

FORTHCOMING IN INNOVATION AND DEVELOPMENT**ON CONSORTIUM DRIVEN SANITATION INTERVENTIONS TO END OPEN DEFECATION: INSIGHTS FROM AN INDIAN VILLAGE STUDY****By****Shyama V. Ramani***

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ABSTRACT

Under the present global agenda of striving to attain the Sustainable Development Goals (or SDGs), it is necessary to reinforce the diffusion and adoption of inclusive innovations like toilets. SDG6 has created business opportunities for private actors to contribute to sanitation coverage in novel consortia involving public agencies, private actors, international bodies and social enterprises. Can there be tension between the pursuit of public welfare and private interests in such consortia? If so, how can they be managed to eliminate open defecation? To contribute to answering these questions, we study the evolution of sanitation coverage in Kameshwaram village in India via interventions by two consortia and their impact in the short and medium terms. Our case study highlights five sources of challenges: disconnect with beneficiary value evaluation, partner risks, stakeholder risks, systemic risks and missing institutions. Private incentives can be aligned for social welfare, only if payoffs to consortium actors are based not only on the attainment of implementation targets, but also on the impact produced. Thus, incentive design must only reward toilet installations that are of quality construction, safe, functional, long lasting and being used.

KEY WORDS: Sustainable Development Goal 6, consortium, sanitation, rural India, risk, social enterprise

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ON CONSORTIUM DRIVEN INTERVENTIONS TO END OPEN DEFECATION: INSIGHTS FROM AN INDIAN VILLAGE STUDY

1. Introduction

The word ‘sanitation’ figures thrice in Goal 6 of the Sustainable Development Goals (or SDG). First, SDG6 aims to “achieve access to adequate and equitable sanitation and hygiene for all and end open defecation” by 2030. Second, there is to be expansion of “international cooperation and capacity-building support to developing countries in water and sanitation-related activities and programmes”. Third, Goal 6 also intends to “support and strengthen the participation of local communities in improving water and sanitation management”. But how exactly is all this to be done? Presently governments are being aided by multi-stakeholder consortia involving intergovernmental organizations, public agencies, financial sponsors, firms, NGOs, social enterprises and civil society for SDGs attainment. This leads in turn to another obvious question. What kinds of tradeoffs can exist between the pursuit of social welfare and private interests in multi-stakeholder consortia? The answer to this query is far from obvious. Public-private partnerships are typically associated with social and economic infrastructure projects, where there is a clear melding of social value generation for the government and business opportunity for the private actors and they have been well studied by scholars. However, the dynamics of consortia to diffuse pro-poor inclusive innovations like sanitation remains a black box. Thus, to contribute towards a better understanding, we propose a detailed study of two such consortia led sanitation drives in an Indian village.

The objective of the national flagship programme, the Clean India Mission or the Swachh Bharat Mission (SBM), initiated in 2014, is to eliminate open defecation or OD by 2019. SBM aims to make India entirely open defecation free, rather than just build toilets to ensure universal coverage. For this purpose, SBM is calling for multi-actor participation, and in particular, the government is assuring an enabling environment for private sector participation (Ministry of Drinking Water and Sanitation, 2014). A variety of players are active presently in the Indian WASH (Water, Sanitation and Hygiene) sectors, including international agencies (e.g. UNICEF¹, World Bank²), foundations (e.g. The Bill and Malinda Gates Foundation, Clinton Foundation, Water Aid), to private sector companies (e.g. TCS, Hindustan Zinc, Unilever) and non-profits (e.g. Swades Foundation, BORDA³, Water.org). Consequently, as these large organizations seek

¹ UNICEF <http://www.unicef.org/india/wes.html>

²World Bank <http://www.worldbank.org/projects/P132173/india-rural-water-supply-sanitation-project-low-income-states?lang=en>

³ WATERAID <http://www.wateraid.org/where-we-work/page/india;>

GIZ <http://www.giz.de/en/worldwide/368.html>; Borda [http://www.borda-sa.org/;](http://www.borda-sa.org/)

intermediaries to implement their sanitation drives, a dense ecosystem of social enterprises has emerged as service providers in the sanitation sector (Ramani et al. 2017a).

Despite these efforts India remains part of the group of 45 developing countries with less than 50% sanitation coverage. It is the flag bearer of countries struggling with the challenge of its own citizenry practising OD, either due to lack of access to a toilet or because of personal preferences. According to the Indian census of 2011, only 46.9% of the 246.6 million households in India have their own toilet facilities, while 3.2% have access to public toilets, which leaves the remaining while 49.8% households no option but to defecate in the open. In rural areas, where 68.84% of the population lives, the percentage of households without toilets is 69.3%, while in urban areas it is 18.6%. Why has the diffusion of such an obviously useful artefact not been more successful?

Our methodology to answer these queries follows a two-step procedure applying mixed methods. In the first step, through historical reconstruction, we trace the evolution of two major sanitation drives in a village called Kameshwaram situated in the Nagapattinam district of Tamil Nadu state in India. In a second step, we present the results of a survey on toilet usage and its impact on the health status of Kameshwaram residents, three years after the end of the second drive, as the rationale of SDG6 and SBM is to improve health outcomes by eliminating OD.

Such an approach to constructing a case study is suitable for identifying the ‘how’ of phenomena and the associated processes over time, which in this case is the evolution of sanitation coverage and its health impact in Kameshwaram (Eisenhart, 1989; Yin, 2002). The village case study is based on data compiled over a decade in the form of extensive memos, reports to donors, and emails exchanged as a participant-observer in sanitation drives both in that village and in other villages of India. The notes were taken during project implementation meetings, fact finding missions as well as interactive sessions (informal get-togethers, strategic discussions, public meetings etc.) with different stakeholders in sanitation projects, such as rural households, social enterprises undertaking the installation of toilets, micro-finance institutions, corporate sponsors and local and district level government officials.

The remainder of the paper reads as follows. Section 2 starts with a brief review of the relevant literature. Section 3 contains the case study. Section 4 presents the survey. Section 5 discusses the findings of the case study and the survey in terms of the strategic management of consortia led projects for the diffusion of inclusive innovations like toilets. Section 5 concludes.

2. Setting the background: On Toilets as a pro-poor and inclusive innovation

A standard premise in innovation studies is that any artefact or product or service that is newly introduced to a community, which never had access to it before, is an innovation vis-à-vis that specific community – even if it is already used by others. Thus, providing access to previously inaccessible life quality enhancing artefacts, products and services is an important innovation pathway for poverty alleviation and inclusion of the poor in the growth process. Till

the present millennium, the poor were mostly considered the wards of the state and any diffusion of innovations among them was to be undertaken by the state, social entrepreneurs or the communities themselves. Individuals and community movements, knowingly or unknowingly, applied Schumacher's vision of appropriate technology using local resources and bricolage to cope with poverty (Schumacher, 1973). In many developing countries, including India, the state supported appropriate technology projects to increase the returns to existing processes embedded in indigenous knowledge, local raw materials, skills and capabilities (Abrol, 2014).

This perspective however changed considerably with the sighting of fortune at the 'Base Of the income Pyramid' or BoP containing the largest, but poorest socio-economic groups in the global income pyramid living on a few dollars a day (Prahalad and Hart, 2002). Both large firms and scholars began to explore how BoP markets could be penetrated and value created through new product designs and novel delivery platforms including public agencies, social enterprises and NGOs (Brugmann and Prahalad, 2007; Franceys and Weitz, 2003; London et al., 2006). However, the generation of firm profit through diffusion of non-essential consumer products (e.g. shampoo sachets, soft drinks) incremental or disruptive innovations raises questions of legitimacy as they do not contribute to direct and immediate livelihood generation, life quality, or empowerment of BoP (Kolk and Von Tulder, 2006). At the same time, it is noted that firms have made a huge impact on the BoP communities through diffusion of radical innovations such as genetically modified plant varieties and antiretroviral drugs for HIV/AIDS (Ramani and Mukherjee, 2014) for which governments have also lent their support (Ramani et al., 2017b).

This has given rise to a new vocabulary. For instance, BoP innovations refer to those which make products accessible to the poor through small dose packaging (Karnani, 2007) or disruptive innovations involving new designs of products or processes, whose quality and performance do not match their high-end counterparts, but which nevertheless satisfy an underserved demand and are affordable to the BoP (Hart and Christensen, 2002). BoP innovations augment and diversify the consumption of the poor. However, they are also pro-poor if they enhance the productivity and income generation capacity of the BoP household (Mendoza and Thelen, 2008). Adoption and consumption of pro-poor innovations contribute to their efforts to get out of the poverty trap.

Unifying the above is the concept of inclusive innovation, which classifies an innovation as being inclusive if one or more of four criteria are satisfied: it serves the needs of the poor (like appropriate, BoP and pro-poor innovations), it involves co-designing/co-production with poor (like appropriate technology), it can be adopted by the poor (like BoP innovations) or it improves their chances of getting out of the poverty trap (like pro-poor) (Foster and Heek, 2013). That said, the creation and diffusion of inclusive innovations by private actors remains a challenge, because it is difficult to offer products at a low enough price while following environmental regulations, international labour laws and fair trade practices. Moreover,

inclusive innovations are often networked public goods like sewerage and sanitation with high fixed costs, and hence very large volumes are required to even cover costs (Chataway et al. 2014).

Given the above, an individual household toilet may be considered as a pro-poor inclusive innovation for those who never had access to one before. It is pro-poor as toilet usage reduces incidence of excreta related diseases, contributing to health and income generation capabilities (Ramani and Parihar, 2015). It satisfies all criteria of Foster and Heek (2013) for inclusive innovation, except for co-creation as toilets are usually built by masons.

3. Historical Reconstruction of Sanitation Drives in Kameshwaram village⁴

3.1. Introducing the Village

Kameshwaram is a coastal village facing the Bay of Bengal in the district of Nagapattinam, situated in the state of Tamil Nadu in India. On Dec 26th in 2004, killer tsunami waves were triggered by a very powerful earthquake off the coast of Indonesia and Nagapattinam was one of the coastal districts which bore the brunt with 200,000 households being affected. It was the first time in recorded history that a tsunami had struck such heavy casualties

Under the above context, various charitable organisations offered aid to address the immediate needs of the villagers. The government provided temporary shelters. A number of other actors including private sector companies, faith based organizations, charities and individual do-gooders of every nation came to help victims with the construction of new homes, supply of motor boats and other essentials for daily life. Among them was a charity, that we can simply call Charity C henceforth, which came to help the village.

3.2. First Consortium Sanitation Drive in 2006-2007

A regional social enterprise, which will henceforth be referred to as Actor A, was constructing toilets in different areas for international agencies and the State Government. It invited the charity, Actor C, to join a consortium to improve sanitation coverage in Kameshwaram, along with the State Government and an international agency⁵.

A major originality of the sanitation drive was that for the first time it would involve a urine diverting dry toilet or UDDT. This innovative design introduced in India by Paul Calvert during the 1990s was further improved by local social enterprises (Ramani et al., 2008; Calvert et al., 2012). Among the low cost toilet models, the UDDT was and is still not very popular in

⁴ Some of the facts on these sanitation drives have also been discussed in my other papers on sanitation given in the references.

⁵ UNICEF

the regions for which it is designed, because it demands more effort both on the part of the user and the promoter (Ramani et al., 2012). However, it represents a ‘totally decentralized’ and ‘sustainable sanitation system that closes the loop – completely recycling the waste without any risk of environmental contamination and hence is ‘ecosan’ or sanitary for the environment (Langergraber and Muellegger, 2005).

Both Actors A and C were convinced that for a high water coastal area, where no one was using toilets, the UDDT would be the best technology option. The pit latrines constructed in the village in the aftermath of the tsunami by the government and charities were clogged after a week and lay abandoned. The international agency agreed to this experiment. Thus, not only were toilets to be introduced in Kameshwaram, as an innovation to its residents, but moreover, it would be a kind of toilet they had never seen or used before in their lives. With respect to the villagers – it could be considered a radical innovation.

The international agency was the major sponsor for the sanitation drive and Actor C was a minor sponsor contributing funds in lieu of the people’s financial participation as they were destitute after the tsunami. The international agency had an on-site observer for monitoring progress and Actor A provided the construction team and supervisors. Members from Actor C were participant observers. Post-construction reimbursement or subsidies from the State Government to the households was to serve as incentive to households for behavioural change i.e. to switch from OD to toilet usage.

Figure 1 below describes the nature of the consortium. Defining a network as a set of actors who are directly connected to at least one other actor in the network, Figure 1 shows that Actor A mobilized two networks to form the consortium. Actor A was active in both in both networks and was a connector between them.

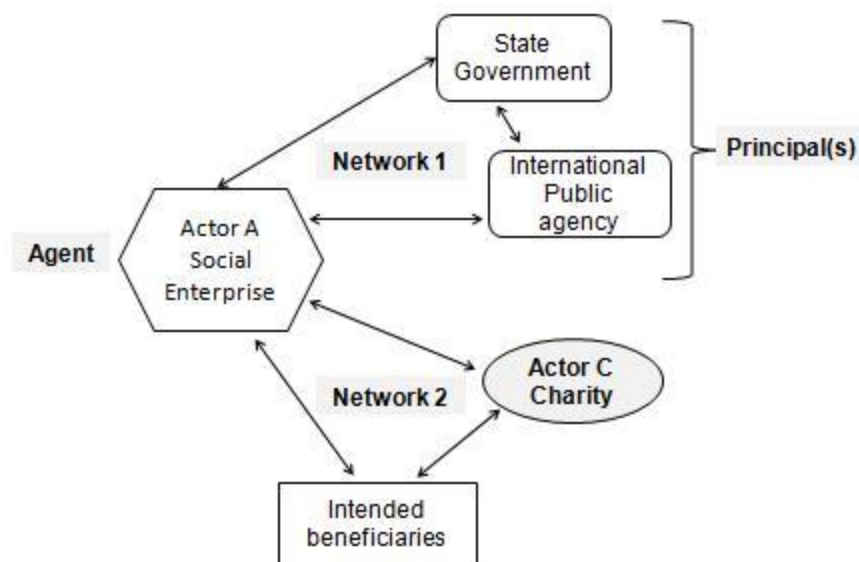


Figure 1. The First Consortium Sanitation Drive

Figure 1 is the typical configuration of a principal agent game, where the principal has to make a contractual offer to an agent to undertake a task. The rewards to the principal are dependent on the capabilities and effort exerted by the agent. The principal has to draw up a contract with rewards and/or fines for possible observable outcomes, without complete information about the agent and knowing that the agent's actions cannot be monitored fully should the contract be initiated. The agent has to decide whether to enter into the contract, and once a contract is executed, has the choice of either respecting or cheating on the contractual engagement – given the design of the contract. In the context of Figure 1, the principals are the state government and the public agency, while the agent is Actor A.

In 2006, Actor A conducted a number of workshops to educate and motivate the villagers about toilets; and thereafter built 150 toilets. Actor A wanted to continue towards full sanitation coverage, and requested Actor C for a new injection of funds. But, Actor C could only raise limited funds for about 50 toilets. Now, after about three dozen toilets were completed, Actor A launched a financial experiment in order to stretch the limited funds given, towards complete sanitation coverage. It outlined the logic of the scheme to the village Panchayat, but did not share the full details with Actor C. It used some of the funds given by Actor C to initiate a 'revolving door fund', a popular financial tool used in the developmental sector by micro-finance institutes. In other words, it gave a set of households' loans to have their toilets constructed. Every month the repayment of loans by the recipient households was to release funds for the construction of more toilets. In the end, the initial capital used for the revolving door fund scheme would be returned to Actor C for investment in another charity project. The village Panchayat head was

happy with the scheme and pleased to share this news with his peers and superiors. Actor A began to construct the compost chambers of more ecosan toilets. The increased construction activity did not go unnoticed. Thus, on the premise that this sanitation drive would soon ensure complete sanitation coverage, the Government of India awarded the Kameshwaram Panchayat, the national award for hygiene achievement, the 'Nirmal Gram Puraskar' in 2007. Actor A also received national recognition.

Meanwhile, in the post-award period, the construction of toilets slowed down and finally stopped. The revolving door mechanism was a complete failure. Actor A fulfilled its contractual obligation to Actor C and built 50 toilets, with some being almost but not fully complete. The households which were provided the first 50 toilets refused to pay their participatory sum, leaving 25 out of the 75 toilets on which work had started, largely incomplete. This left the corresponding households infuriated. Actor A left the village stating it would return to complete the remaining toilets, if and when, the households from which dues were pending paid up.

3.3. Second Consortium Sanitation Drive in 2008

Following the national award, Kameshwaram became renowned. Clearly, a demand for toilets had been established, which was tantamount to a ripe opportunity for any social enterprise constructing toilets. Predictably, in 2008, another social enterprise obtained a contract to build toilets in an underserved zone from another international agency⁶. The said social enterprise, which we will refer to as Actor B, contacted the village Panchayat about building more toilets in the village and it was agreed that they would build 100 additional toilets. As Actor B did not have a team in Kameshwaram, it recruited and trained some temporary local staff to monitor progress and the construction contract was given to a contractor recommended by the village Panchayat. The nature of the consortium is described in Figure 2.

⁶ WATER AID

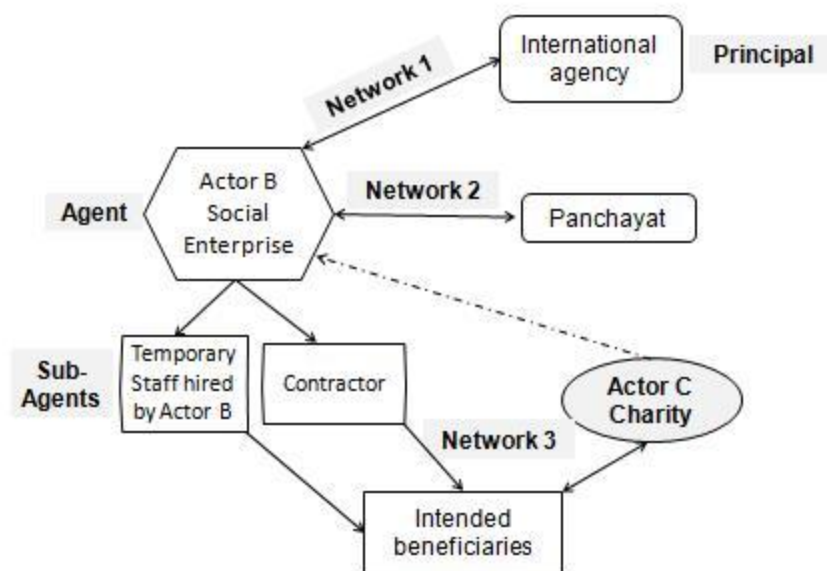


Figure 2: The Second Consortium Sanitation Drive

As Figure 2 illustrates, the second consortium is also a principal-agent setting, where the agency side is layered and there are more networks. Actor B mobilized two networks with the international agency and the Panchayat and a third via its recruits with the beneficiaries and a contractor. Actor C was not solicited to be a part of the consortium. However, Actor C had an established relationship with the intended benefactors due to its permanent presence in Kameshwaram.

After the construction of the first 25 toilets, Actor C noted that nobody was using them. The beneficiaries did not volunteer information even on being asked. Therefore a staff member from Actor C decided to try the toilets to understand the problem. He faced the same problem in the first three he tried. He could not squat down, because his knees grazed the wall. The toilets were built too small. The targeted beneficiaries were aware of this problem early on, but had thought it was impolite to point out the flaw to Actor B or its hired staff who were providing the toilets free of charge. After all, they explained, once the project was over, the toilet could be covered and used as a store room or to keep goats. The staff that was hired by Actor B did not claim responsibility either; they maintained that their job was only to monitor the masons to ensure that they were working the full hours. The contractor cited sudden hikes in the price of cement as the reason for the reduced dimension of the toilets. Actor C intervened and complained directly to Actor B, and this resulted in the tearing down of the first 25 toilets. Thereafter, every toilet was tried out by staff members of Actor C before being handed over to the beneficiary.

3.4. Short term impact: Abandoning of Toilets by 2010

An examination of the short term impact of the two consortia led sanitation drives in 2010 revealed different patterns. With respect to the first consortium, out of the 200 household toilets built, all were being used, but about 100 toilets were in need of repair. However, with respect to the 100 toilets built under the second consortium, 65 were in need of repair and 40 had been abandoned.

What were the repairs required? They lay both in the super-structure and sub-structure of the toilet design. Most toilet roofs had developed cracks, which meant that during the monsoon season- toilets could not be used, and there was always a risk of the roof slab caving in. Walls were falling apart, pipes needed to be fixed, doors could not be closed properly, and latches had fallen off or were too rusty. Septic tanks attached to toilets were badly constructed and overflowed during the rainy season causing a terrible stench. The dynamics of the abandoning process is illustrated in Figure 3.

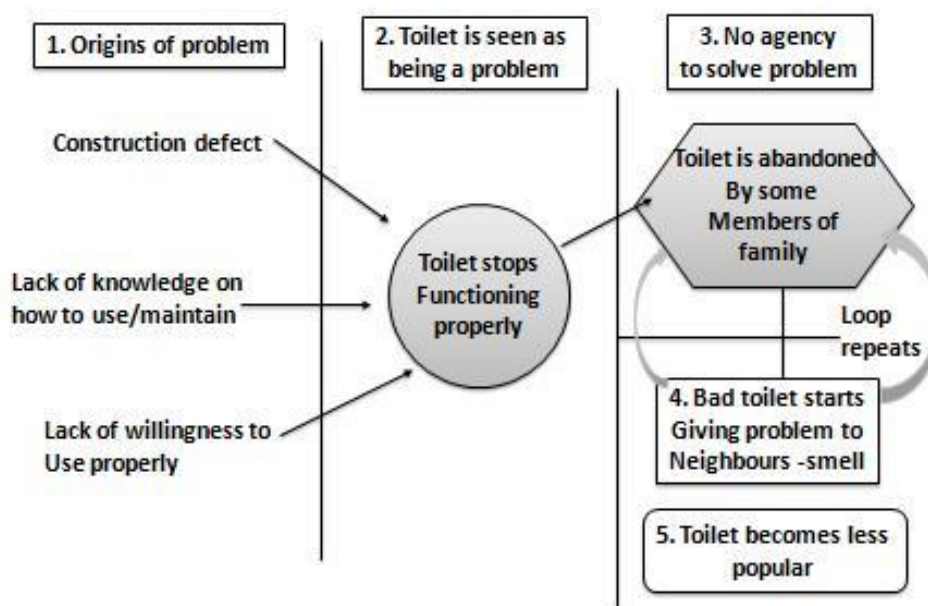


Figure 3. Reasons for abandoning of toilets –not all at once – a dynamic process

Even under the above context, toilets built by first consortium were not abandoned, because Actor A had spent time, effort and funds on a series of education and motivation workshops. A fun sanitation festival had been organized to promote efficient toilet usage once

the project was over and lessons remained etched in the memories of the participants. The second consortium had not only built poorer quality toilets, but they had also invested only one day on an education workshop for the villagers, as they believed the demand for the toilets already existed. Thus, the lack of investment in education by Actor B seems to have played a very important role in 45% of its toilets being abandoned, in contrast to 0% of the first consortium. Finally, it was noted that all the newly constructed toilets were mostly being used by women and not by all members of the household. Indeed, it is widely acknowledged that in rural areas in India it is a challenge to persuade men to use toilets.

Thereafter, as the demand for toilets was established in Kameshwaram, and the village Panchayat was most willing to accept free toilets, other charities came and built some sets of both pit latrines and toilets with septic tanks.

4. Survey Results: Medium Term Impact Health and Behavioural Outcomes by 2013

Given that open defecation and toilet usage co-existed in Kameshwaram after the sanitation drives, it was deemed worthwhile to examine if there were any significant differences in the health status of households which owned toilets and those that did not. Thus, a survey was conducted three years after the ending of the second drive. The questionnaire included questions on both the health outcomes and the household behaviours which are necessary for the health impact to occur (Blum and Feachem, 1983). It was then translated into Tamil and tested for cultural competency, compatibility and pertinence with members of the Panchayat. Finally, the survey was conducted via face-to-face interviews with members of 1000 households and each interview took about an hour.

4.1. Sampling framework and Survey implementation

According to the census of 2011 there were 1535 households divided into nine wards in Kameshwaram. In order to ensure a comprehensive analysis, our sample included 1000 households spread across all the wards. Then within each ward randomization of households was ensured as follows. We started from South East corner and chose the first household at the edge. Then we moved to left hand corner and we chose the second/third household, thus moving towards the center. A careful examination of the responses compiled revealed many which were inconsistent or incomplete. Thus, finally only 605 responses could be used

The questionnaire was designed to yield information on 30 variables, which included both quantitative indicators such as frequency of cleaning the house per week and qualitative variables such as the education level. However, 7 of them were dropped due to lack of variation. For instance, the educational levels of almost all the female head and male head of households was up to at least a primary school education, but very few had finished high school. We now

turn to the distributions of the 23 variables retained. Table 1 presents the salient features of the resource endowments and living conditions of the villagers.

Table 1. Socio-economic status and living conditions (V1-V13)

Variable number	Socio-economic status	Salient features
V1	Household monthly income	67.5% earn less than or equal to INR.4000 per month and only 0.8% earn more than INR10000 per month.
V2	Household per capita monthly income	26% belong to lowest 25% class of per capita income($pci \leq Rs.600$), 26% belongs to highest 25% class ($1428.6 < pci \leq 9000$) and the rest 48% belongs to residual class($600 < pci \leq 1428.6$)
V3	Father's occupation	64.3% are self-employed, 15.7% are skilled or semi-skilled workers, 4.4% are unemployed whereas only 4.1% are professional or salaried.
V4	Mother's occupation	78.4% are unemployed, 16.4% are unskilled workers, 3.2% are semi-skilled and 2% are self-employed. Nobody is professional or salaried.
V5	Access to electricity and Ownership of consumer durables	98.7% have electricity; 97.7% have TV; 95.2% have a fan; 75.5% have a bicycle; 16.9% have a motor bike; 0.2% have a truck; 0% have a car.
V6	Livestock portfolio (goat, cow, pig, chicken etc.)	69.3% have goat, 19.4% have chicken, 9% have cow, and 0.2% have pig.
Living conditions		
V7	Family size	56.3% have 4 members or less, 33.3% have 5 to 7 members, 0.4% have 8 or 9 members.
V8	Number of rooms	51.9% have 2 rooms, 29.9% have 1 room, 14.7% have 3 rooms, 2% have 4 rooms and 1.5% have no room.
V9	Crowding = Number of rooms/Number of family members	32% are in most crowded category($0 \leq \text{crowding} \leq 0.33$), 39% belong to medium crowded($0.33 < \text{crowding} \leq 0.6$) and 29% belong to least crowded($0.6 < \text{crowding} \leq 4$)
V10	Ownership of a toilet	68% do not have toilet where as 32% has toilet in their house.
V11	Access to water – quantity	More than 86% reported that they get enough water for

		necessary purposes
V12	Access to water – quality - Site for water collection	59.8% use individual hand pump, 25.6% use individual bore well/tube well, 12.9% use common hand pump, 9.45% use individual hand pump, 2.1% use water from pond/lake , 0.7% uses water from stream/river and 0.7% uses common tap.
V13	Access to water – effort or time to reach water source	81.4% said that time taken is less than 1 minute and 18.4% said that time taken is 1.1 to 5 minutes. Nobody reported time taken to be more than 10 minutes.

According to the Report of the Planning Commission of India the rural poverty line for the state of Tamil Nadu is given by a per capita income per month of INR 880 (Planning Commission, 2013, p. 5). Thus, it is likely that about a third of the village population is below the poverty line. Additionally, the State government gives bicycles to school going children and during election time, to canvass votes, political parties give out TV, fan etc. Nevertheless, the fact that only 16% have a motorbike and none have a car reveals low purchasing power, as these are not given freely by the government or political parties and are self-bought.

Prevailing social norms in rural areas dictates that women do not work outside the home unless the male members cannot provide for them. Thus, while they declare themselves to be unemployed, they take care of livestock, participate in farming, clean fish etc. to contribute to family income. Goats are raised for self-consumption, as they are easier to maintain and less costly to purchase and feed than other livestock.

In terms of living conditions, water does not seem to be a problem, but living space is extremely restricted and two-thirds of the households did not have a toilet.

The remaining variables V14 – V23 (given below in Table 2) describe hygiene routines, perception of toilets and overall health status of the households.

Table 2. Hygiene, Knowledge and Beliefs and Health Status

Hygiene routines		
V14	Frequency of house cleaning	39.2% cleaned it at least once a fortnight, 30% cleaned their house daily and 26.8% cleaned their house at least once a week.
V15	Frequency of yard cleaning	95.5% swept the yard daily
V16	Method used for water purification	86.9% did not purify their water
Perceptions of toilets		
V17	If a toilets needs to repaired, would you call a mason, a plumber, wait for an	52.1% would wait for NGO, 48.6% would call a mason and 29.6% would call a

	NGO or something else?	plumber.
V18	Is using toilet difficult than open defecation	85.6% said no and only 5.8% said yes.
V19	Will toilet bring better health	99.8% said yes.
V20	Does a toilet bring you convenience, dignity, status and good health	More than 97% said yes in all criteria.
Health Status		
V21	Mortality (Has anyone died within last two years)	Out of the total number of mortalities, 44.6% died due to health problems and 50% due to old age.
V22	Incidence of sickness (Has anyone had diarrhoea, worms, skin problems or fever in last three months)	8.9% had diarrhoea and 9.1% had skin problems or worms. 20.7% had fever and other minor problems. 61.3% had no problem.
V23	Morbidity (Does any member have any major health problem)	15.5% said yes and 84.5% said no.

There is significant variation in the frequency of home cleaning. Only 30% clean their houses daily. Two uncontested indicators of success of the sanitation drives are answers to the advantages of a toilet (V19, V20) – clearly the advantages of a toilet were universally perceived, a great feat in a village where earlier OD had been the social norm.

Health status results are however not striking. The national average for diarrhoea incidence is 9.98 per cent as reported in the National Family Health Survey of India among children below the age of 5 years. In Kameshwaram 8.9% of the households reported incidence of diarrhoea, which is very close to the national average. The sample characteristics while being insightful did not reveal the impact of sanitation on health. Therefore, two logistic regressions were estimated to identify the drivers of incidence of excreta related sickness (V22) and morbidity (V23). After an extensive examination of the interrelationships between the different variables, three explanatory factors for health were considered. They were: presence or absence of household toilet to contain excreta related disease incidence, household income per capita (V2) as a proxy for household economic resilience against malnutrition and pathogens in the pre-disease phase, and degree of crowding as an indicator of the facilitation of spreading of contamination in the post-disease phase (V9). The results are presented in Table 3 and Table 4.

Table 3. Odds ratios of correlates for V22 Sickness

Correlates	Odds Ratio	P>z
V2. Household per capita monthly income	-0.111	0.574
V9. Crowding = Number of rooms/Number of family members	0.259	0.287
V10. Ownership of a toilet	- 1.095	0.000**
Number of observations	605	
LR chi2(3)	36.95**	
Prob > chi2	0.0000	
Pseudo R2	0.0458	

** *significant at the 1% level*

Table 4. Odds ratios of correlates for V23 Morbidity

Correlates	Odds Ratio	P>z
V2. Household per capita monthly income	0.262	0.349
V9. Crowding = Number of rooms/Number of family members	0.118	0.693
V10. Ownership of a toilet	- 0.757	0.002**
Number of observations	605	
LR chi2(3)	14.60**	
Prob > chi2	0.0022	
Pseudo R2	0.1408	

** *significant at the 1% level*

The models clearly affirm that having a household toilet can significantly impact health. According to the estimated regressions, with respect to sickness, for every additional 100 households having toilets, 109.5 incidences of excreta related diseases can be avoided, and another 75.7 cases of morbidity can be eliminated. Indeed, household ownership of toilets emerges as the most important driver of health.

5. Discussion of results: Inferences for multi-stakeholder rural sanitation drives

The Kameshwaram village case study highlighted the diverse challenges of the consortium-led interventions to eliminate OD. Some of them have also been noted in the literature as having troubled sanitation drives in other parts of the world and these are summarized in Table 5.

Table 5. Factors that can lower the performance and impact of sanitation interventions

Impeding Factor	Reference and zone studied
Faulty construction of toilets	Mjoli-Mncube (1997) in South Africa; (Obirih-Opareh) 2001 in Ghana;
Lack of motivation vis-à-vis ownership, maintenance and usage	Murphy et al. (2009) in developing world
Intervention does not take into account adequately ethnic groups, socio-economic differences, language barriers and gender roles in the target groups	Rheinländer et al., (2012) on Vietnam
Lack of interest on the part of beneficiaries in attending cluster meetings, traditional knowledge, poverty, lack of will, preference for open defecation	Akter (2014) on Bangladesh
Rapidly scaled-up projects by local government, poor management and poor stakeholder engagement	Bardosh (2015) on Zambia

The above and other problems faced in Kameshwaram can be recast in terms of risks stemming from imperfect and incomplete knowledge of the context, the partners and the system as well as contextual or systemic shortcomings.

Target community risks: The short term target of sanitation drives is to install toilets and provide access to sanitation, but the long term purpose is to improve health via the newly provided access. For this to materialize, the beneficiaries must use the toilets. Furthermore, for improvement in health, the entire village must become open defecation free. This is a greater challenge as it requires toilet usage to be the new accepted social norm. But some people may just prefer to continue with OD, especially men and the elderly. It is difficult to bring behaviour change as actor payoff valuation is determined by preferences which are shaped by a gamut of factors such as personal history, household status, community history, culture and personal emotions like shame and pride and the need to conform.

However, the case study also clearly pointed that education is part of the solution. Though both the sanitation drives had fulfilled the consortium target of toilet installations, their medium term outcomes were very different. While many toilets built under both drives were in need of repair, very few toilets under the first drive had been abandoned, because Actor A had invested a lot of efforts in awareness and motivation creation. In contrast, Actor B believed that there was already a demand backed up by knowledge and motivation for toilet usage in Kameshwaram after the national NGP award. Hence, Actor B invested only one day in education workshops for the beneficiaries. This coupled with sub-optimal construction led to a 65% abandonment rate. This happened despite the fact that 85.6% of the households surveyed

believed that using toilet is not more difficult than open defecation and 99.85% believed that using a toilet will bring better health. These facts reiterate the key roles played by education and quality construction to minimize the rate of toilet abandonment.

Partner risks: With partners, informational problems can lead to adverse selection and/or moral hazard. Adverse selection and moral hazard are well known problems in principal-agent settings. Adverse selection arises whenever an actor lies by omission or falsification, while moral hazard is non-respect of engagements.

The challenge posed by adverse selection and moral hazard were well illustrated in consortium 1. When Actor A wanted to build more toilets after the completion of the first 150, it approached Actor C for funding. At the same time, it also launched a private initiative, a ‘revolving door fund’ mechanism for the construction of 25 more household toilets with the given resources, without discussions with all stakeholders. In other words, the ‘revolving door fund’ was adversely selected by the stakeholders due to lack of full information. Reputational gains were indeed reaped, when the village got the national award, on the presumption that the revolving door fund would be successful in providing complete sanitation coverage. However, the initiative itself failed, because of lack of due diligence and moral hazard on the part of beneficiaries who refused to repay the loans, i.e. who did not respect their engagement. Thus, funds could not be made available for the toilets’ construction of their neighbours and 25 households which had been promised toilets never got them.

Systemic risks: Systemic risk stems from uncertainties linked to the evolution of contextual parameters which at least one or more of the actors cannot foresee and/or control. Even in the absence of partner risks, things can do wrong due to systemic risk. For instance, in the second drive, even under the premise that all actors in network 3, with Actor B, local temporary staff, the local contractor, the benefactors and Actor C, had the best of intentions, cramped unusable toilets had been built. This outcome was explained by the contractor as having been due to the market shock of increase in cement prices. Societal norms, which debar one from complaining when something is given for free, silenced the benefactors; as they were given the toilets for free, they were ashamed to point out that the toilets were too small to be used.

Missing Institutions: For toilet usage to be sustained beyond the short term ensuing toilet construction, it is very important to have a permanent local agency which can repair toilets even if complete coverage is achieved and which can motivate and facilitate toilet construction if only partial coverage is attained. Despite their initial success, approximately 44% of the household toilets built under the first consortium and 65% of those built under the second consortium, were in need of repair. Additionally 52.1% of households claimed that they would prefer to wait for an NGO to repair their toilets rather than take any action themselves. While the village Panchayat did not refuse the initiation of any sanitation drives, it did not engage itself with the maintenance and repair of toilets as these activities fall outside its governance responsibilities. Similarly, other administrative actors in the village system, such as the village administrative office and officials at the block and district level – are not mandated to repair household toilets.

This indicates that in the millions of villages in India where the Clean India Mission is being implemented, it is not clear whose responsibility it is to repair toilets or motivate those with toilets to actually use them instead of practising OD. This institutional or governance gap has to be closed to achieve sustained impact.

6. Conclusion

Toilets are a pro-poor inclusive innovation whose *suboptimal* diffusion and adoption makes OD a major challenge in rural areas of developing countries. Reversing the trend needs a better understanding of the processes of sanitation diffusion and adoption. The objective of the present paper was therefore to obtain greater clarity on this issue through a detailed study of consortia led sanitation drives in an isolated Indian village.

The case studies added three main insights to the existing literature on diffusion of inclusive innovations, which can also be considered as avenues of future research. At the outset, the main focus of the inclusive innovations literature is on the design of useful, safe products, compatible with local culture and resources that can be distributed at an affordable price to the underserved. In this exercise, it is often assumed that BoP demand is uniquely driven by low purchasing power, inadequate capabilities and community specific cultural parameters, which need not be the case. For instance, the sub-optimal diffusion of toilets vis-à-vis mobile phones is also because phones are much more aspirational across communities. The dynamics of value construction, which has been so well understood and exploited in the diffusion of BoP innovations should be studied more in the case of inclusive innovations. Needs need not equate to wants and further wants need not get translated into demand. Perceptions of value of inclusive innovations cannot be taken for granted even among asset and resource constrained BoP.

Then, it is usually supposed that once an innovation is adopted, it will be continue to be used. Our case study highlighted that in the diffusion trajectories of inclusive innovations there can be externalities, which generate band-wagon effects. Via communication (Rogers, 1962) adopted innovations can also be abandoned. Further, inclusive innovations might not only require complementary assets for successful adoption, but also behavioural change. Both subsidy and nudge interventions may therefore be required for sustained adoption. More studies of failed innovations would add to our understanding of the systemic features that either nudge or thwart diffusion of inclusive innovations. It is to be noted that these two types of problems stem from a disconnect with or an inadequate understanding of the perspectives of the BoP community.

Within the innovation system, the literature has rightly noted that both state agencies and private firms find it challenging to undertake the dissemination of inclusive innovations and hence a variety of consortia are rising to tackle this challenge. However, existing works have not peered deeply into the black box of consortia driven projects to identify their challenges and propose solution designs. This is the gap that the present paper attempted to contribute to fill and it proposes four main recommendations for consortia led diffusion drives, which of course must be redesigned each time for the context concerned.

First, prior to the initiation of any consortium, there must be a risk analysis of the consortium and the context. There must be an evaluation of the potential for adverse selection and/or moral hazard from the consortium partners and other stakeholders. Reflection is also necessary on possible belief systems and preferences of the target community, systemic uncertainties and partner heterogeneity in terms of resources and capabilities. Due diligence with contingency funds must insure against the different risks.

Second, the consortium members must understand that diffusion drives have both a short term and a long term objective. The performance of any consortium must therefore be evaluated both on completion of the short term targets and also on their long term impact vis-à-vis the receiving community. For example, in the Kameshwaram interventions, the toilets built were not of good quality and many were abandoned. However, the health status of those with toilets improved, because many beneficiaries used them. Thus, both the consortia can be regarded as having contributed positively to SDG6 and the national mission, SBM.

Third, the above factors must feed into effective contract designs. Contracts for consortium partners must be designed taking into account the complexity of the process as well as its multiple objectives (and those of the partners) and the multiple challenges. Private incentives must be aligned for social welfare, by associating the payoffs to implementers not only on the basis of the attainment of short term targets, but also on the impact produced beyond the immediate term. Incentive design must ensure that only consortia that install/diffuse functional artefacts of high quality, which are adopted well by the receiving community, are well rewarded. In the case of SDG6, for example, this would mean the installation of toilets of quality construction that are also safe, functional, long lasting and used by both men and women.

Fourth and most importantly, there must be an institution to ensure sustainability. An agency must be present to ensure the operations and maintenance of the consortia installations. The form that such an agency should take for village projects is an issue that both academics and practitioners would do well to reflect upon. For the SDG6 mission, this was glaringly highlighted by our study. OD elimination requires continued maintenance and monitoring of toilets and their usage. Thus, every village needs an agency to ensure toilet repair, to facilitate those without toilets to invest in one, and to motivate those practising OD to use toilets. Such an agency has to also act as a point of continuum between different sanitation drives and government initiatives and handle complementary activities like access to water and waste management. This issue needs to be explored seriously, especially because development programs often get disrupted in between political elections and/or when a different party comes into power, and hence, an independent local agency is absolutely necessary to ensure that quality of life enhancing installations are well maintained and used.

To conclude, while it is evident that multi-stakeholder partnerships are important vehicles for the diffusion of inclusive innovations such as sanitation, it is not clear how the cooperation should be designed to ensure that all partners find it in their own interest to participate and invest optimally to make the social mission a success. Governance of multi-actor partnerships is

complex as players or player groups may have a personal agenda in addition to the collective mission and their intentions and capabilities might be private knowledge rather than being common knowledge. Success will then depend on how at least five types of challenges are addressed: disconnect with beneficiary value evaluation, partner risks, stakeholder risks, systemic risks and missing institutions. Private incentives can be aligned for social welfare, only if payoffs to consortium actors are based not only on the attainment of short term implementation targets, but also on the medium term impact produced.

References

- Abrol D (2014) Pro-poor Innovation-making, knowledge production and technology implementation for rural areas: Lessons from the Indian Experience In: Ramani SV (ed). *Innovation in India: Combining Economic Growth with Inclusive Development*. Cambridge University Press, New Delhi, 339-378
- Akter T, Ali A (2014) Factors influencing knowledge and practice of hygiene in Water, Sanitation and Hygiene (WASH) programme areas of Bangladesh Rural Advancement Committee. *Rural Remote Health* 14: 2628
- Bardosh K (2015) Achieving “total sanitation” in rural African geographies: poverty, participation and pit latrines in Eastern Zambia. *Geoforum* 66: 53-63
- Blum D, Feachem RG (1983) Measuring the impact of water supply and sanitation investments on diarrhoeal diseases: problems of methodology. *International journal of epidemiology* 12: 357-365
- Brugmann J, Prahalad CK (2007) Cocreating Business's New Social Compact. *Harvard Business Review* 85: 80-90
- Calvert P, Seneviratne A, Premakumara DGJ, Mendis UA (2002) Ecological sanitation a success in Sri Lanka. *Waterlines* 21: 22-24
- Census_of_India (2011) By Chandramouli, C, General, Registrar, Census of India 2011." Provisional Population Totals. New Delhi: Government of India
http://www.censusindia.gov.in/2011census/PCA/PCA_Highlights/pca_highlights_file/India/Chapter-1.pdf
- Chataway J, Hanlin R, Kaplinsky R (2014) Inclusive innovation: an architecture for policy development. *Innovation and Development* 4: 33-54
- Eisenhardt K (1989) Building theories from case study research. *Academy of Management Review* 14: 532-550
- Foster C, Heeks R (2013) Conceptualising inclusive innovation: Modifying systems of innovation frameworks to understand diffusion of new technology to low-income consumers. *The European Journal of Development Research* 25: 333-355
- Franceys R, Weitz A (2003) Public-private community partnerships in infrastructure for the poor. *Journal of International Development* 15: 1083-1098

- Hart SL, Christensen CM (2002) The great leap: driving innovation from the base of the pyramid. *MIT Sloan Management Review* Fall: 51-56
- Karnani A (2007) The mirage of marketing to the bottom of the pyramid: How the private sector can help alleviate poverty. *California management review* 49: 90-111
- Kolk A, Van Tulder R (2006) Poverty alleviation as business strategy? Evaluating commitments of frontrunner multinational corporations. *World Development* 34: 789-801
- Langergraber G, Muellegger E (2005) Ecological Sanitation—a way to solve global sanitation problems? *Environment International* 31: 433-444
- London T, Rondinelli DA, O'Neill H (2006) Strange bedfellows: Alliances between corporations and nonprofits. In: Shenkar O, Reuer JJ (eds). *Handbook of strategic alliances*. SAGE Publications, Thousand Oaks, 479 p.
- Mendoza RU, Thelen N (2008) Innovations to make markets more inclusive for the poor. *Development Policy Review* 26: 427-458
- Ministry_of_Drinking_Water_And_Sanitation (2014) Guidelines for SWACHH BHARAT MISSION (GRAMIN)."
<http://www.mdws.gov.in/sites/default/files/SwachBharatGuidlines.pdf> retrieved in September 2015
- Mjoli-Mncube N (1997) The impact of an alternative sanitation system on the lives of women in South Africa. *Science, Technology and Development* 15: 104-111
- Murphy HM, McBean EA, Khosrow F (2009) Appropriate Technology- A comprehensive approach for water and sanitation in the developing world. *Technology in Society* 31: 158-167
- Obirih-Opareh N (2001) Public or Private? A Policy Dilemma of Liquid Waste Management in Accra. In: Van der Geest S, Odei MA, Post J, Obirih-Opareh N (eds). *Toilet and Sanitation in Ghana: An Urgent Matter*. CSIR, Accra,
- Planning_Commission (2013) Press Note on Poverty Estimates 2011-2012. Government of India
http://planningcommission.nic.in/news/pre_pov2307.pdf
- Prahalad CK, Hart S (2002) The fortune at the bottom of the pyramid *Strategy+Business* 54-67
- Ramani S, Benyacar A, Didier A (2008) Commercializing an Innovation in an Invisible Market: Case of Ecosan toilets. *eSS Occasional Papers* 1: 77-90.
- Ramani SV, Mukherjee V (2014) Can breakthrough innovations serve the poor (bop) and create reputational (CSR) value? Indian case studies. *Technovation* 34 295-305
- Ramani SV, Parihar R (2015) Linkages between sanitation, health and poverty reduction. Report for EU FP7 Project. MNEmerge. Deliverable 1.5. Grant agreement no: 612889
- Ramani SV, SadreGhazi S, Duysters G (2012) On the diffusion of toilets as bottom of the pyramid innovation: Lessons from sanitation entrepreneurs. *Technological Forecasting and Social Change* 79: 676-687
- Ramani SV, SadreGhazi S, Gupta S (2017a) Catalysing innovation for social impact: The role of social enterprises in the Indian sanitation sector. *Technological Forecasting and Social Change* 121: 216-227

- Ramani SV, Thutupalli A, Urias E (2017b) High-value hi-tech product introduction in emerging countries: The role and construction of legitimacy. *Qualitative Market Research: An International Journal* 20: 208-225
- Rheinländer T, Thanh Xuan LT, Ngoc Hoat L, Dalsgaard A, Konradsen F (2012) Hygiene and sanitation promotion strategies among ethnic minority communities in Northern Vietnam: a stakeholder analysis. *Health policy and planning* 27: 600-612
- Rogers EM (1962) *Diffusion of innovations*. 5th edn. Glencoe: Free Press,
- Schumacher EF (1973) *Small is beautiful : a study of economics as if people mattered*. Blond and Briggs, London
- Yin RK (2002) *Case Study Research, Design and Methods*. Sage Publications 3rd ed., Newbury Park