CHAPTER 5

Stakeholder participation in greywater management in the Jordanian Badia

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The aim of this chapter is to illustrate the process of stakeholder participation in greywater (GW) management in the Badia of Jordan. The work was carried out as a part of a project entitled Integrated Wastewater Management Policies and Technologies in Marginal Communities in Jordan, described more fully in Chapter 4. The objectives of the project were to improve the quality of life and well-being for rural Jordanians, strategically support GW use and improve hygienic conditions. The stakeholders participating in GW management included local people, non-governmental organizations (NGOs), community-based organizations (CBOs), governmental authorities and scientists and experts from universities as well as research institutions. Local people were involved in different capacity-building programs, including technical field visits, a participatory rapid (or rural) appraisal (PRA) training course and awareness campaigns. Local people were also involved in data collection, community selection, GW quality and quantity assessment, treatment technology, construction and operation. Experts and governmental authorities participated in treatment technology selection and design. The study revealed that combining the strengths of different stakeholders made up for the scarce learning resources and human and financial resources that are needed to develop GW treatment technology for the Badia region. It was concluded that incorporation of inputs from different stakeholders enhanced the quality, ownership and sustainability of the project.

Introduction

This chapter describes a GW project conducted in the north-eastern Badia of Jordan. Badia is a local term for Jordanian dry lands where the local nomadic and non-nomadic Bedouins live or used to live. The north-eastern Badia of Jordan covers an area of about 25,600 km^2. The population size of the north-eastern Badia was about 28,480 people in 2003, living in 33 small communities. The towns and villages of the Badia are scattered throughout the area and have low-population density (Department of Statistics, 2001).

The existing household sanitation facilities in the Badia were built to satisfy households' demand for privacy and convenience (outdoor toilets and indoor shower rooms). The cultural and religious traditions of Muslim communities of the Badia require the use of water for ablution and washing after defecation, where possible (Al-Jayyousi, 2003).

The current GW use practices in these rural communities include the separation of GW from toilet wastewater (blackwater). Blackwater is generally disposed of in cesspools, and GW (wastewater effluent from the ablution or hand washing basin, kitchen sink, shower room, bath tubs and washing machines) is either used for irrigation or disposed of directly to the environment without treatment (Royal Scientific Society, 2003–06).

The driving forces behind GW separation include religious attitudes and beliefs, the state of the economy and the need to maximize the use of the available water (Al-Jayyousi, 2003; Dutton et al., 1998). According to the teachings of Islam, water containing faeces or urine is considered unclean (*mutanajjis*). Because of this, some people are not content to discharge water from sinks and showers, and kitchen water (i.e. greywater) into the same cesspool as blackwater. In the case of kitchen GW, this also may stem from the fact that it contains some food remains, which are regarded as 'God's gift' (Dutton et al., 1998).

The technicalities of the GW project is more fully described in Chapter 4.

The community involvement in this project included questionnaires, information gathering visits (Pretty and Vodouhê, 1998), and the use of participatory rapid (or rural) appraisal (PRA) (Singh and Rennie, 1996). PRA can be an efficient and cost-effective way of gathering information from local people. PRA techniques rely very much on identifying an overall picture, rather than looking for statistical significance, and emphasize the importance of local knowledge (ibid).

Providing the public with effective means of participation and building trust with communities, by involving them at an early stage in the planning process and in collecting data, assessing needs, building capacity, selecting alternative sites and technologies, and having an input in the management of a project, is a most important tool that ensures the cooperative management of community resources and enhances project quality and sustainability (Ockelford and Reed, 2002).

Sustainable and integrated management of GW in rural communities requires the production of GW appropriate for irrigation without significant negative impacts on health and the environment. Greywater management is directly effected by the awareness of local people and depends on the regular follow-up and maintenance of the treatment facilities by house owners and, in many cases, housewives (Dalahmeh and Assayed, 2007).

The objective of this chapter is to present a case study for the public involvement and participation of different stakeholders in GW management in Jordan.

Research methodology

Preparation

Formal and informal information meetings were held with community leaders and representatives, municipality directors, principals of girls' and boys' schools, and representatives of non-governmental organizations (NGOs) and community-based organizations (CBOs) to introduce the project idea, objectives, methodology of work, and role of the community in GW management. A local stakeholder committee (LSC) was formed by the community itself. The committee was comprised of 15 people (4 women and 11 men) from different communities in the project area.

Professional officers from the relevant government authorities, experts and scientists from research centres, and academic institutions in Jordan were invited to participate in the project through steering and expert committees.

Capacity building

A four-day training course on participatory development communication (PDC) and PRA was organized by the research team and delivered by CARE International in Jordan/CARE Australia and PLAN:NET, Canada. The training targeted the LSC members and was held in the Um Al Quttain Social Club. Indicators were selected to measure the effectiveness in capacity building. These were: 1) number of participants; 2) training reports prepared by the trainers; 3) participants' knowledge about PRA methods before and after training.

Five field trips to wastewater and GW treatment-and-use projects in Jordan were organized for the LSC and other community representatives. The indicators used to measure the effectiveness of technical visits in increasing people's knowledge of wastewater issues were: 1) the number of participants; 2) field reports prepared by the trainees; 3) participants knowledge about wastewater and GW before and after trips.

An environmental awareness campaign was launched by the Environment and Economic Investment Cooperative Society (one of the NGOs working on relevant fields in the project area). The awareness campaign targeted community leaders, religious leaders, housewives, school teachers, school students and public health specialists. The awareness campaigns included three main activities: scoping sessions, best environmental drawing contest and lectures and workshops. The indicators used to measure the effectiveness of environmental awareness campaigns were: 1) the number and types of target groups; 2) mission report of the Environment and Economic Investment Cooperative Society; 3) participants' knowledge about GW management before and after the awareness campaigns.

Data collection and situation analysis

The research team and LSC collected social, economic, environmental and technical data relating to wastewater and GW in the study area using PRA tools and methods. Data was collected from a sample of 8–15 per cent of the population by five work teams, each consisting of three to five members including at least one woman. A total of 404 household-level interviews were carried out during 13 days of field work in 33 communities.

Greywater quantities in six households were measured by one community member on a daily basis. Physical and chemical parameters of GW were analysed in the laboratories of an environmental research centre. Expert and steering committees participated in assessing the quality of GW generated in the study area based on the Jordanian wastewater guidelines and standards of use (see Chapter 4 for more details).

Community selection criteria and treatment technology criteria

Community selection criteria were set by the research team and LSC to identify the best communities within the project area where pilot field experiments for GW collection, treatment, and use could be conducted.

The expert committee and steering committee then developed GWT selection criteria. The criteria took into consideration GW characteristics, environmental requirements, social and economic requirements and standards and regulations for use. Five treatment technologies were proposed to treat GW in the study area, and they were evaluated in view of the criteria. The technologies included septic tank, sand filter, constructed wetlands, sequential batch reactor and up-flow anaerobic sludge blanket (UASB).

Design criteria were developed by the expert committee and research team to design the selected treatment systems (see Chapter 4).

Construction and operation of treatment systems

A septic tank followed by an intermittent sand filter was constructed in Abu Al-Farth Village, and a UASB was constructed near Zamlat Al-Amir Ghazi Village. A training session on the construction and operational requirement of the treatment systems was held, targeting house owners and other local people in the villages. The flow of information between the different stakeholders of the project is shown in Figure 5.1.

Results and discussion

Preparation

Over a four-day period 15 information meetings were attended by about 150 participants including community leaders, community members, officials, NGOs and CBOs in the study area. The meetings enabled the project team to

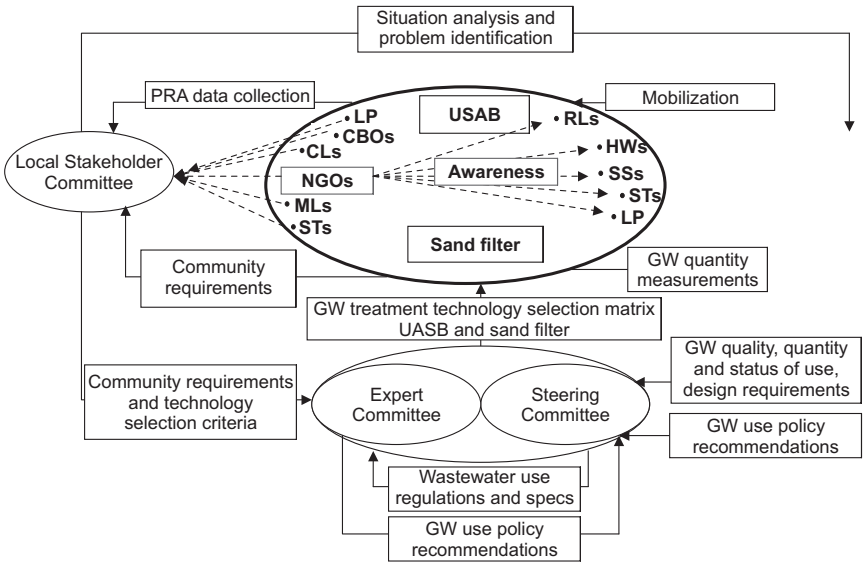

Figure 5.1 Stakeholder information flow

introduce the project objectives, activities, and anticipated outcomes to the communities. Thirty questions and remarks on wastewater-related issues were raised by the audience. The meetings were the main tool used to facilitate dialogue over GW-management issues and provided an opportunity for the interaction of communities with the existing water and wastewater issues in Jordan.

An LSC consisting of 15 people (11 men and 4 women) from the study area was formed. During a 44-month period, more than 50 regular meetings were held between researchers and the LSC to discuss the implementation of activities of the project and define the roles and tasks of the LSC in the project. The LSC brought together the views and opinions of the local people with other stakeholders, such as the project team, government authorities, and research institutions.

A steering committee of seven members from the Ministry of Water and Irrigation, Ministry of Health, Ministry of Environment, Badia Research and Development Center, and the LSC was formed. The role of the committee was to discuss different aspects of GW management in the rural communities, future governmental plans, and strategies for the development of integrated management of the Badia resources.

An expert committee was formulated and consisted of 10 scientists and experts from the Royal Scientific Society, University of Jordan, Jordan University for Science and Technology, National Center for Agricultural Research and Technology Transfer, Ministry of Water and Irrigation, and Inter-Islamic Network on Water Resources Development and Management (INWRDAM). The

role of this committee was to establish a network for discussion, assessment, and evaluation of, as well as exchange of information about, affordable and attractive GW treatment options that suit the study area.

Capacity building

One major challenge concerning community involvement in GW projects in rural areas in Jordan was the development of community knowledge about GW-related issues. The levels of understanding and knowledge about GW management and use were increased through awareness campaigns, site visits, training courses, workshops, regular meetings, and group discussions, all of which were among the activities of the project.

About 30 community members participated in a PRA training course. The course enabled the LSC to conduct face-to-face interviews, semi-structured interviews, community mapping, daily routine, observations, and data analysis during the data collection phase and led to identifying technical, political, social and financial issues, problems and constraints currently facing wastewater management in small communities.

Five rounds of field trips were organized for community members (see Chapter 4 for details of these field trips). These visits had a positive impact on the communities' perspectives and perceptions of GW treatment and use, and further developed community know-how and provided an opportunity to be exposed to other experiences and practices in GW management.

About 500 school students, 35 school teachers, 15 religious leaders, 50 housewives, and 8 health inspectors participated in the awareness lectures and workshops that targeted the study area. There was a drawing contest which 230 school students participated in and a poster for the best seven environmental drawings was designed, published and distributed among schools, NGOs, CBOs and local people.

Evaluation of the awareness campaigns shows that there was an increase in people's knowledge of methods and practices that could be used to help improve the quality of the GW at source, usage of treated GW and health impacts of direct contact with untreated GW. The awareness campaigns helped the target groups to understand the role of local people in managing GW resources, the role of religious leaders in encouraging appropriate water conservation and use conditions, and the role of teachers in disseminating information about GW management to their students who can transfer the new knowledge to their families.

CBOs and NGOs played an important role in capacity building and information dissemination. This was accomplished through the participation of the Anakeed Al Khair Society, the Um Al Quttain Social Club, and the Environmental and Economic Investment Society in hosting PRA training, organizing the awareness workshops, presenting lectures, and distributing posters.

Data collection and situation analysis

Local people participated thoroughly in data collection and situation analysis during the initial phase of the project. The following issues were identified by the LSC during the PRA and socioeconomic surveys:

- The project area suffers from a water shortage problem. Domestic water is supplied through the public network for only 24 hours each week. Inhabitants purchase water from the private sector (water tankers) particularly in the summer period. People spend five per cent of their income on the water bill.
- The community relies mainly on unlined cesspools as on-site wastewater collection systems. In some areas, cesspools are rarely emptied. In others, the cesspools are pumped out on a monthly basis, at an average cost of JOD21 per pump-out (based on exchange rates of May 2009, JOD1 = US$1.41). The closest legal liquid waste disposal site is 80 km away from the area, and inhabitants believe that the wastewater pumped out of cesspools is being illegally disposed of in nearby streams. About 62 per cent of the public in the project area utilize pit latrines or ventilated improved pit latrines, 33 per cent have a traditional (no-flush) indoor toilet, while only 1 per cent use flush toilet (compared to 89 per cent on the national level). Only 40 per cent of the community has showers and kitchen sinks.
- Two-thirds of the community separate GW from blackwater, apparently mainly for religious considerations. Greywater is being used directly (without any treatment) to irrigate the planted backyards in an uncontrolled manner, paying little attention to health aspects.
- The majority of the rural communities of the Badia region are aware of the existence of GW problems that affect both public health and the environment. The major public health issues attributed to GW are those related to the presence of insects, rodents and offensive odours.
- Most people show acceptance to the idea of treating GW on a household level and reusing it for the irrigation of fodder or olive trees. People have willingness to operate and maintain GW treatment facilities.

Community selection and treatment technology selection and design criteria

Community selection criteria were developed by the LSC and research team and are described in the chapter by Suleiman and others in this volume.

Based on these criteria, Abu Al-Farth (Rawdat Al-Amir Ali) Village and a nearby settlement near Zamlat Al-Amir Ghazi were selected to implement treatment units in their territories.

The participation of the expert committee, the steering committee and the research team resulted in developing treatment technology evaluation and design criteria. The evaluation criteria are shown in Table 5.1.

Table 5.1 Treatment technology evaluation criteria

Source characteristics	*Community requirements*	*Receiving environment*	*Use opportunity and local regulations*
Effectiveness in handling high organic loads (Yes/No) Effectiveness in removing BOD, TSS, FOG, N, and pathogens removal efficiency (%) Ability to operate under variable flow patterns, shock loads (Yes/No)	Land requirement Area (m2) Production of odours (Yes/No) Maintenance requirement (Daily, Weekly, Monthly, Yearly) (Yes/No, type maintenance required, cost) Operation requirements, is it a user-friendly system? (Yes/No) Approximate construction costs (JOD) Approximate operation costs (JOD)	Need for specific environmental conditions (temperature, topography) (Yes/No) Availability of construction materials/treatment media in the study area (Yes/No)	Effluent quality meets the Jordanian Specification 893/2002 for Restricted Irrigation (JSIM, 2002) (Yes/No) Losses (evaporation, evapo-transpiration) (High/Low)

Five treatment options were evaluated using the above-mentioned treatment technology criteria. These options include: 1) septic tank; 2) intermittent sand filters; 3) wetlands; 4) sequencing batch reactor; 5) up-flow anaerobic sludge blanket (UASB).

Out of the five systems, the UASB and septic tank followed by intermittent sand filter were selected by the expert and steering committees to be designed and constructed in the study area. The septic tank–sand filter and UASB units were designed based on the criteria in Table 5.2, which were also set by the expert and steering committees taking into consideration the acceptance of the house owners.

The participation of local people was greatest in the short-term data collection, situation analysis and community selection phase, and long-term

Table 5.2 Design criteria for the treatment systems

Household owner	*MM*	*FA*
Village	Abu Al-Farth (Rawdat Al-Amir Ali)	Nayifa (near Zamlat Al-Amir Ghazi)
Treatment option	Septic tank followed by intermittent sand filter	Up-flow anaerobic sludge blanket (UASB)
Design flow	150 litre/day	300 litre/day
Design BOD_5/COD	BOD5: 1,000 mg/l	COD: 2,500 mg/l
Design TSS	750 mg/l	780 mg/l

implementation and operation phase. The communities were not so involved in the design phase, since they were deemed not to have the necessary engineering skills. The communities, through the LSC, participated in deciding the type of the treatment technology that best suited their social and economic conditions.

Construction and operation of treatment units

Septic tanks followed by intermittent sand filters were constructed in single households in Abu Al-Farth Village (Rawdat Al-Amir Ali). A UASB unit was constructed near Zamlat Al-Amir Ghazi Village.

The units were built by the communities themselves using local construction materials, fittings, and machinery available in the area. The treatment units were operated and maintained by the households.

The sustainability of treatment units was strengthened by conducting training sessions on construction and operational requirements of the treatment systems. The training was targeted at householders and other interested people in the villages. Arabic-language guidelines, *Guidelines for Greywater Management on Household Level in the Small Communities in Northeastern Badia of Jordan*, were prepared by the research team in consultation with the steering committee, the expert committee, and LSC. The guidelines were distributed to the people in the study area.

Conclusion

Integrated management of GW in the Badia of Jordan is a challenge because of the local traditions and values held by the communities. Nonetheless, GW use as a means of increasing the availability of affordable water is of great importance to the improvement of the quality of life for such marginalized communities. Its successful implementation was seen to hinge on early involvement of the communities in the selection, design, implementation, operation, and maintenance of the treatment systems in ways that suited local environmental conditions and socioeconomic circumstances.

It was seen that the existing knowledge of local people should be recognized, and participatory approaches should be applied when investigating integrated water resource management programs for small communities. However, this was usefully combined with intensive awareness campaigns. Field visits of local people to other wastewater treatment and use projects were seen to be valuable in terms of developing community knowledge and sharing knowledge and ideas.

Combining the knowledge and experience of the different stakeholders (local communities, governmental organizations, and experts) was seen to increase the available human resource base, especially in a rural, semi-isolated region like the Badia.

The development of a common understanding between local communities and the various responsible governmental agencies is considered an important requirement to encourage taking responsibility and provide the users with the support and knowledge they need. This approach makes the project more likely to be sustainable.

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