Composite Factor Analysis of Single and Multiple Village Drinking Water Schemes

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Background

Groundwater is the basic source of drinking water for most of rural India, and certainly for most rural habitations in Maharashtra. As needs expand and as groundwater faces competing uses, it is now increasingly unreliable in providing for the basic needs of drinking and domestic use. In fact, many regions now face systematic drinking water shortage. The only solutions that are now available are

(i) structures to augment local surface water storage and recharge, watershed management and afforestation,

(ii) demand management, and finally

(iii) transfer of water from surplus areas.

In general, (i) faces a long and arduous design phase and a long implementation phase prone to legal wranglings. Design and implementation of small regional storage structures is not really a well-developed protocol and needs further study. Benefits of watershed development procedures also are not quantifiable easily. Concerning (ii), demand management is also difficult, since many habitations are under severe stress. If over-exploitation of groundwater is a problem, then this requires regulation, which needs substantial social and governance inputs. In many situations, it is option (iii) which is the most reasonable. When surplus surface water exists in neighboring areas, a multi-village drinking water scheme (MVS) may be the best option. In principle, this is technically the simplest and with the most quantifiable costs and benefits. It is also the workhorse for most rural habitations of the world.

We see, however, that this option has not been utilized much. A study of the Maharashtra Jeevan Pradhikaran (MJP) schemes for the 4 Konkan districts (from their website) reveals the following:

Konkan MJP Projects			
	Rural		Urban
	Completed	Underway	C+U
Number	21	13	> 30
Benef. (lakhs)	2.94	0.97	62.1

In effect, the picture is of urban schemes succeeding and extensively reserving and using surface water while rural schemes seem to falter. One reason for this paucity of rural schemes may well be the technical feasibility of such schemes. This aspect was studied in the North Karjat Pipeline Scheme feasibility study (`www.cse.iitb.ac.in/~ karjat/ruralpipeline.ppt`) which tackled the water-starved northern part of Karjat taluka, Raigad district. The study showed that such a scheme was indeed techno-economically feasible.

On the other side, the Single Village scheme (SVS) is another work-horse which is aimed at reducing the drudgery involved in fetching water and ensuring a measure of water security in terms of quantity and quality. SVSs are built under various programs such as Bharat Nirman, Jal Swarajya and so on. While concrete data is not available to us, our experience suggests that about 1/3rd of the SVSs fail within the first 5 years. One case study done by IIT-TISS-Prayas in Thane district of Jal Swarajya schemes in 2007 revealed such numbers, and also various probelms faced by SVSs, viz., source failure, mismatch of source strength and scheme design, variability in access leading to conflict, poor capacity building and so on.

In our opinion, both the MVS and SVS options are important options to explore and refine so as to ensure their successful deployment. In regions of wide-spread groundwater collapse, MVS is the only option. Besides, alleviating severe stress, it may be an important rural infrastructure driving rural livelihoods and well-being and has the potential to change urban-rural dynamics. But for all this to happen, MVSs must run successfully. The design of an MVS involves many sub-designs, besides of course, of the engineering system. It involves an arrangement between several GPs, a tarriff mechanism, differentiated billing systems, dealing with truancy and reneging, tertiary and standpost system design which alligns with local dynamics, capacity building, and so on. All of these aspects need careful attention for the scheme to succeed. While these arrangements have been understood and accepted in the urban setting, there is an urgent need to develop such an understanding in the rural environment.

On the SVS side, a careful analysis is needed of the protocols followed by the three basic agencies involved, viz., GSDA for source strength determination, MI or RDW for the engineering and the GP for administration. The analysis will bring out various problem areas which will need to be addressed. These may be technical, e.g., a more robust yield test, or social, such as more participatory optimization framework for tertiary network design.

The main objective of this project is to precisely generate such knowledge and know-how, both technical and social/institutional which will help in the successful design of MVSs and SVSs. This will need a collaboration between various agents, starting with IIT-Bombay, Unicef, GSDA and MJP. Besides this, liaison with the local administration of study areas, PRI institutions, active NGOs and field agencies will also be needed.

The IIT-Bombay team will be led by the Center for Technology Alternatives for Rural Areas (CTARA), an academic and research body of IIT-Bombay, which specializes in the field of technology and developement. CTARA has been active for 25 years now and has done several projects, extension activities, prototype generation, studies and so on. A large part of the R&D of CTARA happens through student projects and through collaboration with field agencies. Please look at `www.ctara.iitb.ac.in` and `www.ctara.iitb.ac.in/SL.html` for a new and popular initiative for inviting students to participate in development projects.

We will also draw from expertise in other departments, such as Civil Engg., Earth Sciences and Humanities. CTARA has collaborated with all these departments (and many more) in the past on various projects in drinking water. See, e.g., the Gudwanwadi checkdam project of 2005. In drinking water, CTARA has a wide range of experience, starting from the surface storage, GP level documentation, pipeline scheme design, groundwater regulation and so on (see, e.g., `www.cse.iitb.ac.in/~karjat/unicef/` for a variety of documentation).

Goals and Objectives

The ultimate goal, of course, is safe and secure supply of drinking water for all. Towards this, our objectives are:

- A composite and structured factor analysis of MVS and SVS schemes from a socio-economic, technical, institutional and planning framework.
- A diagonostic protocol and tool for the analysis and interventions for taluka level SVS schemes and for MVS scheme.
- Execution of this tool at specific locations and derving recommendations.

For MVS schemes, the concrete objectives will be a review of the technical, social and institutional framework for the design and implementation of MVSs. This review will be based on (i) existing studies and a study of existing MJP procedures, government norms etc., and (ii) a concrete case study of several MVSs and the various stakeholders veiwpoints. Recommendations will be culled from this case-study and design alternatives will be examined. The output will be a study of best practices, dos-and-donts and in general, design methodology for an MVS. If found acceptable, the project may engage with an ongoing design exercise.

For SVSs, we propose developing a protocol for analysing SVSs at the taluka level. This tool will be applied to specified talukas and learnings will be reported. This will require collaboration with the Panchayat Samiti, esp. the RDW engineers, GSDA and field agencies.

Both the MVS and SVS depend crucially on the design of the tertiary network, institutional arrangements and tariff setting. This will be studied closely and a protocol for tertiary design will be proposed. This tool will convert socio-economic ground realities into parameters for design.

Ground Reality	Protocol	Design parameters for sustainability
• Stakeholder identification • Social/political differences • Ability/willing-ness to pay • Demand and Use pattern • Seasonality, Differential QoS • Existence of other sources • others	$\Longrightarrow$	• Technical system • Institutions • Tariff structure

The project timeline will depend on the specific locations chosen for study. For about 2-3 MVS schemes, a timeline of 1 year of field work and an additional 6 months for analysis should suffice. The report format for a single case study appears in the appendix and may be discussed. For a wider engagement such as in ongoing design projects, a longer project duration is required. For SVSs, a taluka level survey will run in parallel and will need about 3-5 months to develop and about 6 months to apply. An additional 6 months will be required for analysis.

Project Location

We suggest 2-3 key MVS sites. One of them, the Anjap-Sugave scheme in Karjat taluka, Raigad Dist. is already under our study. All these schemes should preferably be within 200km of Mumbai. Karjat taluka could also be the site for an SVS analysis and tool design. We will need liaison with the taluka administration, MJP offices, PRI institutions and some NGOs and CSOs operating in the area. We may seek collaborations with faculty and students of engineering colleges and other educational institutions in the area.

Approach and Methods.

The basic flow and stake-holders of the MVS and SVS is as follows:

	SVS	MVS
Demand Expression	GP, RDW	GPs, ZP
Design	RDW, GSDA	MJP, MSEB
Implementation	RDW, GP	MJP, GPs
Handover	RDW, GP	MJP, ZP
Sustenance	GP, TSP	ZP, TSP

For both the MVS and SVS study, there will be three key activities which we will design:

(i) Background Study

- Survey and review of existing literature, studies and documents.
- Analysis of participating agencies, protocols, norms and schedules, design formats etc.
- Study of governance strucures, norms, existing laws.

(ii) Field Study

- Familiarization-GIS, Census data gathering. Contacts with NGOs and CSOs.
- First stakeholder meetings-with designers, implementers, beneficiaries, officials and so on. Design and planning of interaction, tools and questionairres.

- Actual stay and field work. Collection of all viewpoints. Building narratives and basic analysis.
- Report writing and documentation.

(iii) Analysis

- Learnings from case studies. Building of common framework.
- Final reporting and recommendations. Sharing back with stakeholders.

Key meetings with agencies such as GSDA, MJP and taluka administration will be an important part of the study. This will need a sustained interest and support from all the above stakeholders. The study depends crucially on this support and cooperation.

The project initiation phase will involve setting up mechanisms of collaboration between the sponsors and the participants, viz., MJP, GSDA, Unicef and CTARA, IIT-Bombay.

Key Project Components

The projects will have following components

- Development of indicators for evaluation of projects: Indicators for Technical, Social, Economic, Institutional and Environmental parameters will be developed. Each of parameters would be clubbed into broad areas.
  - Technical Evaluation would include broad areas of demand requirements, design of water treatment plants and water supply system, project implementation, project operation, project maintenance, project monitoring.
  - Social evaluation would include broad areas of socio-economic mix, education and capacity, payment ability and willingness, cultural aspects, water thefts, etc.
  - Economic evaluation would include financial viability aspects considered during planning, taxation & fining system, *etc.*
  - Insitutional evaluation includes the reporting mechanism, response mechanism and response time, *etc.*
  - Environmental evaluation would include source stability and enhancement, level of sanitation, health status, *etc.*
- Development of protocol for evaluation: The developed protocol would be discussed with the concerned stakeholders for inputs
- Evaluation of MVS and SVS schemes using protocol developed: The developed protocol would be put to use by evaluating an existing scheme in each category
- Incorporation of protocol for Project Design: The developed indicators would be utilized as planning evaluation indicators.