

“USED Water” and Scope of DEWATS – Learning from Pilots in Madurai, India

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ABSTRACT:

The very survival of human beings hugely depends on the effective handling of environmental issues and management of natural resources, more specifically in water starved nations. Issues like sanitation, hygiene and water that affect billions of people every day are getting limited attention both in media and in people movements so that the government and the citizens take sanitation management as the main agenda. Poor sanitation and bad environmental hygiene are either the chief or the underlying cause in over half the annual 10 million child deaths. An estimate shows that 20 percent of the burdens in India are air- and water prone. The poor and underprivileged bear the brunt of resource degradation.

The Millennium development goals too have targets with clearly defined indicators on clean environment (MDG 7 – Target 10 –Indicator 30). Tamil Nadu state in India is one of the states with very rapid growth of urbanization taking place. The steady growth of economy and huge investments made to improve the urban infrastructures under Jawaharlal Nehru National Urban Renewal Mission and/or City Sanitation Plan provide ample opportunities and scope to develop environmental systems that prevail in the urban area.

DHAN Foundation's Centre for Urban Water Resources (CURE), has implemented three pilot DEWATS Units in uncovered urban fringe areas and at a management academy and learnt that DEWATS has a potential solution to be considered by city planners and Municipal Corporations, gated communities and the like in India.

1. INTRODUCTION

In twenty first century, the issues related to water and wastewater, otherwise “used water” (newly coined term to overcome mental blocks of humanity) get more attention of governmental and non-governmental organizations. Especially the quality and quantity of water bodies in Indian sub-continent is the most precarious and are in an alarming situation in terms of meeting access, affordability and equity.

During the year 2000 the world signed up to the UN Millennium Development Goal (MDG) target to halve the proportion of people (in 1990) without access to safe drinking water by 2015 (MDG 7 – Target 10 – Indicator 30). In 2002 another target was added: to halve the proportion of people without access to improved sanitation (Indicator 31). At the current rate the sanitation target will be missed in both Africa and Asia. Also India is currently not on track with 400 million people to be covered with improved sanitation within the next years.

In order to increase the number of people with access to adequate sanitation, DHAN Foundation inaugurated during the International Year of Sanitation 2008 its new Centre for Urban Water Resources (CURE) within DHAN Vayalagam (Tank) Foundation. The centre and its staff focus on renovation and sustainable use of water resources. CURE's activities concentrate on three fields of services to address people needs with their active participation. They include:

- Renovation of Urban Water Resources,
- Provision of Safe Drinking Water,
- Wastewater and Sanitation Management.



2. MADURAI CITY – WASTE WATER AND ISSUES:

Under the centrally sponsored Scheme of Jawaharlal Nehru National Urban Renewal Mission (JnNURM), the south Indian cities like Madurai in South India the efforts have been taken on improving the inadequate situation by increasingly providing underground wastewater drainage and adequate treatment in the wards within Madurai Corporation. However, planned improvements through augmentation of the wastewater collection system are often restricted to certain main city wards and the planned centralized treatment systems are limited to wastewater generated in core areas. Therefore, planned improvements are – despite all health, environmental, economical and cultural benefits – not sufficient as significantly huge parts of the population are left out. The left out population consist of the urban poor living in slums, in the periphery and unauthorized settlements.

For the uncovered area of Madurai City, decentralized wastewater treatment offers a cost effective, environmentally sound, fair, efficient and sustainable answer. Those technologies provide a number of advantages besides the fact that they are easily applicable in areas where centralized treatment is not feasible for technical, political or economical reasons (e.g. remote or sparsely populated areas, areas where local reuse of the water is applicable, areas where freshwater is in short supply, areas where centralized collection is economically not feasible, etc). Benefits of decentralized wastewater management include cost efficient investments, minimal O&M needs and costs, water and energy savings, local reuse of resources (water, nutrients and energy), reduced groundwater pollution, reduced pollution of open water bodies, efficient pathogen removal, easy storm water separation and so on.

Appropriate areas for decentralized systems identified while developing Detailed Project Report on Sanitation by Madurai Corporation include settlements in the periphery, new settlement, villages in the outskirts, areas with low population density, single households, unauthorized settlements (temporary solution), areas with high groundwater tables, schools, training centers, hospitals, hostels, and all areas which are not connected to a centralized underground sewer system.

Hence, the coexistence of conventional centralized treatment systems for core areas, combined with decentralized systems for appropriate locations is the most beneficial solution. Centralized and decentralized management strategies have to go hand-in-hand (hybrid solution).

2.1 Scope for DEWATS

- DEWATS is a socio-technical sanitation approach developed and continuously improved by the Bremen Overseas Research and Development Association (BORDA), an international development organization headquartered in Germany. The Consortium for DEWATS Dissemination (CDD) Society represents and coordinates BORDA activities in South Asia and represents as an umbrella organisation several relevant government, public and private stakeholders.
- DEWATS systems are effective, reliable, cost efficient and custom-made wastewater treatment systems, which are perfectly suited for small to medium-size systems (5-1000m³/d) on community level and for individual users like e.g. schools, hospitals, or enterprises (SME). On community level, DEWATS can be integrated into a sanitation complex, which is operated on pay-and-use basis, creating income opportunities for local personal (Community Based Sanitation, CBS). DEWATS solutions are not intended to replace but rather to complement centralised systems in applicable areas.
- The technical options within DEWATS are based on a modular and partly standardized design. DEWATS is based on basic technical treatment processes: mechanical treatment (sedimentation and flotation) and biological (anaerobic and aerobic) treatment. The most common DEWATS modules are settlers, biogas settlers, anaerobic baffled reactors (ABR), anaerobic filters (AF), planted gravel filters (PGF), and (if needed) polishing ponds. The systems can be designed for individual needs.

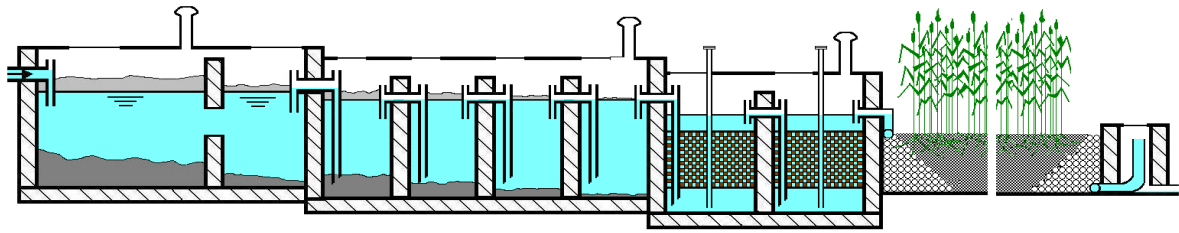


Figure 1. DEWATS consisting of settler – ABR – AF – PGF (not true to scale)

2.2 Areas of Application for DEWATS

- Where individual onsite systems fail and the community cannot afford the cost of a conventional wastewater management system
- Where the community or facility is remote from existing sewers,
- Where local water reuse options are available,
- Where existing wastewater treatment plant capacity is limited,
- Where the expansion of the existing wastewater collection and treatment facilities would involve unnecessary disruption of the community,
- Where residential density is sparse,
- Where specific wastewater constituents are treated or altered more appropriately at the point of generation.

2.3 Benefits of DEWATS

- Cost efficient as no or only simplified underground sewer system needed,
- Low running costs and energy savings as no electrical devices needed,
- Minimal O&M needs and costs as lower human resources capacity levels needed,
- Reliable, long lasting and tolerant towards inflow fluctuation
- High variety of local water, energy and nutrient reuse options,
- No groundwater pollution,
- Easy and efficient user involvement and participation; and high user acceptance,
- Applicable on household, cluster and community level.

3.0 Existing Wastewater Treatment

The two existing WWTS in Avaniapuram and Sakkimangalam consist of wastewater stabilization lagoons. Both WWTS are currently in dilapidated condition and in need of urgent capacity augmentation and refurbishment. Especially since the commissioning of the augmented UGSS under NRCP Phase I, the capacities of both WWTS – originally designed for 13 MLD each – are insufficient. Avaniapuram WWTS is currently nearly dysfunctional.

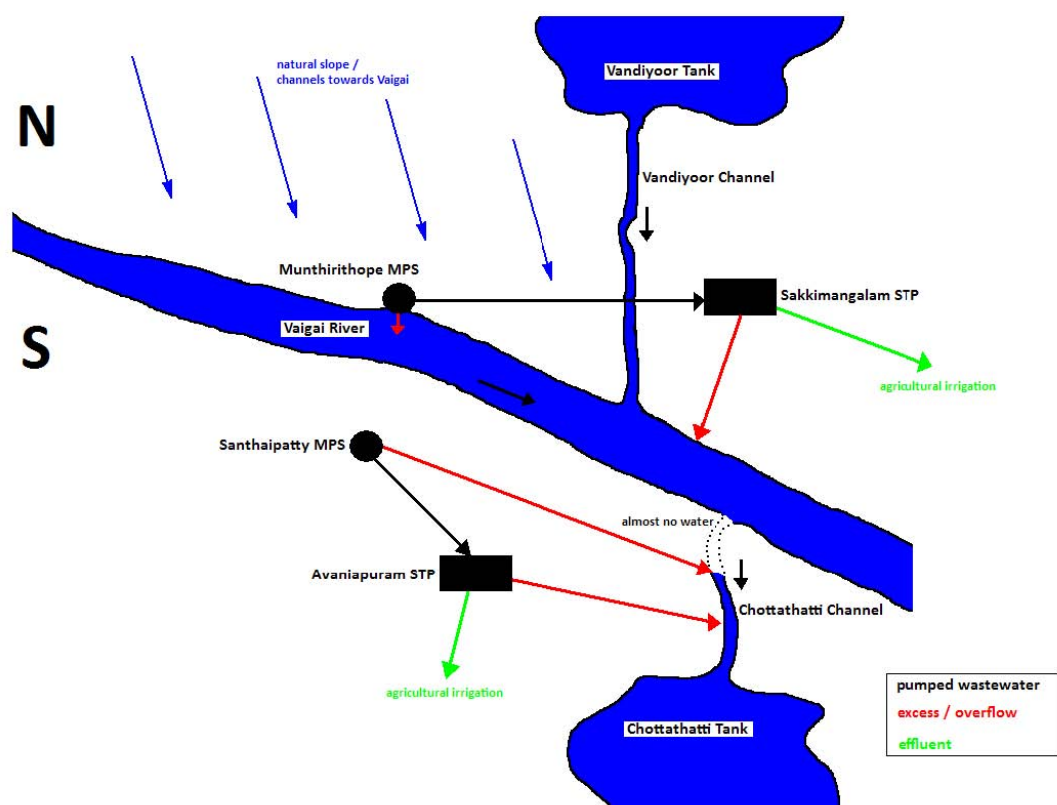


Table 1. Present Condition of the existing WWTS within Corporation Limits

Description	Unit	Present Status	
		Avaniapuram	Sakkimangalam
WWTS	-		
Drainage zone	-	South	North
Connected blocks	No.	15	5
Year of commissioning	-	1924	1990
Total area	ha	156	55
Design Capacity of WWTS	MLD	13	13
Effective inflow	MLD	17	10
Stabilisation ponds	No.	2	3
Operational ponds	No.	1	1 (26)
Size of ponds	m	95 x 95 x 2.5	90 x 38.5 x 2.5
Total volume	m ³	45,125 (22,563 effect.)	25,988 (8,663 effect.)
Theoretical HRT (design inflow)	days	3.5 (1.7 effect.)	2.0 (0.67 effect.)
Theoretical HRT (real inflow)	days	2.7 (1.3 effect.)	2.6 (0.87 effect.)
Effluent disposal	discharge into agricultural fields or water channels for irrigation (via French Drain Systems)		
Remarks	Effluent of lagoons is routed to French Drain System for further treatment		

All proposed improvements (UGSS and WWTS) under the NRCP are limited to Madurai Municipal Corporation areas. Madurai City as a whole, with settlements excluded from MC's responsibilities, is not covered under this programme. For example, Madurai residents living in uncovered outskirts need to continue dealing with improper sanitation, such as people living in uncovered unauthorized settlements, villagers, etc.

3.1 Pilot projects in Madurai

Case1: Tata-Dhan Academy is a development school located in Mellakal, Madurai. The academy offers two years post-graduation in development management, creating multi-disciplinary knowledge including applied technologies relevant to the context.

The academy consists of an administrative block (including classrooms and offices), a library block, and a hostel complex (including kitchen and canteen) for students and permanent staff. The complete campus is covered by two DEWATS units. One DEWATS is constructed at the admin cluster to treat the wastewater generated at the school and the library. Another DEWATS serves the hostel block.



Design quantity in Cu.m/day	Buildup Area in Sq,m	Total project cost in Lakh	Inlet in mg/l		Outlet in mg/l		No of users	Operation status
			COD	BOD	COD	BOD		
15	210	9.00	300	150	28	10	100	Efficiently functioning over the past two years.
8	150						200	

Case 2: Panaiyur village is located in the South-East of Madurai, 4km outside of Municipal Corporation limits. 674 families live in the village. The total population is about 3,150 residents. Only 200 houses are equipped with individual toilets; however about 50% of them are not in use to keep O&M costs for the attached septic tank low. One 9-seater community toilet is provided by the local Panchayat; however it is partly dysfunctional and only for women. Hence, before project implementation, open defecation was practiced for above reasons excessively along the main road, leading to disgusting sceneries, smell and community health problems. So, community toilet and DEWATS unit is constructed.

Design quantity in Cu.m/day	Buildup Area in Sq,m	Total project cost in Rs	Inlet in mg/l		Outlet in mg/l		No of users	Operation status
			COD	BOD	COD	BOD		
12	300	14.95	3000	1500	65	20	1700 Nos	Being governed and operated by Self Help Women Groups for the past one and half year

3.2 CURE offers the following services within the sanitation management component:

- Preparation of Feasibility Studies (FS) for CBS-DEWATS and SME-DEWATS, including pre-design and approximate cost estimation,
- Preparation of Detailed Project Reports (DPR) for CBS-DEWATS and SME-DEWATS, including detailed design, technical drawings and detailed cost estimation,
- Design of DEWATS for different areas of application (SME, CBS),
- Construction of DEWATS, including tendering process, construction supervision and commissioning,
- Organization of Half-Day Introduction Sessions or One-Day Introduction Workshops on Decentralised Wastewater Treatment,
- Organization of One to Three Days DEWATS Training Workshops,
- Lectures about Decentralised Wastewater Management at Colleges and Universities,
- Dissemination of awareness creating booklets, technical manuals and training materials.

4.0 CONCLUSION

Decentralised sanitation management (through DEWATS or ecosan) is beyond doubt a feasible, or better, an imperatively necessary wastewater management strategy to complement the centralized urban sewerage system for Madurai and comparable cities, especially with focus on poverty reduction and environmental conservation.

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