THE EVOLUTIONARY DYNAMICS OF INDIA'S RURAL WATER SYSTEMS (PART I)

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ABSTRACT

Poor microbial water quality management in rural India causes numerous instances of fatal, yet preventable, waterborne diseases. One intervention to reduce this disease is testing and sharing water quality information to increase awareness of water quality issues and safe water practices. In order to better understand how this particular informational intervention could be most impactful in the context of rural India, this paper explores the evolutionary dynamics of rural water management. The focus of the first phase of this work, presented here, is to generate insight into - not a working model of - the dynamics surrounding water systems in the various rural terrains of India. This work, conducted using a combination of field observations, interviews, and group model building exercises, considers water schemes in the mountainous region of the state of Uttarakhand, and also in the plains of Jharkhand. Analysis of water schemes in these two diverse contexts of rural India has elicited five stages of the evolutionary dynamics that contribute to water safety in a village: the maturity of community institutions, infrastructure and usage of sanitation systems, water quantity and availability, operation & maintenance of water distribution systems, and the dynamics of water quality and health. This work presents a model invoked from ethnography, and is the first model to characterize factors influencing water quality in rural India.

INTRODUCTION AND RESEARCH QUESTION

Increasing access to improved microbial water quality in rural India is a critical goal moving forward. In particular, poor microbial water quality is linked with poor hygiene and sanitation practices, and this results in numerous fatal diseases each year. An estimated 801,000 children younger than 5 years of age die from diarrhea each year, mostly in developing countries; this means about 2200 children are dying every day as a result of diarrheal diseases (Liu et al. 2012). In India particularly, diarrheal disease is an enormous problem, as diarrhea is responsible for 13% of all deaths per year in children under 5 years of age (Lakshminarayanan and Jayalakshmy 2015) Additionally, diarrhea is the third leading cause of child mortality in India (Lakshminarayanan and Jayalakshmy 2015)

What makes these statistics so remarkable is that the vast majority of deaths from diarrhea are easily preventable: "Unsafe drinking water, inadequate availability of water for hygiene, and lack of access to sanitation together contribute to about 88% of deaths from diarrheal diseases (Prüss-Üstün et al. 2008). Thus, there are several efforts to improve water and sanitation practices, which often use a combination of "software" and "hardware" approaches. There have been massive resources invested in installing water and sanitation "hardware", which includes physical drinking water disinfection technologies, improved toilets, and hand-washing stands (Peal, Evans, and van der Voorden 2010). However, the effectiveness of such technologies is dependent on the degree of compliance (Mosler 2011). If used improperly or not at all, the hardware is ineffective. Thus, this "hardware" must be accompanied by "software" such as behavior change programs or persuasive and informational messaging (Peal, Evans, and van der Voorden 2010)

In this context, our research, a collaboration between System Scientists, Mechanical Engineers, and two NGOs (Himmotthan and PRADAN), is focused on designing a solution that combines the "hardware" *and* "software" side to improve microbial water safety in rural India. On the "hardware" side, we are designing a sensor to detect microbial contamination in 2-4 hours in a point-of-use setting. This technology would provide a significant improvement over current lab tests that take 24-48 hours for incubation, and require transporting water samples over 50-100 km from poorly connected villages (Bono et al. 2017). *The focus of this research is the "software" side, which is aimed at developing the package of practice to insert and act upon the information generated by the sensor technology in the rural settings effectively.* The package of practice side of this work is as critical as the sensor technology side, as in rural areas where the water is scarce; simply detecting problems with water quality without making communities capable of dealing with this new information creates a panic. We have planned the package of practice side of the investigation in two parts: (I) understanding the current state of water systems, communities' interactions with them, and the resulting water safety scenarios in rural India to arrive at a conceptual model; and (II) creating a working model, analyzing it for identifying policy for inserting microbial contamination insertion, and developing a package of practice for NGOs and communities managing water safety. *Presented here is the Part I of this research.*

The remainder of this paper is organized as follows. We start with describing the field setting to familiarize the reader with the terrains and water sources where we are working. We then lay out the methodology followed. The large majority of this paper is spent on the following section that discusses the findings in terms of the evolutionary dynamics of water systems in rural India. These findings are then synthesized into a conceptual model. We finally lay out the conclusions and next steps for this research.

FIELD SETTINGS

Since the summer of 2016, we have partnered with two nongovernmental organizations (NGOs) that are both involved in implementing water and sanitation projects: Himmotthan, which is based in Uttarakhand, a northern state located in the Himalayan region of India; and PRADAN, based in Jharkhand, a largely tribal state located in the eastern plains of India. *The purpose behind these partnerships is to study a mutually exclusive but collectively exhaustive sample of rural water systems as drawn from mountain as well as plain areas.*

Himmotthan in Uttarakhand

The Himmotthan Society was registered in 2007 and works among rural mountain communities in the Central Himalayan region. Himmotthan focuses on developing sustainable livelihoods related to livestock and agriculture, and focuses on intervening in communities to improve their access to education, water, sanitation, and energy. It is primarily funded by the Sir Rata Tata Trust, one of the oldest philanthropic institutions in India (*Himmotthan.in*, 2014). While Himmotthan has made progress in a variety of areas, their accomplishments in water and sanitation infrastructure are notable. Their water and sanitation program, ongoing since 2004 under the broader organization "Himmotthan Pariyojana", has assisted 176 villages to have access to drinking water delivered to their doorstep. They have assisted with the implementation of sanitation facilities for over 4,160 households. (*Himmotthan Annual Report 2014-2015*, 2015) Currently**,** Himmotthan is working with 313 villages. There are 53 people in total working for Himmotthan, 17 of which work specifically in an office dedicated specifically to water. Himmotthan works in Uttarakhand and Himachal Pradesh, but for the purpose of this investigation their experience working in Uttarakhand is considered.

Figure 1: Uttarakhand Landscape where Gravity-fed Piped Water Infrastructure is prominent

Uttarakhand has a total area of 53,483 km2, of which 86% is mountainous and 65% is covered by forest. The terrain in Uttarakhand lies among the lower Himalayas and is rough and hilly. Uttarakhand was carved out of northern Uttar Pradesh in 2000 to form the 27th state of India. (*Uttarakhand: State Profile*, n.d.) It has a population of approximately 10,086,000 people, of which 7,037,000 live in rural areas, or approximately 70% (Government of Uttarakhand, 2014). Himmotthan works in 26 blocks across 9 districts in Uttarakhand (*Himmotthan Annual Report 2014-2015*, 2015). According to Vinod Kothari, member of Himmotthan, 94% of drinking water is coming through the springs. Figure 1 above depicts piped water running through a pipe from a spring to the village of Kudiyal Gaon. Below, Figure 2 depicts a group model building session held in Uttarakhand; you can see the hilly terrain in the background.

Figure 2: Group Building Session in Jadipani, Uttarakhand

Pradan in Jharkhand

PRADAN was founded in 1983 with the mentality that educated professionals could work in communities to help poor people improve their lives. (*Pradan: Building a World Where Everyone Can Live With Dignity*, 2017) PRADAN stands for Professional Assistance for Development Action and is inspired by the mentality that removing poverty requires empathy and a helping motivation ("The Origin: PRADAN," 2016). PRADAN is funded by numerous organizations including the Bill and Melinda Gates Foundation, Tata Trusts, and various banks (*Pradan: Building a World Where Everyone Can Live With Dignity*, 2017). Their mission statement is "to enable the most marginalized people, especially rural women, to earn a decent living and take charge of their own lives" (*PRADAN: Building a World Where Everyone Can Live With Dignity*, 2017). In order to accomplish this, they focus on developing women's collectives, or self help groups, that in turn will be able to develop their own skills and initiatives. As of March 2015, PRADAN worked with 28,592 Self Help Groups across 7 states, which represents a total membership of 367,871 rural poor women (*PROMOTION OF SHG'S*, n.d.). They work in states across the central region of India; Rajasthan, Madhya Pradesh, Chhattisgarh, Bihar, Orissa, West Bengal and Jharkhand. PRADAN has made notable advances on installing piped water systems for villages, though across the country water seems to be a newer portfolio for them.

Figure 3: Jharkhand Landscape, a picture outside Jolha Karma, Jharkhand

For the purposes of this study PRADAN's experience in selected villages in Jharkhand is considered. Jharkhand became the 28th state of India in November of 2000 (Government of Jharkhand, 2013). In a stark contrast to Uttarakhand, most of the state lies on the Chota Nagpur Plateau, and approximately 29% of the state is covered in woodlands. (Government of Jharkhand, 2013) Jharkhand has a population of approximately 32,988,000 people, of which 25,055,000 live in rural areas, or approximately 75%. (*Jharkhand Population Census data 2011*, 2015). In Jharkhand, PRADAN works in 11% of the villages. ("The Origin: PRADAN," 2016) Much of the state is still covered by forest, and its largely tribal population coexists with a population of tigers and Asian elephants. **Figure 3** above shows the flat landscape of Jharkhand. **Figure 4** below shows a Group Model Building session conducted in Ronhe, a village served by Pradan in rural Jharkhand.

Figure 4: Group Model Building Session in Ronhe, Jharkhand with the NGO PRADAN

METHODOLOGY

In each state, we spent one full day talking to the NGO about their perceptions of water quality. Our discussion was loosely based off of the Hines modeling process; in which one elicits important variables and then investigates the behavior of such variables. We asked about the flow of water, and then asked how contaminants entered the water at each stage. Members of the NGO listed variables that caused contamination to increase and decrease, and then we plotted how those variables changed over time. From these reference modes, we were able to elicit some preliminary structural insights. These insights helped guide our subsequent focus group sessions throughout the week.

In each location we led 4 focus group discussions that centered around topics of water flow, water contamination, water borne diseases, institutions that interact with water management (including Self Help Groups), and what important channels of information flow there were in the city. Each focus group had approximately 8 - 20 people, and were usually members of a local women's collective called a Self Help Group. Additionally, we complemented the information we got through our group model building sessions with in-depth interviews of various staff members. Ultimately, the information that we gathered will be used directly to inform our comprehensive model of how various stakeholders can impact microbial water quality in rural India

The overall methodology followed can be understood as three interconnected blocks depicted in **Figure 5**. Additionally, the detailed questionnaire used for unstructured interview and the protocol used for Group Model Building can be found in Appendix I.

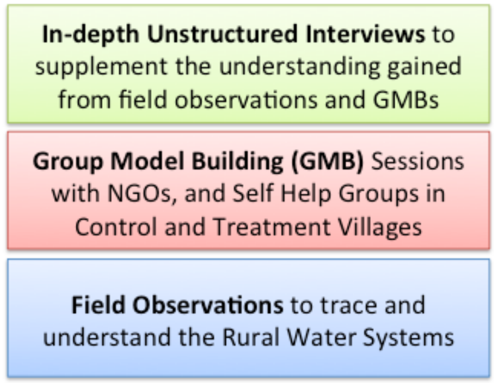

Figure 5: Research Methodologies

To achieve a reasonable sampling of water sources serving India's rural areas we used the following criteria: (a) we chose to work with NGOs in mountain and plain regions to represent a cover a large majority of rural water scenarios; (b) within the regions served by the two NGO partners, we sampled two types of villages, one where the water systems are mature and others where they are not. It is important to bear in mind that a completely random sampling is difficult in such remote regions as one is necessarily dependent upon the trust NGOs have built, and the access one has through these NGOs. Table 1 shows the villages where we chose to conduct the GMB sessions. We believe this sample is a very good approximation for a reasonably mutually exclusive and collectively exhaustive sample.

Date	Treatment Village (Relatively Mature Water Systems)	Control Village (Relatively Poor Water Systems)
Mountain Region (with Himmotthan)		
Jan 11, 2017	Kudial Gaon (Group 1)	
Jan 12, 2017	Kudial Gaon (Group 2)	
Jan 13, 2017	Chureddhar	
Jan 14, 2017		Jadipani
Plains Region (with PRADAN)		
Jan 17, 2017	Ronhe	
Jan 18, 2017		Gopla Pakhertoli
Jan 19, 2017	Belkhara	
Jan 20, 2017	Jolha Karma	

Table 1: Village Sampling for Group Model Building

FINDINGS: EVOLUTIONARY STAGES OF RURAL WATER SYSTEMS

Through analysis of these 2 diverse contexts, 5 stages of dynamics emerged that are crucial to understanding the evolution through which water systems in rural India mature; Community Maturity Dynamics, Water Sufficiency, Operations and Maintenance, Sanitation Infrastructure, and Water Quality & Health. Described below is each stage of this maturation process.

Stage I: Community Maturity Dynamics

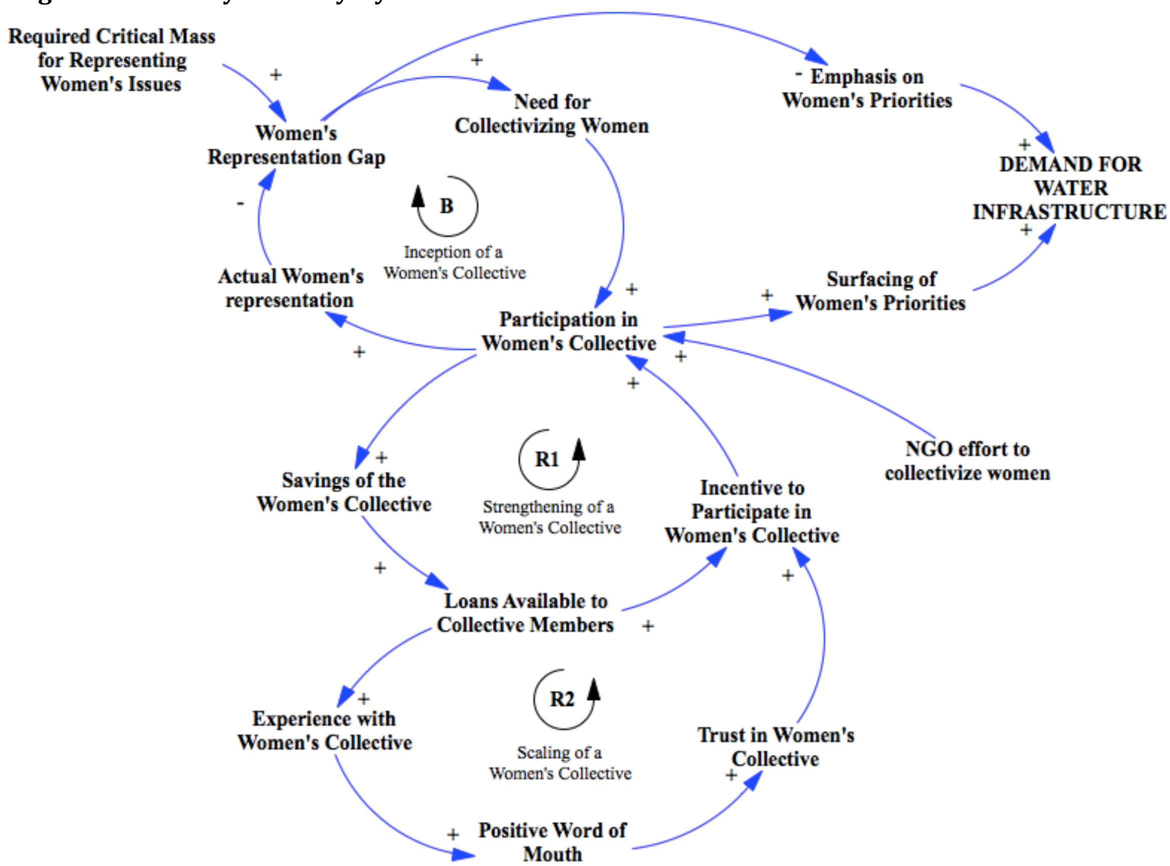

Figure 6 Stage I: Community Maturity Dynamics

Figure 6 shows the dynamics that lead to the maturing of community institutions. Based on our fieldwork, we found that the maturity of community institutions truly shapes the demand for sufficient and safe water. (Thus, the "Demand for Water Infrastructure" variable above is highlighted in all capitals). Self Help Groups, a form of women's collectives, became a powerful force in moving the community forward in areas of livelihood creation, financial stability, and water management. Self Help Groups exist in Uttarakhand, Jharkhand, and throughout India, and can serve slightly different purposes depending on the context of the community. However, the common thread throughout any Self Help Groups was that they are able to highlight the needs the community and catalyze taking action to tackle problems.

Inception of a Women's Collective

In order for a Self Help Group (SHG) or women collective to begin emphasizing their needs, there must be enough people involved. Thus, there is a gap that needs to be overcome between the "required critical mass for representing women's issues" and "actual women's representation". When an NGO like Pradan interacts with a village, women in the village are able to visualize their problems more clearly (inequality between genders, insufficient income, etc) and the "need for collectivizing women" increases. The need to collectivize women, coupled with the "NGO effort to collectivize women" directly contributes to increasing participation in the Women's Collective. Thus, participation in the women's collective goes up, actual women's representation goes up, and the women's representation gap narrows.

Strengthening of a Women's Collective

A women's Self Help Group has several benefits. As participation goes up, financial savings go up. As the savings go up, more loans are made available, and thus the incentive to participate in the women's collective increases, furthering the actual participation in the women's collective.

Scaling of a Women's Collective

Furthermore, as more loans are made available, people have a more positive experience with the Self Help Group, and positive Word of Mouth (WOM) will increase surrounding membership. Trust grows, and incentive to participate grows, thus again increasing participation.

Ultimately, as self help groups become stronger and have more women participants, the women begin to get a voice in the community governance. Their needs "surface" and are able to be discussed across the village. One such demand that women begin to make is improved water management strategies. Water management is typically a task women are expected to handle; they collect water for their families from far away sources. However, the male dominated community governance did not recognize the hardship women faced in gathering water, as men themselves had no issue. For example, according to Pradan, it was the women in the Self Help Group that actually brought to their attention the need for closer and safer water. It was only then that PRADAN was able to begin investigating ways to assist the community. Overall, the strengthening of women's collectives directly contributed to the demand for water infrastructure that would provide them with a safer and closer water source.

Stage II: Water Sufficiency Dynamics

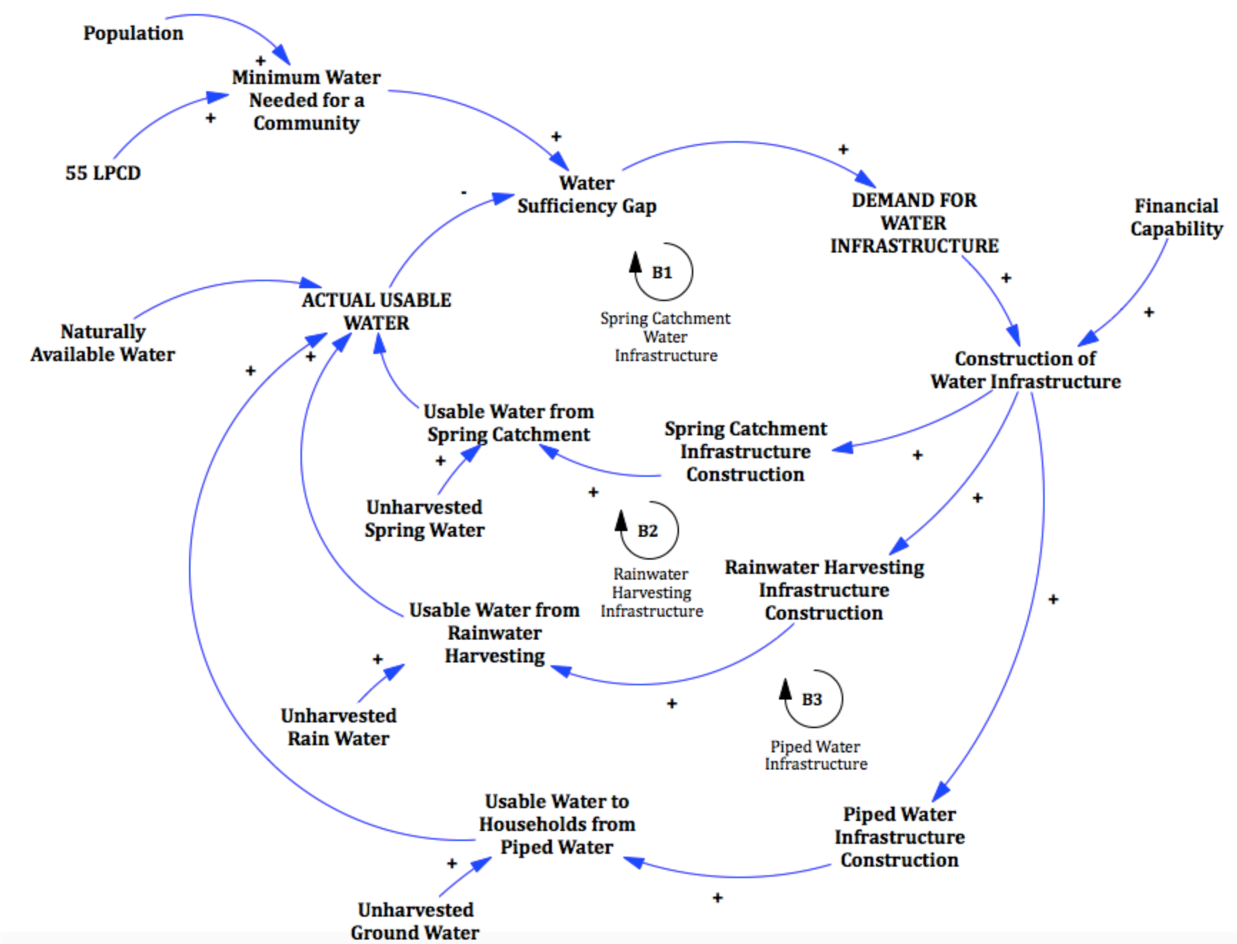

Figure 7: *Stage III* Water Sufficiency Dynamics

Figure 8 shows the dynamics we uncovered that lead to water sufficiency in rural areas. Several communities throughout rural India face challenges of water quantity. There is a gap between the actual usable amount of water and the desired amount of water to meet the minimum need that communities have. This usable amount of water comes in two ways: water that is naturally available, and water that has been harvested through infrastructure. The difference between the usable amount of water and the needed amount of water can be referred to as the water sufficiency gap. If the water sufficiency gap is large enough, there will be a "demand for water infrastructure", which we have already seen is largely driven by community institutions like self-help groups. However, demand alone does not lead to the construction of water infrastructure; the village must have the financial capability to pay for any new schemes. Through our fieldwork, we discovered instances when villages would opt for only part of a water improvement plan due to financial constraints. For example, one village in Uttarakhand decided only to invest in rainwater harvesting and not a piped water-pumping scheme.

In our fieldwork, we saw three main styles of water infrastructure; spring catchment systems, rainwater harvesting systems, and piped water infrastructure from ground water. In Uttarakhand, a common strategy was the management of natural springs and Rainwater harvesting infrastructure. In Jharkhand, piped water infrastructure using groundwater was a popular mechanism. All three methods have been represented above as variables. Each style of infrastructure will increase the "usable water" from its respective water source, and in turn will increase the actual usable water. Thus, the water sufficiency gap also decreases, balancing the demand for more water infrastructure, thus creating a balancing loop.

Stage III: Operation and Maintenance Dynamics

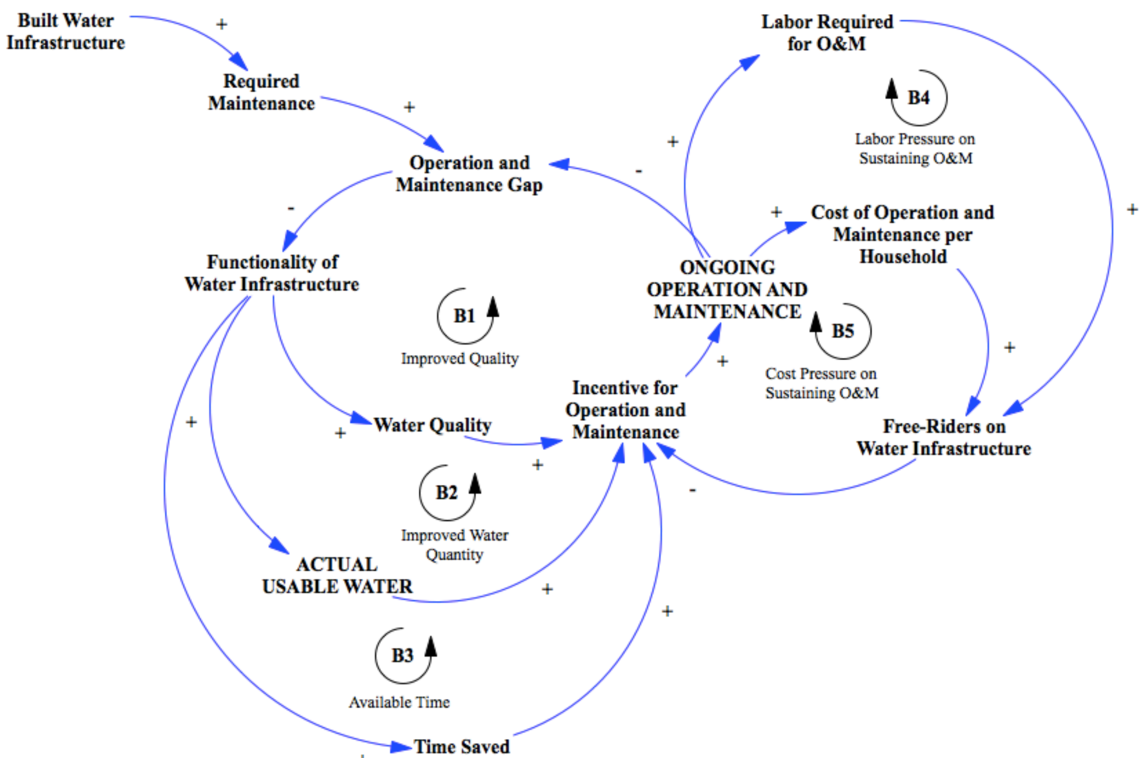

Figure 8 Stage IV: Operations and Maintenance Dynamics

Figure 9 shows the operations and maintenance dynamics our fieldwork revealed. Once a water structure system is up and running, operation and maintenance are key to keep it going to prevent slip back. Successful operation and maintenance will result in the chlorination and cleaning of the community water source; this could be an overhead tank in the case of Pradan, or a tank collecting spring water in the case of Himmotthan. To understand this system we can think of there being a difference between the needed operation and maintenance, and the actual amount of ongoing operation and maintenance. The more operation and maintenance there is, the greater the "functionality" of the water infrastructure. This functionality leads to numerous benefits; it increases and maintains the amount of usable water, it increases water quality, and it increases the amount of time women can save by having a closer water source.

The amount of water that the system produces has a direct impact on the incentive of the community to keep maintaining their system; if it is producing enough water then they will want to keep it going. Additionally, Pipes won't be leaking, hand pumps won't be rusting, and chlorine will be added regularly to water storage. The increased water quality (and resulting health impacts) will create an incentive to continue operation and maintenance.

However, typically the more operation and maintenance that is required, the more labor is required, and the more the system costs to upkeep. As the costs rise to maintain the system, the greater chance there is for "free-riders", individuals who take advantage of the common access to water without paying their fair share or helping clean the tank when needed. This problem of the commons, or increasing free riders, actually decreases the incentive to continue operation and maintenance practices; people don't want to pay or work for others unfairly.

Stage IV: Sanitation Infrastructure Dynamics

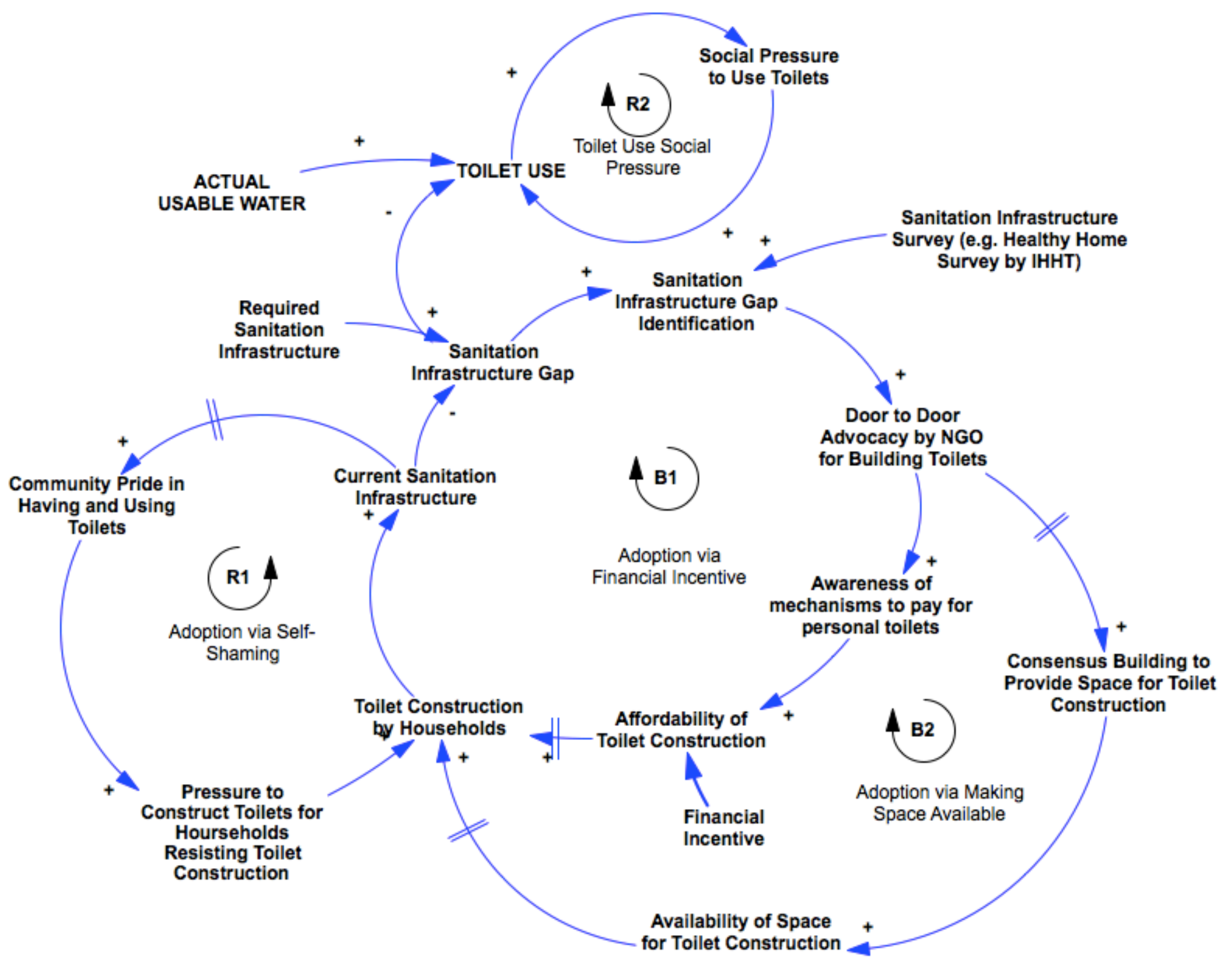

Figure 9 Stage II: Sanitation Infrastructure Dynamics

Figure 9 shows the process by which sanitation infrastructure gets adopted and used. Because of the close linkage between sanitation and water quality, it is important to capture the nature of the sanitation dynamics in a village to get a complete picture of water quality. In rural India, a common practice has been open defecation. However, the effort to install sanitation units has been growing; a recent initiative by the government called Swachh Bharat Abihyan ("Clean India") has set aside funding for the implementation of millions of toilets in the coming years. Given this push for sanitation by the government, both Himmotthan and Pradan have had extensive involvement in working with communities to address their sanitation needs. From their experiences, we were able to elicit some important factors that lead to increased toilet construction. There are two kinds of challenges that these NGOs face concerning sanitation; installation of toilets and actual use of toilets.

We consider that every village has a gap between the required sanitation infrastructure and the current sanitation infrastructure; the “Sanitation Infrastructure Gap”. The larger the gap is, the easier it is to be identified by NGOs like those in Uttarakhand, who survey communities through use of a “Healthy Home Survey”. If there are a lot of people who need sanitation units, door-to-door advocacy for toilets increases. As this door-to-door advocacy by NGOs increases, the awareness of funds and mechanisms to pay for toilets also increases, and toilet construction will also increase. The door-to-door advocacy also eventually results in consensus from community members to provide space for toilet construction. Often times, people do not own enough land to create a toilet; they must rely on the generosity and understanding of those around them to allocate them space for a unit. All of these factors increase the amount of toilets constructed by households, increase the current infrastructure, and reduce the sanitation gap. As there are more and more toilets; the sanitation infrastructure in a community eventually reaches its saturation point and less and less toilets are constructed.

There are also other important dynamics to consider that impact people’s desire for toilets. As more and more toilets are installed, people begin to see toilets as a status symbol and they take pride in having their own. The more pride there is associated with having a toilet, the more people feel pressured into constructing a toilet of their own. This reinforcing structure helps to increase the number of toilets installed in a community. However, installing toilets is only part of the sanitation picture. There are other factors that influence toilet use. The amount of water available impacts people’s ability to use toilets; they need water to clean and flush. Also, people often are accustomed to open defecation and resist using toilets, even if they are available to them. Eventually, increasing social pressure will push community members to use toilets for themselves.

Stage V: Water Quality and Health Dynamics

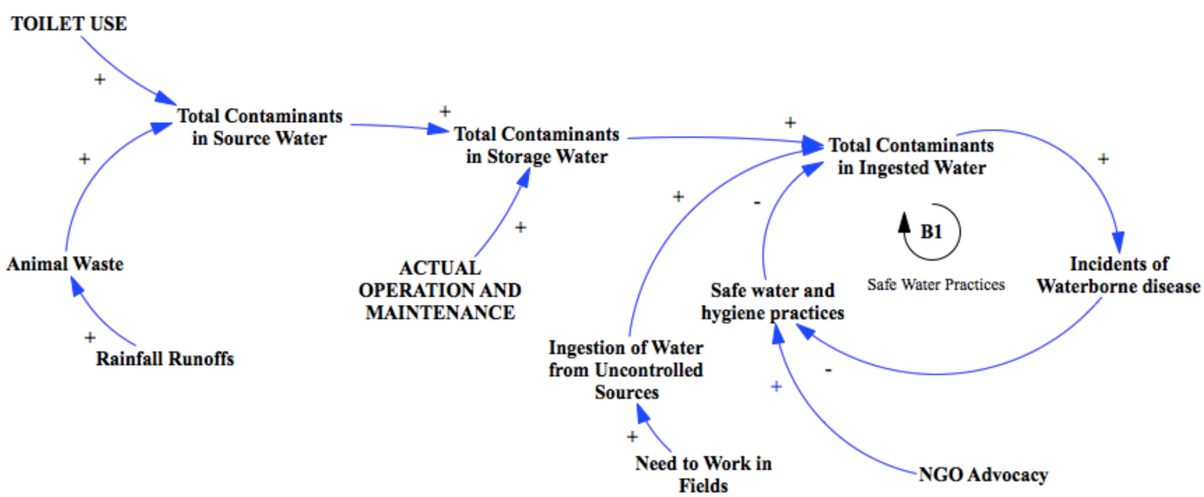

Figure 10 Stage V: Water Quality and Health Dynamics

Figure 10 shows the water quality and health dynamics our fieldwork revealed, and synthesizes some factors from earlier dynamics we explored. When water quality flows through a village, it generally goes from source water, to community storage, to ingested water in the home.

Source Water

As you can see above, toilet use (which we have already elaborated on the dynamics of) directly impacts the total contaminants in a source. We heard from both NGOs that toilet use is important because it reduces the amount of contaminants in the water source. However, animal waste and other particles can still enter the water source. This phenomena is highest during monsoon or rainy season; the water washes contamination into the source.

Storage Water

Actual ongoing operation and maintenance, as described in earlier dynamics, directly impacts the total contaminants in the community storage water. This maintenance includes chlorination, cleaning, and maintaining a hygienic environment around the storage space. Naturally, the contaminants in the source water will influence the number of contaminants in the storage water.

Ingested Water & Health

The storage water directly impacts the ingested water (which is stored locally in the home). Personal safe water and hygiene practices influence the quality of this water. These practices can include boiling, hand-washing, correct disposal of children's waste, and more. We saw that the more contamination there was, the more waterborne disease there was. The increase of diseases led people to practice more safe water habits (i.e. boiling) which then in turn decreased the amount of water borne diseases. NGOs also play a huge role in encouraging safe water practices through behavior change and other means. Other factors that influence ingested water quality are drinking water from multiple sources (which is often due to the fact they must leave their homes and regulated water supply to work far away where it is inconvenient to bring water). . Villagers in Rohne for instance say that their sickness rises when they are drinking water from everywhere.

TOWARDS AN INTEGRATED MODEL

The large majority of our research effort so far has been focused on uncovering the stages I-V of evolution of rural water system described above. The next phase of our research will begin to turn this causal structure into a working model. Figure 11 shows a conceptual stock-flow model that depicts how the five evolutionary stages may affect water infrastructure (and hence quantity) and water quality in rural areas. The idea here is to model the coflow of water quantity and quality that covers the flow of water and the contamination, respectively, from water source to water ingestion, and how the various evolutionary stages affect the system.

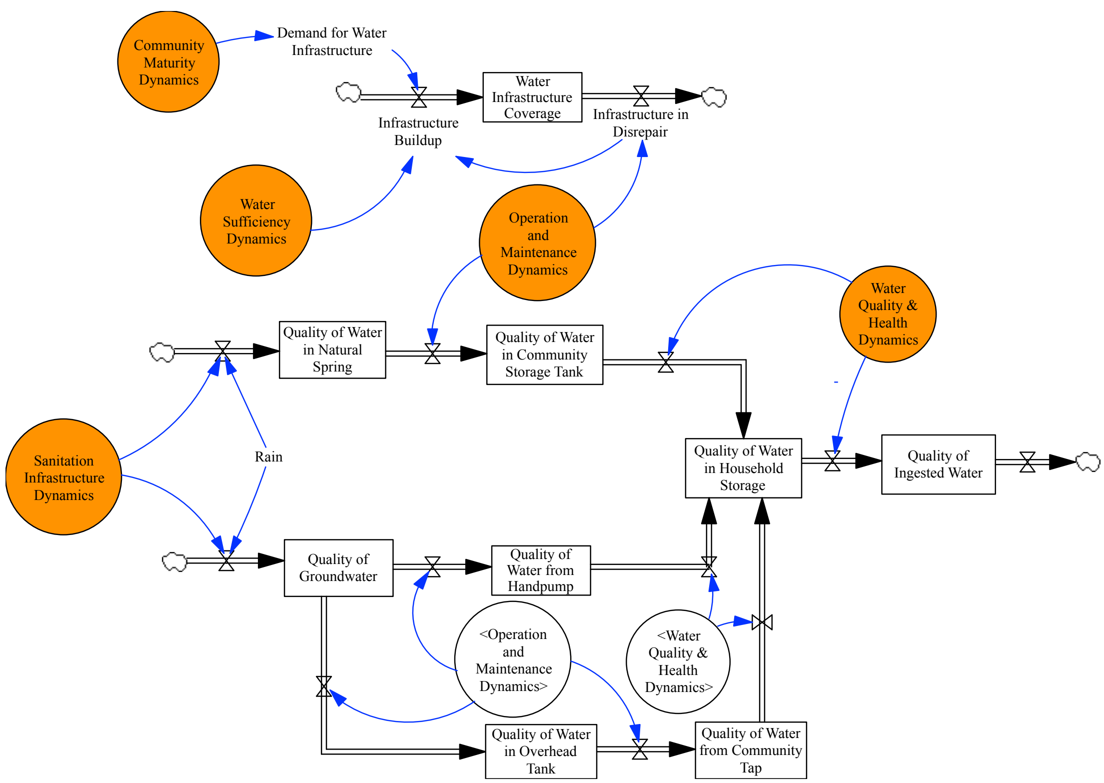

Figure 11 A Conceptual Stock and Flow Formulation (Evolutionary Stages as Orange Circles)

CONCLUSION AND NEXT STEPS

In this paper, we discover the dynamics by which water systems evolve in two very different rural regions of India. Figure 12 shows the stages of this maturation process. As a result of this research, we have come to understand rural water systems as having different levels of maturity, thereby requiring different interventions. *In the context of our quest to create a package of practice that will determine the information generated by the microbial contamination sensor we are developing, our most important lesson is that only those villages that are at the top of the pyramid will be able to accommodate and utilize water quality information (i.e., where community institutions are mature, adequate sanitation and sufficient water are present).* In other places, one must first work on securing lower stages of maturity.

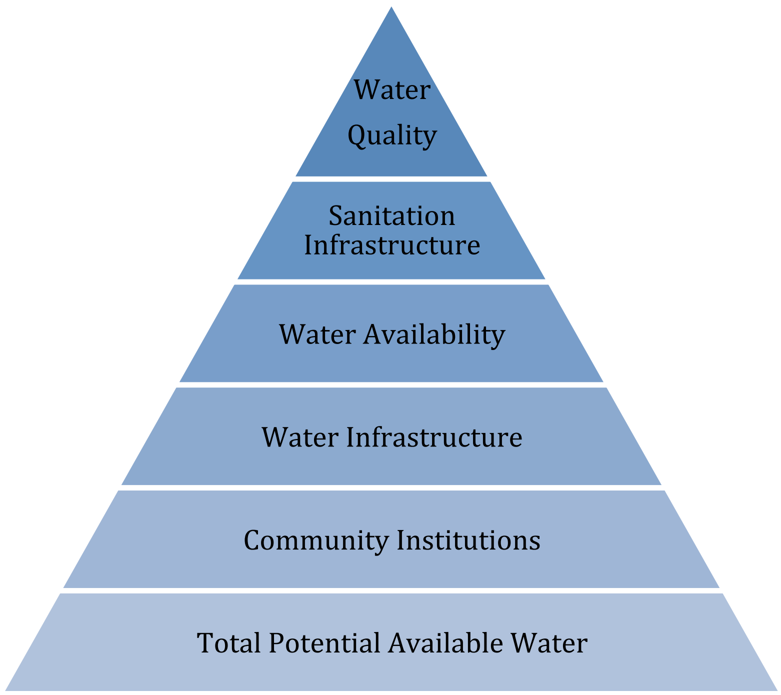

Figure 12 The Evolutionary Stages for Maturation of Rural Water Systems in India

Underpinning these stages of maturity is the total potential available water in a community; water that has the potential to be harvested from the sky, ground, or springs. We view this as an exogenous factor and thus do not delve into dynamics governing it. Mature community institution is the underpinning required for demanding and sustaining water system in a rural area. It is the seasoned community institution that helps achieve the functioning water infrastructure, and is able to ensures regular and effective operations and maintenance of water systems. Functional Infrastructure increases the amount of water available in a community. This available water contributes to the ability of villagers to effectively use toilets. Ultimately, all these practices (sanitation, operation and maintenance, and community institutions) form the basis for good water quality and resulting improved health.

Strengthening some dynamics and weakening other dynamics could influence each stage of evolution. Strategic information insertion could play a role in this. The role of what information to insert and where – the question this research is interested in – will be answered as we further model and test the level of influence each loop has. This is the next step in our research. Overall, this work presents a model invoked from ethnography, and is the first model to characterize factors influencing water quality in rural India.

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APPENDIX I - FIELD RESEARCH MATERIAL

Unstructured Interview Questions

1. Can you generally describe the main ways you interact with communities regarding water and sanitation?

2. In your interactions with communities, what kind of information do you share with the community concerning water quality? Why?

3. How detailed of a message do you think is best to share?

4. Who do you talk to in the community specifically? Why?

5. Are you expecting what you share/teach them to flow the community?

6. Is there information that you choose not to share with a community regarding water quality?

7. Can you give some specific examples of times you shared information with a communities about WASH?

8. What were the (social/economic/geographic) characteristics of each community?

9. What were some of the ways that communities responded to you sharing information with them?

10. Did they respond differently or the similarly? Why do you think this happened?

11. Did you change the message based on the community you worked in?

12. What is the most effective way to distribute information to a community? Why?

13. What are some other ways that you could spread information to a community?

14. What have been your more successful interventions? What is a project that has worked?
Can you give an example of a time that a project didn't work?

15. What is already being told to end users?

16, Who do you think it is most beneficial to distribute water quality information to?
What interventions have been most successful? Why? Who was the major driver of that intervention?

17. How do you usually engage with a community about other topics that are important to a community? Why do you do that? What factors have contributed to their success?

Group Model Building Protocol

Introductions (LECTURE, 5 min)
- Who we are, why are we here
- Participant Intro

Consent Forms (DIALOGUE, 10 min)
- Description
- Verbal Consent

Water System (INDV. EXERCISE, 20 min)
- What is your main drinking water source? How do you fetch and store water?
- Which other sources do you use during the year? Why?
- What is your domestic water source?

Water Quality Perceptions (SURVEY, 5 min)
- How would you rate your water quality (Low, Medium, High)

Waterborne Diseases (INDV.EXERCISE, FGD, 20 min)
- When do waterborne diseases grow and decline? - GRAPH
- Why does the incidence go up?
- Why does the incidence go down?

Contamination (FGD, 30 min)
- Currently, why does the water get contaminated?
  - Why at sources?
  - Why at homes?
- Currently, what do you do for water safety?
  - Source Safety
  - Home Safety
  - Are there challenges to complying with safe practices?

SHG Involvement in Water Management (FGD, 10 min)
- When was this SHG formed?
- Does it play a role in water management?

Inserting Water Information (SURVEY & RANK, 15 min)
- Which in your opinion is the best place to insert water quality information?
- Why?