (also see Rath 2013), i.e, in effect from region-specific programs to general programs[14]. Given this, national programs should focus on broad normative issues and generally be adaptable by the states to suit their purposes. However, NRDWP does not quite meet that requirement. Stringent (and time-consuming) modalities such as detailed fund allocation and reporting rules induce states to adopt the NRDWP processes completely for both management and knowledge needs. When this happens, as in case of Maharashtra, the short-comings of NRDWP become more apparent. States such as Gujarat and Kerala, have made separate provisions for policies and practices specific to the state[15] and the results do indicate the benefits of such a regional approach.

Finally, given the emerging importance of the water sector, and the growing demand for water professionals, GoI should focus on the knowledge requirements of the sector, and

especially on coordination with ministries such as Science and Technology (DST) and Human Resource (MHRD). It should forge agreement on a new inter-disciplinary curriculum for engineers and applied social scientists[16] to be taught in our colleges and researched by our institutions. It should also enable linkages between academia and state agencies so that the knowledge and practice of water is firmly entrenched in the public domain before big private players come in.

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Notes:

1. Keshab Das (Das 2006: 2) quips about the obsession with PWS. However, in states such as Maharashtra where distance of houses from source can be large, PWS is the option of choice.
2. See http://www.cse.iitb.ac.in/~sohoni/water/ for links to these studies
3. As per data provided by Raigad ZP and GSDA Raigad district offices
4. As per the (NRDWP Guidelines 2010 : 37) a habitation is fully covered (FC) when there is 40 LPCD of water (at least 10 LPCD of which is safe) within 500m (in the plains) or 50m elevation (in hilly areas) of the household.
5. Ashramshala schemes are completely funded by the government (including operation and maintenance) and hence are not directly comparable to the pure supply or demand driven PWS schemes. This is why we report the Ashramshala scheme separately from others.
6. Source: Records of tanker fed villages in the Karjat block panchayat office
7. Government manuals on sustainability structures: (i) Guidelines on Sustainability of drinking water sources under ARWSP and PMGY, Department of Drinking Water Supply, Ministry of Rural Development, 2000; (ii) Manual on Artificial Recharge of Groundwater, Ministry of Water Resources 2007; (iii) Manual for Implementation of Sustainability Schemes Under National Rural Drinking Water Programme, Ministry of Drinking Water and Sanitation
8. GoM GR 17/3/2010, section 8.2
9. Source: Interview with Sr Geologist, Raigad district
10. Sources: Letter dated 2/1/2012 from Karjat Tehsildar to all sarpanch outlining the process to get added to the list of water scarce habitations; interview with the Karjat BDO; documentation submitted by notified water scarce habitations
11. Source: As per interview with MSEB official in Karjat sub-division office
12. The Block Resource Cell (BRC) of NRDWP is woefully under-designed (see section 9.5 of Strategic Plan 2011-22). Note that in the role definition, there are no outcomes which the BRC must ensure. Unfortunately, it forms the core of GoM design for capacity building.
13. Referred to as the Development Research Institutes in the *Development Professional concept note*: http://www.cse.iitb.ac.in/~sohoni/devprof.pdf
14. In case of water and sanitation, this is further complicated by the proximity of GoI to multilateral agencies and their thinking. See for example the number of reports that WSD writes for MDWS, presumably gratis
15. Gujarat and Kerala states' expenditures have exceeded the central expenditure on rural drinking water. Kerala's state expenditure for 2012-13 was 66% of the total investment in the sector, and Gujarat state's expenditure was 57% of the total spent for the same period, as compared to Maharashtra's 47% state contribution of the total expenditure in the sector
16. Again see the Development Professional Concept Note

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