

## **Community knowledge in action**

### **A path towards a sustainable water access**

The Case study of AQUACOL, Colombia

*Flavia Cárdenas*

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A thesis submitted in fulfillment of the requirements of Lund University International  
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## Abstract

The provision of drinking water in Colombia, according to the constitution, is responsibility of the municipalities; they have to make sure everyone has access to a proper and reliable service. However, this is not the case when it comes to the rural and peri-urban areas of the country, where more than 90% of the drinking water is currently being provided by community managed aqueducts, a system in which organized autonomous communities manage, control, operate and maintain the drinking water provision of the isolated areas. This thesis is going to investigate the role of a collective community based association called AQUACOL, situated in the Valle del Cauca department, at the south west of Colombia. AQUACOL was created by community aqueducts, and it manages to increase the access, the effectiveness and efficiency of existing community systems by sharing the knowledge and experience of its member communities. This thesis argues that AQUACOL is guiding the aqueducts towards a more sustainable path mainly by relying on the creation of social capital, especially communities of practice, where the creation and sharing of knowledge and experience can help build stronger and more adaptable institutions; these conditions are essential to achieving sustainability (Ostrom, 1990). Lastly, this thesis also discusses the possibility to use the knowledge sharing and social capital building proposed by AQUACOL, in the creation of sustainable communities in other rural areas of the country where the water supply is also provided by community aqueducts.

**Key words:** *Colombia, community water management, aqueducts, social capital, knowledge sharing.*

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## **Chapter 1. Introduction**

The decentralized system in Colombia has delegated the responsibility of providing drinking water to the municipalities, which according to the constitution, can at the same time entrust the role to public or private entities specialized in the supply of the service. However, neither the public nor the private approach have been able to achieve a satisfactory development of the water and sanitation sector in the rural and peri-urban areas of the country (PNUD, 2011). In these areas, only 31% of the population receives water of an acceptable quality for drinking (WB, 2011); there is a 56.3% of coverage; and the distribution networks present the biggest problem in the country (Fernandez, 2004). As a consequence, the water supply services of almost 90% of the rural areas in Colombia are provided by community-based organizations (PNUD, 2011), a system in which organized autonomous communities are able to manage, control, operate, and maintain the drinking water provision in a responsible, efficient, socially equitable, and technological way, by establishing horizontal relations with NGOs, government and private institutions (García and Bastidas, 2000; Garcia and Chavez, 2010).

Community water management was established in many Latin American countries since the end of the 1960's, and in Colombia it was ratified as a legal practice by the Constitution of 1991 (Law 142 from 1994). Along the country, it is possible to highlight the importance of this type of practice for the supply of drinking water in poor rural communities, places that have shown willingness to get together and work to find solutions towards accessing public services where the presence of the state is nonexistent and the private sector has not shown any interest in satisfying their needs. The community based models established in Colombia vary greatly depending on the socio-economic situation, cultural and ethnic background, educational levels, configuration of settlements, geography and topography of the region (Garcia, 2005). However, because these models are so diverse and autonomous, it has been possible to see that many community systems have faced a variety of problems and obstacles in their services, making them less sustainable or reliable compared to those that the public or private models can provide (Lockwood, 2002).

There are a number of departments in Colombia that are well known for their communities managing the drinking water systems, and one of them is the Valle del Cauca (Figure 1), a region that hosts 10% of the country's population. 14% of its population lives in small rural communities with 500 or less habitants (ACRSE, 2009). Because the state does not have a good presence in relation to the supply of drinking water in the region, a great number of community based water systems have taken control over the resource provision of the department, and some of them have managed to provide a reliable and trustful service in a significant amount of communities (Rojas et al, 2011).

In the year 2000, some providers of drinking water from the Valle del Cauca and the Cauca departments decided to establish an organization called AQUACOL, an association that gathers 33 small community based aqueducts that have a significant experience in managing water supply and sewerage services from the rural and peri-urban marginal areas. This organization offers small communities technical, administrative and legal assistance aiming to provide a better service of the community-based drinking water (AQUACOL, Rojas et al, 2011).

### **1.1 Aim and research questions**

The aims of this thesis are to determine

1. In what extent a collective community based organization (as AQUACOL) is able to improve and lead the management of the water supply system of small peri-urban and rural communities towards a more sustainable path, and
2. In what extent does the model proposed can be considered as a solution for improving the access and control of drinking water for other rural communities in Colombia? What are the limitations of such a model?

### **1.2 Methodology and research design**

This Section outlines the parameters of the chosen methodology and its applicability to the case of study.

#### **1.2.1 Research design**

The research design is based on qualitative data collection (“understand the social world through an examination of the interpretation of that world by its participants”; Bryman, 2008) making the

epistemological standpoint to be interpretivism (“an epistemological position that requires the social scientist to grasp the subjective meaning of social action”; Bryman, 2008) with constructivism as an ontological position (critical position defined by the understanding that “social phenomena and their meanings are continually being accomplished by social actors”; Bryman, 2008).

Usually when undergoing interpretative research, it is important to start by gathering as much information about the case as possible, until getting a better picture about what is necessary (Yin, 2002). Therefore, the collection of the data of the case study was based on exploratory research, a type of research that provides insights and understanding into a topic. Multiple methods were used (literature review, interviews and observations) in order to get a greater confidence (Bryman 2008).

### **1.2.2 Case study**

Because it was the aim of this research to emphasize intensively in one case as the focus of interest, a case study was chosen. Case studies “investigate a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident” (Yin 2002). The type of case study that was chosen was an “exemplifying case” which looks to capture the circumstances and conditions of an everyday or common place situation (Yin, 2002).

The case study from the present thesis makes reference to a communal community based water management system, called AQUACOL, that has shown to be able to guarantee rural and peri-urban communities access to drinking water in the south west of Colombia. The case study would be used to understand how the chosen aqueducts got together and were able to improve the drinking water service in a specific territory by building social capital.

### **1.2.3 Literature review**

The research started with a comprehensive literature review in order to understand how water services in Colombia work, the influential policy trends and the extent in which these policies help the government to achieve the Millennium Development Goals towards the rural areas by 2015.

The research was mainly based on documentation analysis from diverse sources of information, like reports made by the Colombian government (laws, norms and national policies related to the drinking water provision); international organizations that work in development and poverty issues in the country; and national and international NGOs related to water supply and sanitation from the rural areas, all of them considered to be reliable sources. Diverse points of view can help to achieve a stronger analysis (Atkinson and Coffey, 2004). However, this is only possible if the information that is published can be relied-upon (Bryman, 2008). Both of the above named factors can completely change the way in which the data should be interpreted and how reality is understood. Using diverse points of view can make a more accurate interpretation of reality.

Almost all of the information AQUACOL produces is shared through the Internet. This was very important for my research because it allowed me to have easy access. However, the way they publish it, in blogs and websites that are constantly appearing and disappearing, makes it hard to determine what to consider as real scientific reliable information (Bryman, 2008). Another issue that should be taken into account when using the internet as a main source of information is that the findings could be limited depending on the search engine that was being used; the chosen key words; and the fact that some articles disappear or new ones can appear every day (Bryman, 2008). These factors can influence the final result of the research.

#### **1.2.4 Interviews**

The design and development of the semi-structured interviews started in January 2012. Between February and March, 2012, some of the actors directly involved (community leaders, researchers who have worked together with the community, aqueduct managers, community members who have benefited from the association) were interviewed by Skype (2 people) and by e-mail (4 people) given that it was not possible to do field work. These interviews aimed to understand the perspective of the people who have actually worked with the association, based on their personal experiences (Kvale and Brinkmann 2008).

The advantages that both of these methodologies have, rely in the fact that both are cheap, given that there is no need to personally visit the subject; they can eliminate the bias that people may

have because of the personal appearance of the interviewer; and usually they are easy to supervise and manage. On the other hand, some complications with the approach can be that given the characteristics of the people who were aimed to be interviewed, it is possible that they do not have phone or internet access; or maybe they do not know how to use email; usually this type of interviews are likely to be shorter; if the person does not want to answer the question they just do not answer the phone or delete their mail; and it is not possible to observe their reactions towards the situation, in other words it is impossible to see the faces of the interviewees, which could give a better idea of what they are thinking. There is some evidence that says that the quality of data derived from telephone/e-mail interviews is inferior to that which comes from face-to face dialogues (Byrman, 2008).

A second literature review was a follow-up step in gathering qualitative information, to make the attaining of information from the interviews stronger and more reliable (Yin, 2002). Accessing information from virtual data bases (written material/texts/newspaper/reports related with the case) allowed me to generate an in-depth analysis and helped me to be able to interpret the information and learn about the institutional organizations (local organization and management; technology adopted and resources for water supply; operation and maintenance; self-help input and sustainability; water quality; etc.) However, given that it was also mainly done through the internet, this process had the same inconvenience already mentioned before.

### **1.3 Limitations of the study**

The first limitation was the inability to do field work because of financial constraints. It would have been very interesting to see the reality in which the different aqueducts work, or to attend to some of the meetings made by AQUACOL. In addition, the points of view of the people who are users of AQUACOL would have made the thesis stronger, as well as getting their perspectives and thoughts on how the association works and provides benefits to the community. Developing the thesis at a distance can also cause some bias in the understanding of the situation because the people, who were interviewed or approached through electronic ways, were people who directly work with AQUACOL. This can make the opinions lean towards how well the system works, but in

reality it may not be as marvelous as it sounds. On the other hand, it was not possible to get influenced by what the locations show as reality.

However, taking into account that this thesis aims to analyze the role that AQUACOL has in strengthening the communities, my presence was not imperative in the field. Fortunately, all the information needed was available (especially through the internet).

Even though it was possible to identify the actors who could help me in the development of the research, a second limitation was the access to them. Getting in contact with them was very hard. First, because of time zone differences (6 hours during the winter), it was difficult to find them at their working places while I was in my most productive hours. And considering that the people I was supposed to contact usually had to go to the field, it was very hard to find them at their offices, making it impossible to undergo Skype interviews. The other option was communicating to their cellular phones, however, because most of the aqueducts are located in remote rural areas of Colombia, sometimes the signal was not good, and the communication got constantly interrupted.

One way in which I was looking to attain more information, was by attending the 6<sup>th</sup> WORLD WATER FORUM (March 2012, Marseille France), where I wanted to do open interviews with experts and learn about the opinion that people have about community-based water systems in Latin America, especially in Colombia. Also, I wanted to have some inputs that could help me to understand the importance of sustainable water systems in the water supply for rural areas around the world. However, having a Colombian passport does not make things easy once you want to travel, and because of problems with my visa, I was not able to attend the forum.

## **Chapter 2. The bigger picture**

### **2.1 Drinking-water in the World**

For the past two decades, governments, private companies and NGOs have been working towards eradicating extreme poverty and hunger. To achieve this goal, the main emphasis is on the provision of sufficient, safe, acceptable, accessible and affordable drinkable water for everyone (UN, 2000, Kyessi, 2005). Almost all regions of the world have succeeded in reducing the amount of unimproved sources for drinking-water. However, and despite the efforts, it is estimated that still 672 million people from developing world countries will lack access to improved sanitation and safe drinking-water by 2015 (WHO – UNICEF, 2010).

Since the 19<sup>th</sup> century, the city model of water supply (network pipes) became a material expression of political inclusion and “civilization” (Bakker, 2010), a model that helped to guarantee universal access to water while improving people’s health and ensuring environmental protection (Carter et al, 1999; Bakker, 2010). Since the year 2000, over half of the world’s population that currently lives in cities have improved their living conditions by using an enhanced source of drinking-water (WHO – UNICEF, 2010). However, piped systems present challenges, including the access to public funds to maintain the existing facilities, and the building of new infrastructure for the expansion of unplanned settlements (WHO – UNICEF, 2010). In lower-income countries, many urban residents still lack access to in-home connections for safe drinking water. Instead, they rely on costly alternative solutions (water vendors and self-dug wells) that provide water of poor quality and unreliable availability (Bakker, 2010).

On the other hand, the number of people living in rural areas who do not use enhanced sources of drinking-water is over five times the number of those living in urban areas (WHO – UNICEF, 2010). Rural populations usually have to deal with systems that constantly are failing, leading to inefficient use of the resource. Nevertheless, for the last two to three decades, there has been an important achievement in relation to the drinking water supply, coverage and access in rural areas (Rojas et al, 2011). Still, work has to be done in finding solutions for making the available water of a better quality, safe and trustful. Different studies have shown that about 30% to 40% of the

existing systems in rural areas do not work at all or do not work under the expected characteristics (Rojas et al, 2011).

There are 3 models for managing the network piped systems identified in contemporary cities: private, public or state, and community run. It is important to take into account that these systems can work effectively, efficiently and can deliver a proper service to a considerable amount of people in some places; however, and according to Olivera and Lewis (2004) and Shiva (2002), private and public providers can resemble in the inability to incorporate environmental externalities, rely on the adequate amounts of finance, and have managed to exclude the most vulnerable communities.

## **2.2 Public water provision**

The main supplier of drinking water is believed to be the state, institution which is supposed to be in charge of building up an effective, equitable, and responsive system committed to social equity of universal water provision, where costumers pay according to what they can afford (Bakker, 2010). This model was supposed to support the industrialization of the water supply, ensuring that the levels of consumption, development of infrastructure and roles of the state could improve. However, government agencies responsible for delivering the service, rapidly developed infrastructure with limited finances and lacked the access to technological innovations, paying no attention to the environmental impact, governance issues and operating costs, generating a poor management of the resources and unresponsiveness to the needs of the people, especially the poor and the rural habitants. Low investment, low performance, low cost recovery and a bias towards urban elite, showed that the public supply of drinking water was less productive, efficient and effective than markets. This caused the need to look for alternative approaches for water management (Bakker, 2010), and decentralization and privatization came as key elements in the new agenda (Bakker, 2007).

## **2.3 Private water provision**

“Water socialism had failed the poor and market forces, properly regulated are the best means of fulfilling human rights to water” is a quote that Bakker (2010) uses to explain why privatization of the drinking water and sanitation sector was brought up as the solution for the water supply crisis

in 1990. It is understood that private companies will perform more efficiently, generate more income (economic growth), develop higher technological approaches, facilitate broader reforms (water as an economic good) and ensure environmentally friendly outcomes (water conservation and the reduction of pollution; Bakker, 2010). Under this idea, profit maximization became the center of water governance, and the role of the state changed to be a regulator rather than the manager and provider of the public service (Bakker, 2007). Economic equity (benefit or willingness to pay) displaced social equity (ability to pay), and consumer access to the resource depended on their purchase capacity. Growing cities with solid economic power were very attractive targets for this type of practice, and now perhaps 20 % of the world's urban population is supplied by the private sector (Bakker, 2010), mainly countries and cities that have the ability to pay. On the other hand, investment in poor urban areas and rural areas from developing countries was not taken into account by this model (Bakker, 2010), turning the access to drinking water a luxury that goes hand in hand with the purchasing possibilities of the community and the individuals.

As is possible to see, the management of government institutions has been poor while the private entities service does not include the community in any decision making (IRC, 2003). Whether it is the state or the private companies that provide the service, it is usually the people with higher economic power who get a better service, while poor people have to conform to having access to whatever they can (Bakker, 2010).

## **2.4 Community-based water supply systems**

Even though “everyone has the right to clean and accessible water, adequate for the health and well-being of the individual and family, and no one shall be deprived of such access or quality of water due to individual economic circumstances” (Scanlon et al, 2004), the conventional models of water management and supply networks -private and public (state)-, have shown that the decision making agendas are not effectively taking into account the needs of all citizens (Bakker, 2010).

To overcome this problem around the world, communities where there was not a strong state or market presence began to look for methods which might improve their living conditions, and by involving users in the planning and the implementation of the management of their drinking water

resources, they managed to deliver drinking water to the whole population (Quiroga et al, 1998; Ostrom et al, 1999). These community participation and community management models were promoted as the key responses for sustaining the clean water services during the late 1980s and early 1990s, in poor countries (Lockwood, 2002).

Now a days, **community based water supply systems** are the principal means by which lower-income households, mainly in rural areas, have access to affordable drinking water (WSSCC, 2011). These systems can be defined as a bottom-up development approach, where, according to the needs of the population and their cultural, social and political identities, communities get full responsibility, control and authority over the planning, implementation and management of the water supply and sewage systems (McCommon, Warner, and Yohalem, 1990; Isham and Kähkönen, 1999). These community water systems are not public (in the sense that the government is not directly involved in their control) neither private (they cannot be considered to be formal corporations), but a mix of private strategies (where there is profit or non-profit) carried out by members of the “public” (private individuals and community groups”; Bakker, 2010) who mobilize local labor and encourage community participation by using small scale and artisanal technology (World bank, 2007).

The community water supply model is an interesting option toward a universal water supply for poor and rural territories. However, given that most of the time they work in isolated areas where they do not have the support of any institution (governmental, private, NGO) which can guarantee their sustainability in time, they are exposed to a variety of problems (Lockwood, 2002), mainly shown in the strength of its social institutions (Carter, Tyrrel, and Howsam, 1999). Nevertheless, by guaranteeing the continuity and strengthening of the community institutions (social knowledge), it is possible to secure the sustainability of the system (Bakker, 2010).

## Chapter 3. The smaller picture

### 3.1 Drinking water in Colombia

#### 3.1.1 General information about Colombia

The Republic of Colombia is located at the north- west of South America. It has an area of 1,138,914 km<sup>2</sup> divided in 32 departments (Figure 1), 1.119 municipalities and 10 districts, with 7 major cities and 3 seaports.

**Table 1.** Colombian socio-economic situation  
(Source: CEPAL, 2009; WB, 2007; WB, 2011)

<b>Extension (Km<sup>2</sup>)</b>	1,138,914 Km <sup>2</sup>
<b>Population</b>	44,5 million
<b>Population per Km<sup>2</sup></b>	35,3
<b>Rate of growth ( urban/rural)</b>	2,25/-0,05
<b>GDP</b>	2678 (6.9%)
<b>Minimum wage (US, 2006)</b>	170
<b>Level of poverty 2005 (national/urban/rural)</b>	48/42,3/68,2
<b>Level of misery 2005 (national/urban/rural)</b>	14,7/10,2/27,5
<b>Human Development Index (2006)</b>	0,82
<b>Unemployment rate (2007)</b>	12%
<b>Access to water/sanitation 2004 (urban/rural)</b>	93/86

Colombia had a population of 44.53 million habitants in 2009 (Census DANE, 2009), from which almost one third lives in the bigger cities (ex. Bogotá, Cali, Medellin and Barranquilla), and around 12 million people (27% of the total population) lives in rural areas (UNDP, 2011b). Because of the internal conflict endured by the country in the past 30 years, people have been displaced from their towns and have left the rural areas for the protection of bigger cities (UNDP, 2011b), generating a pressure over the provision of the public services (drinking water).

Politically speaking, since 1991, the country established a decentralized system where the territorial entities (departments, districts, municipalities and indigenous territories) were given the autonomy to manage their own interests within the limits of the constitution and the law, including the provision of public services; economically, Colombia has faced a positive growth in the past decade (Table 2), presenting a “high level” (Place 87/187; Table 2) according to the Human Development Index (UNDP, 2011), even though 34% to 48% of the population still presents a medium to high level of poverty (DANE-DNP, 2010). Environmentally, Colombia has always being considered a country rich in water resources. In 2003 it was the third country with the highest amount of internal renewable water resources in the world, according to the FAO (2003). However, because of deforestation and disposal of untreated waste water, the fresh water resources lost their original characteristics, and the amount of suitable water for human consumption has decreased (MADT, 2009).

### ***3.1.2 Provision of drinking water in Colombia***

There are different laws in Colombia in relation to the right to water access. In the first place, there is the Political Constitution, where it is established that the state must guarantee the wellbeing and improvement of the living conditions of the citizens by providing continuous and reliable public services, like the access to drinking water and environmental sanitation (CPC, 1991). To do so, there must be policies that allow the proper monitoring and control of the quality of the service that is provided preferably by private entities (article 49; CPC, 1991). The Public Services Law (Law 142 from 1994) was established as the basis of the political water and sanitation sector in Colombia, which was built under a framework of economic openness and business modernization following the neo-liberalism approach of the state. Law 142 declares that a municipality’s role is to guarantee the provision of water and sanitation services for the communities, while the State guarantees the municipality’s performance by increasing its economic investment in the sector (Law 142).

According to Law 142, the municipalities are required to invest 5.4% of the annual budget they receive in the water sector (budget settled on the System of General Shares or *Sistema General de Participaciones SGP*), either in new infrastructure or subsidizing the tariffs that the poor cannot afford (Law 1176 from 2007).

Drinking water is to be supplied through aqueducts<sup>1</sup> which can be found in different models, depending in the type of organization that provides the service, and the place in which they are found, rural or urban areas (Table 3).

**Table 2.** Number and type of organizations providers of public services register in Colombia (January, 1999) (Source: Perez, 2001)

Type of organization	Number of Business	Total participation (%)
Direct municipal administration	418	24,5
Mix	40	2,3
State owned industrial and commercial business	488	28,6
Private	123	7,2
Community business (legal)	640	37,4

### 3.1.3 Rural –Urban discrepancy

The drinking water services in Colombia, provided by different models (Table 3) has significantly increased between 1993 and 2005 (from 79.7% to 83.4%), where the urban areas have had a better coverage (94.3%; Rojas et al, 2011) than rural areas (about 44% of the population still lacks access to home connection networks for suitable drinking water; Garcia, 2005).

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<sup>1</sup> Aqueducts are defined as “the public service that provides residential drinking water, municipally distributed and suitable for human consumption. It is based in the service by which the water is provisioned (collection, processing, treatment, storage, handling, connection, measuring and management, what includes marketing and billing) and supplied for a dwelling, ensuring quality, quantity, continuity and pressure, and where the user has to pay for the service” by Law 142 from 1994

**Urban** areas, described as *“Those district or municipal areas meant for urban uses according to the municipal management plan that have roads infrastructure, primary energy lines, and aqueduct and sewage systems”* (article 33, Law 388 from 1997) have been the priority for the national and local governments. Since 1994, the government has given priority to the inclusion of the public sector in the provision of drinking water for urban areas, and by 2003, the 15% of the drinking water of the population was being supplied by the private sector (Fernandez, 2004). However, the biggest cities are provided by the public sector, which have the biggest share of the market (68%; SSPD, 2010). Given that these providers are usually big, they are able to provide high quality water, which is efficiently distributed (SSPD).

On the other hand, **Rural** areas, defined as *“Those areas not suitable for urban use because of the opportunity use they can have or because they are intended to be used for agricultural, cattle, forestry, natural resources exploitation, and analogous activities”* (article 33, Law 388 from 1997); or *“The space contained between the municipality center (or by the urban perimeter) and the municipalities border. Can be divided into: those areas made up by groups of at least 20 homes separated by walls, fences and gardens; and those sparsely populated areas where is possible to find scattered farms and houses separated by cultivated areas, forests, fields, pastures, roads, and paths, among others”* (DANE-DNP, 2010), with 30% of Colombia’s population, are the most vulnerable areas of the country in relation to the provision of quality public services, since they lack the support from the local governments to provide and manage the public services.

**Table 3.** Drinking water in Colombia

	<b>RAS 2000 goals</b>		<b>Urban</b>	<b>Rural</b>
<b>Coverage</b>	a) < 2500 habitants 95% as a minimum; b) 2,501 - 60,000 90% as a minimum c) > 60,000 habitants 85% as a minimum (Fernandez, 2004).	Significantly increased between 1993- 2005 (79.7%- 83.4%)	94.3% (Rojas, Mainly provided by public companies (Chaves, 2009).	56.3%, where 11.8% is treated water (USAID and MMADT, 2005) Mainly provided by community-based organizations (Chaves, 2009).
<b>Quality drinkable water</b>	Act 475 from 1998		29% is drinkable water according to Act 475 from 1998	8% is drinkable water according to Act 475 from 1998

<b>Continuity of the service</b>	Inefficiency of the systems, the difficulty to have access to the water along the year, and the vulnerability of the systems associated to climate factors (Perez, 2001)	70% of the providers have a water treatment plant  21.3 hours a day is the average, according to the 25 % of the municipalities that inform about the continuity of the service (Fernandez, 2004)	30% of the providers have a water treatment plant  There is not enough information
<b>Distribution networks</b>	Municipalities should have an idea of the state of the pipes and the system in general, knowing about their materials, how deep the infrastructure is placed, and the year in which they were built	Only 33% of the municipalities inform about the state of the system (Fernandez, 2004)	Present the biggest problems

It is possible to see that even though there has been an important improvement in the drinking water provision of the country after 16 year of the decentralization process, neither the market nor the state have being able to achieve a satisfactory development of the water and sanitation sector in the rural and peri-urban areas (Table 4). The model proposed by the national government is oriented to finance urban areas and favor big private business that do not take into account rural services and rural conditions (Rojas et al, 2011; Salinas, 2011). Therefore, only 31% of Colombia receives quality drinking water (WB, 2011).

### ***3.1.4 The Community based water supply systems in Colombia***

The water supply service of almost 90% of the rural areas is provided by community- based aqueducts (PNUD, 2011). These systems can be characterized as organized autonomous communities that are able to manage, operate and maintain the water supply of their communities in an efficient and equitable way, using social and technological knowledge (Garcia, et al 2000). There are a great number of models along the country, and everyone one of them vary greatly depending on the socio-economic, cultural and ethnic background of the communities, the

educational levels, configuration of settlements, geography and topography, as well as the access to the means of communication (Garcia, 2005). Frequently, in these areas there are only 3 residential strata<sup>2</sup> (1 to 3) and not much subsidy from the government.

Despite the diversity of the community models, all of them share as a general weakness the lack of support provided by the government (at a local, departmental and national level) and the difficulties they have to access and share knowledge and proper technical information on how to deliver a good quality service (Chavez, 2009). According to the Ministry of Environment, Housing and Territorial Development, by the year 2005 there were about 11,552 community based organizations and about 74% of them were not registered under the SSPD<sup>3</sup>, considered illegal, and only 830 were able to provide a service according to what is established by law (Fernandez, 2004; PNUD, 2011; AQUACOL).

One reason for the high level of illegality can be the fact that the public policies that exist for the sector discriminate and make evident some type of unfairness towards the productive and social capabilities of the rural populations (PNUD, 2011), given that they are made to fulfill the urban systems demands. This index of illegality can have disadvantages, especially because it is very hard to know what is actually happening in the country in relation to the provision, quality and effectiveness of the system (Table 4). However, it is possible to establish that because of the high number of providers, there is a high coverage in the country (USAID and MMADT, 2005; SSPD).

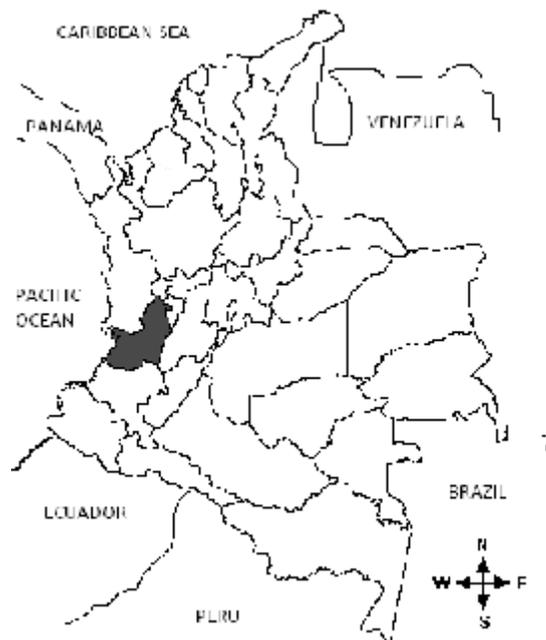
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<sup>2</sup> **Stratification:** All households in Colombia by law (Law 142 de 1994) have to be stratified in economic classes that will determine the tariffs to be paid for public services and taxes according to the personal classification. This stratification identify the poverty of the people according to their residential property, identifying the physical characteristics of their house, the amount and quality of the public services they receive, the house location (urban or rural), the surroundings and the area in which it is located (productive capacity for rural areas) and if it is an indigenous settlement. There are 6 strata, were 1 is the poorest and 6 is the richest (CONPES, 2005). Strata 1 and 2, (usually 3) are subsidized by strata 4, 5 and 6, and also receive benefits from the state. In strata 1 there is 22, 3% of the population; strata 2 has 41, 2%; strata 3: 27.1%; strata 4: 6.3%; strata 5: 1.9% and strata 6: 1.2% (CONPES, 2005), which shows that according to this classification, more than 63% of Colombia is poor and has to be subsidized.

<sup>3</sup> **SSPD:** The superintendence of home public services is the entity that monitors and controls that the technical and quality norms and regulations for the provision of the water and sanitation services are being fulfilled in an efficient, competitive and sustainable way, while protecting the users rights (Salinas, 2011).

### 3.1.5 AQUACOL as a case study

The Valle del Cauca department represents 1.9% of the Colombian territory and has 10% of the country's population (ACRSE, 2009). It is located in the southwest of Colombia (Figure1) , between the Pacific Ocean and the central mountain chain, which makes it highly diverse in terms of geography, weather, natural resources, and ethnical and cultural heterogenic, with a great African-Colombian representation (it is the department with the highest number of afro descendant population of the country) and indigenous groups (ACRSE, 2009; Rojas et al, 2011).



**Figure 1.** Valle del Cauca department in Colombia  
(Source IGAC, 2010)

The department has 42 municipalities that are divided in 5 sub regions (Figure 2) in which 14% of the population lives in rural areas mainly in small communities with 500 or less habitants (Table 1). The main economic activity (95%) is the provision of services (commerce, transport, banking, and communications), however there is also industry, livestock, and agriculture (ACRSE, 2009). The social situation of the area is hard given to the presence of armed groups along the territory (guerrilla, narcotraffic, criminality) that have the ability to freely move in the rural areas of the department given its geographical characteristics (ACRSE, 2009).

**Table 4.** General information on the Valle del Cauca department in Colombia  
(Source: Censo Dane, 2005; ACRSE, 2009)

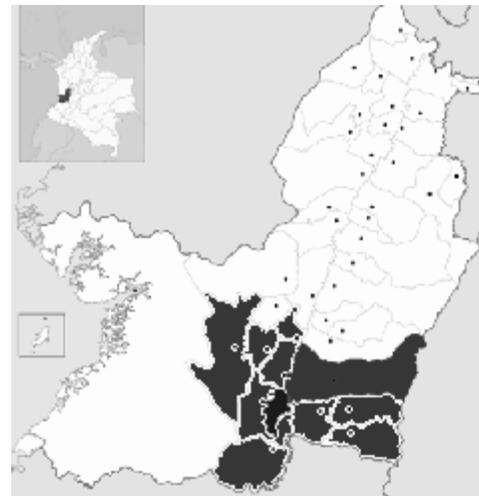
<b>Area</b>	21.195 Km 2
<b>Number of municipalities</b>	42
<b>Population (2009)</b>	4.161.425
<b>Urban population</b>	86.64%
<b>Rural population</b>	13.36%
<b>Participation in national GDP (2007)</b>	10.48%
<b>GDP rate growth</b>	8.7%
<b>Population under the poverty line (2008)</b>	28.5%
<b>Population under misery line (2008)</b>	8.8%
<b>GINI (2001)</b>	0.52
<b>Human development index</b>	0.80
<b>Economically active population (2005)</b>	2.289.254 people
<b>Unsatisfied basic needs (NBI)</b>	15.57%
<b>Unemployment rate</b>	10.9%

The department has a relative high rate of coverage for drinking water and sanitation services in relation with the rest of the country. In 2007, 96% of the urban population had access to drinking water and 89% to sanitation. The service is mainly provided by the state, by a company called ACUAVALLE S.A ESP, which attends 14% of the total population from urban areas (Rojas et al, 2011).

On the other hand, the rural areas of the department are the places with the highest level of poverty (ACRSE, 2009), and where the community-based models are the main providers and operators for the water and sanitation services (Rojas et al, 2011). By 2005, 72% of the population of rural areas had access to drinking water and 50, 4% to sanitation (Rojas et al, 2011).



**Figure 2.** The 5 Sub-regions in which the Valle del Cauca department is divided  
Source IGAC, 2010



**Figure 3.** Municipalities that make the south sub region of Valle del Cauca (Candelaria, Cali, Dagua, Florida, Jamundi, La Cumbre, Palmira, Pradera, Yumbo y Vijes)  
Source IGAC, 2010

The aqueducts that are part of this study are all concentrated in the south region of the department (Figure 3), an area characterized for having the highest population of the region (2.824.889 people) mainly concentrated in the urban area (75% live in/close to Cali, the biggest city) and with a high (53, 49%) amount of people with unsatisfied basic needs (ACRSE, 2009).

33 of the community-based water providers of the region have joined and are working together in an organization called **AQUACOL**, an association made by community aqueducts from peri-urban or rural areas that has been working with the provision of water. This entity was chosen to be the scope of this research given that it has a community nature, works in a national level, and provides a model that looks to strengthen the rural water supply (Table 6).

## Chapter 4. Theoretical framework

To be able to understand why there are some people who have access to a fundamental human need, like the access to safe drinking water, and some others who don't, it is important to understand human-environment relations across a full range of scales (micro, meso, and macro); multiple governance levels (local, regional, national, and global); and multiple and diverse social actors (Kates et al, 2001; Holling, 2003). All of these scales interact in a complex, dynamic of interactive systems of living networks, which are studied in sustainability science.

Comprehending how the above named relations take place, sustainability science identifies that there are different spatial scales where the diverse phenomena are occurring, and scientists, stakeholders, citizens and users are participating in this processes. These actors are creating a systematic use of networks where social learning is promoted, and by combining different types of expertise, a new type of knowledge is created. This allows the creation of new methodical approaches that can be applied in different scales, which makes it easier to get a better grasp of the realities taking place along the complex system (Kates et al, 2001).

Currently, the major barriers that exist for achieving sustainability are based on the disconnections that exist between the national, regional, and local governments; the lack of involvement between rural and urban areas, and the detachments that exist between the business and research communities (Dale and Newman 2008). These disconnections make it hard to achieve sustainability, and can be considered the causes why the fulfilling of human needs or maintenance of natural resources has not been achieved.

It has been stated in past chapters that there are some communities in the rural areas of Colombia that lack access to water, which can be explained because they are not part of a sustainable system (Dale and Newman, 2008).

In the following chapter, some tools that could be used to pave the way to achieve the sustainability of the drinking water system will be revised (Kates et al, 2001). These tools will be later on used to discuss the Colombian case study of AQUACOL.

The general framework of this thesis is based on the assumption that to attain a sustainable system the institutions that build up the system must be strong and should be able to adapt to change. Adaptation and strength are achieved by learning, and social capital is a way in which knowledge is attained.

**On the way to sustainably, is important to have...**

#### **4.1 Strong institutions**

As a first step towards attaining sustainability, communities should be able to rely on strong, adaptable, accountable, well-structured institutions (Ostrom, 1990). The way institutions are understood is as “shared concepts used by humans in repetitive situations organized by rules, norms, and strategies” (Ostrom, 2007). Ostrom (1990) argues that successful institutions neither have to be public or private. She has stated that communities like self-governing institutions (adaptive governance) have shown to be a reliable alternative to achieving benefits. Using cooperation and direct information, these types of institutions have been able to allocate resources in an equitable way, with limited efficiency losses, while overcoming different types of obstacles (Ostrom, 1990; Agrawal and Gibson, 1999, McKean, 1992).

However, for community self-governing systems to be effective, some characteristics have to be taken into account. First, it is important to realize that there must be a small geographical area with a set of established rules that follow the needs of the local people (Bakker, 2010). Secondly, the citizens affected by the rules should actively participate in the process of rule modification. Third, there should always be internal communication among the communities where everyone is aware of the rules that concern them. If there is lack of understanding, there would be poor delivery and management of the resources (Carter, Howsam, Turkel, 1999). Fourth, the communities should be able to monitor the behavior of their members, and allow sanctions when necessary. Fifth, to deal with differences, there should be conflict resolution mechanisms. Finally,

governance activities must be organized in multiple layers of nested activities where a variety of actors and stakeholders are involved (Ostrom, 1990; Dietz, Ostrom and Stern, 2003).

The above named characteristics will only be possible to achieve if there is an active dialog between different actors. Having an effective involvement can only be achieved if everyone understands the rules of the system and can help building social capital and trust while achieving mutual benefits (Tylers, 2006). It is important to include a variety of institutions when this process is taking place. These institutions must be complex (Nesting), meaning that there is not only one type of institution but many, from different levels and with different interests (Dietz, Ostrom and Stern, 2003). That way, there would be involvement of more rules that can lead to the increase of information and allow to have more angles and perspectives of understanding (Dietz, Ostrom and Stern, 2003).

Even though the institutions governed by communities have shown to provide many advantages, it is very important that they have some type of external institutional support (Harvey and Reed, 2006), particularly because policy and management are increasingly demanding the integration of cross-disciplinary knowledge of social and ecological systems to provide better development frameworks (Roark, Yacoob, Roark, 1989). Therefore, institutions must learn how to create these support networks with different organizations and learn how to adapt to the new conditions, questions and changing realities.

#### **4.2 Learning as a tool**

Once the institution has recognized and understood what the implications are that change poses for the community and the institution, it would be easy for them to treat the causes of the problems rather than just the symptom, which will lead to adaptive and resilient institutions (Pahl-Wostl et al, 2007). Being adaptable means to be able to modify old patterns of behavior and develop the capacity of accepting the need to change (Pahl-Wostl et al, 2007).

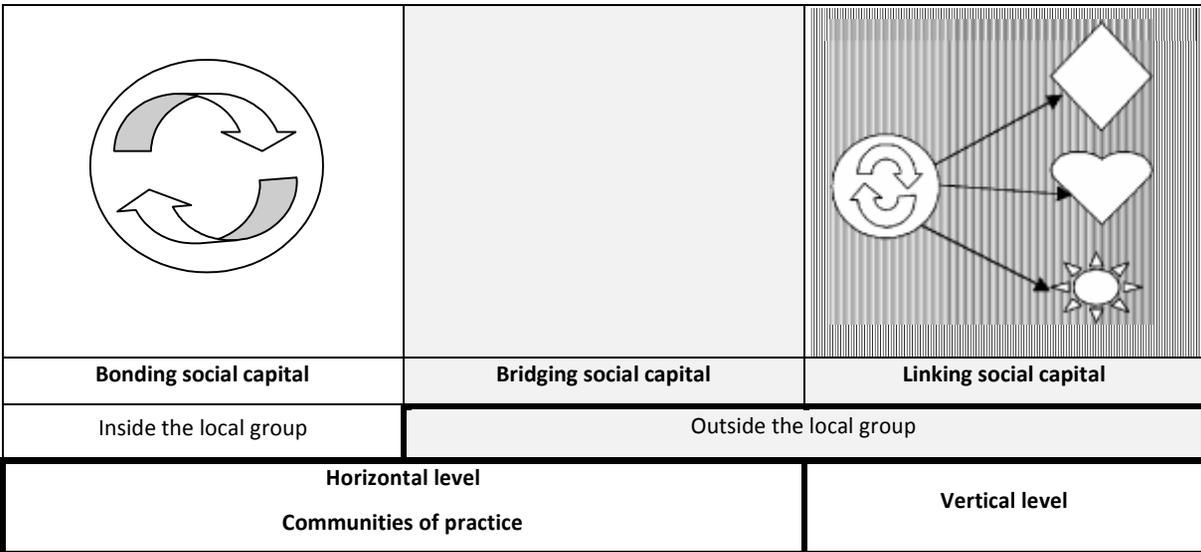
The adaptation process is complex, and requires that the community is constantly learning while they translate the acquired knowledge and awareness in proactive outcomes. Learning is a continuous process, especially for sustainability issues, and the main way to learn about

sustainability is based on developing meta-cognitive skills: "practicing different ways of thinking in a variety of contexts and giving less emphasis on trying to fill students with a large volume of facts and knowledge" (Pahl-Wostl et al, 2007). When people are able to change in practice the way they act, people gain the experience of different perspectives, creating the possibility of developing adaptability, which means building confidence when dealing with new situations and new cognitive abilities. Learners became more proficient to learn in new situations, and a person who learns how to learn, will eventually develop greater openness to change and will become an adaptive expert learner (Pahl-Wostl et al, 2007).

The ability that societies have to adapt is determined in part by the ability to act collectively, which some actors call social capital (Adger, 2003). These learning processes often provide a basis for improving social interactions and resolving conflicts, and are only possible to achieve by exchanging experiences and learning among different scales and levels.

#### **4.3 Building social capital**

Social capital is a theory that looks to improve the efficiency of societies by facilitating coordinated actions among social organizations (Putman, 1993; Cohen and Prusak, 2001). Social capital is based on the idea of working in networks which through the sharing of norms, values and behaviors, create trust and mutual understanding. These networks are intended to create relations across multiple systems: the Micro-system (individual); Meso-system (relations among individuals); Exo-system (decision making made outside that directly affects the individual) and Macro-system (blueprints for defining and organizing the institutional life of the society; Ebi and Semenza, 2008). However, it does not take into account power issues.



**Figure 4.** AQUACOL building of social capital

(Source: made by the author for this thesis)

A first level of social capital is the grouping of homogeneous groups where a common identity and defined socioeconomic base is shared. This is known as **bonding social capital** (Figure 4), where connections are made between people who know each other very well, such as family or close friends. This type of social capital can be characterized because is built upon a great amount of trust, cooperation, and shared behaviors. However, it lacks the expertise, authority and financial resources needed to perform “real” changes in the community (Adger, 2003; Ebi and Semenza, 2008).

Building of social capital is directly related to the creation of networks at different scales and levels. These networks are created between people and institutions outside the local groups (Adger, 2003). When homogeneous groups are linked through communication and collaboration by horizontal links, it is known as **bridging social capital** (Figure 4; Warner et al, 1997). Here, groups are connected to outside resources, providing benefits to the communities. For example, lessons learned from adaptation actions in one community may prove helpful to other communities. These relations facilitate the evolution of new institutions by community association and networking, generating social resilience as an outcome (Adger, 2003).

When people at different levels of power are connected (status and wealth), it is a process known as **Linking social capital** (Adger, 2003), which is characterized by the creation of vertical links (Figure 4; Ebi and Semenza, 2008). Linking social capital allows achieving a broader political and economic change with the creation of associations between civil society and the state (Warner et al, 1997), generating new institutional arrangements that are crucial for closing structural holes within and outside communities. These changes allow institutions to evolve and learn while aiming to the creation of synergistic social capital that promotes the adaptive capacity of societies in general (Dale and Newman, 2008).

At the horizontal level of grouping, a **community of practice (CP)** can be another way to conceptualize collective action. It can be a way of bonding and bridging work together (Figure 4). According to Pierce (1998), CP is among the major sources of social capital. It takes place among small groups of people who understand each other and have spent time addressing a recurring set of problems and then decide to informally engage in a shared practice or project (Wegner, 1998; Pierce, 1998; Eckert, 2006). The interest for learning is what keeps these communities together (Wegner, 1998; Wenger and Snyder, 2000). As communities generate knowledge, they reinforce and renew themselves. Their strength lies in the ability they have to be self-perpetuating (Wenger and Snyder, 2000) given that the knowledge that is created engages people around it and is constantly creating more. Communities of practice are considered to be the mayor building blocks of creativity, where accumulation and sharing of knowledge can lead to the generation of new and innovative strategies, solution of problems, best practices, and the development of professional skills. However, to legitimize the knowledge that is created, recognized experts need to be involved in the process (Wenger, 1998).

Communities of practice are a type of bonding and bridging social capital where the boundaries are clearly defined. The grouping depends on shared meaning, identity and social learning, in or outside the own group, and it provides a framework for dealing with how change is shaped and how people deal with the changes. In CP social learning is the core of the process, and around it, members build collaborative relationships, establish common goals and visions (joint enterprise). Trust and new shared norms are built among participants where there is the establishment of a common ground for handling tensions and disagreements (mutual engagement); and new routines

and rituals, become part of the group of practice. This gives additional meaning to the action (shared repertoire; Wenger, 1998). A social cohesion of these characteristics, that group for collective action, is known to sustain and develop over time.

**Table 5.** Social capital Framework  
(Source: Adger 2003)

<b>Well-functioning” state</b>	<b>A “well-functioning” state with low levels of networking social capital</b>	“In this case the state can provide the necessary underpinning and social security for marginalized groups, although some social groups are inevitably excluded from all formal social security”.
	<b>A “well-functioning” state with high levels of networking social capital</b>	“The idealized situation is a synergy between the state and civil society (Evans 1996) that promotes social and policy learning. Open processes of democratic participation and environmental governance can promote both Self-regulation and the sustainable use of environmental resources” (Agrawal 2001).
<b>Dysfunctional or absent state</b>	<b>A dysfunctional or absent state with low levels of networking social capital</b>	“Coercive states often deliberately exclude or undermine social capital. When a state is driven by ideology, subjected to colonialism, or provoked by other circumstances to be at odds with the civil society, conflict ensues, and the most marginal sections of the society are made vulnerable” (Adger, 2003).
	<b>A dysfunctional or absent state with high levels of networking social capital</b>	“In the absence of an effective state, networking social capital is forced to substitute for some or many of the roles provided by governments. But the outcomes are often far from desirable” (Adger, 2003).

As stated before, social capital is based on trust and cooperation. The higher the number of citizens that participate, the higher the learning and trust that is created. When high levels of trust are achieved, greater reciprocity is attained, because people who trust others have greater confidence in political institutions, and when civil society trusts the state, is easier to develop stronger models that can lead to adaptation (Adger, 2003).

Tocqueville (1969) stated that "An association, be it political, industrial, commercial, or even literary or scientific, is an educated and powerful body of citizens which cannot be twisted to any man's will or quietly trodden down, and by defending its private interests against the encroachments of power, it saves common liberties". Tocqueville states that when communities are strong institutions that are able to develop social capital from the bottom up, they can help the society to perceive itself as having the power to alter their own condition, making them likely to create connections and increase their own adaptive capacity (Adger, 2003). Therefore, high levels of social capital can be considered crucial for measuring collective well-being (Brehm and Rahn, 1997).

It is important to take into account that the success of networks over time depends on external conditions often outside of the community. It is a mix of bonding, bridging and linking ties what creates safety and adaptability, both attained by the flow of information created between individuals and groups (Dale and Newman, 2008). By closing the 'structural holes' that exist within the society, communities aim to get stronger and achieve more efficient networking. Therefore, the significance of networks to create horizontal and vertical ties are especially important for marginalized communities to gain autonomy and control over their situation, even though vertical ties may be the most crucial for access to enabling government policies and incentives for the communities (Dale and Newman, 2008).

According to the theory, communities rich in social capital will demonstrate outcomes of strong social connection, high levels of participation and a willingness to work together for the common good. Such communities are more likely to engage in local government strategies designed to involve communities in decision making (Butler 2005). Community involvement is also becoming increasingly important to local governments as they recognize communities as an asset that can assist and enable local government to achieve outcomes that benefit greatly from local knowledge and partnership development (Butler 2005). According to Putnam (1993) the most important factor in explaining good government is "the degree to which social and political life in a region approximates the ideal of a civic community, where civic communities "is self-reinforcing: civic engagement and good government become locked together in a 'virtuous circle'". A shift from 'getting by' to 'getting ahead' entails a shift from bonding to linking social capital, through bridging

networks, without forgetting the importance of government policies, which are a necessary condition for sustaining the momentum for getting ahead (Butler 2005).

Working networks can allow the community to bring in new resources and share innovation to stimulate change, which can help to facilitate resource mobilization, the second feature of social capital. This is higher in communities with networks based on generalized reciprocity and trust, elements that ensure that the community investments are not draining off by a few. To achieve these, the symbolic diversity is important, where differences are appreciated, community boundaries are permeable and actors are invited to participate in constructive disagreements (Warner et al, 1997).

A considerable number of authors argue that by developing an open social capital structure which is diverse and involves ties at the horizontal and vertical levels, could guarantee the achievement of a sustainable community development (Dale and Newman, 2008).

## **Chapter 5. Results and Discussion**

The aim of the following chapter is to determine in what extent the model proposed by AQUACOL, an association composed by small community aqueducts working in the south west of Colombia, has been able to improve the management of the water supply systems of the territory. To do so, this section of the thesis looks to determine how AQUACOL emerged, what are its functions and guiding principles; who are the actors involved and in what extent the model it proposes is suitable as a solution for improving the access of drinking water in other rural communities of Colombia where there are community aqueducts.

### **5.1 How did AQUACOL emerge?**

Community water management, a common model of water provision that existed since the 1960s along Latin America countries, became a common practice in Colombia when people in rural and peri-urban areas didn't have any access to drinking water because of the disorganization of the decentralization process. Before 1987, Colombia had a centralized political system and the National Health Institute had a program called "Basic rural planning" where the public service issues from isolated rural regions were addressed. In 1991, the country suffered a decentralization process and the national government handed the responsibility of providing public services to the local governments, which were supposed to be in contact with the rural communities and give them financial and technical support to fulfill their needs (Rojas et al, 2011). However, given the lack of resources and infrastructure, the government showed more interest in developing the urban areas and didn't reach for the rural territories, creating a great number of rural areas in which there was no access to drinking water.

The rural communities, looking to solve their own public service issues, got organized and took over the nearest clean water sources and established their own water provisions or aqueducts (Garcia personal communication, 2012), using only their will and empirical knowledge, given that they didn't have any guidance from the local or national government (Torres personal communication, 2012).

In the rural areas of the Valle del Cauca department the “Research and development institute on water supply, sanitation and water resources conservation” (CINARA, *Instituto de investigacion y desarrollo en abastecimiento de agua, saneamiento ambiental y conservacion del recurso hidrico* for its acronym in Spanish) from the Valle University, had worked for over a decade with certain isolated communities where there was no presence of the state and lacked access to drinking water, but managed to organize and provide drinking water to the communities (Garcia personal communication, 2012).

In 1998, CINARA gathered a number of leaders from different community aqueducts and organized a training workshop in which it was sought that the assistants could share experiences and knowledge related to technical, legal, social and monetary management problems the aqueducts presented (Rojas et al, 2011). After the exchange of ideas, some motivated leaders realized the importance of working together in the area of drinking water and sanitation management; sharing the knowledge they have, and using it to build collective and alternative solutions for the problems they shared (Rojas et al, 2011).

By the year 2000, the community leaders who had participated in the first dialogs had the opportunity to attend a meeting with the leaders of an organization of community based water system from Honduras called AHJASA (acronym for the “Honduras association of water system management boards” in Spanish), and were able to learn about the work made by “The National Drinking Water Clearinghouse” from the University of West Virginia (Rojas et al, 2011). Both experiences highlighted the importance and the benefits of joining forces and having some sort of external support if they wanted to provide a better service. After these initial meetings, it was possible to establish that by working together it would be easier to make some amendments to the existing regulations on the sector, and it would be more likely that the government would listen to their demands (Rojas et al, 2011). The higher the number of organizations working together, the simpler it would be to improve the level of representation in the water and sanitation sector, making it easier to actively participate in political decision making, allowing their needs, problems and strengths to be more visible (Chavez, 2009).

When Act 421 from 2000 (legalization of the drinking water and sanitation service provision by community organizations) was officially instituted as a national law, the “Colombian association of community organizations providers of drinking water and sanitation” (AQUACOL for its acronym in Spanish *Asociación Colombiana de Organizaciones Comunitarias Prestadoras de Servicios de Agua y Saneamiento*) was established.

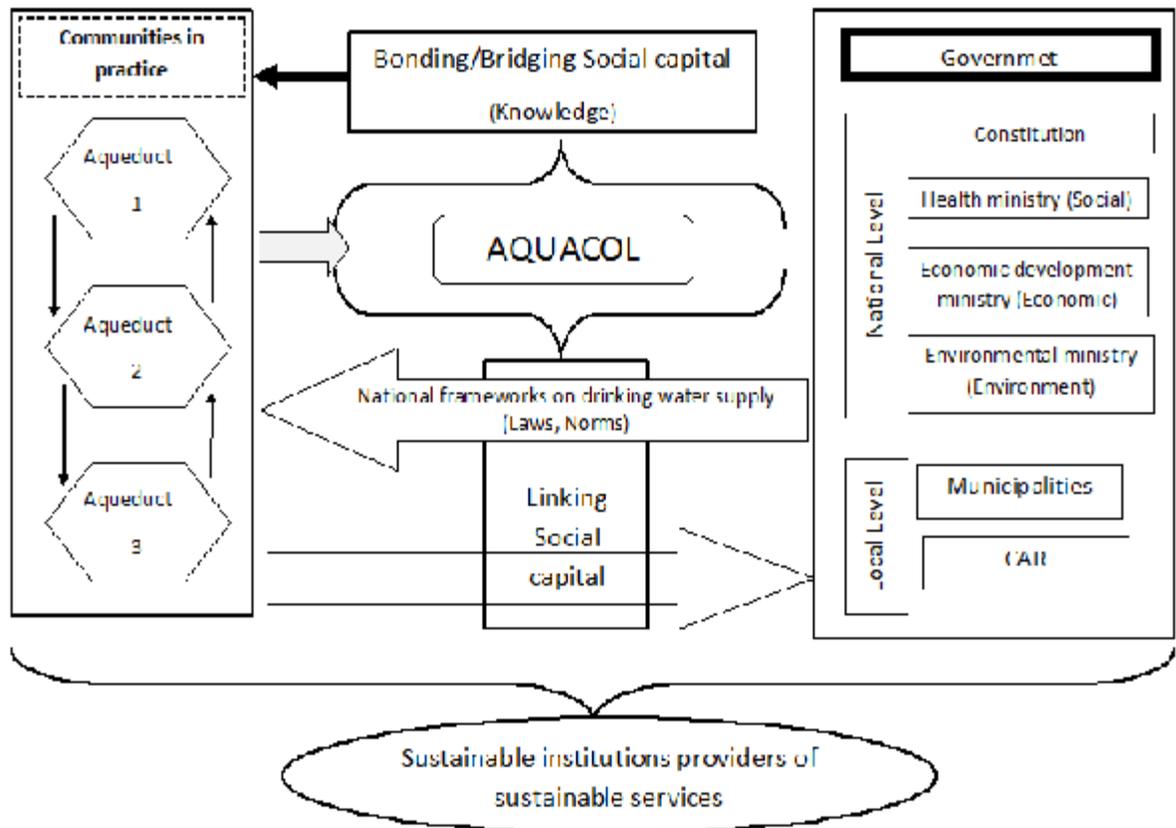
## **5.2 The role of AQUACOL**

The national government of Colombia has managed to create a legal framework (Appendix 1) that aims towards a sustainable and proper access to the drinking water service. However, there is a significant disconnection between what the national, regional and local governments require in the legislation and what the actual community systems are providing in terms of drinking water. These issues can mainly be attributed to the way the national legislation is framed, where there are major gaps between the involvement of state, private institution and communities, and the importance that is given to rural and urban areas.

With the help of CINARA, a number of community aqueducts from the south of the Valle del Cauca, realized that being isolated from the national reality was keeping them away from having the capacity of developing the service they provided in a sustainable way, mainly because each aqueduct was a weak institution.

AQUACOL was structured resembling the theory of communities in practice, where aqueducts that shared the same recurring set of problems, in the drinking water and sewage supply services from the rural and peri -urban marginal areas of the departments of Cauca and Valle del Cauca decided to informally engage in a shared project (Wegner, 1998; Pierce, 1998; Garcia, 2005; Eckert, 2006) where it was possible to offer technical, administrative and legal assistance (AQUACOL, Rojas, 2011) to all of its members based on a working philosophy of solidarity, participation among equals and horizontal cooperation, always taking into account gender principles (Figure 5; AQUACOL). The way AQUACOL works can be compared to the goals that communities in action propose; 1) its members meet regularly and discuss problems of individual systems, 2) by doing so, they create new strategies to tackle existing problems, share solutions and best practices, while

developing professional skills (Wegner, 1998; Wenger and Snyder, 2000). This creation of knowledge has allowed AQUACOL to be a platform for channeling proposals for external agencies and have helped attract resources, and allow the rural communities to actively engage in national policy dialogue (Garcia, 2005).



**Figure 5.** Overview on how AQUACOL uses Social capital to improve the sustainability of the institutions. (Source: Made by the author for this thesis)

Once AQUACOL started to work, it was possible to see how by working together and sharing experiences, **knowledge** from the independent aqueducts increased and the **institutional relations** (horizontal and vertical; Figure 5) grew and got stronger. It was also possible to realize that by **associating**, operational and maintenance costs were reduced, and they were able to create bigger projects while strengthening individual and organizational capacities using better social, economic, and environmental resources (AQUACOL; Chavez, 2009). What AQUACOL was doing was building social capital.

## **5.3 AQUACOL and the building of social capital**

### ***5.3.1 Knowledge transfer as a tool for success***

According to the law (law 142, 1992), the State is supposed to subsidize rural water supply and guarantee the access to water for everyone. However, this financial aid is not very well perceived by the aqueduct organizations associated in AQUACOL because the parameters that the municipalities must fulfill to be able to attain the state funds are hard to achieve, especially in rural areas. In addition, there is usually not enough knowledge on how to do it.

For example, according to Law142, to have access to the national funds, the municipalities have to be organized taking into account the stratification framework, and these stratifications do not exist in the majority of the rural areas because they are mainly directed to urban areas (Garcia, personal comment, 2012). On the other hand, for the aqueducts to be able to ask for financial capital, they have to be legal, which means to follow a number of compulsory requirements asked by the different national normative. However, there is not enough knowledge on what the requisites are, or on how to attain them; therefore, the rural aqueducts most of the time are illegal. The few aqueducts that can actually have access to state funding do not receive the money on a regular basis, sometimes they even have to wait for the payment for years before they can actually use it. Taking the above into account, community aqueducts usually do not desire to be part of the system, they do not trust the government intentions, and think is easier to look for funding someplace else (Torres personal communication, 2012). These situations show the lack of communication that exists between the national level and the rural areas in terms of knowing the law, being able to apply it and effectively use it.

In Colombia, is understood that the knowledge is found in the institutions or the academia, and having a good education means attending a university or a technical college, a type of education that forms people for the urban reality, not the rural one (Garcia, personal communication, 2012). Formal education only covers 30% of rural areas, the rest of the population relies on the education that has being acquired during the daily activities and life experiences, based on the interpretation and understanding of the different situations (Garcia, personal comment, 2012). This is the

knowledge in which the majority of rural water supply systems have been developed. However, it is not a type of knowledge that is taken into account as important, because it does not allow people to be able to understand the norms and laws, and does not allow implementing the different frameworks that the government develops to provide different services. It is a type of knowledge that is considered to be inferior because it goes beyond the academia (Garcia, personal comment, 2012).

It is possible to see how, even though there are norms and rules (Figure 5), rural areas do not know them. When they do not know them, there is a specific type of knowledge required that people lack based on what the norms ask for, creating gaps in the generation and transfer of knowledge between the state and the communities, and between the urban and rural areas.

For these reasons, one of the most important inter-institutional associations that have been made by AQUACOL is the linking of the communities with the academia, which allows to legitimize the knowledge that is created by involving recognized experts (Wenger, 1998). Together with CINARA, AQUACOL has developed a great number of training workshops and events specially for the people in charge of the management and operation of the aqueducts, where experts from different fields (building, management, computer operation, environment, etc), have taken the responsibility of training the community to overcome the weaknesses that each aqueduct may present (operation, legal, financial, etc.; Torres, personal communication, 2012) looking forward to making a more effective system in terms of what the state has established (CINARA).

Even though people from the rural areas do not have access to formal education, it is possible to see that they have been able to manage and operate the community aqueducts using their own empirical knowledge and personal experiences (Torres personal communication, 2012), which shows that the acquired knowledge (meta-cognitive skills) is of great importance (Pahl-Wostl et al, 2007). Taking homogeneous groups, like the aqueducts, and highlighting their experiences and knowledge, can be useful as learning and teaching material to be shared, to create new experiences and information useful for the rest, leading to the development of stronger communities, which can be understood as the formation of social capital (Figure 5; Adger, 2003).

According to the SSPD, there are about 12,000 community organizations around the country, and about 6% of them are legal. Despite that the rest 94% are illegal, and that they lack the knowledge on what public service providers should deliver according to the state regulations, and having little or almost nonexistent institutional support (state, NGO, etc) for the rural organizations to make their services more efficient (Garcia, 2005), they have managed to supply according to the needs of the community. Only with the knowledge acquired by trial and error, they have reached the majority of the communities. But this knowledge can get stronger by involving experts from the different areas. They do not have to have the last word, because the reality of each community is different. However they can turn the acquired knowledge into a creative and strong idea that can be handled in a way in which it follows what the norms and laws require, legitimizing the acquired knowledge (Wenger, 1998).

By generating knowledge, AQUACOL has managed to develop the ability to be self-perpetuating (Wenger and Snyder, 2000), where the created knowledge allowed more people to engage around it, and it has led to the creation of more knowledge. For example, now days, the association is made up by 33 community aqueducts that have managed to provide services to 70,000 habitants (47% from the Valle del Cauca department and 53% from Cauca department) in 133 communities (Rojas et al, 2011).

Even though the legitimization of knowledge is important in the model that AQUACOL has developed, the most important workshops set up by AQUACOL are those in which the training comes directly from the people of the communities who have acquired field experience and are familiar with the problems of the communities' water suppliers (Torres personal communication, 2012).

AQUACOL has developed the **Community Learning Centers** (CCA, *Centros de aprendizaje comunitario* for is acronym in Spanish; Appendix 2), a space in which is possible to create discussions relying on cultural practices and true life experiences (IRC. 2006; Vivas, 2009, Rojas, et al, 2011). Here, 5 communal aqueducts with recognized experience in one topic (environment, management, operation and technologies) lead the process in which communities are able to share their personal experience with other associations, exchanging knowledge and opinions;

discussing on how to improve their practices by replicating the good experiences, and asking questions that can prevent organizations to make the same mistakes some other organization already made (AQUACOL, IRC, 2006). These centers have become an essential mechanism for the correct management of the communal aqueducts. Here, leaders and facilitators are created by acquiring tools for the improvement of their practices, by developing personal capabilities and strengthening the communication skills they have with different stakeholders from different fields, and by improving the relationships between institutions (Vivas, 2009). Creating these types of communities in practice allows the community to get together and exchange knowledge, achieving what Pahl-Wostl and collaborators (2007) identify as adaptability, where the improvement of knowledge sharing in an indirect way manages to create adaptable institutions and individuals that would be able to deal with change and sustainability issues.

A physical demonstration on how AQUACOL has managed to make bonding knowledge a tool to create adaptability is the “AQUACOL Bulletin”. The Bulletin is a tool written by the community’s leaders with simplified important technical issues on water and sanitation so that the communities can understand them. To develop this bulletin, CINARA and AQUACOL organized workshops where the community leaders had the opportunity to improve their communication skills by enhancing their editorial and analytical abilities (Chavez, 2009). Information about the water and sanitation sector is shared between the different communities, allowing them to be linked and aware of the public services situation in the other aqueducts that also belong to AQUACOL (Vivas, 2009). Learning from the reality of the others allows different communities to adapt by being aware and able to recognize the implication that changing their common habits will have in the service provision, making it easier to address the causes of the problems they are facing, rather than just the symptoms, which can lead to resilient institutions and sustainable communities (Pahl-Wostl et al, 2007).

The impact created by AQUACOL has allowed them to become “consultants”, meaning that other public service organizations pay them to support the management and training of their institutions (Corrales and Restrepo, 2012). This activity gives the association a little financial freedom (Chavez, 2009; Rojas, 2011). AQUACOL economically sustains itself by the affiliation fee that new members pay and the monthly payment rate the associates give depending on the number of users the

system has. Therefore, the role of an institution that is consulted by others to improve their system is another example that allows to see how the sharing of knowledge is one of the main axis of the AQUACOL model, looking to create social capital by creating networks with different institutions.

By strengthening the institutional knowledge among the aqueducts that belong to AQUACOL allows to create strong, accountable and well structured sustainable institutions, the type of institutions Ostrom (1990) considers to be successful for the management of common resources given that they can help to build social capital and trust while achieving mutual benefits (Tylers, 2006). These type of institutions can guarantee the continuity of the projects, for example the CCA or the AQUACOL bulletin, even when there are changes in the government or in the aqueduct management (Torres personal communication, 2012). This can lead to sustainable communities that can adapt to change, and are willing to improve.

Since the creation of AQUACOL and the model in which social capital is created among equals, the association has improved the coverage of the system. Between 1990 and 2008, 10.7 million people gained access to improved sanitation facilities, and the number of people using improved drinking water sources increased by 12.2 million (Chavez, 2009). The number of water supply systems that have acquired a drinking water treatment plant (PTAP) have notably increased, mainly because of the big effort made by community leaders that understand the importance of supplying secure water services (Valcke, 2009). These results were attained once the knowledge was shared among the different aqueducts, where those aqueducts that owned a PTAP shared how their service has improved, allowing the communities to which the knowledge was shared to adapt to the new technological innovations, improving their service and coverage.

Garcia mentioned in our personal communication (2012) that AQUACOL model works like an institution that is able to construct social capital based on the assumption that communities can teach each other through support networks, collaboration and mutual help, where the main emphasis is made in the importance of constant learning while the acquired knowledge translates in outcomes. Developing practical skills, gaining experience and new perspectives while taking action, can make people become more adaptable to change by building confidence, be more

prone to develop further social interactions, act collectively, and have more interest in participating in the creation of change in the surrounding. These can be considered basic attitudes that can lead to sustainable communities (Pahl-Wostl et al, 2007). Knowledge allows people to have resources to innovate and imagine new ways of being.

AQUACOL model, based in the building brick of social capital, where the community and their leaders can develop and maximize personal capabilities (AQUACOL), has managed to pave the way to eventually achieve what WASH and Hoclgkins (1994) identify as a sustainable drinking water system. They also have managed to start sustainable model for an institution, where a group of communities with the same needs, have created better and stronger solutions by expanding and sharing a vision, making a transparent and fair model. However, as stated by Harvey and Reed (2006), having strong institutions is not enough to attain sustainability. There have to exist relations among different type of institutions and integration of cross disciplinary knowledge. And this has being achieved by AQUACOL by creating stronger and more dynamic relations between the local aqueducts and national and local institutions.

### ***5.3.2 Enabling institutional strengthening***

According to the social theory framework proposed by Adger (2003), the drinking water service provision for the rural area of the Valle del Cauca department in Colombia lacks the presence of a well functioning state with low or high levels of social capital given that it is not a state that can provide the necessary social security for marginalized groups, or presents a synergy between the state and civil society, promoting policy learning, open participation, self regulation, etc (Table 5). What the Colombian case shows is that the state neglects the vulnerable people, allowing the presence of unreliable public services that lack coverage, quality, continuity, and suitable distribution networks (Table 4). In the present case, it is possible to see that one of the major problems presented in the provision of drinking water is the lack of communication between the national level (where the laws are made and established), and the municipalities (where these norms are supposed to be applied and developed). For rural areas, there is also a gap of dialog between the rural communities and the municipalities to which they belong to.

Colombia is considered to be an urban country given that the majority of its population lives in urban areas, and because of the forced displacement that Colombia has experience in the past decades, the amount of people moving to the “big cities” grow every day (UNDP, 2011b). However, the reality of the people does not make the population to be urban. The majority of the population has a rural background and rural ways of living (Garcia personal communication, 2012). Despite the above, there is not a specific legal framework addresses specifically for rural communities or community organizations that supply the public service for small rural municipalities (Quiroz et al, 2006). The national legislation for public services provision (Law 142) is strongly attached to the urban sector, given that it is hard for the state institutions to approach the logic of rural communities while developing national policies. Therefore, the rural areas have to bind themselves to follow a very complex legislation which is not made for them (Quiroz et al, 2006).

One of the interests of AQUACOL has being to create a community that has an interest in supporting the needs of rural communities at a national level, especially by influencing the national policies, which usually are thought for big urban public service providers (Figure 5). For example, the SSPD requires to the different water supply systems along the country to fill up the “Unique system of information” (SID, *sistema unico de informacion*, for its acronym in Spanish), a form that looks to determine the administrative, commercial, financial and technical-operative conditions of the aqueducts along the country. However, as the majority of the norms of the public services sector, it is a form that has being developed thinking about the big providers of urban areas, therefore, is very hard for small rural community systems to comply with everything it asks for (Torres personal communication, 2012). The current president of AQUACOL stated that *“The work there is regarding the legislation, it is still hard; the state should realize that the rural area of the country is different, and the current legislation is made for the urban area. It is important to think about changing the legislation taking into account the rural sector”* (Edgar Vivas, AQUACOL president).

Realizing the challenge for rural and peri-urban community aqueducts to fulfill what the national law asks for, AQUACOL started a dialog between CINARA (academia), the Valle del Cauca government and some national institutions (state) aiming to re-write the legislation concerning

provision of drinking water and sanitation in terms of rural areas. The dialogs aimed to understand what the rural communities could actually accomplish in terms of what the urban legislation asked for (Garcia personal communication, 2012). The result of these conversations was materialized in the “Rural SID” (Rural unique system of information), a new mechanism that allowed to divide the small rural providers in such a way that the amount of requirements the SSPD asked for depended in the amount of people the aqueduct supplied. It came to be established that if the big providers had to fill in about 767 forms, the rural providers, with the new Rural SID, would only have to fill 17, depending on the number of users (Torres personal communication, 2012). This achievement was possible to obtain by making stronger the links between the different aqueducts (bonding and bridging interests), given that when claims come from bigger crowds, it is easier to influence policies and the state institutions.

Another example on how AQUACOL is improving institutional strengthening can be seen by the relation they have established with the Regional Autonomous Corporation (CAR, *Corporacion autonoma regional* for its acronymic in Spanish), a decentralized state institution which can be considered to be the environmental authority in each department. Despite that AQUACOL does not work closely with them, they have managed to advise the communities on the importance of establishing good relations, as they represent the government. Between AQUACOL and the CAR from the Valle del Cauca, conversations have being undergoing on how to teach the communities better ways to achieve a sustainable and legal water uptake from the different watersheds, given that there is a growing number of illegal organizations that deliver the service and have no real authorization to use the water. For the community aqueducts to be able to obtain the required authorization, they must be legalized, and most of them understand that being legal means being private (more expensive, without community involvement in the decision making, etc.); therefore, they don’t really look forward to attaining a legal status (Garcia, personal communication, 2012). On the other hand, when the organizations are in fact legal and they apply for a water concession following the legal frameworks, the bureaucracy that exists around these types of institutions make the process very complex, and some times, not worth it (Torres, personal communication, 2012).

AQUACOL aims to change the understanding that communities have on what having a legal status means, making them realize that illegality makes the aqueducts vulnerable and inefficient, where most of the time, the governmental control entities do not consider them as capable of providing a good service, turning into an easy target for other institutions (private or public) to take control over them (Garcia, personal communication, 2012). Therefore, AQUACOL is trying to help by training the different illegal aqueducts of the area so that they can become legalized and learn how to cope with different problems and work transparently and efficiently giving an effective use to the resources (social, economical, environmental).

In the past two examples it is possible to see AQUACOL as developing a linking network of social capital (Figure 5), creating connections between institutions outside the “local” group, connecting people at different levels of power (Ebi and Semenza, 2008), and creating new institutional arrangements. Closing the gaps within the communities, helping to create social adaptation (Dale and Newman, 2008), is possible to see in the increased number of legal organizations, and the new legislations explicitly made for rural areas.

It has been established that communities that manage their own resources need to be supported by external institutions so that they can deliver a better service (Lockwood, 2002). Rojas and collaborators (2011) made possible to see how this statement is put into practice in the Valle del Cauca and Caldas departments of Colombia, where different types of institutions (international, national, local) are currently supporting the relations between the community aqueducts and the government (Table 6; Garcia, personal communication, 2012). Among the institutions there is the Health Secretary, a governmental institution that has developed a space in which by the use of workshops, the communities and the government get together to plan and decide how to support the community aqueducts according to their needs. It is also possible to find in the same area the “Support program for rural aqueducts” (PAAR, *programa para el aprovisionamiento de agua rural*); An initiative created by the municipal government and the private sector in which by looking to improve the quality of life of the rural population, communities have managed to channel financial resources in a joint, well-planned and articulated manner, improving the water supply coverage of the region (Rojas et al, 2011).

**Table 6.** Support models analyzed in the study of Rojas et al, 2011  
(Source: CINARA (Rojas et al, 2011))

Level	Models to strength the rural area	Nature
<b>National level</b>		
	<ul style="list-style-type: none"> <li>• Program for the strengthening of small municipalities lead by the Vice ministry of water and sanitation</li> <li>• International plan</li> <li>• AQUACOL</li> </ul>	<ul style="list-style-type: none"> <li>• State</li> <li>• International NGO</li> <li>• Community</li> </ul>
<b>Regional level</b>		
Caldas department	<ul style="list-style-type: none"> <li>• Water and sanitation unit</li> <li>• Coffee ecological foundation</li> <li>• Manizales waters</li> <li>• Spring waters of Pácora</li> </ul>	<ul style="list-style-type: none"> <li>• State</li> <li>• Private productive union</li> <li>• Municipal urban provider</li> <li>• Municipal urban provider</li> </ul>
Valle del Cauca Department	<ul style="list-style-type: none"> <li>• Program for rural water supply (PAAR)</li> <li>• Municipal health secretary</li> </ul>	<ul style="list-style-type: none"> <li>• State</li> <li>• State</li> </ul>

Contrary to the other types of models found in the region (Table 6), AQUACOL is developing a model that has a community nature. In this case, it is the community that is looking to create the networks and interactions; it is the community that, by creating a community among equals, has being able to identify what are the needs of the region and according to the identified needs, they create networks among different types of institutions that can support them in the process of improving the drinking water systems. This makes the model AQUACOL proposes unique in the area, giving the power to the communities on the decision making. It Is them who approach the private and public entities, not the other way around. It Is the association that establishes the community needs, and not the government that suggests solutions according to what they think the problems are.

### ***5.3.3 The importance of participation***

The model developed by AQUACOL (Figure 5) allows information to flow through the creation and sharing of knowledge among horizontal and vertical levels. This information flow can only be achieved through active participation, which helps to close gaps between the traditional power structures that exist, and allows the creation of institutional adaptation.

Institutional adaptation can be translated into the creation of new type of institutions; institutions that are able to change the way to proceed, and design new rules according to what is needed, creating dialog between those hierarchical levels where the power lies with those that commonly have had no power at all. The more horizontal and vertical interaction created, the less inequality there will be because when those that have experienced the problems (social, economical, environmental) have a voice, the significant issues from the communities can enter to the local political agenda.

The degrees of adaptation from the institutions can be measured by taking into account the levels of participation that are presented. Participation creates stronger ties, and improves the willingness of people to actively incorporate in discussion. When different communities are willing to get together and support each other bringing new knowledge, resources, share innovation and learn how to create more efficient networking, this creates a proper environment necessary for institutional change (Quiroz and collaborators, 2006; Dale and Newman, 2008). According to Putman (1993), once people learn about the importance of being active and when they are happy to be engaged on different processes regarding the decision making of their communities, the population gains a certain amount of autonomy by learning that they have control over their situation. This makes the community realize about the importance of being closely involved in the creation of new policies and incentives, where they can express their own views on what needs to be fulfilled.

Changes in small communities can spill, and eventually transform and influence different scales (Putman, 1993), which is important to deal with cross-cutting issues such as sustainability, where in problem solving is important to take into account different scales among different power structures (Dale and Newman, 2008). The changes in the communities achieved by learning and adapting to the needs of the other (Adger, 2003) allow them to see the importance of creating bigger bridges and bigger networks that facilitate the conditions outside of the communities (Putman, 1993; Dale and Newman, 2008).

According to Garcia (2012), the association has gain so much power now a days, that it has being established in other regions of Colombia (Antioquia, Atlantic coast, among others) among rural aqueducts (Garcia, 2005). However, it usually comes as part of the political agenda of the ruling governments, losing its strength when the political periods end and political interests change (Garcia, 2005). This highlights a reason why the model proposed by AQUACOL has shown to be more sustainable in time, given that it is managed entirely by the community, there are no second intentions by politicians, is only the community and its personal interest what make the system work and improve over time. There is also an idea to start developing a Colombian national confederation of community water systems; and a Swiss NGO called VIDA, is promoting the idea of a Latin American confederation related to communities as environmental managers of their water (Garcia, personal comment, 2012). These projects come from the government and NGOs; they are not initiatives from the communities.

Social capital can be considered to be a step by which is possible to close existing differences between institutions that have to deal with the same issues. The creation of social capital can guarantee that the communities are able to respond on their own initiative and will be able to work in cooperation and as partners with local and global forms such as the government, private sectors, and other local community organizations (Dale and Newman, 2008).

As stated by Berdegue et al (2011), *“improving the human agency, social structures and creating institutional change and social coalitions can help in the achievement of reduction of poverty, economic growth, and improve distribution income, because with better social institutions it would be possible to promote the capacity of the territory to express all its true potential”*. AQUACOL has

managed to develop a model in which is possible to see social capital as the glue for attaining sustainability, which can be very important taking into account that *"The rural sector of the country can be used as a crucial axis for the development of the country; a development with equity, social inclusion and democracy. In other words, betting on the human development"* (PNUD, 2011). If this could be achieved in all the rural communities of the country, the human development attained in the rural area can lead to a more democratic growth of the country, more inclusive, where all the citizens will be able to participate in the decision making, and the needs of the most vulnerable will be taking into account.

## Chapter 6. Conclusions

The rural public service provision in Colombia can be characterized by the communication barriers that exist between the national government, the local government, the municipalities and the rural communities.

Even ( ) though AQUACOL model is not a panacea, as a community institution it has managed to initiate the path for the creation of sustainable community aqueducts, where the active participation of the population and the empirical knowledge of the communities have managed to join with the academia and different national and local institutions. By understanding how the system works, it is possible to infer that the proposed model is creating a more efficient, effective and equalitarian drinking water provision. However, it is important to get deeper into the system, understand the role of the different communities and the differences that exist in between the aqueducts when it is time for the decision making process.

With the present research is possible to say that AQUACOL's model, based on the construction of social capital, has improved to some extent the **access** to drinking water for the rural and peri-urban populations in the south of the Valle del Cauca department.; it has allowed for the different communities to receive a **service** that is constantly improving by the strengthening of knowledge and the creation of inter-institutional relations; and it has led to the building of **trust** inside the communities, between the communities, and communities with other institutions, which increases collaborative networks or linking ties. However, it is important to do develop further understanding and determine in what extent this has been done, and what is needed to be improved.

Even though the collaborative networks that AQUACOL has created can help to close the gaps between the traditional power conflicts that exist in the different governance levels, more research has to be done on actually how the power structures that are created inside ACQUACOL work. The creation and sharing of knowledge between different power scales can lead to an integral way of problem solving, essential step to deal with cross cutting issues such as sustainable

development. But to achieve this, the way this power relation works should be understood, so that it is possible to see how it can be improved.

Although social capital is not enough for communities to achieve sustainability (as stated by Dale and Newman, 2008), it is a step that can help to close existing differences between institutions. Social capital can guarantee that the communities are able to respond on their own initiative and will be able to work in cooperation and partnership in a local and global level with the government, private sectors and other communal organizations.

Therefore, the proposed model can be considered to be suitable as a solution for improving the access and control of drinking water in other rural communities of Colombia that rely on community aqueducts. Given that it is a model that aims to improve the human agency, what will later be translated in the creation of new institutions and better social institutions, can promote the true potential of each territory, where a more democratic and inclusive growth will take into account the needs of the most vulnerable for the policy making .

*“When people learn to trust one another in associations and informal social networks; trust and reciprocity are spill over the society and a capacity for collective action is created in the pursuit of shared goals”*

- Putnam, 1993

## Chapter 7. Further research

A next step could be to determine in what extent the small rural water providers in Colombia have managed to have a role in the Colombian policy making in relation to the rural drinking water provision? How to make this participation increase so that there is more equitable and fair policies that can be developed and implemented in the rural national level? What other types of inequalities have developed and disappeared since the presence of AQUACOL in the territory?

What other unintended consequences, apart from the creation of social capital, AQUACOL has created in the rural communities? Emphasizing on people narratives, finding out what users have to say about the role AQUACOL, the role of the institution in their lives; what do communities think is the next step? What has being the community experience and what do they have gained during the construction of social capital? What role has AQUACOL had in the development of gender roles in the associated communities?

Another question that could be answered in future research is related to the indicators (economical, environmental, and social) that look to make a profile on the situation of the country. Establishing what is truly behind the different indicators in the rural areas of Colombia can be interesting to see. Usually, depending on the perspective, the results show different outcomes. In the case of public services, indicators measure the amount of people being provided with the service (drinking water), but there is not really information on how much of that water is actually appropriate for human consumption, not giving a clear idea of the public service situation in the country.

Finally, it would be interesting to understand the powerful relations that exist inside the different communities', municipalities and territories in relation to AQUACOL, making it possible to understand the complexity of the situation and the role of the different institutions, while determining the conditions there must exist so that the model that AQUACOL proposes can be used in different territories.

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## **Interviews**

Anyela Torres was interviewed on February 23, 2012.

She is the current secretary of AQUACOL and the legal representative of La Sirena Aqueduct (member of AQUACOL) located in Cali, Valle del Cauca, Colombia.

Mariela Garcia was interviewed on March 1, 2012.

She is a member of the direction team of CINARA; the Director of the Research team on institutional development and communitary management in water and sanitation ; and an Associate professor of the Valle University.

## Appendix

### Appendix 1. Water legislation in Colombia

Colombian laws related to drinking water rights, use and quality.

Political constitution	Water rights	The provision of public services and environmental sanitation are a duty of the state and the state must improve the population basic needs, like access to drinkable water, not only in terms of universal coverage service, but a continuous and reliable services. It is also stated that is a duty of the State to guarantee the wellbeing and improvement of the living conditions of the citizens while taking care of the health, education, environmental sanitation and drinking water (article 366; CPC, 1991). To do so, the state should establish policies that will guarantee the provision of the service by private entities, while developing policies that allow the proper monitoring and control of the quality of the service that is provided by the entities (article 49).
Law 99, 1993	Law that creates the Ministry of Environment Created by the Presidency	
Law 142, 1994	Law of Public services Created by the Presidency	Municipality's role is to guarantee the provision of water and sanitation services

for their communities, while the State guarantees the municipality's performance by increasing its economic investment in the sector. According to law 142, the municipalities are required to invest 5.4% of the annual budget they receive in the water sector (budget settlement on the System of General Shares or Sistema General de Participaciones SGP), either in new infrastructure or subsidizing the tariffs that the poor cannot afford (Law 1176 from 2007).

Regulatory Commission for Potable Water and Basic Sanitation (**CRA**, Comision reguladora de agua potable y saneamiento basico) Design the methodologies that would lead to the establishment of the cost and tariffs providers could and should impose to the users, while regulating the possible monopolies that can be created in the sector. These methodologies have to assure the superiority of the service regarding management, measurement, efficiency and quality of the water (Salinas, 2011; Rojas et al, 2011).

Superintendency of Residential Public Services (**SSPD**, Superintendencia de servicios publicos domiciliarios) Entity that monitors and controls the technical and quality norms and regulations for the provision of the water and sanitation services. These are supposed to be fulfilled in an efficient, competitive and sustainable way, while



## Appendix 2. Community Learning Centers

(Centros Comunitarios de aprendizaje)

(Source : made by the author for this thesis)

