SISAR: a sustainable management model for small rural decentralized water and wastewater systems in developing countries

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ABSTRACT

Investments for basic rural sanitation programs should not only focus on the construction of new installations, but also on the necessity of implementing proper management models that guarantee the operational and financial sustainability of the investments. The integrated rural sanitation system (SISAR) is based on the idea of creating a confederation of local user groups which come together on a regional basis, and through an adequate institutional setup, are responsible for managing SISAR and assuring the adequate provision of water supply and in some cases, wastewater services. Financial sustainability is achieved by the implementation of tariffs for water consumption and provision of wastewater services generating revenue which is redistributed among all systems in order to cover all operational, maintenance and administration costs. Important stakeholders in the model include, besides the users, local and state government and international financing institutions responsible for financing the investments in the construction of rural water supply and wastewater systems. This document focuses on the experience and results achieved by SISAR in the Brazilian state of Ceará. In 2001 eight SISARs began providing improved water supply services in 66 settlements. Today, more than 560 settlements (more than 330,000 inhabitants) are supplied by SISARs.

Key words | community participation, regional rural sanitation model, self-administration and financially sustainable management

INTRODUCTION

The implementation of sustainable basic rural water and sanitation programs in developing countries is a great challenge that deeply relies on successfully integrating technical, financial, institutional and social aspects. A profound analysis of local cultural environments is mandatory and success for the implementation of these programs depends on correctly assessing these components. Following this approach, in three states of northeastern Brazil, one of the poorest regions in the country with scarce water availability and extreme climate conditions, public policy has been focused on reducing the number of people without access to basic water and sanitation services and on the improvement of the health conditions of the population through the implementation of a community based management model for guaranteeing a sustainable and cost recovery provision of improved water supply and wastewater services in rural areas.

Different basic rural sanitation programs in developing countries in the past have failed to do this due to the lack of an adequate structure and institutional setup for operating and maintaining the newly constructed water supply systems (WSS) and wastewater systems (WWS). In this respect, after more than 15 years of experience and continuous development, the ‘Sistema Integrado de Saneamento Rural’ – SISAR – (Integrated System for Rural Sanitation) model has been recently recognized by Brazil’s National Health...
Foundation (FUNASA) as one of the most promising management models in Brazil for guaranteeing the sustainability of the investments and assuring their correct operation and maintenance based on the active participation of local user groups and financially supported by the payment for water consumption.

With some small variations in its institutional setup, the SISAR management model is a reality in the Brazilian states of Bahia, Piauí and Ceará. International financing institutions like the German Development Bank (KfW) and the World Bank (WB) have positively contributed to their implementation and development, being responsible for financing the investments in the construction of the WSS and WSS which are transferred for operation to the SISARs. Furthermore, KfW has recognized the importance for soft measures during the early stages of the setup of this management model and has therefore financed institutional consultants to support the implementation of capacity building and institutional setup measures for six of these SISARs.

Especially interesting is the case of the state of Ceará, where in the mid 1990s the state government, based on the success of the pilot project in the Sobral region financed by KfW, decided to replicate this management model at a state scale. The government recognized the importance of improving the access and quality of basic sanitation for the overall health, social and economic development of the state. Figure 1 shows the existing eight SISARs, distributed following a water catchments approach within the state (Cortez 2009). Results are impressive: after more than 15 years, SISAR has been responsible for bringing reliable and good quality water supply access to over 330,000 inhabitants (more than 68,000 active household connections) in more than 560 small rural communities in Ceará (Companhia Estadual de Água e Esgoto [CAGECE] 2010). Still, this effort only represents around 13% of the rural population of the state meaning there is still a big demand for improved water supply services.

Although the SISAR management model is suited for combining the provision of water supply and wastewater services in rural areas, in this document the main focus will be on water supply as this was the focus of the strategy adopted by the state of Ceará during its state-wide replication phase. Nevertheless, the SISARs in the neighboring states of Piauí and Bahia and the original SISAR in the Sobral region, combine the management of water supply and sanitation services.

THE SISAR MODEL

The philosophy of SISAR is based on the concept of a basic sanitation program responsible for constructing new water supply and WWSs which are then transferred to the institution in order to be operated and maintained following a regional community based approach. SISAR is a non-governmental, non-profit institution created by the representatives of rural local user groups. Within this institutional setup, SISAR and the local user groups become responsible for the decision making process related to the administration of the systems and for assuring long-terms sustainability in the provision of improved water services. The model foresees the cost recovery of all operation, maintenance and administration costs and doesn’t include the payback of the capital expenditure costs, which are a responsibility of the state government.

Stakeholders involved

Various stakeholders are present and interact during the implementation and operational stages of the SISAR
model. These stakeholders link the political and initial financial support to put this model in place with the constitutional obligations for providing services for rural communities together with the efforts for fostering active community participation with regard to the efficient provision of improved water services.

First, the SISAR model relies on a clear public policy that supports the idea and necessity of implementing appropriate management models for bridging the gap in access to sustainable rural water supply and wastewater services. State and/or federal governments are fundamental for tapping and guaranteeing the availability of financial resources for the required investments (Capital Expenditure) associated with the initial setup of SISAR. In the case of Ceará, international financial institutions have also played an important role securing these financial resources.

Second, a project implementation unit (PIU) for materializing the investment program is necessary. In the case of Ceará, the state government appointed the Water Supply and Sewage Company of Ceará (CAGECE) as the PIU. The PIU brings together different areas of expertise within the utility to support all areas of project implementation: the preparation of prefeasibility studies (considering technical, environmental and social aspects), the preparation of detailed engineering designs, the implementation of social work activities with the beneficiary communities and the execution of construction works for the WSS and WWS.

Third, local governments (municipalities) are fundamental stakeholders for the implementation of SISAR. As the Brazilian Basic Sanitation Law (No. 11.775/2007) indicates, water supply and sanitation service provision is the responsibility of the municipalities. Therefore it is necessary to have their acceptance, support and participation within the management model in order to effectively go forward with its implementation. Municipalities are responsible for giving the concession to SISAR and the local user groups for administrating, operating and maintaining the WSSs that have been constructed in their communities. As the SISAR model is based on a regional approach, it is common to have various municipalities involved in this process. For fostering transparency and good governance, a representative from the municipalities is a member of SISAR’s administration council.

Local user groups are the fourth big stakeholder in the model. They represent the basis of the model’s approach and their empowerment and fulfillment of their responsibilities is crucial for the success of SISAR. It is therefore absolutely necessary to support the strengthening and regularization of the local user groups following the requirements of the Brazilian law. Following this process, the independent local user groups associate themselves to legally constitute SISAR, a non-profit, non-governmental association (confederation of the local user groups). SISAR’s mission is to improve the quality of life in rural areas, providing maintenance of basic sanitation services through a self-managed and cost recovery model that contributes to social development and environmental preservation.

SISAR’s structure is composed by a General Assembly formed by the presidents of each of the local user groups involved. Among these representatives, SISAR’s president, vice-president, treasurer and members of the Management and Fiscal Councils are elected. The Management Council has representatives from the local user groups and the state and municipal governments. This combination of stakeholders guarantees a system of checks and balances as a basis for the good governance of the model. The General Assembly meets on a yearly basis to discuss and decide on important administrative, financial, technical and social issues regarding the institution, and the member local user groups (community associations). The Management and Fiscal Councils meet on a quarterly basis.

In addition to the uppermost decision making organ of SISAR, an operational unit for the day to day management and operation of the WSS and WSS exists. This operational unit, with appropriate staff trained to fulfill the duties, provides support in the three main areas (technical, administrative and social) to the local user groups in order to run and maintain the systems. As opposed to the members of SISAR’s General Assembly who are volunteers, the staff of the operational unit of SISAR are hired and paid through the revenues generated by the water consumption in each of the member communities.

A general overview of SISAR’s institutional set-up is presented in Figure 2.

External consultants are also present during the initial stages of the creation and development of SISAR and provide
the soft measures for its institutional setup and development. This capacity building and knowledge transfer is important for assuring the sustainability of the investments through the implementation of adequate administration, operation and maintenance routines. Consultants also contribute to the liaison among all stakeholders and conflict resolution and give special support to SISARs in their process for becoming a self-sustainable and independent institution.

Characterization of SISARs in Ceará (Brazil)

The size of a SISAR may vary depending on geographical, political and water availability characteristics. In the state of Ceará, eight SISARs were created in each of the main water catchments. Today SISAR is present in 128 of 180 municipalities in Ceará providing water and sanitation services in more than 560 rural settlements. The number of settlements which make part of one SISAR may vary from one case to another, depending on various aspects such as the free acceptance of rural communities to participate in the model (with their rights and responsibilities), the availability of water and the interest of local governments. Normally, the basic sanitation programs prioritize the selection of beneficiary communities within municipalities based on their human development index (HDI) classification. The selection of the beneficiary communities must be backed up by a democratic vote accepting joining SISAR.

Real commitment of local governments to accept and participate in the model also plays an important role in this process.

On the technical side, in order to assure the correct operation and maintenance of the WSSs at the time of their transfer to SISAR, only systems which comply with SISAR’s technical standards (which include availability and quality of water sources, metered household connections, bulk water meters, appropriate treatment and storage facilities, etc) are eligible for joining the institution. SISAR’s Management Council, backed by its operational unit, has the autonomy for accepting or rejecting the inclusion of new systems in case they don’t fulfill these standards. WSS may vary from around 50 up to 2,000 household connections, with an average of 135 houses per system. All households have a water meter installed in their premises and have a 24/7 access to water in their taps, thus changing the previous approach of having an intermittent non-potable supply either at their homes, or public taps (or even having no access at all to near sources). Depending on the raw water quality, treatment may vary from simple disinfection for groundwater sources to direct filtration and disinfection processes for surface waters.

Each community, through the local group of users, runs the WSS on a daily basis while the technical department of SISAR is responsible for the corrective and preventive maintenance. The person appointed by the community to operate...
the system is trained by SISAR to carry out simple maintenance routines. Additionally, the team is responsible for following up on the operational condition and efficiency of all systems. The model is based on economy of scale and where the revenue from water consumption from larger systems supports covering the operational and maintenance expenses of the smaller systems.

SISAR is responsible for preparing and distributing, on a monthly basis, the bills for all clients in all communities. Monthly bills clearly differentiate the services that are being charged for. From one side, the revenue that will be administrated by SISAR’s operational unit exclusively comes from the water consumption billed to customers and additional fees related to late payments in cases where they exist. SISAR’s challenge is to efficiently administrate this financial resource and appropriately redistribute it among all WSS in order to cover the operational expenses (including chemical products for water treatment, equipment refurbishment or replacement, hydraulic and electrical spare parts, all preventive and corrective maintenance costs) of all WSS systems, the administrative costs of SISAR’s operational unit, and all corrective/preventive maintenance and small extensions costs. On the other side, the monthly bill also includes some fees that are administrated by the respective local user group association. These include the energy fee charged to each client, rated based on the individual client’s monthly consumption, the gratification to the operator (determined by the local user group) for running the WSS on a daily basis and any additional fee decided by the local user group association.

This approach promotes transparency and fosters the combined responsibility of both the local user groups and SISAR in administrating and efficiently running the rural water supply model.

Table 1 provides an insight into the differences between the eight SISARs in Ceará and summarizes basic data with regard to the provision of improved water services for each of them.

The main focus of the investment programs that supported SISAR’s state wide replication in Ceará in the last decade was on the construction and transfer of water supply infrastructure to local user groups and SISARs for operation and maintenance. The institutions and programs that have financed the construction or rehabilitation of WSS in Ceará and which today make up part of SISARs include: FUNASA (Projeto Alvorada), Superintendence of Hydraulic Works of Ceará (SOHIDRA), World Bank (Projeto São Jose) and KfW (Basic Sanitation Program Ceará I, II and III). The World Bank project has been the largest contributor to the development of the WSS in all SISARs, accounting for almost 85% of the newly built WSSs. Only the KfW program has foreseen the implementation of WWS in parallel with the WSS. Furthermore, this program is actually working with two of the eight SISARs in the state. The solutions for provision of wastewater services include the construction or improvement of individual sanitation solutions (toilets with septic tanks) for households or, in bigger more dense systems, a sewerage network with treatment ponds. The compliance of the treatment processes with existing environmental regulations is observed.

Table 1: Basic WSS operational data for the 8 existing SISARs in Ceará (CAGECE December 2010)

<table>
<thead>
<tr>
<th>SISAR</th>
<th>Municipalities</th>
<th>WSS systems</th>
<th>Network length [m]</th>
<th>Total # connections</th>
<th>Active connections %</th>
<th>Population served</th>
</tr>
</thead>
<tbody>
<tr>
<td>BAC</td>
<td>28</td>
<td>88</td>
<td>243,772</td>
<td>16,603</td>
<td>90.9</td>
<td>72,887</td>
</tr>
<tr>
<td>BAJ</td>
<td>13</td>
<td>56</td>
<td>171,100</td>
<td>7,995</td>
<td>93.9</td>
<td>35,098</td>
</tr>
<tr>
<td>BBA</td>
<td>20</td>
<td>84</td>
<td>379,840</td>
<td>10,812</td>
<td>90.0</td>
<td>47,465</td>
</tr>
<tr>
<td>BBJ</td>
<td>8</td>
<td>25</td>
<td>79,793</td>
<td>3,651</td>
<td>90.1</td>
<td>16,028</td>
</tr>
<tr>
<td>BCL</td>
<td>15</td>
<td>59</td>
<td>169,726</td>
<td>6,998</td>
<td>89.5</td>
<td>30,721</td>
</tr>
<tr>
<td>BME</td>
<td>9</td>
<td>36</td>
<td>98,711</td>
<td>3,521</td>
<td>89.0</td>
<td>15,457</td>
</tr>
<tr>
<td>BPA</td>
<td>14</td>
<td>100</td>
<td>254,655</td>
<td>13,321</td>
<td>90.4</td>
<td>58,479</td>
</tr>
<tr>
<td>BSA</td>
<td>21</td>
<td>112</td>
<td>277,228</td>
<td>12,531</td>
<td>92.0</td>
<td>55,011</td>
</tr>
<tr>
<td>TOTAL</td>
<td>128</td>
<td>560</td>
<td>1,674,825</td>
<td>75,432</td>
<td>90.5</td>
<td>331,146</td>
</tr>
</tbody>
</table>
It is worth mentioning that in the neighboring state of Piauí, the Basic Sanitation Program, financed by KfW too, has constructed WSS and WWS in parallel in all 30 systems run by another SISAR: SISAR/PI (SISAR Piauí). SISAR/PI operates, together with the local user groups, over 6,000 households, all of which have 100% provision of water supply and sanitation services. Within SISAR/PI’s structure, each client also pays a monthly fee for using the sanitation solution. This revenue is administrated by SISAR which becomes responsible for periodically emptying each of the septic tanks.

Basics for a successful implementation strategy

Overall, the basis for successfully implementing the SISAR model depends on successfully integrating the following multidisciplinary components (Meleg & Bandeira 2009): (i) social work and capacity building with local user groups, (ii) development and strengthening the model’s institutional setup, (iii) selection and implementation of appropriate technical standards and operation and maintenance routines for SISAR, and (iv) defining an adequate strategy for guaranteeing financial sustainability.

Social component

The social component is represented by the active participation of local user groups throughout the model. During the early stages of the program, a wide range of social activities are organized by the PIU and consultants in order to raise model awareness and interest among the population in potential eligible communities (CAGECE 2009). The next step in this process is to do with the democratic acceptance – by more than 75% of the community – to adhere to SISAR. Only after local user organizations freely accept joining SISAR, the technical project cycle may begin. In order to guarantee the fulfillment of responsibilities and duties by the local user groups once the WSS are already in use, SISAR’s operational unit is responsible for constantly training and providing capacity building measures to the associations with regard to their optimal and legal organization, adequate administration, correct operation of the WSS, and last but not least, promoting hygiene and environmental campaigns.

Institutional component

This component is based on the implementation of a sound legal framework that clearly defines the responsibilities and rights of each stakeholder supported on a check and balances approach. The legal framework has been adapted to federal and state water sector laws (Meleg & Bandeira 2009) and has been a milestone for the development of the rural sanitation sector in Brazil as it recognizes the long-term institutional viability of the SISAR management model. Additionally, the legal framework guarantees SISAR’s independence, clearly promotes the participation of the communities, and protects the institution from external political and institutional risks.

The results achieved so far in this topic have been supported by the work of consultants (financing of soft measures), who thoroughly understand the idea of the SISAR model for managing rural sanitation, and who have been responsible for the liaison between all stakeholders and putting in place a strategy for developing and strengthening the model’s institutional setup.

Technical component

In the model, SISAR’s operational unit is responsible for assuring that the WSS are correctly operated and maintained and for guaranteeing a continuous water supply in compliance with existing water quality regulations. This fact forms the basis for the operational sustainability of the model. In order to do this, SISARs rely on the work of local user group operators which are periodically trained to run the systems on a daily basis. Local operator’s responsibilities include the daily operation of pumping systems, water treatment procedures, registering operational data and taking the monthly lectures of all installed water meters. SISAR relies on a constant communication with each system’s local operator in order to know and follow-up the operational situation of the system. This task is complemented by periodical visits to each system to get a first hand impression of the operational situation and, if necessary, improve the situation. In practice, technical staff from SISAR’s operational unit are responsible for: (i) guaranteeing correct operation of WSS and WWS, (ii) assuring the maintenance of the WSSs (hydraulic, electromechanical
repairs, water treatment installations, etc.) through the implementation of preventive plans and execution of corrective measures, (iii) controlling water quality and improving the treatment processes, (iv) training and monitoring the execution of services by local operators, (v) evaluating the technical conditions of WSS systems with an interest in joining SISAR, and (vi) overall monitoring and benchmarking through the implementation of technical indicators. Through periodical training workshops at local and regional levels, the technical staff of SISAR are also trained.

Adequate technical standards that foresee local conditions, minimize operating costs, and observe simplicity to operate and maintain the systems, are fundamental for this community based model. In this respect, the PIU, financial institutions and consultants play a very important role defining, and guaranteeing the application of, the appropriate standards for SISAR.

Recently, SISAR has also started to focus its efforts in modernizing its technical management capacity by implementing an appropriate and simplified benchmarking system (system’s water losses, energy and chemical product consumption, amount of hours to do corrective maintenance, water quality index, etc.) and doing water balance calculations for the rural WSS systems. This allows understanding of the operational efficiency of the WSS and supports decision making regarding the implementation of action plans for improving their performance while reducing the operational costs of the systems.

Planning and execution of small rehabilitation or expansion of systems can be done with SISAR’s own funds once it is financially sustainable, but major investments for expanding the existing systems will need, in the future, access to additional sources of financing. As it happens in Ceará, SISAR may also get specialized subsidies from supporting institutions for specific activities such as, for example, the refurbishment of household water meters that have completed a five year period of installation and use. Nevertheless, SISARs philosophy foresees to gradually cut all these subsidies in order to really become sustainable.

Financial component

Financial sustainability is assured through the implementation of a cost recovery water tariff strategy (Meleg et al. 2010) based on economy of scale between all the member communities. As mentioned before, SISAR is a regional rural management model for water supply and wastewater services, and in this regard, the equilibrium point that assures financial sustainability can be achieved when SISAR administrates, approximately, 5,000 household connections.

The tariff structure in Ceará follows a block tariff approach, differentiating between residential, public and commercial users, although the first ones account for the great majority of the clients. Water pricing for SISAR is supported by the elaboration of business plans which are updated on a yearly basis. The business plans provide an overview of the institution’s current situation and define strategies for the technical, social and administrative development of the institution. Business plans are supported by updated financial projections and include a risk management analysis. All these elements provide sufficient information for defining the appropriate water tariff that assures the financial sustainability of the model without compromising the level of the service quality. The final decision on acceptance of a new water tariff is the responsibility of SISAR’s general assembly (presidents of all local user groups), so the end users are basically the ones that democratically vote on the tariff they want to pay. In this regard they also become, through their own decisions, responsible for assuring the sustainable provision of improved water services.

In the case of SISARs in the state of Ceará, a block tariff has been implemented in which each household must pay a monthly fee of R$ 5.50 (set in March 2011 [€ 1.00 equals R$ 2.40, March 2012]) which gives the right to consume 10.0 m³ of water. Above this consumption there will be an increase in the value for each additional cubic meter of water consumed. On average, the monthly household water consumption varies from 8.0 to 11.0 m³ (60-80 l.c.d). Seasonal and regional variations due to climate conditions have a clear effect on the monthly consumption figures. Financial planning takes these facts into account when defining the operation and maintenance plans and the schedule for investments.

Another aspect that safeguards SISAR from a financial point of view is the implementation of sound management and commercial practices i.e. use of an appropriate management information systems for registering consumption and
preparing the monthly bills, complete reporting and implementing debt recuperation schemes. Today, collection efficiency is on average 95% (CAGECE 2010) for all SISARs in Ceará.

**Model comparison within Brazil**

Different basic sanitation experiences have been implemented nationwide during the last two decades in Brazil. Besides Ceará, the SISAR concept has also been implemented in the state of Piauí (only in one region within the state, SISAR/PI) and in the state of Bahia in two regions (CENTRAL [Central de Associações Comunitárias para Manutenção de Sistemas de Abastecimento de Água], serving 83 communities and operating 7,921 water connections at the end of 2010) Seabra and Jacobina).

When comparing in the institutional component in these cases, in Ceará SISARs have been replicated due to the large interest of the government, and have been supported by CAGECE, thus being supported by an important component of technical know-how and structure. In the case of SISAR/PI, the model has been implemented within the Secretary of Health, and there has been no support from the state’s water utility, thus the know-how was acquired mainly by consultants responsible for doing all the training and capacity building in the institutional, technical, social and financial/commercial areas. Unfortunately, in Bahia the state government has not been so supportive of the basic sanitation model, and both Seabra and Jacobina institutions are currently dealing with institutional problems, mainly with the local user associations and their interest in remaining part of the confederation of associations. In the latter case, the legal framework to manage this risk was not implemented.

There are also some differences regarding the scope of action of the basic sanitation programs that support the implementation of SISAR. In Ceará, with some exceptions, SISARs have mainly focused on water supply, as opposed to the SISAR/PI, where, from the beginning, backed by an investment program, it was defined that each community making part of SISAR would have 100% coverage in both water supply and sanitation services. In this case, the investment program focused on the construction of both systems in each community.

From a financial point of view, SISAR/PI is already financially sustainable, with 6,320 house connections and 2,790 newly constructed sanitary units by February 2011 (Bezerra 2011), and doesn’t receive subsidies. This is not the case for some SISARs in the state of Ceará, where CAGECE still subsidizes part of the salaries of SISAR’s operational unit staff. As previously mentioned, CAGECE also provides subsidies for the recovery and refurbishment of water meters and the acquisition of specific chemical products for water treatment and allows water quality analyses to be carried out in its regional laboratories.

Technical subsidies, like the ones described above, are of interest during the early stages of the implementation of SISAR due to the high investment and operational costs that would be incurred to set up a structure to cover these activities. On the contrary, subsidies to pay SISAR’s staff are not considered to be of interest because they may compromise the quality and working efficiency of staff and go against SISAR’s philosophy of independence for decision making and separation of managing and decision making roles between the governmental institutions and this community based organization.

With regard to collection efficiency, all SISARs have very good figures to show. Both in SISAR/PI and on average for all SISARs in Ceará, the monthly collection efficiency is above 95% (which is reinforced through the suspension policy when users do not pay two bills), while for the CENTRAL, this figure is 97%. These figures indicate that overall the users in the rural communities are aware of the importance of paying their bills in order to secure continuity and quality in the supply, approve the quality of service they are receiving, and recognize the benefits of the SISAR model with regard to the accessibility and facility to get water, its cost compared to the previous ways of fetching it, and the improvement of health conditions of the children.

As opposed to the community driven approach implemented in north-eastern Brazil with the SISAR model, during 2007 in Minas Gerais, the Water and Sanitation Company of the state of Minas Gerais (COPASA) created the Company for Integrated Sanitation Services of North and Northeast of Minas Gerais (COPANOR) (its subsidiary), offering water supply and sanitation services in rural areas (COPASA 2009). From the technical
side, it has received all the support and know-how from the state utility, including direct subsidies to cover all investments and structure, besides paying all staff. Tariffs are meant to cover the operational costs of the water supply and WWSs. In this case a strong inclusion and participation of local user groups in the management of the model and WSS/WWS (through a check and balances approach) is not present in this model.

CONCLUSIONS

The SISAR model was developed more than 15 years ago with the objective of increasing the percentage or rural inhabitants with sustainable access to improved water provision services. Although the SISARs in Ceará didn’t focus on the provision of sanitation services during their replication stage, some SISARs within the state are developing this integration supported by specific investment programs such as the one from KfW. Nevertheless, the experience from the SISAR/PI combining the sustainable provision of both services from the beginning of the investment program is an indicator of its viability within this management model. Public policy and future basic sanitation programs should then recognize the importance of integrating water supply and sanitation services for the improvement of life-quality and social well-being in rural areas.

Although there has been a constant development during the last decade regarding the number of beneficiaries provisioned with improved water supply services through the SISAR model in Ceará, there is still a big demand for developing the sector. The ongoing implementation of the legal framework, that institutionalizes SISAR, strengthens community participation and recognizes its viability as a sustainable management model for the provision of rural water supply and sanitation services, will be key for increasing its presence within the state and can be considered as a very important base for the replication of the model either in other regions of Brazil or in other countries. Having a well-defined institutional structure and relations between stakeholders, together with the interest of the governmental institutions, are key conditions for facilitating the access to financing this management model.

Additionally, the SISAR model has been effective in reducing political paternalism in rural areas and has showed the benefits of offering sustainable provision of sanitation services which needs to be independent of political interests. This management model also brings together the empowerment of local user groups, strengthening their administrative and organizational capacities which are also beneficial for the socio-economic development of the communities.

The process required for SISAR to become financially sustainable is not easy. During the initial stages of its implementation SISAR is dependent on subsidies for covering its operational costs, but the faster the investment programs advance, the easier it will be to reach the equilibrium point, estimated at approximately 5,000 connections based on a cost recovery but social tariff. As SISAR approaches this equilibrium point, the gradual dismantlement of the subsidies should be a clear objective for the institution. It is also of paramount importance for achieving both SISAR’s independence and its true financial sustainability.

The fact that the SISAR model provides an appropriate institutional setup with clear responsibilities between stakeholders, is based on an adequate organization and implementation of technical, administrative and social measures that provide important elements for technical and financial sustainability of the model, and promotes community participation in decision making and administration, are key elements that can be considered for other governments in order to adapt and implement this management model in their countries.

Finally, the financing needs for rural water supply and sanitation services still remain substantial in many regions in the world. A different approach to overcome this situation could be assessing the possibility of creating a specialized water fund in order to finance the implementation of SISAR in other regions of Brazil or in other countries. Targeted investors for the water fund should be both public and private. Besides providing new sources of financing this water fund could increase the awareness of SISAR as a sustainable and effective management model for rural sanitation, offer new possibilities for financing basic sanitation development needs, and last but not least, harmonize and coordinate donor initiatives while attracting private capital.
REFERENCES


CAGECE 2009 UGP (Unit for Management of Programs) - Presentation of the KfW’s Basic Sanitation Program Ceará II. Companhia Estadual de Água e Esgoto do Ceará, Fortaleza, Brazil, June 2009.


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