Designing a Functional Village-Scale Sanitation Ecosystem

The lived experience in two villages of GEAG, Gorakhpur, India

Key Message

Peri-urban areas that are especially vulnerable to natural disasters, need methods to strengthen the ecosystem of these areas. This involves the construction of proper sanitation facilities as a sanitation ecosystem to maintain favorable human health conditions.

The negative effects of poor sanitation are clear to local residents. In order to ignite change it is necessary to demonstrate the connection between current practices and their negative effects by appropriate tools.

Healthy sanitation practices (habits of the heart and mind) need to be sustained along with the brick-and-cement structures. An analysis using a public goods lens will produce an understanding of costs of transformation and transaction. Agreements are needed to be crafted between local users and all other relevant actors that will assign responsibility and authority for monitoring and corrective action in different parts of the sanitation ecosystem.

The paper is based on experiences related to interventions of Gorakhpur Environmental Action Group in selected peri-urban villages of Gorakhpur City towards Urban Climate Change Resilience – as a part of Asian Cities Climate Change Resilience Network (ACCCRN).

Abstract:

Sustainability is critical in all development interventions. Theoretical frameworks can be applied, beyond the Community-Led Total Sanitation (CLTS), to help local people to be a part of a sanitation system that will contribute to good health. A simple application of systems thinking will help to locate the parts of the sanitation system. Defining the types of goods and services within this sanitation system, using the theory of public goods, will help to identify roles and responsibilities related to provision, production, consumption, and co-production. An understanding of institutional analysis using the grammar of institutions will help to create the cement (interconnections and interdependence) that binds people in collective action. The inclusion of transformation and transaction costs simplified as costs of capital and assets, operation, maintenance, information and co-ordination will contribute to sustainability.

How this paper is organised?

1. The problem is presented.
2. One possible solution is described.
3. A description follows of some theoretical frameworks.
4. Next comes GEAG's experience of a working model.
5. A sustainability discussion concludes the paper.

1. The Problem

About 65% of our rural areas are without sanitation facilities (MDWS GoI Report, 2017) . Such areas also face acute water shortage. A direct link exists between water, sanitation, nutrition and human health. Contaminated drinking water, improper disposal of human excreta, lack of personal hygiene, food hygiene and improper disposal of solid and liquid waste have been major causes of many diseases in eastern villages. Children, particularly girls and women, are most affected (MDWS GoI Report, 2017). In addition women suffer from lack of privacy, harassment and need to walk long distances to find a suitable place for defecation. For achieving real development, the country needs to address issues of water and sanitation, with a focus on people who are poor and marginalised.

2. One Solution

Create the physical (brick-and-cement) structures. Nurture the institutions that will govern the daily operation and regular maintenance. Design mechanisms to ensure that money is available for managing the operation and maintenance including long-term replacement.

3. Theoretical Frameworks

3.1 Systems

One possible solution is to establish a sanitation sub-system made up of household toilets with septic tanks. Flush toilets need water which means a sub-system of water availability needs to be ensured. Water that comes into the house turns into black water (any contact with faecal matter) or grey water (bathing, washing, kitchen). Black water goes into the septic tank. Grey water leaves the house and often accumulates in stagnant pools creating mosquito habitats. To avoid this, a drainage network must be created. This drainage network must be connected to a wastewater treatment plant to recycle greywater into irrigation water. This irrigation water, in part, will recharge groundwater which is again pumped up through various machines. A functioning system of the above parts will result in reduction in open defecation, reduction in uncovered human excreta, reduction of waste water logging and the opportunity for recycling wastewater for irrigation. This will contribute to the breaking of the cycles of several diseases that arise from the housefly and mosquito.

Business Ecosystem: The network of organizations – including suppliers, distributors, customers, competitors, government agencies and so on – involved in the delivery of a specific product or service through both competition and cooperation.

A **System** or a mere collection of items? A system has **parts**, that are **interdependent and interconnected**. There are **inputs** that are transformed into **outputs** using **processes**. There is a **hierarchy** of nested systems: smaller systems are nested into bigger systems. Every system pursues a **purpose** using **feedback** (information related to progress towards purpose) and **corrective action** (action to align activities towards achievement of purpose).

(Joseph, S, 2007)

3.2 Institutions

This sub-system involves people in addition to the bricks and cement. All brick and cement structures need operation and maintenance. Most health issues require co-production by the user. When two or more persons are affected by a problem they need a common understanding or a shared understanding between them. Institutions (holders of common understanding) assist in the creation of such shared understanding which in turn helps people to govern their behaviour when working in groups. Institutions can be analysed as shared-strategies, or norms or rules-in-use. It follows that a system that has people, must also have institutions that hold people together in collective / group action. At the family level there is a need for an increased awareness of personal hygiene, especially the washing of hands with soap after defecation as well as practices to ensure safe drinking water. At the village level, it is important to recognise that open defecation exists because it is a shared strategy. New institutions need to be nurtured to replace those coming down across generations.

Grammar of Institutions (simplified by Sam Joseph based on the original by Ostrom and Crawford)

- **A** Attributes of membership (who is part of this group)
- **I** Aim of the group
- **C** Conditions (where, when, how, who, action responsibilities)
- **D** Deontic: statements about what is obligatory, prohibited, and permissible (Must do, Must not do, May do)
- **O** Or Else: penalties for breaking the rules of working together

Levels or robustness of group action

- **AIC** shared strategy
- **AICD** Norm
- **AICDO** Rules-in-use

3.3 Public Goods, Private Goods, Toll Goods, Common Pool Resources

A number of goods and services are available in this sanitation system. From a sustainability perspective it is important to identify the characteristics of these goods and services from a public goods lens.

		Subtractability of Use	
		High	Low
Difficulty of Excluding Potential Beneficiaries	High	Common-pool resources: groundwater basins, lakes, irrigation systems, fisheries, forests, etc.	Public goods: peace and security of a community, national defense, knowledge, fire protection,
	Low	Private goods: food, clothing, automobiles, etc.	Toll goods: theaters, private clubs, day-care centers

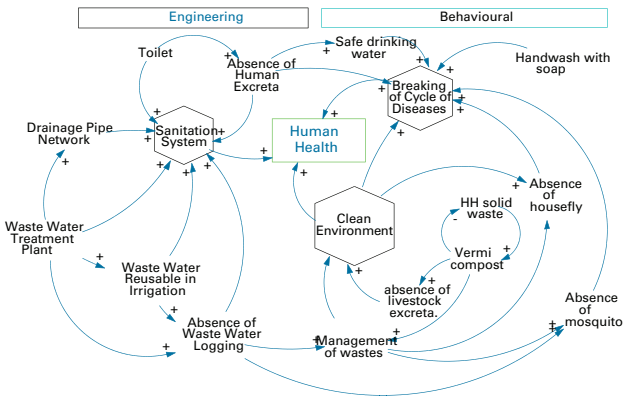
(Four types of goods. Source: Adapted from E. Ostrom, 2005: 24)

A toilet in a household qualifies as private good with no difficulty in excluding non-family members. It can be used only turn by turn: it cannot be used jointly by several persons at the same time – high subtractability. The drainage network on the other hand can be used by several households at the same time – low subtractability. It would involve high difficulty in excluding anyone from using the drains. Individual handpumps in the household exhibit the extraction of water as a common pool resource but it comes as private good due to low difficulty of exclusion of non-family members. In contrast public hand pumps are a common pool resource. The water treatment plant looks like a public good at the village level because many people can use it at the same time and exclusion is difficult. However, due the issue of carrying capacity, there is a high subtractability factor so it is a common pool resource. The recycled water is available as a common pool resource to the farmers in the discharge area.

Provision, Production, Consumption and Co-production: Provision involves questions related to size, quality, carrying capacity, funds, finance and management. Production includes all the day-to-day activities of operation and maintenance. Consumption implies all the action involved in using a good. Co-production is the contribution of time and money by a user to convert a good into a benefit. E.g. users of a drain must not put garbage in the drains that will choke the drain. Instead users must carry garbage to the garbage dumping area. Toilets and septic tanks are provisioned, produced and used by households. Government departments carry the provision function of Public hand pumps, tap-water supply, drains and water treatment plants. Production of these is contracted out. The consumption is by people of the village.

4. GEAG's Experience and Working Model

4.1 An eco-system systemic view of GEAG's working model



4.2 Behavioural

Community-Led Total Sanitation (CLTS) is an approach which helps rural communities to understand and realize the negative effects of poor sanitation. While this is the intention of *CLTS* "CLTS is focused on igniting change in sanitation behaviours, rather than constructing toilets, thus is done by a process of social awakening, then is stimulated by facilitations from within or outside the community (source www.sswm.infor, GoI objective on CLTS)", there is need to include additional theories to make total sanitation a reality.

GEAG began *by* introducing the CLTS process in two selected village Semra Devi Prasad of Khorabar block and Sheikhpurwa of Chargawan block of Gorakhpur district, for eradicating open defecation. Beyond CLTS they also identified interconnected priority areas like disposal and treatment of sewage and grey water as part of a system for dealing with interdependent sanitation issues.

4.2.1 Social Pressure as a consequence of toilet mapping on social map

When the process of toilet mapping on a social map was carried out among the community, certain members of the community boycotted it as open defecation (OD) is looked upon as a social evil. This boycott tends to create social pressure on the other community members as well. Toilets are constructed and they are also put to use. During the process of social mapping, if a community member says that he is unable to get a toilet constructed at the time of discussion, then the option of constructing the toilet with the help of other community members is presented to him/her. This has created a shared strategy (AIC in Grammar of Institutions) among the community. This has helped the construction of toilets. After this, on World Toilet Day, the community members took an oath to use toilets : a norm as AICD.

4.2.2 Biological Water Testing

Testing by H_2S Vial was carried out among the community. 25 such tests were conducted. The community members witnessed the result of this test in their own homes which made them realise the need for safe drinking water. The water from the hand pump in areas where the practice of OD was prevalent turned black during the H_2S Vial Test. This eye-opening test made the community members give up on OD. Some people even got new taps installed.

4.2.3 Awareness among community members across all age groups

Awareness drives were carried out among community members of all ages on sanitation issues, especially on common issues like hand washing and excreta management. For the age group of 0-6 years, Focus Group Discussions (FGDs) were held with mothers, as they are the ones who inculcate hygienic practices among the children. Each FGD had around 18-30 women participants.

For the age group of 7-16 years, awareness sessions were held in schools. For adults (above 18 years), regular follow ups were conducted in areas where OD was prevalent and community meetings were organized by using IEC and pamphlets on water borne diseases were distributed. As this is a peri-urban area, people were also making an effort for solid waste dumping.

5. Sustainability Discussion

5.1 Toilets plus septic tanks

The toilets are private goods. Their construction, operation and maintenance are at the household level. Keeping in mind that the privacy and safety needs of women have been addressed, the assumption can be made that they will continue to be used.

5.2 Water sources

Private hand pumps will be maintained because it is a private good. The water in these pumps is a common pool resource under the ground. All common pool resources need rules that can be enforced for the amounts of water that can extracted in different seasons. Over exploitation of any common pool resource results in the destruction of such a resource.

Public hand pumps need working agreements between the residents of the street and local government officials to ensure timely feedback and corrective action. This will require some funds to meet both information and coordination costs. Private taps are part of a local sub-system of piped water. All the costs of operation and maintenance are included in the water bill. However, the water in this system is a common pool resource and the precautions stated above need attention.

5.3 Drainage network

While a DEWATS (see below) committee has been formed, and the assumption is made that this committee will be responsible, there is risk that individual households will shirk their own responsibility regarding the drains. From an institutional analysis perspective, every house creates waste water. This water is now directed into drains. The drains have characteristics of a common pool resource. There is limit to carrying capacity. This means rules of using drains by each household need to be created at every street level, and then aggregated into neighbourhood level and then into the *gram sabha* (village assembly of adults for local self-governance guaranteed under the 73rd and 74th Amendments to the Constitution of India).

5.4 Water treatment plant

Decentralized Wastewater Treatment Systems (DEWATS): A DEWATS committee has been created. It is assumed that this committee will be responsible for the survival of the system along with local government officials of the Panchayat Raj (local government) and local water authority (Jal Nigam). In the box on systems (see 3.1) the assertion is made that systems pursue a purpose through feedback and corrective action. Further under 3.2, collective action can be classified as a shared strategy, a norm or a working rule. It may be necessary to strengthen the feedback and corrective action by creating written agreements that clearly list the responsibilities at different levels of this system: household, street, neighbourhood, village, *gram sabha*, local government officials and the water authority. In the absence of working rules (institutions that contain ADICO), opportunistic behaviour consisting of shirking, free riding, rent-seeking and bribery/corruption will undermine the sustainability of this system.

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