A case of reducing environmental pollution with piloting DEWATS at Road 28-29, Ward-10, Khulna, Bangladesh

Background and context

Khulna is the third largest industrial city of Bangladesh. The city covers an area of 45.65 square kilometers with a population of about 1.5 million, among them 188,442 poor and landless people live in 520 slums. Access to safe sanitation is increasing challenging to the slum dwellers of Khulna city. In recent years, Bangladesh has managed to achieve a significant reduction of open defecation although still about half the population in the country do not have access to improved sanitation. In absence of technical sewerage system in Khulna, the predominant onsite technologies has created a new challenge of wastewater management. This situation coupled with the destitute economic condition of poor migrants has given rise to the formation of a large number of slums where service inadequacies on sanitation have been compounded and multiplied on a massive scale, resulting in hazardous environmental condition.

Figure 1 *Location of Pilot Intervention*

Unfortunately, successful examples of innovative alternative sanitation solutions at scale are limited in Bangladesh and the region. In the absence of investment in sewerage for the whole area, LGIs and urban projects generally concentrate on promoting conventional on-site solutions, pits and latrines, yet without attention to safe faecal sludge management services, treatment or disposal of that waste. It is urgent to demonstrate alternative sustainable sanitation solutions for the context of urban Bangladesh.

From year 2015 with the support of BMGF, SNV started working with thrive to tackle the second-generation sanitation challenges. In such scenario, SNV developed a pilot intervention for the construction of low-cost sanitation systems in Ward 10 of Khulna City Corporation (KCC), with technical assistance provided by WSUP. The WSUP Advisory report detailed three alternative sanitation solutions. SNV then contracted the WSUP Programmes team to provide technical advice in the construction of one of these pilot interventions through a ‘community contracting system’.

Intervene location:

A baseline situation depicting study shows that especially Ward 10 is one of the most vulnerable areas in terms of sanitation practices and services. To visualize the situation, Water and Sanitation for Urban Poor (WSUP) engaged in a feasibility study of low cost sanitation planning and design of different options for this area. The percentage of households with no toilet, shared toilet, and improved individual toilet in Ward 10 was in the bottom quintile of the city, that is the poorest of Khulna. The access to safe FSM services as required by the Sustainable Development Goals (SDGs) is non-existent. It estimated that nearly medium-sized vacuum tankers could empty 66% of all septic tanks in Ward 10 and over 50% of the pit latrines. As a part of SNV’s thrive to demonstrate community based improve sanitation system at ‘Road 28-29 under Ward No 10 of KCC’ has been taken for piloting the new of its kinds sanitation system. Figure-1 shows the location map of the selected area of intervention. In the recent past, there were no operative sewerage systems. All septic tanks and drainage system were also not active. As a result human excreta/ fecal matters from household accumulated in nearby premises. With a larger period of crude dumping and mismanagement, the only available area i.e. backward of household series was primarily selected for the intervention. Figure-2 is presenting a glimpse of the pre-intervene situation.

Figure 2 *Pre-intervene site situation*

Technology Adopted:

Contextualizing the prevailing situation and availability of space, concept of Decentralized Waste Water Treatment System (DEWATS) system has been adopt here with the installation cost of BDT 19,69,000/-. Referring to a specific system comprises of Settlers, consecutively Anaerobic Baffled Reactors (ABR) and Anaerobic Filter Chambers (AF) has been design as an effective and efficient wastewater treatment solution that minimizes wastewater and deposited faecal solids and respective environmental pollution in housing complex/settlements. Design consideration adopted here is as follows:

Table 1.0: Design consideration for Modular type DEWATS	
Design population: 468 nos	Average wastewater production rate: 20 liter/capita/day (lpcd)
Maximum Surface Overflow Rate (SOR): 0.6 cum/hr	Hydraulic Retention Time (HRT): 06 hrs for Settler, 24 hrs for ABR, 12 hrs for AF.
Influent Biological Oxygen Demand (BOD): 600 mg/lit	Effluent BOD: <40 mg/lit
Up flow velocity: 1.0 m/hr	Desludging period: 01 year

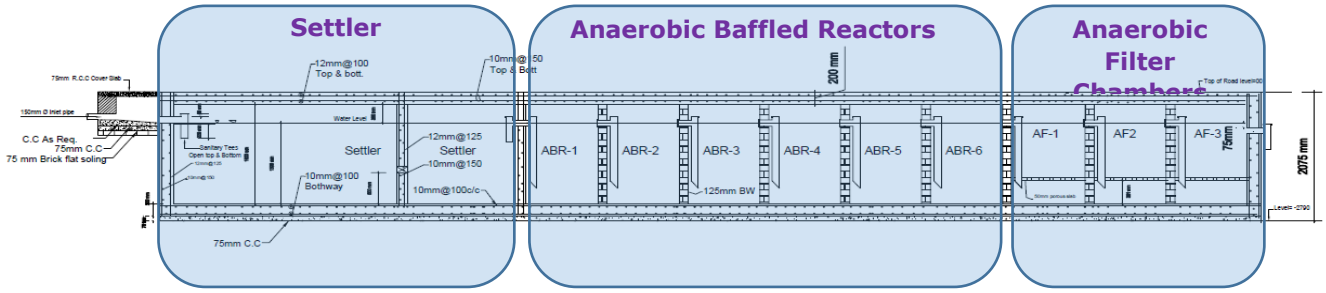

Figure 3 *Section (drawing) of DEWATS*

Figure 4 is depicting the working mechanism of the installed system started with the direct connection from the household latrine through number of connection pits to the main sewer conveyance pipe of size 150mm carries the faecal matters to the Settler. As shown in Figure 3 This 7.8 cum size of settlers mostly act as primary treatment unit. It effectively remove easily settle able solids. In addition, technically the bottom part of settlers initiate the anaerobic fermentation of sludge. The fundamental anaerobic digestion of faecal sludge start within the Anaerobic Baffled Reactors (ABR). Six number of ABRs of size 1.95 cum each facilitate mineralization of suspended or dissolved organic compounds with acceleration of volume reduction and settlement process. Successively, three numbers of Anaerobic Filter Chambers posing enable bacterial colonialization stimulated anaerobic and facultative biological process also the oxygen-deficient environment facilitate digestion of wastewater components. Baffle walls allow the separation of solids from wastewater as heavier solids settle and lighter particles float. However, settling process is a pre-requisite of turbulence-free environment.

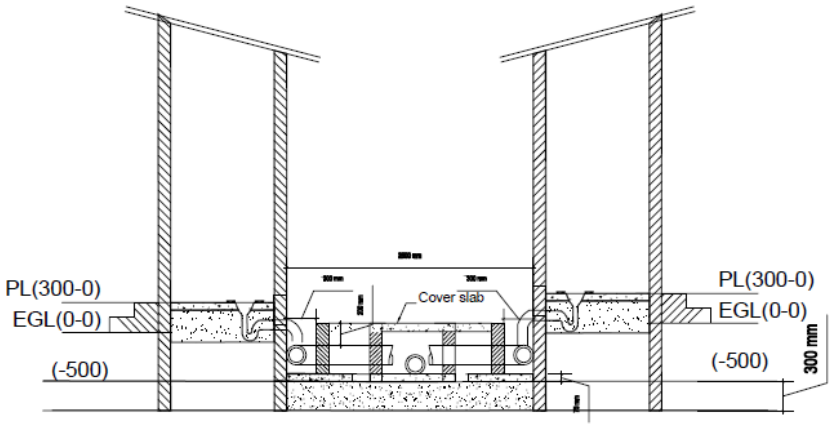

Figure 4 *Drawing of HH toilet connection to DEWATS.*

Going forward

The piloted DEWATS has seen much success in resolving the sanitation and environmental health issues plaguing households of a cluster of Ward-10 of KCC (Figure 5). Considering the small isolated cluster having substantial numbers of people, DEWATS seems to the perfect choice for wastewater treatment. Also in the upcoming tenure, the efficiency of the system can be optimize with periodical effluent quality measures. The beneficiaries along with the respective ward councilor have been very active and sincere in terms of participation in the process, significant contributions in terms of money, labour and land; playing very sincere roles on operation and maintenance; which indicates that option inspite of being a new piloting has been owned by the community. Effective community mobilization is the most significant and potential background promoter for the successful establishment as well as ongoing operation and maintenances. Also in times of climate change, Khulna is one of the climate threatened divisions where DEWATS should be perfect solution for wastewater management considering its proven climate change adaptation capacity. However, overall as second-generation sanitation problem is already knocking the door, therefore based on this successful experience in Khulna, DEWATS has to be consider as one of the ideal solutions where motivation, implementation, dissemination, advocacy and influencing should go in parallel.

Figure 5 *Post-intervene site situation.*
