

Community Learning Centers for the implementation and development of sustainable sanitation in Chile.

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Abstract: Chile has a long tradition in Community Management of water supply and sanitation at the rural areas. However, 80 percent of rural areas don't have access to waste water treatment, with the risk of diseases and pollution of water sources. There are significant challenges to address to solve these, ranging from the necessity of infrastructure to cooperation and technology transference among peers, and technical and management agencies within the country. The implementation of the first Community Learning Center (CLC) on Environmental Sanitation in Chile is developed by FESAN with the support of national government, international organizations and academic sector from Chile and Colombia. The CLC will act as an education hub of rural water sanitation management. It will train, network and empower community leaders and operators of rural sanitation services, also being a demonstration center on eco-efficient treatment technologies. As a result, CLC will build a management model for cooperative operators and create knowledge on the adoption of eco-technologies.

Keywords: Community Management, Knowledge Management, Eco-Technologies, Environmental Sanitation, Sustainability.

Introduction

Chile has a long tradition in Community Management of water supply and sanitation at the rural areas. However, 80 percent of rural areas don't have access to waste water treatment, with the risk of diseases and pollution of water sources. The transformation of this situation requires the implementation of technologies, but especially the strengthening of community management, with technical criteria to decide on the most appropriate technological options for their respective contexts and the sustainable management of these.

The experience of the Cooperativa de Servicios Sanitarios Maule, Chile, in joint work with the Federación Nacional de Cooperativas de Servicios Sanitarios de Chile, FESAN, presented in this paper, shows a joint effort between communities, national government, international organizations and academia in Chile and Colombia. In this experience, parallel to the adaptation and dissemination of eco-technologies, is developing a process to build a Community Learning Center on Environmental Sanitation (CLC) to facilitate the exchange of knowledge and experiences on sanitation and water supply for human consumption.

Context

Chile has a population of 17 million inhabitants. 88 percent of them reside in urban areas where drinking water coverage is 99%, wastewater treatment reaching 90 percent of coverage. These services are provided by nearly 60 private companies, which are supervised by the Superintendent of Sanitation Services. The sanitation law establishes that all urban areas with more than 500 connections must be concessioned to a sanitary services company.

In urban areas, until 1990 the Government invested in infrastructure for drinking water and sewage systems, with a small percentage destined to wastewater systems. The investments from that year on are destined fundamentally to wastewater treatment and in a lower percentage to infrastructure of sewage and drinking water systems.

In rural areas of Chile there are about 1,600 small water and sanitation operators, who serve 2 million inhabitants. 95 percent of these inhabitants have drinking water coverage, and only 20 percent are covered by wastewater treatment. Drinking water and sewage services are delivered by Rural Drinking Water Committees and Rural Drinking Water Cooperatives. The committees are functional and legal entities ruled by Law 19,418 of Neighborhood Assemblies and Community Organizations; the cooperatives are private-law bodies and are ruled by the Law of Cooperatives. Both types of organizations must operate, manage and maintain the service with the financial contributions made by users through the payment of monthly fees for receiving that service. The rural operators are technically supervised by the Dirección de Obras Hidráulicas of the Ministerio de Obras Públicas (DOH). Until June 2013, there are 172 rural water cooperatives and 1,420 rural water committees. The only statute that governs them is the Sanitary Code, which establishes the quality, quantity and continuity standards, according to the Chilean Standard NCh 409/1. Of 2005 of Drinking Water, for which operators must get approval from the Ministry of Health.

In Chile, the community management of drinking water and sewage systems lacks a proper legal framework. This, because the rural water committees are entities attached to the Neighborhood Assemblies. In 2005, in consultation with the Senate, the Government, through the Ministry of Public Works and in conjunction with the National Federation of Rural Drinking Water Associations, developed a first draft of a law for drinking water and rural sanitation. Its main pillars were: the model that is chosen must preserve the communitarian character of the rural drinking water, the adoption of the cooperative model which considers the implicit economical character in the delivery of the service, and establish a differentiated regulation that recognizes the specificity of the rural areas, as well as the different size of the systems in those areas. After that, the current Government elaborated a second draft. However, the Comisión de Obras Públicas of the Cámara de Diputados has the law on hold since January 10, 2010.

According to a diagnosis made in 2004 by the Programa de Agua Potable Rural, APR, to 1,350 services, it was found that only 17% were sustainable and able to undertake greater challenges in terms of quality of services to its users, organizational strengthening and management and administration capacities. This diagnosis also revealed that a 17 percent of the systems could further develop their potential, for which they would require support from the State. It also showed that 30% of the systems do not fully meet the technical indicators: (Charpentier 2004).

However, the main problem for operators of rural systems is the management, as demonstrated by a diagnosis done by the Departamento de Programas Sanitarios del Ministerio de Obras Públicas. These revealed that 30 percent of Committees and Cooperatives in the country do not register minimum acceptable technical indicators and that a high percentage of these organizations have management problems, such as lack of annual investment plans (66%), lack of tools for planning and management evaluation (56 %) and operational sustainability issues (75%), which result in a poor maintenance of existing infrastructure: (Fuentealba 2011).

Despite this situation, some of the cooperatives that exist from the late 60s have developed a sustainable management and have evolved to turn into concessions. Such is the case of Cooperativa de Servicios Sanitarios Maule, Cooperativa de agua Potable Santo Domingo, Cooperativa Sagrada Familia, and Cooperativa Sarmiento.

In this context, we understand the importance of the appearance of second-tier organizations such as Federación Nacional de Cooperativas de Servicios Sanitarios, FESAN, in November 2008. The idea of creating FESAN arises from an exchange of experiences among Cooperatives (Santo Domingo Water Cooperative, COOPAGUA, the Cooperative Hospital Champa and Cooperative Maule) exchange that was facilitated by a Cinara Institute's professional, Colombia, and held in 2007 under the "Assessment of Local Private Participation Experiences of Small Scale Water and Sanitation in Andean Countries" promoted by the Water and Sanitation program of the World Bank (WSP) carried out in four South American countries (Bolivia, Colombia, Chile and Ecuador) and four other Central American countries: (Garcia 2007). FESAN, www.fesan.coop, is a nonprofit organization which integrates seven small rural operators of water and sewage services, who serve 11,000 rural families in central zone of Chile. To strengthen its capabilities, FESAN maintains a strategic alliance with the Instituto Cinara de la Universidad del Valle de Colombia, www.cinara.univalle.edu.co, which has extensive experience working in rural areas of Colombia and other Latin American countries; and Centro Internacional de Economía Social y Cooperativa, CIESCOOP de la Universidad de Chile, www.ciescoop.usach.cl.

The support of the Global Water Operators' Partnerships Alliance, GWOPA-UNHABITAT, and the Inter-American Development Bank, IDB, have been important for the consolidation of FESAN as an organization. With the sponsorship of these entities, FESAN has been able to implement several Water Operators Partnerships (WOP) programmes which, in turn, have generated initiatives and projects such as the study for post-earthquake recovery of stabilization ponds of the Cooperativa de Servicios Sanitarios Maule.

Results and Discussion

Maule, a community with a proven track record



Picture 1. Cooperativa de Servicios Sanitarios Maule, Headquarters

One of the prominent members of FESAN is Cooperativa de Servicios Sanitarios Maule, which was founded on July 31, 1969, with 80 founding members. Initially, it provided drinking water with two moderately deep water wells. In 1992, it began the construction of sewage systems, which was accomplished with fiscal funding of the Fondo Nacional de Desarrollo Regional, FNDR. The systems were completed in 1997, when they were given to the Cooperative for administration. Currently the cooperative has 2287 water and sewage subscribed clients.

In 2000 came into operation three stabilization ponds which currently discharge wastewater from 12,000 inhabitants of the town and nearby towns, from a total of 38,000 in the city of Maule, in the Seventh Region, Province of Talca (Chile), agricultural and vineyards region, located 300 km south of the city of Santiago, the capital.

The cooperative, as all entities of this nature, has Members General Assembly as a highest authority. This assembly elects the Management Board and the Supervisory Board, in whom the Assembly delegates the management of the cooperative. The cooperative also has a manager and seven officers from different areas (accounting, administration, operations manager and field operators).

In 2002, Cooperativa de Servicios Sanitarios del Maule was accepted by the Superintendencia de Servicios Públicos as water concessionaire. This achievement is a sign of the strength of community management. The cooperative had never thought of becoming a concessionaire. This, because it lacked a master plan, although it had more than 500 connections, which guaranteed that they could maintain its status as a rural operator. However, on March 1, 2002 the Superintendencia de Servicios Sanitarios issued a press release about the application of Empresa de Servicios Sanitarios San Isidro S.A for the concession Concesión Sanitaria de Maule. This situation took the Directors of the Cooperative by surprise, because Maule is a small rural area, and they never imagined that the zone would attract the interest of large companies. Only later they found out that there was a 1939 decree which stated that one of the streets of Maule has the urban status, but not even the Mayor of the town knew of that decree.

When the Directors informed the Community Assembly on the situation was this that motivated the Cooperative to ask for the Concession. Competing for the concession became an obligation for the cooperative and the Superintendencia de Servicios Sanitarios allowed the Cooperative to begin the process to become a Sanitary Concessionaire, giving a deadline until April 30, 2002 to submit the documents. The cooperative could enter into a formal competition for the concession, which it won, supported by a proper professional advice and also the ability to fulfil the warranty policy for the compliance of the plan, something difficult to acquire for a non-profit institution. The sense of belonging of the members and the commitment of the leaders were crucial in moving the process forward. It is important to highlight the female leadership in the cooperative. A woman who worked as Manager of the Cooperative was the one who led the application process of the Concession. Subsequently, the cooperative has had a woman in the role of President of the Cooperative.

Creating a space for the ecotechnologies in the rural areas of chile

In Chile, the use of conventional technologies for wastewater treatment is predominant. These are very difficult to operate and maintain by rural communities, given the complexity of the tasks these technologies demand, as well as the costs of operation and maintenance. Therefore, one of the major concerns of the Directors of the Cooperativa Maule when the sanitary concession was granted was that to the public eye they “lacked a treatment system” for wastewaters, because the stabilization ponds were not considered as such. In 2008, when the cooperative gets linked to FESAN, the ponds were covered by floating macrophytes (Picture 2) since there was no commitment to its maintenance and efforts were focused on getting resources to obtain a treatment system that met the standards.



Picture 2. Stabilization ponds, 2008

In February 2010, the existing ponds in Maule were seriously damaged by the 8.8° earthquake in Chile, which caused a major malfunction in the system. This situation that continues to date, which has resulted in failure to comply the regulations related to the discharge of treated water to canals (Decreto Supremo Ministerio del Interior, DS N°90/Chile) and the resulting pollution, with odors and percolation of the soil that contaminate groundwater and streams.



Picture 3. Stabilization ponds, 2011

The exchange that FESAN has developed with Instituto Cinara has allowed the federation to revalue the ponds, so that the damage suffered in 2010 was used as an opportunity to work for their optimization and also as a learning spot for rural communities in Chile regarding the use, operation and maintenance of eco-technologies for wastewater treatment. Two seminars have been completed in this regard (Santiago 2010 with the assistance of 180 people linked to 40 water and sewage organizations, and Maule, 2012, attended by 25 people linked to municipal government of Maule.

The design of the recovery and optimization project for the ponds, (Picture 3), which was funded by the Chilean Government, is finished and has been delivered to the Municipio de Maule, which this year will manage the investment required for the recovery of this infrastructure through regular investment programs of the Gobierno Regional: (Peña *et al.* 2012)

Maule Cooperative Wastewater Decontamination System Recovery

Primary Treatment. Improved Anaerobic pond (IAP). In this type of lagoon the hydraulic retention time is at least 24 hours. The wastewater without sand and coarse solids enters on one end of the lagoon and organic and inorganic solids are used as food by anaerobic microorganisms. When they reproduce, these produce biogas and water.

The enhanced anaerobic pond is a deep pool and consists of two compartments. The first is 4 meters deep and can be covered to capture the methane emanated from the digestion of the microorganisms, as it is in this compartment where the main mechanisms of digestion are performed. The second compartment is 3.5 meters deep.

Secondary Treatment. Facultative pond enhanced with baffles (BEFP). This processing unit is responsible for refining the physical, chemical and microbiological characteristics of wastewater from the previous steps. Its operation is achieved through the simultaneous occurrence of phenomena such as sedimentation, anaerobiosis, aerobiosis and photosynthesis, in a flow of organic matter and energy, provided primarily by sunlight.

The most important features of this kind of ponds are its hydraulic retention periods (over three days), shallow depths, soft greenish color, large surface areas and, as the name suggests, the presence of one or more baffles located inside the pond. This latter feature promotes the functioning of the unit as a reactor in which the processes are divided into several stages, which increases its efficiency.

Disinfection System. To achieve the required removal of fecal coliforms, the engineers chose ultraviolet radiation, since these cause damage to nucleic acids in the cells of the microorganisms. To achieve this, it is necessary to withdraw an important percentage of the free solids. Finally the effluent discharges into a canal meeting the DS 90 standards.

Adequacy of Biosolids. Dehydration and drying of biosolids generated by the IAP is made in drying beds. The sludge is dewatered by drainage and evaporation on the surface. The drain is usually constructed of perforated plastic pipe with a slope, which collects all the water from drying beds, dewatering every 20 days.

Biogas Management. During degradation of organic material in the IAP gases such as methane and hydrogen sulphide are released. Because of this, a biological treatment system for gases has been designed. This is a biofilter packed with compost and with an attached biogas burner. The biofilter biologically oxidizes sulphydric acid generated in anaerobic decomposition and thus prevents the formation of odors. Burner function is to eliminate methane to minimize its impact as greenhouse gas.

The Meeting and Training Center. Besides the aforementioned infrastructure, the project includes the construction of a meeting and training center for communities right next to the stabilization ponds. It has been defined that the site design will evoke the Mapuche ceremonial drum and that the perimeter of the facilities will be planted with copihue, a vine whose flower is one of the national symbols of Chile. These elements of national identity built on the work of engineering are part of the integral vision with which the project was conceived. We believe that the appropriation of technology is a process of cultural renewal.

Along with the optimization of Maule's wastewater treatment system, there is an ongoing process to strengthen management capacity of the Cooperativa Maule as system administrator. Also, we are generating the conditions for the communication, appropriation and replication of such technologies by communities within FESAN and others. These will make Maule a Community Learning Center in Environmental Sanitation at a national and international level.

Emergence of a Community Learning Center

Since 2005, Asociación de Organizaciones Comunitarias Prestadoras de Servicios de Agua y Saneamiento de Colombia, AQUACOL, has been promoting the construction of Community Learning Centers in Water and Sanitation, with the support of Instituto Cinara. This implies that some of the organizations associated to AQUACOL have accepted the challenge of sharing the knowledge gained from their cultural practices in the management of water resources, sanitation and daily tasks in the management of public services.

Such knowledge is shared in the first instance with other communities, but also with authorities of different level, institutions, academy, and diversity of visitors. We believe that the community as such, their water and sanitation systems and its supplying microenvironment are the fields where the learning takes place. This, without taking into account the usefulness of infrastructure such as offices, which provide the physical space to receive visitor and develop workshops. This "field" method was known by FESAN leaders on a technical visit (WOP) to Colombia, taking it as a reference to adapt it to Chile.

The solid background of the Cooperativa de Servicios Sanitarios del Maule have set up the conditions for the establishment of the first Community Learning Center in Environmental Sanitation. FESAN members, as well as more than 20 non-affiliated organizations have visited Maule to get to know more of this wastewater treatment technology, pioneer in the country. With the support of CIESCOOP, different initiatives have been implemented in order to strengthen the administration of the Cooperativa de Maule, such as seminars and participatory workshops. During the process of characterizing the situation of stabilization ponds after the earthquake and participatory design for optimization, which Instituto Cinara de Colombia followed up, 40 community leaders from different locations have been involved in the process.

Maule is leveraging the knowledge generated through their own experience, supported by the knowledge acquired with organizations such as CIESCOOP and Cinara. Through systematization and analysis of their challenges, Maule is generating knowledge that must be shared with people committed to improving the welfare of their communities in rural areas of Chile through the use of high efficiency and non-damaging eco-technologies: administrators, operators, community leaders and the population in general.

Conclusions

The leadership undertaken by the directives of the Cooperativa de Maule to restructure and set it as Sanitary Concessionaire has been decisive for its positioning and sustainability.

Maule has a highly committed and stable team of professionals, which has allowed the cooperative to take on challenges and carry them out with own resources, using external consultants only rarely.

The sustainability of public sanitation services in rural areas is closely linked to the sustainability of the technologies in use. Eco-technologies have proven to be a good response for treating the wastewaters produced in such locations.

The work developed by FESAN in Chile shows that by understanding the situation of the country it is possible to produce results that are consistent with the context, taking advantage of the support of international organizations, Government and contact with research centres in Latin America.

Finally, after a logical process of knowledge exchange, support of academic and financial entities, technology appropriation and the construction of the management and operation model, the result will be a Community Learning Centre for the implementation and development of sustainable sanitation. And also, a demonstration centre on eco-efficient technologies applied to a system of community wastewater treatment. The CLC of Maule will be the pilot for the implementation of other two learning centres in other communities across the country. Besides the role already indicated, they will promote the strengthening of community organizations management, as well as other actions that contribute to the generation of social capital.

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