RURAL WATER SUPPLY IN COLOMBIA

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Economía, Organización y Ciencias Sociales

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Editorial Área de Innovación y Desarrollo,S.L.

ÁREA DE INNOVACIÓN Y DESARROLLO, S.L.
C/ Els Alzamora, 17 - 03802 - ALCOY (ALICANTE) info@3ciencias.com

Primera edición: **noviembre 2017**

ISBN: **978-84-947848-6-6**

DOI: **http://dx.doi.org/10.17993/EcoOrgyCso.2017.28**

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Index

ABSTRACT

Colombia has made significant advances in recent year to reduce water inequality in rural parts of the country. The key method by which this has been achieved in community-based management, complemented by the assistance of government, NGOs, and the private sector. There is some resistance to this method; in general, though, support is widespread, and its use continues to be prevalent. This book reviews efforts to date to resolve the rural water supply problem, assessing the successes and failures of various programs and systems, and identifying potential solutions for improving community-based management in the future.

Key words: Colombia, community-based management, rural water supply, urban water supply.

RESUMEN

Colombia ha logrado avances significativos en el año reciente para reducir la desigualdad del agua en las zonas rurales del país. El método clave por el cual se ha logrado esto en la gestión comunitaria, complementada con la asistencia del gobierno, las ONG y el sector privado. Hay cierta resistencia a este método; en general, sin embargo, el apoyo es generalizado, y su uso sigue siendo frecuente. En este libro se examinan los esfuerzos realizados hasta la fecha para resolver el problema del suministro de agua en zonas rurales, evaluar los éxitos y fracasos de diversos programas y sistemas e identificar posibles soluciones para mejorar la gestión basada en la comunidad en el futuro.

Palabras clave: Colombia, gestión basada en la comunidad, abastecimiento de agua rural, abastecimiento urbano de agua.

INTRODUCTION

According to a OECD (2015) study, in hydrological terms, Colombia is one of the world's wealthiest nations. The report adds that, while the country has adequate surface water to meet its needs, the coverage and quality of water supply and sanitation has historically been insubstantial, especially in rural areas. Figures for rural coverage and quality of water supply and sanitation have always been lower than urban figures (Smits, 2002), but this is an issue with which Columbia has been engaged in tackling for some time (Arana, 2016). The Antea Group, who conducted an extensive market survey of Colombia's water sector in 2012, argue that the country's government has been at the forefront of the development of excellent water sector policies to resolve this inequality. The survey highlights the fact that the nation has developed an extensive legal architecture that draws distinctions between policy-making and service provision, which, it adds, facilitates the involvement of private organizations. The involvement of the private sector in Colombia's water management – and resource management in general, for that matter – is novel in comparison with other countries (Plummer, 2002) with origins stretching back only to the 1991 Constitution (Gómez-Lobo & Meléndez, 2008). It has been instrumental in the improvements made to the country's water sector. Colombia's success in establishing this legal framework, and in reforming a water sector that gave coverage to a mere 44% of its geographical area in 1993 (Perez, Gomez, & Valencia, 1997), is largely thanks to its capacity to devise, develop, establish, and implement country-, context-, and environment-specific solutions, and its successful adaptation of theoretical models employed in other parts of the world to the specific environmental and cultural circumstances of the country (Giugale, Lafourcade, & Luff, 2002; Lockwood & Smits, 2011; Sánchez-Triana, Ahmed, & Awe, 2007). The country's capacity for reform is driven by a desire to ameliorate the 'efficiency, efficacy, and effectiveness' of water management, both urban and rural, in a sustainable way, by re-evaluating norms, strengthening relevant institutions, and engaging in water management regulation (OECD 2015). The upshot of this is notable headway in the broadening of water supply and sanitation services (Lockwood & Smits, 2011; Giugale et al., 2002; Marin, 2009). However, urban water supply coverage is still far more extensive than rural water supply coverage, and even for many of those in rural areas with access to water supply, water quality is so low that the supply is not potable (OECD, 2015). This is unusual given that Moriarty and Butterworth (2003) feel that there has been a heavy inclination in the country towards investing in water supplies for the purpose of solving public health issues – that is, towards the supply of potable water supplied

to meet demands for better hygiene. Even so, while only the progress of expanding rural water supply services is of concern here, as opposed to the expansion of rural water sanitation services, this does not mean to say that any implications are made that improving supply but not sanitation is beneficial or desirable. To the contrary, Fragano (2011) suggests that this can be detrimental for health. This review will assess efforts to improve rural water supply in Colombia to date, the reasons for any misgivings, and any potential alternative solutions.

1. METHODOLOGY

The literature review presented in this book includes reports, journals, and other academic texts related to the issue of rural water supply in Colombia. It uses an anti-positivist research paradigm. This paradigm centers on the notion that reality can only be understood via subjective interpretation (Myeko, 2014). Anti-positivists believe that there is no simple definitive truth (Keegan, 2009), and that there are multiple different perceptions of reality that are all equally valid (Myeko, 2014). This paradigm is typically associated with qualitative research (Tubey, Rotich, & Bengat, 2015), and is the most commonly used research paradigm within the social sciences (Goodsell, 2013), making it appropriate for this study.

A qualitative research approach was selected for the present research. This means that the data that are gathered are descriptive as opposed to numerical in their nature. There are a number of different advantages to opting for this approach. Qualitative data is typically rich and contains a great deal of depth. It is appropriate for studies in which a detailed understanding of an issue is required, making it well suited to the current study. It also enables situations to be viewed holistically within their proper context (University of Lancaster, 2016).

In addition to these points, qualitative research methods are also appropriate for the study of phenomena that are difficult to describe using numerical data. The supply of water to rural areas of Colombia falls within this category. It is useful for describing current situations and existing circumstances, and yields findings that can aid in the pioneering of new means of understanding the subject of study (University of Southern California, 2017).

The present study involves searching for literature that is relevant to the rural water supply. Sources to be considered for inclusion include journals, official government websites, reports by reputable national and international organizations, and other academic texts. Texts with clear sources of bias or obvious inaccuracies are excluded from the review. All literature that is included is directly relevant to the research topic.

2. NORMATIVE FRAMEWORK

Colombia's normative framework sets a minimum standard for water quality in both rural and urban areas of the nation. Water quality is assessed using the IRCA, or Indicator of Water Quality Risk (IRCA is the acronym for the Spanish version of this indicator's name). This indicator is based upon a number of different water quality parameters, and a high score means that a district has a poor quality of water.

The framework also dictates what the minimum efficiency of water supply systems within each region is. It does this by assessing the net quantity of water that is produced, taking into account the design norms for the systems. If too much or too little water is provided, water use is considered to be inefficient (Smits, Rojas, & Tamayo, 2013).

The Colombian Constitution states that sanitation should be provided efficiently and universally throughout the entire country (Young, 2012). This suggests that rural as well as urban areas should have effective, hygienic sanitation systems in place. Although it does not specifically guarantee personal water supply to all citizens, constitutional case law dictates that access to water is a fundamental right, but that it is only obligatory to provide the minimum quantity of it that is required in order to survive (Sutorius & Rodríguez, 2015).

3. URBAN WATER SUPPLY

The earliest progress in water supply coverage improvements could be seen at the end of the 1980s, when the government unveiled a landmark project called the Water Supply and Sewerage Sector Project. At the time, the country worked on developing tailored ways of cooperating with private organizations to improve rural water supply services, based on methods used in other countries (Giugale et al., 2002). The World Bank contributed $150 to the project, which involved the municipality contracting operations by way of a long-term lease contract to mixed ownerships firms, who controlled operations in conjunction with the municipality, a private international operator, and local private investors (World Bank, 2006a). Cartagena is often cited as the starting point for the country's success in improving water supply services (Oliviera, 2014). While the purpose of this book is not to discuss urban water supply, it is worth looking at the foundations on which rural water supply service provision improvements were based.

At the beginning of the 1990s, Cartagena, which serves as the capital of one of Colombia's main departments (Special Unit for South–South Cooperation, 2016) was characterized by poor water supply services, and coverage was below 70% (World Bank, 2004; World Bank, 2006a; Special Unit for South–South Cooperation, 2016). For that reason, it was important for the government to find a solution. In 1994, a 26-year contract was given to a private firm called Aguas de Cartagena (AGUACAR), which was owned by both the municipality and a number of shareholders, the primary one of which was a firm called Aguas de Barcelona (Plummer, 2002; World Bank, 2004; World bank, 2006a; Special Unit for South–South Cooperation, 2016). According to Plummer (2002), this was unprecedented in Colombia, where private sector participation in basic public service provision had been previously absent. The author adds that the short-term aims of the project were to minimize the fiscal burden of a poorly- run internal operation by delegating managerial function, and to maximize efficiency by exploiting relevant technical prowess from the private sector, while the long-term aim was to obtain funding from global finance institutions to improve and broaden the system. By 2005, 99% of the population of Cartagena and its surrounding areas had access to water supply, helping over 1 million households (World Bank, 2006a).

The success is Cartagena was followed by further progress in Bogota, with the introduction of the Santafe I Water Supply and Sewerage Rehabilitation Project (Giugale et al., 2002), which aimed to turn around the failing Bogota

Water and Sewerage Company with a $145 million loan from the International Bank for Reconstruction and Development – the original World Bank institution – the result of which was improved water supply access for 2 million people (World Bank, 2006a).

4. RURAL WATER SUPPLY

The results of Cartagena and Bogota acted as a catalyst for rural change. Following these successes, the administrations of urban areas expressed an interest in reforming their own water supply services. By the beginning of the 21st century, urban water supply access was almost total, at 99%, while rural water supply was substantially lower, at 71% (World Bank, 2006a). This was obviously problematic given that 24% of the country's population of 45.3 million lived in rural areas. In 2001, the World Bank provided a $40 million IBRD loan as part of the Water Sector Reform Assistance Project, designed to assist the government in the development of a policy to advance water supply services in rural areas (Giugale et al., 2002). Key components of the policy included: subsidizing supply for poorer households; the introduction of transparent funding from the government at national level to municipalities, which correlated with performance; and encouraging the use of small, local contractors (World Bank, 2006a). In 2005, another loan was provided, totaling $70 million, as part of the Water and Sanitation Sector Support Project. This aimed at improving water supply services in the country, efficiently and sustainably, by providing subsidies for the poorest urban residents and by improving the quality of services (Lockwood and Smits, 2011). The key aims of the project were: to expand the participation of private firms in urban areas, by implementing performance-based control agreements with expert operators; to facilitate water supply service improvement funding by obtaining capital grants; and to improve water supply services in urban areas (World Bank, 2006a). The benefits of involving the private sector in rural water supply projects in Colombia is backed by strong case study evidence. For example, Rosensweig (2001) discusses private sector participation in Marinilla, close to Medellin, which he argues is a model that should be replicated in other municipalities in Colombia.

The Vice-Ministry of Water and Sanitation is directly responsible for the provision of water in both rural and urban areas of Colombia. It is a division of the Ministry of Housing and Territory. It works closely with the National Planning Department to develop policies and plans related to water supplies. This department puts together the National Development Plan, which establishes guiding policies for the provision of public services, including water supplies. The most recent National Development Plan prioritizes facilitating access to water in rural areas.

Water is provided via municipalities, private firms, and community-based organizations. The water supply to rural communities is mostly delivered by

small providers, with 96% of providers to such communities falling within this category. The remaining 4% is delivered by large private firms. Small rural providers are subsidized by the government (World Bank, 2016b). Difficulties in assessing the needs of specific rural communities have been identified. This is due to the diverse variety of different ways in which water is used in such areas (Domínguez, Torres-López, Restrepo-Tarquino, Oviedo-Ocaña, & Smout, 2014). This could potentially complicate the allocation of funding.

Water and sanitation management in rural areas of Colombia have been negatively impacted upon by armed conflicts and attacks on infrastructure (Coppi, 2016). Until recently, the nation was caught up in a 52-year-long civil war (Human Rights Watch, 2017) that claimed an estimated 260,000 lives (Barton, 2016). It has now been ended, with a peace treaty being signed in late 2016 (O'Shaughnessy, 2017). It can be difficult to rebuild a country's infrastructure following a sustained period of conflict (Mardirosian, 2010; Molfino, 2014), which means that the damage that the war has caused to the water management capabilities in rural Colombia are likely to be long-lasting.

According to Krause (2009), there is a substantial disparity between water and sanitation provision in affluent and less affluent rural areas. Areas in which the average income is higher have a much larger likelihood of having high-quality water supplies provided than those in which the average income is relatively low (Krause, 2009). This suggests that there is not only inequality between urban and rural districts in terms of water supply, but also that the same is true of wealthy and impoverished rural areas.

Krause (2009) has also noted a larger number of disruptions in water supply to rural areas than to larger cities. This is possibly due to the difficulty in providing water to some of these areas on account of their remote locations. The quality of the drinking water that is provided also tends to be lower in rural areas. The smaller the settlement, the poorer the quality of the water tends to be (Krause, 2009).

There is also evidence that some of the sanitation systems used in rural areas of Colombia are more likely to be harmful to the population than those used in their urban counterparts. Van Koppen et al. (2009) point out that some rural sanitation systems involve sewage being pumped into nearby water systems, which can lead to pollution. Diseases stemming from contaminated water supplies are a major problem in rural Colombia. They include skin infections, intestinal parasites, amoebiasis, gastrointestinal infections, and cholera.

Many consume water straight from the source rather than using the official drinking water system. Some do this because of lack of access to the official system, whereas others do it in spite of being able to access it. They evaluate the quality of the water based upon its appearance, which can often be misleading, as there is sometimes pollution present in water that is visually extremely similar to that which is free from pollution (Rojas & Megerle, 2013).

5. COMMUNITY-BASED MANAGEMENT

Much of the literature on rural water management in Colombia, and other Latin American countries, discusses community-based management. It involves the discretionary pooling of resources and combination of efforts in order to attain common benefits (Ostrom, 2014), entailing basic water supplies being developed by rural communities themselves, through joint participation (Bernal, Rivas, & Peña, 2014). At the heart of community-based management is the idea that communities are in charge of their own development (Quiroga, 1996). Rojas, Tamayo, and García (2011) propose that there are 12,000 instances of this in Colombia alone, improving water supply for over 7 million people. Bernal et al. (2014) and Smits et al. (2013) suggest that these 12,000 community organizations are responsible for approximately 90% of Colombia's rural water supply.

Community-based management is also sometimes generally referred to as community-based natural resource management, defined by Fabricius (2009) as 'the collective use and management of natural resources in rural areas by a group of people with a self-defined, distinct identity, using communally owned facilities.' According to Smits et al. (2013), community-based management is the prevailing means by which of water is supplied to rural areas in Colombia, and Schouten (2006) proposes that very few rural water supply systems are implemented in the modern day without some form of community involvement or participation. It is also the preferred model for rural water service provision in a range of other parts of the world, including various countries across Africa (Harvey & Reed, 2007) and Latin America (De San Miguel, Flores, Vilchis, Tovar, & Pedraza, 2015). This method has been in existence and has been part of the socio-cultural identity of rural areas for some time (Boelens, Roth, & Zwarteveen, 2004) – approximately 40 years in total (Binswanger-Mkhize, De Regt, & Spector, 2010) – suggesting that it is one of the oldest forms of natural resource management in rural communities (Palerm & Martínez, 2009).

Yet, it only gained global recognition in the 1990s, which is when it was formally adopted and awarded legal recognition by Colombia (Congreso de Colombia, 1994). It was around this time that collaborative management fell into the spotlight as a valuable method of gathering various stakeholders to work together, including individuals, communities, all levels of government, and various other civil society organizations (Carlsson & Berkes, 2005). Since then, Colombia has been comparatively more proactive than other Latin American countries in their development of community-based management

initiatives, involving very defined strategies that are consistent with local conditions (Lockwood & Smits, 2011), and ensuring that communities are able to continue operating their water systems once they have been implemented.

Cárdenas (2012) claims that community-based water management programs are the most beneficial option for water management in rural Colombia, as they ensure that relevant knowledge is shared with the community. This means that they can continue to operate their own systems throughout the years to come (Cárdenas, 2012). Haq, Hassan and Ahmad (2014) have also highlighted the benefits associated with this model of water management for rural communities. They claim that it is the most sustainable model.

5.1 Assistance for community-based management programs

Colombia is a State coordinated by central government, whose power is decentralized and delegated to its several departments (32 in total) – that is, regional entities that incorporate various and municipalities (1,112 in total), but that do not retain regulatory autonomy (Bernal et al., 2014; World Bank, 2006a). The decentralized nature of water supply has been more effective than previous centralized models of governance in the country (Rosensweig, 2001; Acevedo, Furlong, & Arias, 2015). These departments are responsible for a variety of functions in relation to funds allocation for water supply and control of water supply, while municipalities are responsible for ensuring access to water in rural areas (Bernal et al., 2014). The country's Law on Public Services provides that municipalities are obliged to control local water supply, but that community-based service-providers – which are more often than not small-scale providers (Solo, 2003) – are tasked with 'the operation and maintenance of systems and the administration of services' (Smits et al., 2013). In one respect, community-based management is a method of autonomous management, which dictates that communities are to be organized and establish their own rules for water management and use (Lockwood, 2002); in another, it is a method of heteronomous management, which dictates that communities require assistance from a variety of sources (World Bank, 1999). While communities may own their own development, this ownership is made possible by the formation of partnerships with various actors to successfully develop programs designed facilitate local decision-making and active involvement in program execution (Quiroga, 1996). Bernal et al. (2014) suggest that such partnerships or interrelationships between these actors or stakeholders is guided by the rules set out in the relevant legislation. It is within this regulatory framework

that Quiroga (1996) proposes that communities are able to identify and define issues, and subsequently to locate appropriate solutions with the actors involved.

The Law on Public Services tacitly requires that municipalities should lend assistance to local service-providers, in order to improve service delivery, the performance of service-providers, and maintenance of systems (Smits et al., 2013). However, seeing as this requirement is not explicit, this is achieved by way of differing systems across municipalities. In some municipalities, assistance is provided directly; in others, the responsibility is assigned to the municipality's urban service-providers; and in many, no assistance is provided. Analogously, some assistance is provided to service-providers by non-governmental organizations (NGOs), where no alternative assistance is available (Tamayo & García, 2006). The World Bank and other NGOs have acted in both an advisory and a support capacity, providing the country with much needed assistance and funding, worth billions of dollars. The World Bank alone has contributed over $700 million to improving the country's water supply (World Bank, 2006a). Assistance is also provided by the government, at both departmental – such as through the Colombian Programa de Cultura Empresarial (Business Culture Program) (Tamayo & García, 2006) – and national level. This is one element of the government's commitment to improving rural water supply in both the short- and long-term. The United Nations Children's Fund (UNICEF) and the World Health Organization (WHO) (2012) argue that government participation, at all levels, in community-based management is essential for the successful development of sustainable water supplies. The proposition that such assistance should be a fundamental component of community-based management is represented in both policy and practical terms in a number of Latin American countries, including Colombia (Departamento Nacional de Planeación [DNP], 2011).

A study by the Inter-American Development bank (IDB), which evaluated the efficacy of the Colombian government's efforts, found that those responsible for providing assistance did not do so effectively, and that there was both a significant need for more effective assistance and exploitation of the assistance available (Smits, Tamayo, Ibarra, Rojas, Benavidez, & Bey, 2012). The IDB has been instrumental in providing financial assistance for community-based management initiatives across the country, aimed at helping improve rural access to good-quality, efficient, and sustainable water supplies, and to build on associated systems and management of these supplies. One program – the CO-L1105: Rural Water Supply and Wastewater Management Program (IDB, 2012a) – was developed in order to support the

development of rural municipalities through the provision of the means to 'operate, maintain, and manage services on a long-term basis' (IDB, 2012b). Information as to how this can be achieved was disseminated through a variety of workshops designed to maximize involvement of locals in the program, which managed to improve access to water supply systems in 8,500 homes in Nariño, Cauca, Antioquia, Cordoba, and La Guajiral – the country's least developed areas (IDB, 2012b).

5.2 Issues with community-based management programs

Even though community-based management programs have led to substantial improvement to rural water access in Colombia (IDB, 2012b; Bernal et al., 2014), and have both empowered local communities and facilitated local development (Bernal, 2011), their results are often disappointing for a variety of reasons. Moreover, Wright et al. (2014) and UNICEF and WHO (2015) argue that, even though there has been significant progress globally and in Colombia over the past two decades, the proportion of Colombia's citizens who have access to good quality sources of water in rural areas is still markedly lower than the proportion of citizens with such access in urban areas. The authors state that this equality gap can be explained by the fact that capacities for knowledge gathering, planning, and decision-making are poorer in rural areas than they are in urban areas. Moreover, both Asociación Colombiana de Ingeniería Sanitaria y Ambiental [ACODAL] (2014) and the DNP (2014) argue that this equality gap can also be explained by the fact that water projects in rural areas have a tendency to be guided more by political motivations than they are in urban areas, rather than by the real sense of urgency that exists in the Colombian water sector (Antea Group, 2012).

Bernal et al. (2014) argue that the failure of these programs is not attributable to the nature of the community-based management model itself, but rather to the fact that a homogeneous public policy or management model has yet to be implemented at the national level in Colombia. The authors add that, while there are national rules for public household services, which includes potable water of a 'bacteriologically and chemically safe' (Perez et al., 1997) nature, these rules are applicable across the board; the country is yet to develop rules specifically for water supply in rural areas. However, the Plan Nacional de Desarrollo de Colombia (National Development Plan of Colombia) (2010-2014) necessitated that guidelines should be developed in this respect. Evidence of these guidelines is yet to be seen, but it is expected that once they have been introduced, the situation

will improve drastically (Bernal et al., 2014). Schouten (2006) broadly argues that it is this lack of public policy or management model that accounts for the fact that many communities still find their management tasks difficult, and thus why many water systems, while successful at first, fail after some time. Even so, Colombia is advanced in the establishment of independent regulators, which controls and enforces regulations on service providers (DuBash and Morgan, 2013).

However, others offer more specific reasons for the failure of these systems. Perez et al. (1997) suggest that a number of community-based solutions, including 'piped gravity water supplies, most with yard or house connections…[or] conventional treatment systems…[and] small-scale treatment plants,' are not built for longevity. For this reason, the state of some existing systems of this nature are progressively becoming worse, others are no longer able to function at all, and some simply can no longer be operated, maintained, and managed by communities. According to Komives, Foster, Halpern, and Wodon (2005), many of these systems are very rudimentary, meaning that they are more likely to fail or begin to deteriorate than the more sophisticated systems in place in cities like Bogota and Cali. Poor distribution networks are one of the key reasons for system failure. Quiroga (1996) found that, once systems are in place, they are connected to households without due evaluation, guidance, or technical assistance, which affects distribution networks. A good illustration of this is the municipality of El Tambo, where water supply has been worsened by unlawful and unofficial connection. The author adds that distribution networks are often designed, constructed, or extended badly. For example, pipes which 'are over- or under-designed, do not include pressure break boxes or pressure or flow control valves, are poorly located, and are of poor quality material' can cause pipes to rupture and thus increase the consumption of water in areas of high water pressure and the failure to deliver water in areas of low pressure. Lockwood and Smits (2011) argue that community-based providers are hampered by issues of a technical and administrative nature.

Roa and Brown (2014) have also note that community-based management programs still receive limited state recognition. This means that they are frequently unable to access state resources. They frequently require unpaid volunteers in order to make them work (Roa & Brown, 2014). Chowns (2015) claims that in practice, they can sometimes be used as a means for the state to ignore its duty to provide water to rural areas under the logic that the communities are charged with the task of managing their own water.

Strickland (2015) believes that community-based management programs in rural Colombia possess a number of different vulnerabilities that can place residents at risk of having to go without water. These vulnerabilities include technical deficiencies, issues related to water sources, and organizational problems. Organizational problems tend to affect the water supply to a greater degree than technical deficiencies or issues related to water sources (Strickland, 2015).

5.3 Private Companies

In recent years, more and more private companies have joined community-based management programs as providers of water and sanitation in rural areas of Colombia. However, it has been arguing that this exacerbates inequality within these districts by placing specific social actors in charge of water management. This means that they have the power to exclude people from access if they wish to do so. It heightens economic inequity and the divide between the genders, as more affluent residents and men tend to have more influence upon the actions of the firms that provide the water (López, 2011).

Helander (2015) also claims that water is often placed in the hands of those with the most power in rural areas on Colombia, and that women tend to suffer the most. She puts this down to corruption. Lombana Cordoba (2011) notes that corruption can prevent water from being provided by private companies. The wealth that was intended to facilitate its delivery is frequently embezzled instead. González de Asís, O'Leary, Ljung and Butterworth (2009) have also stated that private companies providing water infrastructure can lead to price fixing.

Cárdenas (2012) claims that private companies offer a more reliable service than community-based management programs when it comes to the provision of water to rural communities in Colombia. González, Arboleda and Botero (2015) argue that they are necessary to fill the gaps in current water provision. However, Cárdenas (2012) points out that it excludes the community itself from the decision-making process. She has also expressed the notion that it results in a poorer quality of water being provided than when the public sector is responsible for delivering it (Cárdenas, 2012).

Langford (2017) claims that private companies generally tend to provide an inferior quality of water to other modes of water provision in rural areas of community. This has resulted in a negative perception of them developing within the nation. He has noted that pressure has been applied to public

water providers to commercialize and become private entities. He believes that this is likely to have a detrimental impact upon the delivery of water to rural communities (Langford, 2017).

It is also notable that many community-based management programs outsource services to private operators. Whilst some degree of asset ownership and authority remain within the community, tasks such as billing and book keeping are subcontracted to private companies or individuals. This enhances the degree of professionalism that community-based management programs are capable of delivering, and means that they are able to operate in collaboration with private entities (Moriarty, Smits, Butterworth, & Franceys, 2013).

6. DISCUSSION

Although improvements have been made, not all rural water communities have enough resources to satisfy their needs. Some believe that the problem simply lies in the need for sort of assistance to overcome administrative and technical issues. Because programs require substantial assistance, as outlined above, and cannot function effectively without it, Van den Broek and Brown (2015) suggest that community-based management cannot be viewed as a viable method of rural water service delivery. Bernal et al. (2014) also discuss the problematic nature of assistance being necessary for community-based management programs to be effective.

They believe that assistance provided – and the power that is attached to the ability to provide assistance – by the various parties discussed is not always equally distributed. They add that, basically, this means that the model can be disadvantageous because stronger parties, such as the government and NGOs, may wield greater power and thus impose their decisions on weaker parties, such as communities. Leach, Mearns, and Scoones (1999) and Eikeset, Ritcher, Diekert, Dankel, and Stenseth (2011) propose that the relationships between all parties can be complex and challenging. For example, the government is comprised of a number of different departments with varying regulated duties and responsibilities, but which often overlap with each other, thus representing substantial complexity.

Yet, relationships of assistance developed under the guidance of the government may not necessarily be regulated. An illustration of this could be a national rule may dictate the operation of water supplies, but operation may be dictated by local conditions. In order to avoid the complexities involved with certain parties wielding more power, the provision of assistance to communities should be accepted with a caveat limiting the power of these actors, therefore allowing communities to retain the bulk of decision-making power (Berkes, 2009). Another example of these relations being difficult is individuals within communities having their own interests, such as the ownership of land, at the same time as having interests shared with the wider community, such as water supply for that land, which may be in direct conflict with each other. Finally, there is no way of foretelling the ways in which communities will act during decision-making. Some communities will be unified in their beliefs and desires, therefore making things easier, while others will be divided by conflicting beliefs and desires, thus making decision-making inherently more problematic (Carlsson & Berkes, 2005). In some instances, the inability of community members to

agree on issues and arrive at coherent decisions has been enough to prevent the formation of formal organizations (Carlsson & Berkes, 2005). Van den Broek and Brown (2015) propose that these are issues encountered by community-management organizations worldwide, and that, because rural communities are massively diverse in nature, community members constantly display independence and self-reliance, as well as substantial variations in income, sex, and so on, all of which can seriously impede on their ability to engage properly in cooperation and collaboration.

As previously stated, there are some advantages to be gained from private companies providing water in place of community-based organizations. It is possible that they will provide a more reliable service (Cárdenas, 2012), and it could potentially fill gaps in service (González et al., 2015). However, it is clear that the numerous different disadvantages associated with this model of delivery outweigh the advantages. It removes power and knowledge from the community and also adds to inequity (Cárdenas, 2012), with an elite few controlling access to water (Helander, 2015). This suggests that the best option is to provide additional support to community-management organizations and enhance their ability to deliver water and sanitation services.

6.1 Areas of opportunity

In assessing the lifecycle of several potable water treatment facilities in the northeast region of Colombia, Ortiz, Villamizar-Gallardo, and García (2016) concluded that, in order to be sustained in the long-term, many are in need of significant improvement or substantial adaptation to an alternative type of technology better suited to the operation, maintenance, management, and resource capacities of local communities. Quiroga (1996) believes that multi-stage filtration is a good example of such alternative technology. In San Felipe, a small, central municipality, water was improved by incorporating treatment through multi-stage filtration – a mixture of gravel roughing and slow sand filtration – as part of a technology transfer project designed to improve the water distribution network plagued by leaks in taps, pipes, and toilets.

Ortiz et al. (2016) discuss the municipality of La Castilla, where the distribution system was planned and constructed without much community involvement, meaning that it was badly designed and constructed as a result. The authors strongly advocate for community participation at both the design and construction stage to guarantee ongoing success, arguing that 'it is well known that community participation in the entire project cycle is a

determining factor for having a greater chance of ensuring a sustainable water supply project, especially in rural areas. Quiroga (1996) discusses other rural projects in Colombia designed to improve poor distribution networks, all of which are excellent examples of communities solving water-related issues with the assistance of other actors. For instance, in Inza, a small municipality in the south, a project was initiated to improve the water supply system by installing flow restrictors in the distribution system, helping to minimize water loss appreciably and allowing it to be re-treated and distributed to households quicker. In this instance, community members worked alongside the Instituto Cinara, who were able to achieve the aforementioned with funding from UNICEF.

In El Hormiguero, a small community near Cali, a project was initiated to improve the water supply system, the quality of which was poor, as was the quality of the distribution system, taps, pipes, and toilets. The project involved the drilling of a new well, in addition to improving the delivery network and household installations. In this instance, community members worked alongside the Instituto Cinara, the municipal public service, and a number of other organizations, with funding from the Health Secretariat and Plan International. In order to resolve issues of a technical or administrative nature, Lockwood and Smits (2011) state that a broader variety of models of assistance have been developed to ensure that community-based management is as successful as possible. These include: direct assistance from the government through the Business Culture Program; assistance by departmental authorities as part of a wider infrastructure for development efforts; assistance by municipalities for community-based service providers; and technical assistance through NGOs and the private sector. According to Ryan (2006), the purpose of programs like the Business Culture Program is to establish a business culture among rural water supply operators, but the author argues that this is often not enough, and can be complemented by the use of resident score cards, used to give service providers practical feedback.

The IBD's revelation that community-based water management programs require additional assistance also represents an opportunity. It means that the Colombian government is now more aware of this deficiency and can take the necessary steps that are required in order to remedy it. It also means that it will feel additional pressure to do so due to the fact that external bodies are aware of the situation.
In addition to these points, according to Transparency International, the fact that Colombia's 25-year war has finally come to an end represents a major opportunity for expanding rural water infrastructure. This could enhance the

level of coverage. Transport infrastructure could also facilitate better testing of water supplies to reduce the levels of contamination, as samples could be taken to laboratories for examination more easily. This could potentially boost the quality of rural water supplies and reduce the likelihood of them carrying water-borne diseases.

7. CONCLUSIONS

From the available evidence, it appears that excellent progress has been made in Colombia to improve water service delivery across the country's rural areas. The community-based management approach has been instrumental to the country's success in expanding coverage in the past two and a half decades. Placing the responsibility for development in the hands of community members and complementing this with vital assistance from various actors has been an important means of effecting essential change. The approach has been backed by a robust policy and regulatory framework, without which such change would have been impracticable. Recent solutions have helped place communities in a position to operate, maintain, and manage their own systems once they have been installed, which means that they are mostly self-sufficient from that point onwards, requiring minimal ongoing assistance. However, it is important to note that it is vital to strike a balance between offering reduced yet essential post-construction support and monitoring, as often the scale can tip too far in one direction (Bakalian & Wakeman, 2009).

Yet, even in the face of positive change, it is clear that the existing focus on community-based management has not yet managed to eradicate water inequality between urban and rural areas in the country. While, collaboration between communities and the government, NGOs, and the private sector has proven successful, some argue that the basic nature of such relationships, in terms of conflicting interests and imbalanced power, mean that community-based management can never work. Nonetheless, this seems to be a minority opinion. The reality is that the systems installed in communities must be suitable for the needs and capabilities of those communities. Thus, in moving forwards, these factors must be taken into consideration, in addition to the technical viability of the systems in question, when considering the suitability of any given water supply system for a rural community.

The current system for managing the provision of water to rural communities in Colombia is by no means perfect. Rural areas have less consistency in the delivery of water resources, and less coverage. They also generally tend to suffer from reduced quality water. However, it appears that the government is taking steps to rectify these issues. Maybe now that the country is no longer in a state of conflict and its infrastructures can be enhanced, there will come a time when rural and urban areas have a similarly high quality of water management associated with them.

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