

**Sustainability of community operated water  
filtration plants installed by SRSO**

**Field Investigation Report**

**By**

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## **Executive Summary**

In the aftermath of floods in 2010 provision of clean water emerged as a key concern for many flood affected communities in Sindh. Government of Sindh (GoS) selected 40 villages for installation of filtration plants to treat contaminated water in Jacobabad, Shikarpur and Khairpur districts. Sindh Rural Support Organization (SRSO) was approached to install these filtration plants, identify and train local plant operators and engage communities for supervision and operation of the plants. SRSO had its partner communities in some villages and formed community organizations (COs) during plant installations in the remaining villages. Majority of households in these COs consisted of poor. However, provision of clean drinking water drastically reduced their health related expenses as disease pattern in these villages depicted prevalence of water borne diseases. This led to improvement and health and income of these families. GoS paid the Operation and Maintenance (O&M) cost of these plants from November 2010 to March 2011. Average monthly O&M cost was in the vicinity of Rs. 25,000.

In April 2011 GoS directed SRSO to hand over financial responsibility of O&M to the beneficiary communities. Due to large segment of poor households in the beneficiary villages SRSO was concerned about the financial sustainability of this arrangement. Present study was undertaken to determine if communities had the willingness and financial capacity to take over O&M of filtration plants. Study found out that opportunity cost of lack of clean drinking water is much higher than the per month contribution to be made by beneficiary households for sustainable O&M of filtration plants. However, SRSO needs to provide technical and social guidance to the beneficiary communities in the early stages of O&M transfer to build the capacity of local communities to perform this task successfully. In the case of extremely poor communities power driven plants may be converted to manually operated plants to save energy costs. Alternatively, overhead water storage tanks may be built to drastically reduce pumping charges. These two later options can be exercised by provision of one time grant to COs for one time change in the physical structure. All the options mentioned above can put in place a financially sustainable O&M system and community level.

## **Acronyms**

CEO	Chief Executive Officer
CO	Community Organization
FDG	Focus Group Discussion
GoS	Government of Sindh
O&M	Operation and Maintenance
PPM	Parts Per Million
PSC	Poverty Score Cards
SRSO	Sindh Rural Support Organization
UC	Union Council
VDO	Village Development Organization
VO	Village Organization
WHO	World Health Organization

## **Sustainability of community operated water filtration plants installed by SRSO Context and Background**

In the aftermath of floods in 2011, Sindh Rural Support Organization (SRSO) was approached by Government of Sindh (GoS) to install water filtration plants at 40 selected sites to provide clean drinking water to flood affected communities. These sites were located in Shikarpur, Jacobabad and Khairpur districts. Water in these areas needed to be treated for physical and microbiological contaminants. Water borne diseases which were common in most of these villages became acute due to floods. Installation of filtration plants started in October 2010 and ended in December 2010. Raasta's<sup>1</sup> design for filtration plant was approved by the GoS. Raasta's filtration plants were designed to treat raw waters with a content of dissolved solids (or salts) greater than 500 parts per million (ppm) which is the allowable content of total dissolved solids in water specified by the World Health Organization (WHO). The plant has the capacity to purify 5000 gallons per day based on 10 hours operation.

The water filtered through the plant is subsequently disinfected to remove bacteria and virus. This is done by using Ultraviolet Radiation (by use of electricity) or by chlorine dosing (Hypochlorite). This disinfection removes microbiological contaminants (bacteria and viruses), which is the main cause of water borne diseases in rural communities. The treated Product water is then collected in a product water tank for distribution. The plant consists of a feed pump, underground reservoir, raw water storage tank, the chlorinator (chlorine dosing unit), the booster pump, sand activated carbon filters, cartridge filters, ultraviolet disinfection unit, product water tank and the skid or frame. Average cost of purchasing and installing a filtration plant and training the operator was Rs. 419,000<sup>2</sup>. Average operational cost for each unit was approximately Rs.22, 000 per unit from November 2010 to April 2011.



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<sup>1</sup> Raasta is name of a consultancy firm based in Karachi

<sup>2</sup> SRSO, Budget vs. Expenses of filtration plants for months of November 2010 to April 2011

## **Picture of a filtration plant**

SRSO's financial proposal worth Rs. 37 million was approved for community mobilization, installation, technical oversight and monitoring, operation and maintenance of plants by Government of Sindh (GoS). In March 2011 SRSO was asked by GoS to handover the plants to the communities and transfer their operation and maintenance (O&M) responsibilities to them as well. Average monthly cost for O&M turned out to be Rs. 22,000. Since most of the community organizations consisted of poorest groups, financial sustainability of O&M emerged as a serious concern for SRSO.

A review of PSC for 5 selected villages shows that out of 2078 households approximately 63% households are poor; out of whom 18% are extremely poor, 21% transitory poor and 24% chronic poor. (see Table 1 below). However, it is important to note here that a leading cause of poverty is treatment expenses for water borne diseases of poor families. Treatment expenses of these families significantly reduce the income of these families in most cases. Keeping this factor in view one can draw the conclusion that provision of clean drinking water would enhance the cash income or savings of these families to such an extent that paying for O&M cost would not add an unbearable burden to their household expenses. This view was verified by Focus Group Discussions (FGD) with Community Organization (CO)<sup>3</sup> members in the field.

### **Table 1: Poverty ranking of selected villages in flood affected areas**

Source: SRSO reports on poverty ranking 2010-11 compiled by Monitoring and Evaluation section

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<sup>3</sup> SRSO has a three tier system of local organizations consisting of Community Organization (usually 15-20 households), Village Development Organization (VDO) or Village Organization (VO) which is a federation of COs in a village and Local Support Organization (LSO) consisting of local professionals who provide technical and social guidance to COs and VOs. O&M responsibility was given to COs, VOs or VDOs keeping in view the history and level of maturity of local institutions.

District Name	Tehsil Name	UC Name	Village Name	VO #	CO #	Total HHs in Village				
						0 – 11	12 - 18	19 – 23	24 - 100	Total
Shikarpur	Shikarpur	Sultankot	Sultankot	5	58	270	302	329	529	1430
Shikarpur	Shikarpur	Lodra	Lodra	2	13	73	84	119	133	409
Jacobabad	G.Kahero	Muhmmad Pur	Sheranpur	1	11	38	50	59	73	220
Khairpur	Sobedero	Sagyoon	Din M. Kalhoro	1	1	1	4	1	5	11
Khairpur	Sobedero	Pir Hayat Shah	Dost M. Kalhore	1	1	2	1	2	3	8
<b>Total</b>				<b>10</b>	<b>84</b>	<b>384</b>	<b>441</b>	<b>510</b>	<b>743</b>	<b>2078</b>

## Objective and Methodology of the Study

This study has been undertaken to assess the potential for sustainable O&M of filtration plants by beneficiary communities. Five communities were selected for in depth review of financial sustainability of O&M by the local organizations. In specific the study has aimed to look at the local context and document, describe and explain the processes which led to the installation of filtration plants , their impact on the livelihood of local communities and communities' capacity to pay O&M cost of filtration plants.. All the documented and undocumented sources of information relating to the initiative under review were to be consulted as part of documentation work. Another objective was to state the lessons learned and make recommendations for changes in programme design, management arrangements, resource allocation and mobilization, partnership development and process for implementation to achieve financial sustainability of O&M of filtration plants .

## Selection of villages

SRSO has installed filtration plants in the districts of Khairpur, Shikarpur and Jacobabad. Some of the villages where these plants were installed had COs, VOs and VDOs in existence much before the floods. SRSO had high level of trust among these communities and local organizations were led by capable, trustworthy, experienced and committed leaders. In other areas SRSO's interaction started with the

communities during installation of filtration plants. Therefore level of trust, experience and ownership of SRSO's intervention was not yet clear. Keeping this distinction in view 5 plant sites were selected for in depth research, three with high level of maturity and trust and two with low level of commitment and experience. These sites were selected in consultation with the Chief Executive Officer (CEO) and management team of SRSO. The villages selected were Shiranpur (Jacobabad), Sultankot and Lodra (Shikarpur) and Din Mohammad Kalhoro and Dost Mohammad Kalhoro (Khairpur). Lodra and Shiranpur were semi active organizations and Sultan Kot, Dost Mohammad Kalhoro and Din Mohammad Kalhoro had mature and committed local organizations.

### **Method and sources of data collection**

Data collection tools consisted of Focused Group Discussions (FDG) with local COs, VDOs and VOs; review of local organizations records, review of Poverty Score Cards (PSCs) prepared for these villages by SRSO, individual interviews with plant operators and office bearers for gathering in depth information and visit to the area and filtration plant sites. FDGs were held to assess the perception of communities about the benefits of drinking filtered water, estimate the cost and benefits of using contaminated and clean water, determine level of ownership and commitment of communities for taking over the responsibility of O&M, existing arrangements for O&M of filtration plants, level of transparency in account keeping and information sharing, assess the communities' capacity to pay and proposed fund raising plans for O&M. Financial records of the organizations were checked to calculate monthly O&M expenses on various heads; PSC was reviewed to double check communities' capacity to pay for O&M of the plant. Individual interviews were held to assess the willingness of plant operators to offer their services on reduced salary or voluntary basis and their role and capacity in mobilizing funds for payment of O&M expenses.

### **Findings of village level meetings: capacity to pay and opportunity cost**

#### **Shiranpur**

CO Shiranpur is based in Jacobabad district. It has 200 members and 250 non member households in and around the village. All these households also collect water from the plant. A 4 member Water Filtration Plant Committee has been formed to look after the plant operation and raise resources for its maintenance. An operator has been given charge for O&M of the plant. Monthly O&M expenses include operator's salary (Rs. 7,000), Petrol expenses (Rs. 15,000), Filter Change ( Rs. 6,000-on need basis), replacement of

cartridges (Rs. 4,000 on need basis) and chlorination Rs. 500. Electricity using a kundi<sup>4</sup> is also used at times. In Shiranpur the filter and cartridges are changed every 2 months, so monthly cost for replacement of parts turns out to be Rs. 5,000. Average monthly O&M expenditure is a little above Rs. 27,000. Complete financial records of O&M expenses are kept at SRSO Head Office in Sukkur and these records will be transferred to COs in the due course.

During the CO meeting all members showed enthusiasm in taking over the responsibility for O&M and collecting contributions from the beneficiary households to pay the O&M expenses. People in Shiranpur are seasonal workers, earning Rs. 150 daily during harvesting season or and summer migration of male workers to Quetta. They consider that opportunity cost of not paying for O&M is very high. Incidence of diahorrea, gastroenteritis and other water borne diseases was high in the village before installation of the filtration plant. Most of the members agreed that average monthly treatment expenses of each family were in the vicinity of Rs. 1000. Therefore CO was willing to do its utmost to raise contributions for plant O&M.

Keeping in view expected monthly expenses of Rs. 27,000, CO planned to collect daily contribution of Rs. 5 per household. Even if they collected contributions from 200 member households they could cover the O&M expenses. In the case it did not materialize, plant operator was willing to forego his salary because he has another source of income. CO was also willing to collect donations from non members and some of local philanthropists who are willing to contribute Rs. 1000 per month. However, CO and Committee members were committed to pay for plant O&M and were confident that they could raise enough money to cover the O&M cost.

## **Sultankot**

Sultankot is a big village and VDO here consists of 50 COs and 1200 member households. Monthly O&M expenses for the plant are 24,000 including Rs. 7000 for operator's salary Rs. 15,000 for petrol and Rs. 2000 for electricity. So far VDO has not made any other expenses. Village water is brackish. Before the installation of plant each household paid Rs. 20 per day for fetching water from dug wells outside the village. In many cases average monthly treatment expenses were Rs. 1000. Installation of filtration plant has eliminated both these expenses. Now water is also available round the clock. Level of commitment and ownership is also very high in this village as COs were formed here 3 years ago. VDO plans to collect

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<sup>4</sup> Kundi is the local term used for illegal and unpaid electricity connection. Some connection holders bribe the linemen of electricity company to keep this arrangement.

monthly contributions from 700 households. Most of the women in the village have regular source of earning as they are handicraft workers and earn handsome daily income through the sale of their craft work. Village has a trained book keeper and money will be collected by the VDO President Mehra who is very influential among the community. Average monthly contribution required from each selected household would be close to Rs. 350 which is much less than the amount paid by these families to purchase water before the installation of filtration plant.

## **Lodra**

A CO has been formed in Lodra very recently. Level of commitment of CO members in Lodra is considered low by SRSO staff. Filtration Plant in Lodra has been installed inside the house of a social worker Faiq Shah to ensure security of the plant. A water tap connected with the plant is fixed outside the yard walls to enable villagers to receive water without any hassle. There are 3 COs, and 70 CO members in this village. However, 400 households fetch water from the filtration plant. A filtration plant committee consisting of 8 members has been formed to take charge of O&M. Operator's salary is Rs. 7,000, petrol expenses for running the plant are Rs. 25,000. This adds up to Rs. 32,000 per month for O&M. VO members agree that clean water has given them relief from the disease and they were willing to pay O&M expenses. The plant was closed for a couple of weeks after transfer of O&M responsibility to the VO. However, members have realized that it was a mistake on their part.

To pay for O&M expenses, operator is willing to work without a salary. Plant gets its power supply from Faiq Shah's connection. An electricity meter is installed in Faiq Shah's name for this connection and he pays electricity bill even if the community cannot pay the entire amount through raising contributions. Faiq Shah's mother is president of the CO, and CO has resolved to pay petrol expenses for running the plant by raising contributions from the members. Most of the CO members are working women and earn Rs. 300-400 weekly. Monthly average saving of each family is Rs. 4000-5000 and they are willing to pay Rs. 70-80 per month. Before the plant installation village residents used to buy water bottles at Rs. 30 each. Payment of O&M expenses for the plants will cost them much less. CO plans to collect Rs. 70-80 as contributions from 400 households. This will enable them to cover the entire O&M cost

## **Din Mohammad Kalhoro**

Village Din Mohammad Kalhoro is located in Katcha<sup>5</sup> Area of Khairpur. There is an active VDO in this village comprising of 3 COs. A filtration plant committee consisting of 9 members has been formed to look into O&M related matters. Plant operator Ahmed Din, is a dynamic and influential young man. He is

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<sup>5</sup> Katcha area is part of the Indus river bed. Certain sections of this bed are inhabited by farmers and cattle grazers during winter and vacated during floods in summer season.

Imam of local mosque and runs a madrassa for educating local children. He also collects milk from the local households and sells it to Engro food company. Most of the member and non member families own buffalos and sell at least 5kg milk daily. Sale price of milk is Rs. 35 per kg; 200 member and 200 non member households fetch water from this filtration plant and sell their milk through the plant operator. Plant operator thinks that each family is capable of paying its due share and he can easily collect the dues by making deductions from their milk sale proceeds. Operator's salary is Rs. 7,000 but he is willing to work without any payment. Electricity for running the plant comes through a kundi. In case of power outage their monthly petrol expenses come to Rs. 1584. They plan to collect Rs. 100 per family from 33 members and 20 non members, thus raising Rs. 5,300 to pay for O&M expenses. Village women told us that their average monthly treatment expenses for diahorea, gastroenteritis and other stomach related diseases were Rs. 500 before the use of filtered water. Plant O&M cost would be much lower than the treatment expenses they used to pay prior to plant installation. Contributions collected from the beneficiaries would also be much higher than the current expenses.

### **Dost Mohammad Kalhoro**

Village Dost Mohammad Kalhoro is also located in Katcha area. Most of the village residents are small land owners and cattle farmers. Each family owns 4-5 buffaloes. Villagers also proudly state that there is no Wadera<sup>6</sup> in their village. Plant O&M expenses include operator's salary (Rs. 7000), petrol charges (Rs. 5,000-6000), chlorine Rs. 800 and cartridges worth Rs. 4,500 (once in three months). This brings O&M expenses close to Rs. 15,000 per month. Village operator is willing to work without a salary. VO Dost Mohammad Kalhoro has 350 member households. Every household is willing to pay Rs. 30 per month for O&M expenses. Each family on average sells 10 kg milk daily at Rs. 40 per kg and earns Rs. 400 daily as cash income. Prior to the installation of filtration plants their monthly health related expenses were Rs. 700 due to incidence of diahorrea, hepatitis, scabies and malaria. Filtration plant has almost eliminated their medical expenses and due to their cash income they see no problem in bearing the O&M expenses. They are happy with the plant and quality of filtered water. VO members also want construction of walls around the plant for plant protection and a roof to prevent water from heating up.

### **Sustainability of community O&M**

Due to sudden decision of GoS to transfer O&M responsibility of filtration plant many newly formed VOs and COs are not fully prepared to take over this responsibility. SRSO field staff will need to have a

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<sup>6</sup> Wadera means chief. This term is used for big land lords who are chief of a tribe or command influence over a peasant community.

series of dialogues with unprepared COs and VOs to strengthen their ownership for this initiative. Communities reluctant in taking over O&M of plants have three options. Option one is to go without the benefits of filtered water in the absence of proper O&M. This would mean payment of very high treatment expenses for water borne diseases and in some cases water purchase bills compared to monthly contribution for O&M. Due to high opportunity cost this would not be acceptable to most of the communities. Other two options are conversion of power driven plants to manually operated plants or construction of overhead tanks to store water and reduce pumping expenses. These two options can be availed if GoS provides one time supplementary grant to convert the plants or build overhead storage capacity. SRCO will need to determine the future course of action on case by case basis through dialogue. However, Option one seems to be the most desirable option as it would not cause any interruption in continued supply of clean drinking water to beneficiary communities.

Some the COs expressed concern about safety of filtration plants without walls and supply of hot water from the plants due to their direct exposure to the sun in the absence of any roofs. Construction of covered structure around these plants would be needed for security of plant and provision of water at moderate temperature. SRSO will need to look into grant funding options for construction of these structures.

### **Self Finance**

Discussion with selected communities in Jacobabad, Shikarpur and Khairpur has revealed that monthly treatment expenses of water borne diseases of families without access to clean drinking water range from Rs. 500-1000. Contribution for covering O&M expenses for these families ranges between Rs. 30-Rs. 350 per month. This clearly shows that self financing is the most suitable option for the beneficiary communities. However, SRSO field staff will need to present these options to the target communities and build their ownership for O&M responsibility. Failing this SRSO can present the other 2 options and explore if communities can mobilize resources for availing these choices.

### **Conversion of power driven to manually operated plant**

For those communities who cannot afford current amount of O&M cost, a one- time conversion to manual operation can tremendously reduce O&M. This would entail conversion of electric to manual plant by converting use of kinetic to mechanical energy to activate pumps without electricity. This is done by replacement of Ultra Violet with Ultra filtration which is a pressure driven membrane separation process that separates particulate matter from soluble components in the carrier fluid. One time conversion of electricity driven to manual plant can cost anywhere between Rs. 95, 000- Rs. 300,000 depending on the make and size of the plant. The cost of Ultra filtration is Rs. 135,000 for US, Rs. 95,000 for German and

Rs. 75,000 for no brand China made membrane. Casing of membrane costs Rs-17500. This will bring down monthly operational cost to the level of Operator's plus occasional expenses on change of cartridges and chlorination.

### **Construction of overhead tanks**

Another low cost option is to build overhead water reservoirs attached to the plants. In this case water pumping will be needed only for 2 hours a day, bringing down electricity and petrol charges to one fourth of present level. Water stored in the overhead tank will run through the filters with the pressure of gravity flow without converting the plant for manual operation.

### **Conclusion and Recommendations**

At present level of income of the poor segments of communities in target villages, opportunity cost for lack of access to drinking water, target communities are willing and able to pay monthly O&M expenses. Due to different levels of maturity and very little preparatory work before handing over O&M responsibilities to them there response has been from lukewarm to very enthusiastic. However, community O&M is realistic and sustainable. SRSO will have to strengthen this effort with technical and social guidance of the target communities. There are more than one options for making this happen and it will make the task of transition easier for SRSO. SRSO with its experienced staff can make this happen and should go for it.

## Annex 1

**LIST OF PLANTS INSTALLED**

S#	District	Union Council	Name of Location	Beneficiaries HHs	No: of Plants Installed
1	Shikarpur	Lodra	Lodra	500	5
2		Sultankot	Sultankot	1,500	
3		Mian Sahib	Muhammad Hashim Kehar	700	
4		Raheem abad	Rato Suhendro	600	
5		Humayyon	Chodio Sadhayo	700	
6	Khairpur	Pir Hayat Shah	Dost Muhammad Kalhoro	385	7
7		Khaimita	Gullu Siyal	660	
8		Hadal Shah	Jhabbar Sheikh	400	
9		Kot Mir Muhammad	Faqir Karim Bux Katper	230	
10		Shadi Shaheed	Shadi Shaheed	400	
11		Sagyoon	Dew Kalhoro / Din Mohd: Kalhoro	450	
12		Sagyoon	Budh watar	300	
13	Qambar Shahdadkot	Aitbak Khan Chandio	Aitebar Khan Chandio	1,500	9
14		Qubo Saeed Khan	Qubo Saeed Khan	2,500	
15		Qubo Saeed Khan	Katchi Pull	2,000	
16		Khaber	Rapwato	900	
17		Jamali	Umeed Ali Junejo	900	
18		Bago Dero	Mirpur Buriro	800	
19		Jamali	Mohammad Hassan Brohi	1,000	
20		Warah	Gul Buriro	1,000	
21		Warah	Junani Bunglow	1,000	
22		Kashmore-Kandhkot	Ghouspur	Marik Bhayo	
23	Jamal		Fazal Ogahi	300	

24		Jamal	Machi Budho	350	
25		Ghouspur	Ghouspur	600	
26		Duniyapur	Wahid bux Bijarani	800	
27		Ghouspur	Ghias Bhayo	400	
28		Maleer	Abdul Qadir Chachar	400	
29		Haibat	Durani Mahar	300	
30		Haibat	Jam Suharo Chachar	400	
31	Jacobabad	Ghari Khairo	Garhi Khairo	2,430	10
32		Ghari Khairo	Mohd Pannah Odho	350	
33		Mohd pur	Sheranpur	325	
34		Jongle	Jongle	350	
35		Mirpur Buriro	Mirpur Buriro	400	
36		Amhedpur	Ali pur	340	
37		Allanpur	Miranpur	300	
38		Allanpur	Naura	400	
39		Bachro	Baxhro	450	
40		Mubarak Pur	Mubarak Pur	450	