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Apartments struggle with 'manage your own sewage' rule

Following BWSSB's 2016 regulation mandating all apartment complexes with more than 20 units to install their own STPs, a study finds many challenges before the ones already in place.

Pradeep Kuttuva, Sharachchandra Lele, and Nakul Heble, 09 Dec 2016

Bengaluru's *bruath* problem with sewage is notoriously well known, with pictures of foaming lakes and fish kills attracting global media attention. But what is less well known is the fact that this city has the highest number of apartment-scale sewage treatment plants (STPs) in the country.

With over 2000 small-scale STPs housed in apartment complexes alone, along with an equally substantial number in commercial complexes, Bengaluru could well be called the 'city of STPs'. The primary driver of this 'revolution' of small-scale STPs in the city is the 2004 KSPCB order mandating all *new* residential complexes with more than 50 units (or more than 5000 sq m) in *un-sewered* areas to install sewage treatment plants (STPs) *and* reuse all treated wastewater on-site (aka zero liquid discharge or ZLD).

This order has recently been eclipsed by the new BWSSB regulation of 2016 forcing *all* residential complexes in BWSSB's jurisdiction, new or existing, including those connected to BWSSB's sewerage network with more than 20 units to install STPs. This new regulation has generated a storm of protest from Residential Welfare Associations (RWAs), with some of them now likely to approach the High Court.

What is the rationale for requiring apartment-level STPs at all? How has this policy worked in the un-sewered areas of Bengaluru's periphery? To what extent? Does it make sense to extend it to sewerred areas in the core of Bengaluru?

In a two-part article, we explore these questions drawing upon our research on apartment-level STPs in Bengaluru. The first part here presents the barriers to success of STPs in the peripheral areas, including economics and enforcement concerns.

STPs in peripheral areas

In unsewered areas, the basic rationale for requiring apartment-level STPs is clear: Sewage treatment and reuse can simultaneously reduce both freshwater demand and pollution of water bodies. Currently, according to KSPCB, there are 600 "operational" STPs within apartment complexes, with an installed treatment capacity of ~100 MLD (million litres per day), or about 14% of BWSSB's installed capacity (721 MLD).

The "operational" ones are but only a subset. In total, a little over 2200 apartment complexes have obtained consent for establishing STPs on-site, from the KSPCB. So, if all of them were operating successfully, the sewage woes in the periphery could be considerably minimized. But sadly, they are not.

By KSPCB's own admission, over 50% of the "operational" STPs may not be adhering to standards.

In an attempt to understand the factors that aid or hinder the successful operation of STPs in the periphery, we contacted over fifty apartment resident welfare associations (RWAs) spread across the city with a detailed questionnaire on costs of operation, source of fresh water, quantum of reuse and KSPCB's monitoring strategy. However, only 16 responded to the request.

Ten of them were treating their sewage to stipulated standards, but were still unable to use more than 50% of their treated water. The remaining were unable to even treat their sewage to stipulated standards.



Aeration tank of an STP employing the Activated Sludge Process (ASP). Pic courtesy: ATREE

A majority of them employed the Activated Sludge Process (ASP) for treatment, though they displayed a wide variation in their size, fresh water source and costs, as can be seen in the table below:

Variables	Range
Number of Units	35-850
Treatment technology	Activated Sludge process = 13; Sequencing Batch Reactor =2; Rotating Biological Contactor =1
Personnel cost	8000 – 80000 (Rs/month)
Fresh water source	Borewells (8); Tanker (2); Borewell+Tanker (3); Borewell+BWSSB (3)
Cost of fresh water	5 – 80 Rs/kL

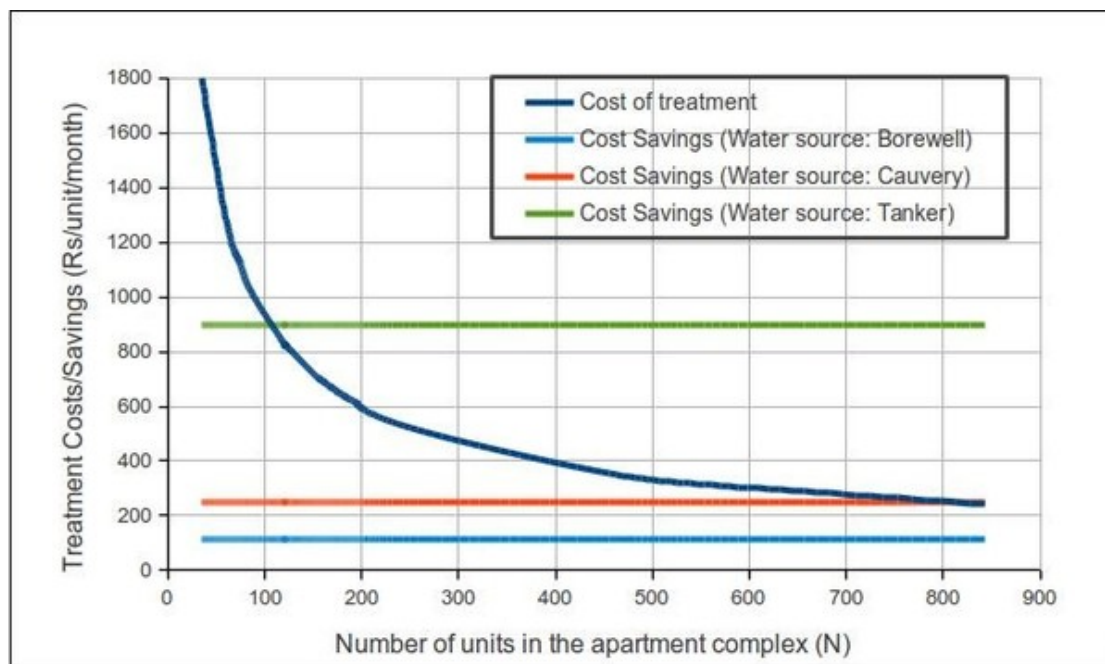
Table: Range of values of key variables in the study that affect apartment-level STP performance

The results obtained from the study present a compelling picture of the pertinent factors affecting STPs that can be used to identify workable policy interventions.

A primary factor is one of economics. The rule does impose a high economic burden, especially on smaller complexes.

The monthly cost paid by each flat towards STP operation and maintenance is shown in the graph below (Dark blue curve). As can be seen, this cost is inversely proportional to the number of units in the apartment complex, mainly

because labour costs for 24-hour operations are relatively fixed.



Variation of treatment costs and savings/unit with number of units in the apartment

Thus a household in a 50-unit apartment complex has to shell out ~Rs.1400/month towards STP operation and maintenance, as compared to only ~Rs. 350/month if it were to be housed in a 500 unit complex!

In comparison, households in BWSSB sewered areas pay only Rs.100/month for sewage disposal!

It is true that apartments could save money on freshwater by reusing treated water. But, here too, only apartments with more than 100 units and dependent solely on tanker water as their source (Green line in the curve at a price = Rs. 80/kL) were able to do so. For others, STPs remained a costly enterprise and this showed in the functionality.

In an effort to reduce costs, smaller complexes shut off their STPs or cut down on the number of personnel, both of which affected treated water quality. So, having the threshold set to 50 units simply did not make any economic sense, unless these apartments were subsidized by BWSSB.

Too much for KSPCB to handle?

In an ideal situation, where the KSPCB is able to enforce its rule stringently, the cost of operation and maintenance should not matter. Clearly, this is not happening, with violations being rampant.

One reason for this is again in the numbers. By decentralizing sewage treatment, KSPCB now has to monitor over 3000 STPs now, as compared to just 14 central STPs currently operated by BWSSB. Given how thinly spread the KSPCB's staff already are, our study found that they only seem to pay visits to the really big apartment complexes. This, coupled with the economies-of-scale, seems to suggest that it would be much more sensible to set the threshold at (say) 150 units.

Enforcement also involves making sure that builders don't pass on undersized, poorly designed or operationally expensive STPs to apartment-owners. KSPCB has lagged far behind on this front. Apartment-owners realize the problem only after the building has been handed over to their RWA and by then it is too late. This leads to frequent operational failures, costly renovations, or quiet abandonment of the STP.

A problem of too much

And finally, even for apartments with fully operational STPs, 100% reuse is simply impossible. A simple engineering calculation proves this.

According to guidelines from the Central Public Health and Environmental Engineering Organisation (CPHEEO), flushing amounts to only 25% of the total water requirement. Garden areas are limited (never more than 25% of floor space). Consumptive water use in such gardens cannot exceed 4 litres/sq m/day. For a 5000 sq m apartment, garden use amounts to only 5 KLD (About 15% of the treated water). Consequently, RWAs can at best consume only about 50% of the treated water internally.

This is acknowledged by the KSPCB in its internal reports, but the order still remains unchanged. A 50% reuse target would be much more realistic, with the rest permitted to be sold (for say nearby construction) or released into storm water drains or lakes.

What lies ahead?

Despite the costs and technical challenges, the study found that several apartment complexes in the periphery of Bengaluru have been treating and at least partially reusing their sewage, owing to a complex mix of factors including environmental awareness, economies of scale and moderate enforcement.

But, these form the exceptions rather than the rule. If this practice is to be scaled-up, more prudent policy measures are required. But does the new BWSSB rule address these challenges? Unfortunately, no. Instead, it opens up a new Pandora's box, as we shall see in the next part of this series.

Pradeep Kuttuva, Sharachchandra Lele , and Nakul Heble ,
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Pradeep Kuttuva completed a Masters at the Autonomuou University of Barcelona, and his MS thesis was on apartment-level STPs in Bengaluru, conducted in collaboration Ashoka Trust for Research in Ecology and the Environment. Sharachchandra Lele and Nakul Heble are Senior Fellow and Research Associate respectively at ATREE.

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