Faecal Sludge Management (FSM)

In India, over 40 million urban dwellers regularly defecate in the open. In this context, the efforts made are usually focussed on building toilets to eliminate open defecation. However, the solution does not lie in only building toilets, as toilets without proper treatment, reuse and disposal do not serve the purpose. Lack of safe disposal of excreta increases the likelihood of contact with faecal pathogens and other contaminants, leading to widespread disease and, often, death. Globally, around 2,000 children under the age of 5 die due to diarrhoeal diseases every day and 90% of these deaths can be attributed to inadequate access to water, sanitation and hygiene (UNICEF, 2013). Also, excreta contains high amounts of organic matter and nutrients such as nitrogen and phosphorous which pollute the environment when introduced imprudently. According to Energy Alternatives India (EAI) estimates, 0.12 million tonnes of faecal sludge are generated in India per day (Energy Alternatives India. N.D.). Most Indian cities witness unhygienic septage handling practices, with huge gaps in construction design, maintenance, and safe disposal from existing septic tanks and pit latrines. Hence, the challenge is to address the performance of the entire sanitation value chain (containment, emptying, transportation, treatment, and disposal/reuse), which requires a paradigm shift in the way sanitation planning is done in urban India.

In Karnataka, urban areas have a sanitation coverage of about 51.2%, i.e., almost half of the urban population still defecates in the open (Census of India, 2011). While the state has a greater coverage than the national share (46.9%) and some cities such as Mysuru and Hassan have been rated highly as per the cleanliness index[1], only 36.9% of households have access to individual water closets (13.6% of households have pit latrines).

Given the sanitation situation in Indian cities, there is a need to consider implementing appropriate sanitation models in a targeted timeframe. In order to address the current and future sanitation needs of the cities, the sanitation research community recognises the need for a 'portfolio approach'[2], emphasising the importance of decision makers to think beyond networked sewer systems to non-networked decentralised/on-site solutions, and other established or upcoming models. There is further a need for innovative solutions that are cost-effective and adaptable to the changing dynamics of Indian cities. It is important to understand that only technical options will not solve the puzzle.

Climate Change and Faecal Sludge Management

Some of the major effects of climate change can be observed through changes in the water cycle. Increasing unpredictability in the water cycle has led to an increased likelihood of reduced water availability and floods which vary from place to place and season to season (Stern, 2007). In Asia, the frequency of heavy rainfall has increased, while the total number of rainy days and the overall amount of precipitation has decreased. In 2016, 330 million people in India were impacted by drought due to two years of inadequate monsoons (France-Presse, 2016), while

[1] 476 cities were surveyed and ranked, of which Mysuru was rated the highest. The cleanliness index took into account the extent of open defecation and solid-waste-management practices in cities and towns. Mysuru had minimal open defecation and extensive adoption of solid-waste management strategies (PTI, 2015).

[2] To address the sanitation issues of a city, through a range of options that is best suited to the context of the city. For example, a dense area of a city (the city core) may be suitable for networked systems, but decentralised and/or on-site systems may be appropriate for the less dense peripheral areas.

some other parts of the country were flooded by torrential rainfall, causing heavy losses of lives, livelihood and infrastructure (Bhatia and Riley, 2016). Floods can increase the risk of exposure to pathogens such as helminths due to overflowing of sanitation facilities. While climate change is a global issue, the greatest impacts are likely to be borne by poor populations that only have access to inadequate water supply and sanitation facilities. Further, even those served by adequate sanitation systems may face risks levied by climate change as the resilience of many technologies in use is questionable. Conventional sewerage networks, for example, show low[3] climate change resilience as they require reliable water inputs, which would be affected by prolonged drought. Further, increased rainfall may cause back flooding or overflowing of sewers, increasing risks to public health. In comparison, unconventional sewerage networks are more resilient as they use less water, although the risk of damage from floods persists (Howard et al., 2010).

Technologies with lower dependence on water supply are expected to have greater resilience, with IPCC suggesting the use of decentralised technologies for wastewater treatment (IPCC, 2008). Moreover, onsite faecal sludge management systems, especially, dry pits, show highest resilience as many different adaptations are possible that can reduce the environmental and health risks posed by floods. While floods can still be a threat, latrine designs can be adapted quickly and changed even after floods to reduce the impact of the consequences (Howard et al., 2010).

Ultimately, existing and new technologies need to be re-examined to determine their effectiveness against the threat of climate change. In a country like India where inadequate sanitation and open defecation are the only options available to some sections of the population, it is important to think critically on climate change resolution alongside social, environmental, and financial considerations. Effective adaptation strategies need to be contextual with respect to development, environmental, and health policies in both rural and urban spaces. Faecal sludge management technologies show great promise against climate change as they are not heavily dependent on water supply and can be designed to minimise flood impacts. However, the most resilient technologies are those that are adapted to the local conditions.

Faecal Sludge Management Toolbox

Funded by the Bill and Melinda Gates Foundation, the Asian Institute of Technology (AIT) has developed a Faecal Sludge Management Toolbox with inputs from its partners such as CSTEP and CEPT University. The FSM toolbox intents on being a 'one-stop database' for the key players involved in the FSM program. The toolbox outlines the entirety of the general FSM program, from understanding the current FSM situation in an area to the evaluation of the project to assess whether the set targets were achieved. At every stage, the toolbox equips users with various forms of resources including, but not limited to: tools, guidance manuals, sample documents, templates, plans, etc.

The FSM toolbox is a demand-driven entity that defines an eight-step program for Faecal Sludge Management. These programs cover seven aspects of FSM: institutional, regulatory, technology, advocacy, capacity building, financial and monitoring. For each of the steps, the relevant key

[3]When compared with unconventional sewerage options. *High*-resilience technologies are likely to function well under most expected climate conditions, *Medium*- resilience technologies under a significant number of such conditions and *Low*-resilience technologies under a restricted number of climatic conditions (Howard et al., 2010).

players (city planners, donors and consultants) are highlighted. Users can find relevant needs that arise and the associated resources for each step.

Bibliography

Bhatia, R., Riley, T., 2016. India crippled by extreme weather as 100 million exposed to floods. The Guardian.

Census of India, 2011. Census of India Website : Office of the Registrar General & Census Commissioner, India [WWW Document]. URL http://www.censusindia.gov.in/ (accessed 7.7.15).

France-Presse, A., 2016. Indian drought "affecting 330 million people" after two weak monsoons. The Guardian.

Howard, G., Charles, K., Pond, K., Brookshaw, A., Hossain, R., Bartram, J., 2010. Securing 2020 vision for 2030: climate change and ensuring resilience in water and sanitation services. J. Water Clim. Change 1, 2–16. doi:10.2166/wcc.2010.105

IPCC, 2008. Climate change and water IPCC technical paper VI, Technical Paper. Intergovernmental Panel on Climate Change (IPCC).

PTI, 2015. Mysuru tops Swachh Bharat rankings, Delhi Cantt. at 15th slot [WWW Document]. The Hindu. URL http://www.thehindu.com/news/national/karnataka/swachh-bharat-mission-mysore-tops-swachh-bharat-rankings-delhi-cantt-at-15th-slot/article7516267.ece (accessed 7.14.16).

Stern, N., 2007. The Economics of Climate Change [WWW Document]. Camb. Univ. Press. URL http://www.cambridge.org/us/academic/subjects/earth-and-environmental-science/climatology-and-climate-change/economics-climate-change-stern-review (accessed 7.13.16).

UNICEF, 2013. Children dying daily because of unsafe water supplies and poor sanitation and hygiene, UNICEF says [WWW Document]. UNICEF. URL http://www.unicef.org/media/media_68359.html (accessed 7.15.16).

