Arghyam
Safe, sustainable water for all

GW-SAN CONNECT RESEARCH PROGRAMME

BACKGROUND

As we strive to increase toilet and sanitation coverage in rural and urban areas, it becomes more important to understand its effect on the water resources. . The launch of Swachh Bharat Mission by the new government at the center aims to achieve total sanitation coverage by 2019 - approximately 125 million toilets to be constructed in both rural and urban - if the toilets built are not facilitated with proper waste treatment and disposal, the impacts could be adverse and multifold on the groundwater. While rural areas are likely to be serviced with on-site sanitation systems for the probable future, urban India is divided between those using septic tanks and connection to sewerage network. In rural areas inadequate design or improper usage infiltrate the untreated sewage into the subsoil and thereafter the groundwater sources/resources and in urban areas the space constraints and lack of operation and maintenance amplifies the problem further.

The scale and complexity of the problem is huge and dynamic. The subject of unsaturated zone hydrology, transport and transformation of pathogens through vadose zone – saturated aquifer is extremely intricate. Most of the studies are based on a laboratory scale and the applicability in field is a problem. The inter-seasonal fluctuations of water table and high water velocity changes adds another complex layer[1] Increasing population and densification of settlements is deteriorating the situation further.

The applicability and practicability of the design guidelines and other policy documents is certainly a significant area that merits probing as we overlay it with the ground realities.

[1]Krishnan, Sunderrajan. *On-site Sanitation and Groundwater Contamination: A Policy and Technical Review.* Ahmedabad: INREM Foundation, Bill and Melinda Gates Foundation, 2011.

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Arghyam strives for safe, sustainable drinking water for all. A decade of work and we are repeatedly becoming conscious that safe and sustainable drinking water cannot be achieved in isolation. Water supply and Sanitation are two important services that are necessary for any human settlement, however "In certain hydro geological conditions these may be in conflict and an integrated approach is required to avoid new pollution hazards[2]. The Groundwater-Sanitation (GW-SAN) Connect Programme stems from acknowledging that a comprehensive understanding of the linkages between water supply and sanitation systems is of prime importance to arrive at an integrated approach. Arghyam is in the process of exploring national and international collaborations to secure significant investments to promote this agenda.

The GW-SAN Connect Programme intends to develop an integrated approach in managing water supply and sanitation. The objective of the programme is to bridge the knowledge gap through rigorous scientific investigations, research, disseminate the body of knowledge and inform policy & regulations

TABLE 1: PARAMETERIZATION FRAMEWORK _GW-SAN CONNECT RESEARCH PROGRAMME

Sl.	RESEARCH THRUST AREA	REMARK
1	Pollutant transport and attenuation in the unsaturated zone beneath pit latrines.	Compared to the often more studied septic tanks with percolation trenches for which the hydraulic loading is a lot higher, but over a significantly larger area.
2	The impact and interaction of high densities of on-site systems (pit latrines and/or septic tank percolation areas) on groundwater pollution.	Existing guidelines often only consider the siting of an individual system not what a safe maximum density would be.
3	The impact of monsoon rainfall intensities on pollutant transport through the unsaturated zone.	During intense storm events the unsaturated zone may well become temporarily saturated leading to rapid transport of pollutants down to the water table and in some cases surface flooding; in addition water tables will rise thereby reducing the depth of the protective unsaturated zone
4	The impact of well design in terms of local pollution from neighbouring on-site effluent	Relatively simple changes to the construction of hand-dug and tube wells can in help to mitigate the transport of pathogens into the water source
5	The socio-economic context of such on-site systems in urban and rural areas.	Many of the poorest live at high densities in areas with the least suitable soil and groundwater conditions for safe effluent disposal. In addition, the effect of poor sanitation has a disproportionate health impact on children

[2]Lewis, W. J., S.S.D. Foster, G.H. Read, and R. Schertenleib. "The Need for an Integrated Approach to Water Supply and Sanitation in Developing Countries." *The Science of the Total Environment*, 1981: 53-59

Following the track, a humble beginning was made in May 2014 with a workshop that brought various experts – Researchers, Field Practitioners, Policy Makers, Academicians to do a quick assessment of the sector and the potential areas of work. The workshop emphasized that the sector is poorly understood and under-researched and there is ample scope for further work. Gathering from the workshop and subsequent discussions within Arghyam and with experts in the sector, in late 2014 we commissioned an extensive literature review to stockpile the existing knowledge in the groundwater and sanitation interface with respect to a few research thrust areas presented in Table 1. The thrust areas were built on the interplay of various parameters like subsoil geochemistry, meteorological conditions, hydraulic loading, pollutants, population density and so on.

The findings from the literature review is expected to identify critical issue(s) in the groundwater – sanitation interface that needs further attention and hence assist in validating relevant research hypotheses for further work. The research projects across different hydro-geological setting across urban and rural India should generate the outcomes as in Table 2.

TABLE 2: EXPECTED OUTCOMES_GW-SAN CONNECT RESEARCH PROGRAMME

Sl.	OUTCOMES	REMARK
1	Collate the knowledge available in literature.	A comprehensive knowledge database – Technical, Scientific, Case Studies of good practices world – wide. Review existing policy, recommendatory and regulatory documents and map the institutional mechanisms in the Indian Context.
2	Bridge the knowledge gaps through research programmes.	The knowledge gaps in scientific understanding, evidence building to theorize, action researches, create a database to calibrate, etc.
3	Integrate the findings from research to incorporate in design guidelines/ recommendatory documents.	Analysis of the data/findings to recommend standards for various hydro-geological settings that factor in rainfall fluctuations (densities of on-site sanitation systems, lateral spacing and suitable depth of subsoil for attenuation of different pollutants, maximum loading, etc.). Infrastructure (well, septic tank, etc.) design and retrofitting. Innovative use of treated waste water, etc.
4	Disseminate the build knowledge to inform policy and regulations.	Dissemination of the quantum of knowledge generated through the research will ensure the applicability and practicability of the same.
5	Recommend governance mechanism and institutional framework to influence practice.	To bring the research into practice and implement policy/regulations necessary governance mechanisms and institutional design to imbibe the learnings/findings in the existing system.

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