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SUSTAINABLE DEVELOPMENT OF WATER RESOURCES, WATER SUPPLY AND ENVIRONMENTAL SANITATION
Women, well-being, work, waste and sanitation (4Ws)

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This project focused on the planning and implementation of action research on alternative strategies for environmental sanitation and waste management in six peri-urban coastal communities in south Asia. Five universities and five NGOs from India, Bangladesh, Sri Lanka, The Netherlands and Finland¹ cooperated with local Governments. This project developed as a result of the need for more research in the area of sanitation. The reader should be aware that this paper represents the processed used and the outcomes from an evaluation of this project. The objectives of this project were to measure the (1) cost-effectiveness of innovative and replicable approaches to excreta and solid waste management in low income peri-urban settlements; (2) to measurably improve sanitation conditions and practices; (3) to scale up the tested approaches; (4) and to strengthen interdisciplinary cooperation and implementation skills of the participating research and civic society institutions. The project used participatory methods to promote the adoption of improved sanitation and hygiene. Local women were trained to produce and install sanitation facilities, generate work and income and improve their status. Innovations were toilets and rainwater harvesting tanks built by local women masons, including lower cost toilets, water tanks and eco-latrines, home composting and vermi composting. The research used an experimental design of three study and three control communities.

Introduction

The project used action research with an experimental design of three pilot communities and three matched control communities. The baseline study was done through social surveys using closed questionnaires on attitudes, practices and conditions regarding environmental sanitation, water and hygiene. The survey was either done in a random sample or (in the Bangladesh area) in all households. It was replicated at the end of the project. Two environmental surveys were carried out which scored the main factors (general overview, water supply, sanitation and solid waste treatment) from 0 (very poor or totally lacking) to 5 (excellent). They were done in November - December 2003 and November - December 2005. Both visits were made during the first months of the dry season, so that the nature and vegetation effects caused by the annual cycle would be as similar as possible. The methodology used has been described in Heinonen-Tanski, H., Snel, M., van Wijk-Sijbesma, C. Quazi, A. R., Mathew, K., Werellagama, I., Rahman, M., Rashid, S. M. A., Jayaweera, P. & Judith, H. 2006. Assessing of Environmental Quality in Six Areas in India, Sri Lanka and Bangladesh, accepted in the refereed international and multidisciplinary journal *Environmental Development Sustainability*.

Main methods used in the study
Inception workshop

The project started with an inception workshop of the seven

core members of the 4WS project from 17 to 21 February 2003 in Delft, the Netherlands. At the workshop, the partners presented the situation in their country/state and their experiences with safe excreta disposal and the management of solid waste. After discussing the project in general, detailed planning started on its design and implementation. This involved the establishment of selection criteria for the study and control communities, the review of safer human excreta disposal and waste management models, the design of a format for the case studies, the design of the questionnaires for the baseline studies, and the planning of the contacts with the authorities in charge of water and sanitation infrastructure and environmental management, especially the local governments. Work was also done on the development of webpages and various types of information materials, the creation of reporting formats, planning of training for women workers and support staff and preparation of a detailed time and workplan for the first phase of the project. Each partner received a CR ROM with relevant information on project related topics. Yearly updates were sent and partners also provided literature.

Baseline studies

After the inception workshop, the partners choose the pilot and control villages, established a working relationship with the local authorities (municipalities in Bangladesh, the Panchayat and municipality in Kerala and the Pradeshiya Sabha in Sri Lanka). In each community, a baseline study

Table 1 Summary of baseline conditions in the project communities

Bangladesh – Pilot community Morelganj <ul style="list-style-type: none"> 79% of adult householders have and use sanitary toilets; the others use a latrine draining on a canal or pond. 43% of the children <5 practice open defecation 50% dispose solid waste in open spaces <ul style="list-style-type: none"> 33% dispose in ponds 16% in drains 1% at roadsites 53% of households use ponds and shallow tubewells for drinking water 26% think this drinking water is unsafe 	Control community Paikgacha <ul style="list-style-type: none"> 42% of adult householders have and use sanitary toilets; the others use a latrine draining on a canal or pond. 67% of the children <5 practice open defecation 71% solid waste disposed in open spaces <ul style="list-style-type: none"> 14% dispose in ponds 8% in drains 2% at roadsites 5% in dustbins from neighbouring ward 93% of households use ponds and shallow tubewells for drinking water 22% think this drinking water is unsafe
Kerala – Pilot community Thumbolly, Allepuzha <ul style="list-style-type: none"> 75% have sanitary latrines 15% soiled by excreta 33% of men practice open defecation 90% depend on a combination of tap and well water 50% dispose solid waste in yard and occasionally burn it. <ul style="list-style-type: none"> In 50% of households waste is collected 33% sells to informal sector collectors 10% segregate 	Control community Shanghumugham, Trivandrum <ul style="list-style-type: none"> 66% have sanitary latrines 36% soiled by excreta 51% of men practice open defecation 70% depend on a combination of tap and well water 70% dumps solid waste on the beach <ul style="list-style-type: none"> The remainder deposits in yard, burn or throw in public places 16% segregates waste before selling or disposing it.
Sri Lanka – Pilot community Karrukkupane <ul style="list-style-type: none"> 44% of the households own a latrine <ul style="list-style-type: none"> Men and children practice open defecation 42% dispose solid waste in yard <ul style="list-style-type: none"> 6% segregate 71% buy piped water from vendors 	Control community Udappana <ul style="list-style-type: none"> 35% of the households have a latrine <ul style="list-style-type: none"> 12% uses a public latrine Men and children practice open defecation 45% dispose solid waste in yard <ul style="list-style-type: none"> 3% segregate 21% use municipal collection service 99% buys water from vendors

was carried out. In Bangladesh and Sri Lanka, all households were interviewed. In Kerala, household samples covered 25% of the pilot community and 3.4% of the control community. The highlights are cited in Table 1.

Case studies

Case studies on the pilot and control areas provided an overview of the situation regarding water supply, excreta disposal, drainage and solid waste management. The studies also gave an overview of public and private sector actors and their activities in the areas and the prevailing sector policies².

Planning workshop

To prepare the pilot projects, COSI Foundation for Technical Cooperation and IRC organized a planning workshop in Kandy, Sri Lanka, from 11 to 14 August, 2003. All eight partners participated in the workshop. The participants visited the project area for structure observations and discussions. They also visited an eco-sanitation project in Matale, to orient themselves about the local experiences with dry latrines. Dry latrines have been included in the latrine options from which the participating households choose their models. A poster session was held at which each team presented their progress. The remainder of the workshop was dedicated to the planning of the mason training and the review and fine-tuning of the action plans. At the workshop, the following selection criteria were agreed on for the selection of the

women masons:

- Gender: balance of women and men (3 women, 2 men)
- Age: 25-45 years
- Marital status: widowed, single mother, married
- Education: minimum of primary school
- Previous experience: healthy and physically strong individuals willing to work as masons. No previous experience in masonry necessary
- Area: Persons from the pilot area

Training

From 14 to 25 October, a training of trainers workshop for solid waste recycling and for the promotion, construction and follow up of sanitary latrines took place in Alleppey, Kerala, India. Six trainees (4 women, 2 men) joined from Sri Lanka, one woman from the pilot community in Kerala and three (all male) from Bangladesh). In the pilot area in Allepuzha, Kerala, five women had expressed an interest in training if their husbands agreed. One of them then joined the training.

Three women from Sri Lanka were also from the pilot community itself. The other participants were from the supporting local NGOs and one University staff member. The trained NGO workers will train in their turn local community members as waste recyclers and latrine promoters and builders in the project. In Sri Lanka and Kerala, these were all women; in Bangladesh, training of five women and five

Table 2 Persons trained for technical tasks, by sex and task, for the three pilot sites

Country	Bangladesh		Kerala		Sri Lanka	
	women	men	women	men	women	men
Household compost bins	2	2	5 from project area (unspecified), 14 women and 1 man from other wards		4 (of whom 3 from the pilot c'ty)	2
RWH tanks	3	6				
Household latrines	2	2				

men was planned. The reason for also training men was the local reluctance that women take up masonry work on their own. The ultimate number of women and men with training on the technologies used is given in Table 2.

Implementation

The intervention took place in three pilot communities, while three matched communities served as control. All are poor communities located in fragile coastal areas. The main characteristics are as follows:

- Morelganj and Paikgacha in south-west Bangladesh are areas of comparable size and density. Both are located in coastal zones with high water tables, saline water and water contamination by arsenic and iron. This has made water supply a priority need in the area, reason why this component was added to the 4WS project. Both communities are newly established municipalities with low income populations who mainly work in small enterprises such as shrimp cultivation and services, with women working as domestic servants (39% and 29%). The communities are typical for many such communities in Bangladesh. The people of Paikgacha are more homogeneously poor than those in Morelganj, and have lower literacy levels. However, the unemployed rate in Morelganj (11%) is higher than in Paikgacha (3%).
- Thumbolly and Shanghumugham in Kerala, India are environmentally and socio-economically comparable low-income peri urban settlements. Shanghumugham is somewhat poorer than Thumbolly. In Shangumugam there is very poor latrine coverage by the Corporation and only very few programs have been implemented. The main occupation of the men folk is fishing. Both areas have a piped water supply with public standposts. The water is treated and chlorinated, but residual chlorine is not monitored. The supply is irregular and many people depend therefore on a combination of tap and well water.
- Karukkupane on the west coast of Sri Lanka is a rapidly growing fishing village ten km outside the main town of Chilaw. The population is ethnically Sinhalese but use Tamil as their mother tongue. The community consists of two villages : Karukapane and Korayapura. Karukapane has two sections: larger and smaller Karukapane. Education is maximally primary school. Almost all households (97%) are Roman Catholics. Udappana, the control community is 30 km away from Chilaw. Its population is Tamil, of which 86% is Hindu, 10% Muslim and 5% Roman Catholic. Both are fishing communities with similar environments, but Karukkupane has an economically more mixed population (poor and middle class).

Women work in the fish production process, taking the fish out of the nets and sorting fish. Some women go also to the fish auction place (Lellama) to sell fish. They also work in mat weaving and raise animals such as poultry and pigs. Yet neither men nor women consider these to be jobs.

Conclusions

A comparison of the baseline and post-baseline survey provided the following points. Overall, the project was able to meet most project objectives through its innovative approaches to technology, promotion, gender and environment:

A. Cost-effectiveness

- Both toilet provision and solid waste segregation and reuse by women proved to be socially and economically viable in Bangladesh and Kerala. In Sri Lanka, alternative types of work have been found for young women, as their employment as masons did not work out, mainly due to selecting unmarried women.
- The 4WS project was 31% cheaper than a comparable government project in Bangladesh and 20% cheaper in Kerala. In Sri Lanka, the 4WS project was 11,6% cheaper in cost than a comparable government project with Japanese support.
- Women masons make an income of US\$ 18 in Bangladesh (125 constructed so far) and the equivalent of US\$ 15-17/month at the solid waste recycling units (3 so far) in Kerala. Women latrine masons in Kerala earn Rs. 250 (US\$ 5.4) per toilet. installed/repaired. Women in the Kerala site obtain money from solid waste recycling and paper and fibre bag making.

B. Measurably improved conditions and practices:

- Ownership of latrines grew from 79% to 100% in the Bangladesh project. In Kerala and Sri Lanka ownership increased to 91% and 89% respectively. There were no or minimal changes in the control areas, except for Kerala where a state-wide sanitation campaign is going on.
- The actual use of the latrines grew to 100% for women and men in the Bangladesh site. This is quite an achievement as men are known to use latrines less than women. The safe disposal of children's faeces also improved, by 46% to 90%. Sixty six percent of the households now use potties; none did this earlier. In Sri Lanka, training children on safe defecation increased by 32% to a total of 83%. Measurement should have been more standardized. Now, the Kerala team did for example not study children's defecation.
- Latrine sharing by those without a toilet of their own increased.
- Quality of construction and operation of latrines showed good results. In Bangladesh, there was a difference of 47% between the pilot and control community in having a clean latrine with the water seal intact. In Kerala, the

percentage of poor latrines was 6% less in the pilot area than in the control area. The greatest improvement was for toilet hygiene, net gains of 31% and 1% respectively. In the Sri Lanka project, all hygiene indicators were better for the pilot community, except the presence of faecal parts in the water: 58% vs. 50%.

- Segregation of solid waste and composting was taken up well. Segregation grew from 0% to 68% in the Bangladesh pilot site, with 29% making compost. In the control area this was 14%. In Kerala, segregation grew from 10% to 69% against 6% in the control area. In Sri Lanka, progress was the least, with a growth in composting to 12,5% against 0% in the control area.
- Water nearby is indispensable. The improvement of the domestic water supply was added by the community members in all three sites. In Bangladesh, safe water use increased from 44% to 85%, of which 41% thanks to the Rain Water Harvesting Tanks (RWH). In the site in Sri Lanka, the people abandoned the use of the sand dune well after testing positive for e-coli. In Kerala, use of wells also increased. Introduction of SODIS (Solar Disinfection) was started to reduce these risks. A start was made to test the effects, but more time and efforts are needed to measure the impact on water quality and water use.
- Measurement of environmental impacts through ranking observations (using a number system of scaling) showed much more progress in the pilot communities than in the control communities. As to soundness of technology, due to the high water table, it would be advisable to introduce more eco-toilets, preferably above ground. A start was made with such toilets in Kerala and Sri Lanka. However, more time is needed to introduce eco-toilets in the communities. Also a focus needs to be placed on reducing the overall costs so as to become widely accepted and used.
- Experiments for school children to measure and demonstrate the impact of the use of urine as natural fertilizer are going on in schools in Morrelganj, Bangladesh and Karrukapone in Sri Lanka.
- Gender impacts include the generation of work and income for poor women in all three sites. More specifically, the training of women for new tasks in solid waste management in the Kerala site and in water supply and sanitation technology and production in the Bangladesh pilot project, the increased participation of women in decision-making, the increased attention to the roles of men in hygienic conditions and practices, the achieved redistribution of work between women and men, benefiting women and adolescent girls in the Kerala project, and the capacity building of women staff in environmental science.

C. Use of the generated knowledge

- Continuity of the approaches in the pilot areas has been ensured with the continuation of the community-level

organizations and follow up with the local administrations.

- Expansion from one to three wards is under way in the Bangladesh site. Lessons on composting are taken up to the national level through the partners' roles as advisors to the national sanitation policy. In Kerala, expansion is under way to 12 of 21 Local Self Governments and two municipalities, following a one day dissemination workshop on 4WS. One proposal has already been sanctioned. The solid waste component has become part of the policy of the State Sanitation Mission. In Sri Lanka, expansion is taking place via links with Plan International and the Red Cross.
- In Morrelganj, Bangladesh, the school experiment for natural science on the use of urine as fertilizer has been upgraded to three secondary schools.
- The project will benefit from the experiences gained in the development and use of participatory methods, gender approaches, and the need for greater standardization of data collection instruments between the countries.

Reference

- Heinonen-Tanski, H., Snel, M., van Wijk-Sijbesma, C., Quazi, A. R., Mathew, K., Werellagama, I., Rahman, M., Rashid, S. M. A., Jayaweera, P. and Judith, H. 2006. Assessing of Environmental Quality in Six Areas in India, Sri Lanka and Bangladesh. *Environmental Development Sustainability*. Accepted. [http://www.springerlink.com/\(fsur4bydikwopb45kpmc1145\)/app/home/contribution.asp?referrer=parent&backto=issue,22,49;journal,1,27;rowsepublicationsresults,394,1585](http://www.springerlink.com/(fsur4bydikwopb45kpmc1145)/app/home/contribution.asp?referrer=parent&backto=issue,22,49;journal,1,27;rowsepublicationsresults,394,1585)

Endnotes

- 1 University of Engineering and Technology, Dhaka, Bangladesh; yola College of Social Sciences, Kerala; University of Peradeniya, Sri Lanka; University of Kuopio, Dept. of Environmental Sciences, Finland; O Forum, Dhaka, Bangladesh; Socio-Economic Units, Thiruvananthapuram, Kerala; COSI Foundation for Technical Cooperation, Kandy, Sri Lanka; and IRC International Water and Sanitation Centre, Delft, The Netherlands
- 2 All the case studies developed by the partners will be integrated in an occasional paper which shall be produced in the coming months.

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