



## Community-managed arsenic mitigation programme – NGO Forum Model

*S M A Rashid, Bangladesh*

WITH A POPULATION of 127 million and a per capita GDP of US\$ 282 (1998-99), Bangladesh is South Asia's most densely populated country. Rapid population growth and poverty, combined with the tradition of drinking water from ponds and poor sanitary habits, contributed in the 1960s and 1970s to a high level of water-related morbidity and mortality - particularly in the rural areas. In response, the Government of Bangladesh launched, with donor support, campaigns in the 1970s to drill tubewells (10-300 meter deep) and install in the rural areas. Municipalities have been provided with production wells and piped distributed systems (covering part of the urbanized areas) whilst non-piped zones, in many places covering more than half of the town, rely on hand-pumped tubewells. The widespread introduction of microbiologically safe drinking water through tubewells and primary health care initiatives are credited with contributing to a significant drop in mortality from diarrhoeal and gastrointestinal diseases. By 1997 this had dropped to approximately 150,000 per year. The shallow groundwater aquifers are replenished during the intense annual monsoon, and the soft clay soils allowed easy drilling without sophisticated equipment. Thus, Bangladesh was one of the few developing countries where water supply coverage was reported to reach 90 percent in 1990 and 98 percent in 1997. This extensive coverage indicated the country's successful attempt to provide safe drinking water to its general population, but this respectable public health effort was overshadowed when in 1993 an alarming discovery confirmed of arsenic contamination in groundwater around the north-western part of Bangladesh.

Arsenic, a metalloid element known for its toxicity and carcinogenicity, is soluble in water and occurs naturally in many minerals. Arsenic contamination of groundwater in Bangladesh is widely accepted to be of geological origin, though the exact mechanisms remain poorly understood. Arsenic occurs in different forms, organic and inorganic, with different toxicity. Arsenic affects the humans mainly through ingestion and inhalation. The WHO has set a provisional guideline value of 0.01 mg/l for total arsenic in drinking water. The Government of Bangladesh has set a provisional water quality standard of 0.05 mg/l arsenic for drinking water. Toxic effects of arsenic range from skin lesions to various forms of cancer, which can be fatal. The latency period, or period of exposure before symptoms become apparent, depends on the amount of arsenic ingested, the length of exposure and the immunity level of the individual. Those with poor socio-economic and nutri-

tional status are thought to be more vulnerable to arsenic poisoning. Arsenicosis, the disease caused by arsenic ingestion, is popularly mistaken for an infectious, contagious or hereditary disease, and there are serious social problems for victims and their families in addition to the clinical effects.

Though at the first stage the arsenic was found in the country's northwest part, it was soon evident that the contamination was more widespread and not confined to any one local area. As more chemical tests and research work were being performed and subsequently concluded, the extent of the problem became evident. The arsenic crisis in Bangladesh is presently viewed as the worst environmental catastrophe of the twentieth century. Estimates vary on how many people are affected, but it is assumed based on different studies conducted so far that the population at risk may vary around 28 to 35 million (DPHE/BGS study). It has been viewed that people of the affected areas are passing their time in a panic situation. It has been reported that a number of social problems have started coming out among the low-income group people of the severely affected areas considering the arsenic-caused disease a contagious one. According to an estimate, at least 47 out of 64 districts in Bangladesh are being affected to various ranges. Tens of thousands of people have already been showing skin discoloration and other more serious manifestations of arsenic toxicity. Also the children below the age of ten are now showing signs of chronic arsenic poisoning. With this the country currently faces a new public health challenge related to water supply.

With half the country's population feared to be affected by this calamity, NGO Forum for Drinking Water Supply & Sanitation (NGO Forum), being one of the leading organizations and the *apex* body of around 600 local, national and international NGOs, CBOs and private sector actors working relentlessly to improve the current WatSan (Water & Sanitation) situation of Bangladesh, could not stand aside and let the situation deteriorate. It should be mentioned that NGO Forum is always responsible to provide all its possible efforts to meet any WatSan related crisis. The acute environmental hazard due to the presence of arsenic in the country's groundwater made NGO Forum accountable to participate actively in the arsenic mitigation programme in collaboration with relevant government agencies and research organizations. Since from the discovery of arsenic in the groundwater of Bangladesh, NGO Forum has been striving in different ways to address these arsenic problems.

## The programme

As part of its intensive hardware-software-mix arsenic mitigation activities being implemented throughout the country, NGO Forum conceived and developed a comprehensive community-based model approach for arsenic mitigation. Considering the then situation in terms of arsenic contaminated tubewells and arsenicosis patients, Nilkanda, an arsenic affected village located 45 kilometers away from the capital city Dhaka, was selected as the intervention area for experimenting this approach. The process of community management was determined as the main operational strategy for this venture. The objectives of the programme were as follows:

### General objective

- Establish an effective and replicable model of community-managed arsenic mitigation programme.

### Specific objectives

- Conduct baseline survey covering the entire village;
- Establish VDC (Village Development Committee) at village level and its empowerment;
- Launch different promotional and motivational activities for creating mass awareness on arsenic and its associated issues;
- Promote alternative safe water supply technologies (Rainwater Harvesting, Arsenic Iron Removal Plant, Pond Sand Filter, Dug Well, etc.) on cost-sharing basis;
- Capacity building of the caretakers of alternative safe water supply technologies;
- Promote installation and use of hygienic latrines; and
- Ensure a follow-up process for a period of 5-year to monitor health consequences and behavioural changes of the targeted population.

### Intervention area

The newly developed approach was applied and implemented at Nilkanda village of Sanmandi union which falls under Sonargaon district. Five years ago some doctors of a government health care agency identified two arsenicosis patients in the village. Later the number of patients increased much throughout the village, which drawn the attention of different government and non-government agencies. Surveys conducted by different agencies confirmed that an unacceptable limit of arsenic exists in a large number of tubewells. In light of this alarming situation, NGO Forum, in due consultation with one of its partner organizations named BACE (Bangladesh Association for Community Education) working there for several years, decided to work in that area following the newly developed approach “community-managed arsenic mitigation programme”.

### Implementation of activities

At the outset of the programme several meetings took place with the villagers, which included school teachers, religious

leaders, influential personalities, elected representatives, volunteers, where the programme objectives and implementation procedure, duties and responsibilities of each and every actor, etc. were elaborately shared and discussed. From those meetings, a VDC was formed comprising of 15 members (10 male and 5 female) and later it conducted a PRA (Participatory Rural Appraisal) session involving the villagers. During the session participants identified arsenic and other related problems, assessed their needs, identified available resources to mitigate the existing problems. The following step was the baseline survey conducted by two trained field workers of NGO Forum. They gathered information on socio-demographic status, pattern of water uses and sanitation practices, arsenicosis disease prevalence. These workers moved to door-to-door and collected information using a pre-tested partially open-ended interview schedule. Besides, they screened all the village people and when they found any people having the symptom of skin lesion, they advised them to consult with medical doctors for complete diagnosis. With the inclusion of the nitric acid as preservatives, all water samples collected from the tested tubewells were sent to the well-reputed and renowned water quality testing laboratory of the School of Environmental Studies (SOES) of Jadavpur University, Kolkata, West Bengal, India, where those samples went through analysis using Atomic Absorption Spectrometry - Flow Injection Hydride Generation (AAS-FIHG) method.

On completion of information collection through baseline survey, the VDC developed a detail plan of action that gave, in a systematic order, the step-by-step activities indicating the responsibilities of the respective programme actors.

### Findings of baseline survey

The total population of the Nilkanda village was 513 of which male and female were 265 (51%) and 248 (49.3%) respectively. The mean age of the population was 24.69 years (SD = 19.23) and the total household number was 104 with an average family size of 4.88. 40.8% people were married. 28.8% of the household members did not receive any formal education and the maximum level of education of 40.4% households was up to class five standard. 16.8% of the people were in service, 24.6% were housewife, 4.1% owned private business and 3.1% was day labor. Of the total number of houses, 97.1% were made of with tinned-roof. The monthly income of 75.8% of households was around US\$ 52.63. Five households used to use hygiene latrine and 6% people used to wash their hands with soap or ashes after defecation. 100% households used tubewell water for drinking purpose, but for cooking purpose 63.4% used pond water. 75% used pond water for bathing and 74% used it for other domestic purposes. Out of the total of 53 tubewells, 44 (83.7%) tubewells were privately owned. The mean age of tubewell was 6.67 years (SD = 4.12) ranging from 1 to 15 years and the mean depth of tubewell was 111.57 feet (SD = 51.24) ranging from 65 to

275 feet. 85.3% tubewells were between 51 to 150 feet, which is quite vulnerable to arsenic contamination. The results of tubewell testing confirmed that only 5 tubewells had arsenic less than 0.05 milligram (mg)/liter (l). The mean arsenic concentration of the tubewell was 0.41 mg/l or 418 ppb (SD = .26) ranging from <.003 mg/l to 1.04 mg/l. During the baseline survey, 63 (34 male and 29 female) people were found suffering from arsenic related skin lesions either by Melanosis, which creates black spots on the skin, or by Keratoses, which creates roughness of the palms and soles. Of these 63 arsenicosis patients, the mean age was 39.57 years (SD = 17) ranging from 6 to 80 years, and of them 19 (30.1%) had Melanosis and 44 (69.9%) had both Melanosis and Keratoses. Following table provides information on the age of arsenicosis patients by arsenical skin lesions:

Age (in years)	Melanosis	Melanosis & Keratoses	Total
1-10	1	0	1
11-20	2	7	9
21-30	0	12	12
31-40	5	9	14
41-50	5	6	11
51-60	2	6	8
>60	4	4	8
<b>Total</b>	<b>19</b>	<b>44</b>	<b>63</b>

On completion of the baseline survey, NGO Forum went on with the following activities in joint collaboration with its partner BACE:

- Monthly VDC meeting
- VDC orientation programme
- Leadership and management training for VDC members
- Courtyard meeting with female members using PRA
- Tea-stall session with male members
- WatSan programme with school students and teachers
- Billboard construction
- Rally and miking (procession with banners, festoons, placards and chanting slogans)
- IEC (Information, Education and Communication) materials
- Mason training
- Caretakers' training

All these activities were carried out involving the VDC and these focused on creating mass awareness on arsenic and its related health hazards. What is arsenic, how it spreads, what are its likely affects on health, how it can be cured, what to do when any people is reported to be affected by arsenicosis disease, etc. were the main agenda discussed in most of the activities. Inter-personal communication using IEC materials informed the community people about the arsenic issues. The process of community management was widely introduced and employed as the main operational strategy under the programme. Choices were kept open to the communities and demand responsive

atmosphere created through the software interventions enabled the community people to determine the most appropriate and useful alternative safe water supply technology for them. One of the specific objectives of the programme was to increase latrine coverage. Different research studies show that while approximately 50 diseases originate from unhygienic latrines, 80 diseases are originated from contaminated water. One third of child mortality is caused by diarrhoeal diseases. The basic facts were conveyed to the village dwellers. Through creative and joint motivational efforts, this message was disseminated throughout the entire population.

Based on the demand created from the software interventions, a number of alternative water supply options and village sanitation centre were installed and established, which are as follows:

- Rainwater harvesting system
- Iron arsenic removal plants
- Dug well
- Pond sand filter
- Village sanitation centre (for latrine production)

Except the village sanitation centre, all water supply technologies were installed on a cost sharing basis. Since those technologies were promoted in the village for the first time, the ratio of the costs shared by beneficiary groups ranged from 5% to 20% of the total cost. Each and every of this technology was provided with two caretakers (1 male and 1 female) selected from the respective community people. These caretakers received intensive training on the operation and maintenance of the technologies. On completion of the training, all caretakers were provided with tools set and manual on operation and maintenance. Following the installation of those technologies, regular testing of water quality was carried out and the test results were regularly shared with the community through the VDC. The VDC has been made responsible to act as the watchdog for overseeing the functions of each and every technology installed in the village.

### Lessons learnt

- This community-managed approach ensured participation of all community people from the planning, designing and implementation to monitoring.
- Active participation of women in all activities contributed to the women's empowerment and proved that they possess much potential in any development effort.
- Introduction of the PRA technique to the community helped the villagers in ascertaining their own problems and finding feasible, solvable measures.
- The process enabled the VDC members to come out as respected spokesperson in the rural community.
- Interpersonal communication proved an effective device in disseminating messages relating to arsenic and hygiene promotion, and also making the community aware of the related issues.

- Establishment of village sanitation centres created much awareness and raised demand for hygienic latrines.
- Display and distribution of a wide range of IEC materials helped in raising much consciousness and contributed in getting rid of misapprehensions regarding arsenic.
- Training components have developed and enriched knowledge and skills among the caretakers and masons on the operation, maintenance and construction of alternative water supply technologies.
- The caretaker's training and the provision of cost sharing have created a sense of ownership within the beneficiaries of the alternative water supply technologies provided. It has also established the fact that both males and females equally possess the required potentiality to contribute in social development.
- Participation of the community people in the VDC has increased their self-confidence and efficiency in improving their own village, which substantially contributed to the improvement of health conditions of the community people.
- The alternative safe water supply technologies played a lifesaving role in the respective villages.
- Regular sharing of water quality test results of the alternative safe water supply technologies was instru-

mental in gaining positive acceptance by the community.

### **Conclusion**

Demand-responsive in nature the community-managed arsenic mitigation approach was successful in involving the community from all walks of life in different steps of the development process; from designing to planning, decision-making, cost sharing, operation & maintenance, monitoring, etc. It played a significant role in changing the community's attitude towards the benefit and use of arsenic-free water, as well as the use of latrines by all family members. Experiences gathered through the Nilkanda programme reveal that the hardware-software mix and demand-driven approach, community management and the ownership of an intervention to ensure long-term sustainability are the few but most essential prerequisites for any successful, sustainable arsenic mitigation efforts.

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S.M.A. RASHID, Executive Director, NGO Forum for Drinking Water Supply and Sanitation, Dhaka, Bangladesh, E-mail: ngof@bangla.net

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