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## The Impact of Support to Community-Based Rural Water Service Providers: Evidence from Colombia

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**ABSTRACT:** There is widespread recognition of the importance of support to community-based water service providers for sustainability of rural water supplies. However, there is little quantitative evidence to back this claim and a very limited understanding about the characteristics of support agents that are most significant in providing effective support.

This paper presents the results of a study on support to service providers in Colombia, including a quantitative analysis of the impact of different support agents on service levels, performance of service providers and functionality of infrastructure assets. The methodology included: 1) characterisation of seven different support agents and their performance, 2) analysis of service levels, performance of service providers and functionality of infrastructure for 29 service providers that received structured support, and 3) analysis of the same factors for 11 service providers that did not receive structured support.

Nearly all service providers in this study were found to receive some type of support, but sometimes this was unstructured and irregular. The providers receiving support in a structured and frequent manner performed better against a list of expected functions than the ones receiving ad hoc support. However, there was no clear effect found between support and the level of service that users received or the asset status. The paper also concludes that there is scope to improve the effectiveness of support agents, with key factors identified which explain that effectiveness; these key factors are the frequency of support, the institutional capacity of the support agent and the targeting of support to different types of communities.

**KEYWORDS:** Rural water supply, recurrent support, community-based management, service providers, support agents

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## INTRODUCTION

Community-based management is the most common rural water service delivery model in Colombia. Although it has been the predominant approach for many decades, it was only in the 1990s that community-based service providers were legally recognised and regulated within the sector's institutional framework, particularly through the Law on Public Services (Congreso de Colombia, 1994). This dictates that municipalities are responsible for ensuring service delivery, but community-based (or municipal, private or mixed) service providers are responsible for the actual operation and maintenance (O&M) of systems and administration of the services. It implicitly implies that municipalities have a role in supporting the community-based service providers in their area of jurisdiction. As no specific

guidance or regulations were developed for fulfilment of this role, a diversity of mechanisms has emerged through which municipalities provide support. Some provide support directly, while others have delegated the support function to their urban utilities. Many smaller municipalities have not set up any support mechanisms at all. In parallel, both the national government and some departmental<sup>1</sup> governments have set up support programmes, though often with limited geographical scope. In some areas where no support was available, other approaches have emerged whereby community-based service providers source support by associating themselves with, or seeking assistance from, NGOs.

The Government of Colombia is engaged in various programmes to extend rural water supplies and improve their sustainability. The further development of mechanisms for support to service providers is one of the components of these programmes. In order to inform this effort, the Inter-American Development Bank (IDB) commissioned a study to assess the effectiveness of different support agents in improving rural water supplies.

This paper presents the results of the study. It focuses on assessment of the impacts of support on service levels, the performance of service providers and asset functionality. The paper also examines the characteristics of the support agents that might explain the effectiveness of the support provided.

A discussion on the concept of support to service providers and its role in sustainability of rural water supplies sets the scene. This is followed by a description of the study methodology. The key findings<sup>2</sup> are then presented, followed by conclusions and a discussion.

## CONCEPTUAL FRAMEWORK

Community-based management has been promoted as the main service delivery model for rural water across the globe since the 1990s. The key characteristic of this model is that a community-based organisation acts as service provider and that the user community has the ultimate decision-making power over how services are provided. A wide body of literature exists describing the potential merits of this approach (Schouten and Moriarty, 2003; Bakalian and Wakeman, 2009).

While there are 'islands of success' (Davis and Iyer, 2002) of community-based service providers, there is a growing recognition that the majority of them struggle to provide quality water supply services without some form of support (Lockwood, 2002; Lockwood et al., 2003; Schouten and Moriarty, 2003; Harvey and Reed, 2006; RWSN, 2010). A recent review of rural water management and support arrangements in 13 countries determined that support should, in fact, be seen as an integral part of community-based management (Lockwood and Smits, 2011). This has been recognised both in policy and practice in various countries in Latin America (Lockwood, 2002), including Bolivia (Quiroz et al., 2006), Brazil (Meleg, 2011), Honduras (WSP, 2004) and indeed Colombia (DNP, 2011).

Different authors use different terminology to describe the concept of the provision of support to (community-based) service providers in their O&M and administration activities by an external entity: institutional support mechanisms (Lockwood, 2002), follow-up support (Lockwood et al., 2003), post-construction support (Bakalian and Wakeman, 2009) and direct support (Smits et al., 2011). Though post-construction support is the term most in use in the Colombian policy framework (DNP, 2011), here we use the term 'support to service providers', as post-construction support is sometimes understood to mean the support for the few months after project implementation is completed, and not the ongoing and continuous support referred to in this paper.

In a study in Bolivia, Ghana and Peru, Whittington et al. (2009) show that the vast majority of community-based service providers, in fact, do receive some external support. However, they mostly

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<sup>1</sup> The Department is the name of the administrative level found between the national and municipal levels.

<sup>2</sup> The full set of findings is available in Spanish in Smits et al. (2012).

solicit and receive this in an ad hoc manner, if and when the need arises and in response to specific problems. Smits et al. (2011) argue that such ad hoc support is different from cases where community-based service providers have a structural relationship with support agents, who visit them and provide support on a regular basis, and are thereby able to anticipate problems. This paper focuses on these structured forms of support to service providers.

Smits et al. (2011) identify the following typical support activities (based on Whittington et al., 2009; Lockwood and Smits, 2010; and Fonseca et al., 2011):

- Monitoring, including water-quality testing and auditing.
- Technical advice in aspects of O&M, administration and organisational development.
- Conflict resolution and moderating between different groups in the community.
- Support in identifying capital maintenance needs and resource mobilisation for such works. Monetary or material support is normally not considered as part of the support functions. It may entail identifying possible funding sources and development of funding proposals.
- (Re)training and refresher courses for service providers.
- Provision of information materials, such as manuals, guidelines and other informative material.

There are different types of institutional arrangements for the function of the support agents, as summarised in Smits et al. (2011):

- In many countries, local governments are the mandated water service authorities (Lockwood and Smits, 2011), the entities ultimately responsible for the provision of water services, through functions such as planning, coordination, regulation and oversight. Though support to service providers may not always be an explicit function of service authority, many actually do carry out this function directly.
- Local government may also delegate this function to a specialised entity, such as a private company, as in some locations in South Africa (Gibson, 2010) or an urban utility, such as the cases from Aguas Manantiales de Pácora and Aguas de Manizales, reported here.
- In some cases, a national government body fulfils the support agent function. Examples include the *Programa de Cultura Empresarial* (business culture programme) in Colombia (Tamayo and García, 2006) and various circuit rider programmes in Central America (Lockwood, 2002). National government may also delegate this function to specialised entities, such as urban utilities in Chile (Fuentealba, 2011), or delegate it to deconcentrated provincial offices, as for example in Namibia (Gibson and Matengu, 2010).
- Associations of community-based service providers form another common institutional arrangement for support. Such associations contract technical assistance from a specialised agency or individuals on behalf of their members, or provide mutual assistance among them. They may also jointly undertake advocacy and policy-influencing activities. Glas and Lambrecht (2010) provide an overview of examples of different types of associations.
- Mixed models combine elements of two or more of the arrangements mentioned above, typically a combination of an association of community-based provider with (local) government involvement. An example of this is the Integrated System for Rural Sanitation in Brazil (SISAR), an association formed by rural service providers that is supported by local government, drawing on technical expertise of urban utilities for support (Meleg, 2011).

Where government provides support to service providers, it can be seen as a de facto transfer of resources from the state to the service provider. Instead of transferring cash to the service provider for

it to contract the required technical staff, the state fills the gap by providing technical assistance. Based on a review of cases of support to service providers from ten countries, Smits et al. (2011) tentatively concluded that expenditure of less than US\$1 per person per year on support was insufficient to ensure improved service delivery – and that an expenditure of more than US\$2-3 per person per year is probably needed to have any effect. Such assistance (financial or other) is needed because the small scale of operation<sup>3</sup> of rural service providers does not generate the economies of scale for each provider to have the required technical expertise in-house or the financial capabilities to contract entities with the expertise. As a result, such expertise needs to be shared between a large number of rural service providers, and can thus be facilitated by the state. Moreover, these costs are often too high to be fully borne by users through tariffs and thus require some level of subsidy (Smits et al., 2011).

Support to service providers is expected to overcome inherent weaknesses in community-based management, and result in:

- Improved service delivery. Support may help to identify small problems in service delivery at an early stage so that corrective action can still be taken and service levels maintained according to standards.
- Improved performance of service providers. Skills can be transferred through support to the service providers, with the aim of better fulfilling their tasks in O&M and administration.
- Better maintenance of the assets. Capital maintenance is generally one of the biggest weaknesses in sustainability of rural services (Fonseca et al., 2013). Community-based service providers often lack funds for capital maintenance and, in addition, may also lack the skills for conducting needs assessments and performing the required interventions. Support agents may facilitate these processes to effectively take place.

However, evidence to support these claims is limited. In a study in Bolivia, Ghana and Peru, Bakalian and Wakeman (2009) did not find a statistically significant association between technical support visits to water systems and the functioning of these systems. However, the same study identified a correlation between support visits in non-technical aspects and performance of the service providers (Whittington et al., 2009). In a study in El Salvador, Kayser et al. (2010) found a statistically significant higher performance of service providers receiving regular support compared to those not receiving support in aspects such as disinfection, tariff payment and transparency in accounting. From a study in the Dominican Republic, Schweitzer and Mihelcic (2012) concluded that financial durability, measured as the ability of tariff-generated income to cover operational costs, improved with increased frequency of support visits, as did the degree of community participation. Adank et al. (2013) found that service providers that regularly received monitoring and support visits by the District Water and Sanitation Team had a better performance in, amongst others, periodic maintenance and financial management than those that did not receive such visits. These cases point to a correlation between support and the performance of service providers in their basic functions and duties, though not necessarily with the functioning of the systems or the level of service provided.

The above studies did not assess how different characteristics of support agents may influence the effectiveness of the support provided. Our hypothesis was that the impact of the support provided would depend on factors such as the frequency of support, the quality of the support provided or the types of tools and methods used. There was expected to be considerable variation in these factors across support agents.

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<sup>3</sup> For example, Colombia has a rural population of ten million, served through an estimated 11,500 community-based service providers (DNP, 2007).

## METHODOLOGY

Using quantitative methods, this study analysed the relationships between 1) the characteristics and performance of different support agents, 2) the performance of the service provider receiving support, and 3) the level of water service provided.

### Support agents

We selected seven support agents operating in the Departments of Caldas, Cauca and Valle del Cauca. These were selected based on the results of an earlier qualitative study (Rojas et al., 2011) as the most prominent support agents in this region. Key features of these support agents are provided in Table 1.

Table 1. Key features of support agents.

| Support agent (short name or acronym in Spanish is also given within brackets)  | Type of entity                                   | Way support is provided  |
|---|--|--|
| Business Culture Programme by the Ministry of Environment, Housing and Territorial Development (MAVDT)                  | National government                              | Service providers express demand for support, after which the MAVDT assigns a local consultant to provide the support, following standard support components, mainly focused on professionalising performance of the service provider.   |
| Drinking Water and Sanitation Unit of the Housing Secretariat of the Government of Caldas (Housing Secretariat, Caldas) | Departmental government                          | Unit dedicated to promoting improved service delivery. Its technicians visit communities on demand and try and address problems with the respective municipalities in the area.  |
| Sanitation Executive Unit of the Municipal Health Secretariat of the Municipality of Cali (UES, Cali)                   | Local government                                 | Unit with two technicians who regularly visit rural systems in the municipal area and either address problems directly, or refer service providers to specialised entities. Solutions to problems that are common across systems are discussed in regular roundtable meetings. |
| Aguas Manantiales de Pácora   | Specialised entity                               | At the request of the municipality, this urban utility provides support to surrounding rural service providers on demand. However, this support function is not formalised.  |
| Aguas de Manzales   | Specialised entity                               | At the request of the municipality, this urban utility provides support to surrounding rural service providers on demand. However, this support function is not formalised.  |
| Association of Community-Based Water and Sanitation Service Providers of Colombia (AQUACOL)                             | Association of community-based service providers | Members of the association provide mutual support to. The board of AQUACOL may also identify problems in service delivery among its members and organise technical assistance to address these.  |
| Organic Coffee Foundation of the Coffee Growers' Association, Caldas (Coffee Growers' Association)                      | NGO  | The Coffee Growers' Association provides billing, bookkeeping and other administrative services to service providers that are members. It may also provide technical assistance on a demand basis.   |

### Sampling frame

To examine the impact of the work of these seven support agents, 40 water providers and systems were selected (the final sample had 29 supported systems and 11 non-supported systems). The systems were selected from the databases of the support agents. From the total population of water systems supported by each support agent, we eliminated from our sample frame those that: 1) served less than 50 or more than 1000 households; 2) were linked to the support agent for under 1 year, 3) had very poor accessibility in terms of time from the main municipal town or being located in zones of armed conflict. From the remaining population of supported systems, a sample was selected randomly. Water systems known to not receive any, or only ad hoc, support were selected randomly to form a sample. These were selected from Departmental databases, after following the same elimination filters (apart from the one on time, linked to the support agent).

After data collection, some systems had to be reclassified: some systems nominally supported by one of the identified support agents were in reality not getting any support; some that were selected as not getting support, were in fact receiving support from one of the agents; and ten of the 40 systems got support from another agent, apart from those pre-identified; these ten received support mostly for their respective municipalities. These were classified as 'other' support agents. As a result of this reclassification, for some support agents the number of supported water systems in the sample was lower than expected, as shown in Table 2.

Table 2. Number of supported water systems included in the study (n) in comparison to the total population ( $N_0$ ) and the total population after applying the elimination filter ( $N_1$ ).

| Support agent               | Number of water systems supported by each support agent ( $N_0$ ) | Number of water systems supported by each support agent, after applying filter ( $N_1$ ) | Number of water systems in the study after reclassification (n) |
|-----------------------------|---|--|---|
| MAVDT                       | 47  | 19   | 2   |
| Housing Secretariat, Caldas | 37  | 12   | 2   |
| UES Cali                    | 67  | 12   | 4   |
| Aguas Manantiales de Pácora | 27  | 7  | 1   |
| Aguas de Manizales          | 25  | 4  | 3   |
| AQUACOL                     | 18  | 9  | 3   |
| Coffee Growers' Association | 193   | 100  | 4   |
| Other                       | Unknown   | Unknown  | 10  |
| No support                  | ~ 2300  | -  | 11  |

### Indicator sets

Four indicator sets were defined to structure data collection and subsequent scoring of each set:

*Descriptive characteristics of the water systems.* This refers to those characteristics that are not scored, but that were expected to influence the score on the other parameter sets, and includes, for example, the number of users, the type of technology and the age of water systems.

*Service levels.* This refers to the characteristics of the water service that the users receive (Moriarty et al., 2010), and this study includes coverage, continuity, net quantity of supply, water quality and user satisfaction. For each of the indicators, we established ordinal scales to allow converting continuous and qualitative data to ordinal numbers, on a scale from 0.25 to 1, for subsequent processing to overall

service-level scores (see Table 3). In this, we established the benchmark for what is considered adequate at a score of 0.75. The corresponding values for the benchmark differed for each indicator, and were either derived from normative standards (such as for water quality) or from what sector experts considered an adequate degree of compliance with a certain indicator.

Table 3. Scores and indicators for service levels.

| Score | Coverage | Continuity of supply | Water quality <sup>4</sup>   | Water quantity received by users (litres per capita per day – lpcd) <sup>5</sup> | User satisfaction  |
|-------|----------|----------------------|--|--|--|
| 1     | >90%     | >23 hours/day        | Meets all water-quality standards with IRCA score: 0-5% (no risk)              | 130-170  | More than 80% of the consulted population satisfied with water quality, quantity, continuity and tariff. |
| 0.75  | 80-90%   | 20-23 hours/day      | Meets basic water-quality standards with IRCA score: 5, 1-14% (low risk)       | 100-129 or 171-200   | At least 70% of the consulted population satisfied with at least three of the indicators.                |
| 0.5   | 60-79%   | 12-19 hours/day      | Does not meet IRCA standards, with IRCA score: 14, 1-80% (medium to high risk) | 50-99 or 201 -250  | At least 50% of the consulted population satisfied with at least three of the indicators.                |
| 0.25  | <59%     | < 12 hours/day       | No water-quality test records available or IRCA score: >80% (very high risk)   | <50 or >250 or no water- quantity records available                              | Less than 50% of the consulted population satisfied with at least three of the indicators.               |

Data on each indicator were obtained from the records that service providers keep. Only user satisfaction data were collected in a focus group discussion. If service providers did not have records of an indicator, as was the case in various instances on water quality, the lowest possible score was assigned to that indicator, as that would indicate that probably the service provider was not addressing that indicator in a structured manner. The overall service level was established by summing the scores of the five indicators, in which all indicators had the same weight. Each system thus obtained a score on a scale from 1.25 to 5, with 5 indicating the highest possible service level, and 3.75 being the benchmark for an overall adequate service level.

*Performance of the service provider.* For each water system, the performance of the respective service provider was assessed in terms of compliance against 21 indicators grouped into three categories of

<sup>4</sup> The national normative measure to assess water quality is through the Indicator of Water Quality Risk, or IRCA (its acronym in Spanish). This is a composite indicator based on a number of water quality parameters, with a higher score indicating a poorer water quality (Ministerio de la Protección Social y Ministerio de Ambiente, Vivienda y Desarrollo Territorial, 2007).

<sup>5</sup> A low score was assigned to systems where the net quantity was below design norms, as well as where it was well above that, as the normative framework considers this to indicate inefficient water use.

service providers' responsibilities: 1) internal organisation, 2) administration of the water service, and 3) O&M tasks. Table 4 lists all the indicators used as well as a short description of them. These were identified on the basis of requirements for service providers as defined in the legal framework for service provision of Colombia (Congreso de Colombia, 1994), complemented by factors identified in earlier studies on community-based management in Colombia (Ministerio de Desarrollo et al., 1998; Pérez Rincón, 2002).

Table 4. Indicators used to assess the performance of the service provider.

| Indicator   | Definition  |
|---|---|
| <i>1. Internal organisation</i>                       |   |
| 1.1 Legal status of the service provider              | Degree of compliance with legal registration of the service provider with the relevant authorities  |
| 1.2 Customer relation procedures                      | Presence of procedures for customer complaints and ratio of number of complaints to number of customers   |
| 1.3 Organisational values                             | Existence of the mission, vision, values and goals of the service provider  |
| 1.4 Organisational structure                          | Presence of a clearly articulated organisational structure and job profiles   |
| 1.5 Asset management                                  | Existence of an asset management plan   |
| 1.6 Gender balance                                    | Ratio of the number of women on the board or as paid staff of the service provider to the total number of persons on the board or as paid staff             |
| 1.7 Accountability mechanism                          | Existence of mechanisms to inform customers about the performance of the service provider   |
| 1.8 Inter-institutional relations                     | Number of other entities with which the service provider has a structural collaborative relationship  |
| 1.9 Renewal of the board                              | The board of the service provider is regularly renewed as per the providers' statutes   |
| <i>2. Administration</i>                              |   |
| 2.1 Training of the personnel of the service provider | Formal training and certification of personnel of the service provider by certified training institutes   |
| 2.2 Inventory of materials and tools                  | Presence of an up to date inventory of all the materials and tools and their way of storage by the service provider   |
| 2.3 User registry                                     | Presence of an up to date registry of all users of the service  |
| 2.4 Debtor rate                                       | Percentage of users who have not settled more than three monthly water bills  |
| 2.5 Mechanisms to reduce rates                        | Presence of formally sanctioned methods to recover overdue water bills from debtors   |
| 2.6 Tariff structure                                  | Degree of compliance of the tariff structure with national tariff regulations   |
| 2.7 Keeping of accounts                               | Presence of up to date financial accounts   |
| <i>3. O&amp;M</i>                                     |   |
| 3.1 Metering  | Percentage of users with installed meters and percentage of water loss  |
| 3.2 Operational capacity                              | Capacity of personnel of the service provider to operate the water system   |
| 3.3 Infrastructure status                             | Ratio of the number of infrastructure components in good state (such as intake, pumps, storage tanks, etc) to the total number of infrastructure components |
| 3.4 Water resources management measures               | Existence of catchment protection or groundwater protection measures by the service provider  |
| 3.5 Water quality management                          | Presence of a potabilisation plant and/or disinfection measures   |

Some of the indicators can be expressed on a continuous scale (e.g. indicator 2.4 debtor rate). The more qualitative indicators were quantified by breaking them down into their constituent parameters, for which a count was done on how many were met. For example, for a service provider to comply fully with indicator 1.1 (legal status), five registrations need to be done with different authorities; we recorded the count of the number of registrations that each service provider had duly completed. In order to bring together the result of both the continuous and the qualitative types of indicators towards an overall score per category, ordinal scores were established on a scale from 0 to 1 for each indicator. The benchmarks differ for each indicator as some represent hard normative requirements (such as the legal registration ones), whereas for others only indicative ranges can be identified from the mentioned studies (such as for the debtor rate or percentage of water losses).

The score per category was obtained by a simple summing of the score of the individual indicators in that category and weighing it so that the maximum score per category would be 33.3. This implies that the individual indicators in the category of O&M have a relatively higher weight, as this category has the least number of indicators; the individual indicators in the category of internal organisation weigh relatively less, as this category is composed of more indicators. This weighting was done so that the score per category could be summed towards an overall score for the performance of the service provider on a scale from 0 to 100, with 100 indicating the highest possible performance. As the benchmarks differ per individual indicator, these could not be simply summed and weighed. Therefore, we defined a simple indicative benchmark for an adequate level of performance at a score of 60 out of 100.

The data for these indicators were obtained through different methods, including a structured interview with staff from the service provider, a sanitary inspection of the water system, a focus group discussion with the board of the service provider and a review of records of the service provider.

*Performance of the support agent.* Nine indicators were identified to describe the performance of the support agent (see Table 5). According to our knowledge, no indicators existed to assess the performance of support agents in Colombia, and we identified these on the basis of the qualitative study done on them by Rojas et al. (2011). However, they were compared and adjusted drawing on similar studies in Ghana (Adank et al., 2013) while the Rural Water and Sanitation Information System (SIASAR) monitoring system was being developed in Central America, which includes a module on the performance of support agents (SIASAR, 2012).

As for the performance of the service providers, an ordinal scoring scale was established on the performance indicators for each of the support agents, so that the results per indicator could be summed towards an overall score.

Data on these indicators were collected through structured interviews with staff of the support agents and a review of their records.

## Analysis

For each of the parameter sets a univariate analysis was carried out of the overall score as well as of the scores of the indicators that make up each set. This was followed by multivariate analyses to establish the correlations between general characteristics of the water systems, the service levels these provide, the status of the assets, the performance of the service providers and the performance of the support agents. The findings were presented in a series of meetings with representatives of support providers, support agents and national government policy makers to interpret the results and discuss possible implications.

Table 5. Indicators used to describe the performance of the support agent.

| Indicator  | Definition   |
|--|--|
| Types of support activities                            | Number of types of support provided by the support agent   |
| Frequency  | Average number of support visits undertaken per system over the last year  |
| Personnel  | Mix of disciplinary backgrounds and expertise of the personnel of the support agent  |
| Tools  | Application of standardised tools and instruments by the support agents in their support activities                        |
| Coverage   | Ratio of the number of water systems assisted during the last year to the number of water systems in its area of operation |
| Monitoring and evaluation                              | Degree of application of structured monitoring and evaluation of the effects of the support by the support agent           |
| Inter-institutional relationships                      | Level of coordination between the support agent and the respective municipality and other entities                         |
| Degree of institutionalisation of the support function | Presence of 1) organisational structure, 2) job descriptions, and 3) goals and target for the support function             |

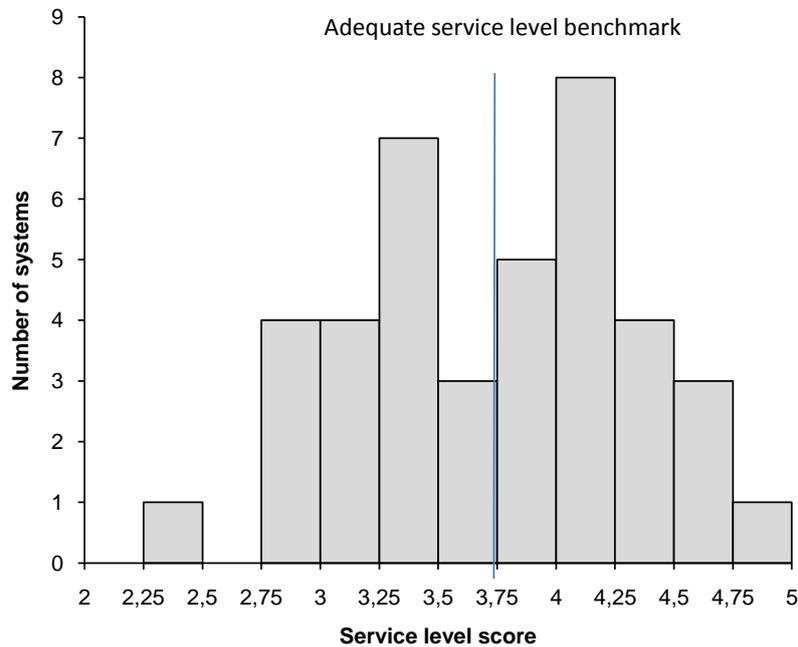
## FINDINGS

### Service levels

Figure 1 presents a histogram of the results of the univariate analysis of the service levels, indicating the number of systems achieving a certain score per indicator as well as the overall score (note that the bin includes the values at the bin's lower limit). As can be seen, there is a wide spread of service-level scores, with a cluster of systems with scores just above the threshold of 3.75, representing an adequate level of service or higher. A second cluster of systems is well below that threshold with a score of between 2.75 and 3.5. As a result, the median score is exactly at the acceptable service level at 3.75.

Indicators most commonly found to be limiting the achievement of higher scores were mainly water quality and to a lesser extent water quantity. More than half (22) of the service providers had no information on water quality, automatically resulting in the lowest possible score on this indicator. As 17 of these systems did not have a functional treatment plant or a functional disinfection installation, it is likely that these systems would score low on the water-quality indicator even if the results of the water-quality test were available. Another nine systems did not have any data on water quantity, which automatically led to a low score on this indicator too. In addition, many systems provided a very high net supply of more than 200 lpcd. Since this is well above the Colombian norms, a low score was assigned in our scoring system. The reasons for these high quantities supplied could not be established with certainty. A likely explanation is that people use their domestic water systems for small-scale productive uses, such as vegetable gardens, livestock watering and post-harvest processing of coffee beans. This kind of multiple use of domestic water supplies is a common practice in the study area and various authors have established that these require relatively high amounts of water, with typical net water consumption levels of around 200 lpcd (Roa García and Brown, 2009; Restrepo Tarquino, 2010; Domínguez et al., 2014 in press).

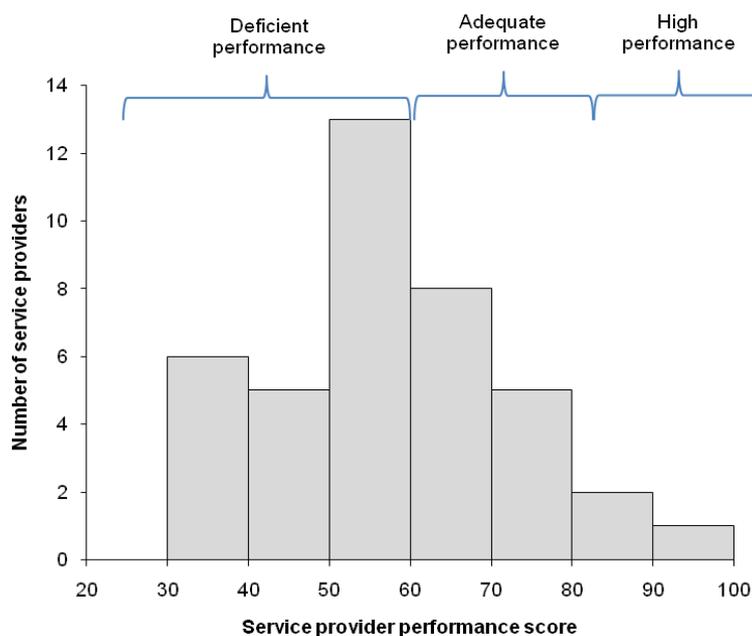
Figure 1. Histogram of service-level scores.



**Performance of service providers**

Figure 2 presents the scores for the performance of the service provider based on the combined assessment of the 21 indicators describing their organisation, administration and operations. Less than half (16) of the service providers had a score above the benchmark for an adequate level of performance (score of 60). Only three service providers achieved a score of more than 80, indicative of a high performance.

Figure 2. Histogram of service provider performance score.



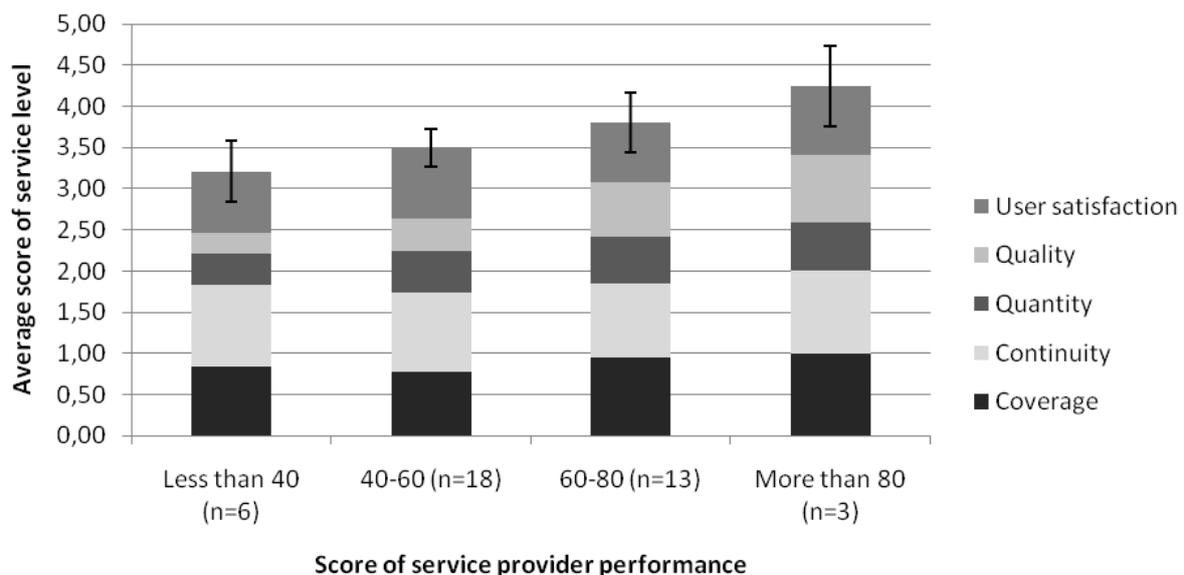
An analysis of the scores per category of indicators and of the individual indicators themselves showed that deficiencies were most common in O&M indicators, with an average score of 17.3 on a scale from 0 to 33.3. The best performance was observed in financial and administrative management indicators, with an average score of 21.1 on a scale from 0 to 33.3. A possible explanation for the relatively high score in financial and administrative management lies in the fact that, in recent years, much emphasis has been placed in the Colombian water sector on the training of service providers in administrative aspects such as bookkeeping, tariff calculation and reducing the percentage of debtors on water bills. This is also illustrated by a very low average level of outstanding debts of 15% on all water bills, a level which is often not even achieved in urban water systems in Colombia (Núñez et al., 2011).

Systems with a drinking water treatment plant had service providers with a higher performance score than those without such plants (at a 95% confidence interval). It is likely that projects to develop plants have been accompanied by efforts to also strengthen capacity of the service providers, as the skills needed to operate and manage such plants are different from less-complicated systems. Also villages with more than 300 users had better-performing service providers with an average score of 73 (on a scale of 0 to 100), compared to an average score of 52 for those with less than 300 inhabitants. This might be because in bigger villages, there is a greater possibility to hire skilled staff for functions of O&M and administration; moreover, the size of the system also requires a more professional service provider. Finally, it was found that, in older systems, the service providers also performed better, probably because over time they had been able to gain experience, build their own capacity and gradually meet the various legal requirements placed on service providers.

**Relation between the performance of the service providers and service level**

A bivariate analysis was carried out on the performance of the service level and service providers. A linear regression between the two scores showed a low level of correlation ( $R^2$  of 0.18 for a 95% confidence interval). Figure 3 shows this trend towards a higher service level as the performance of service providers increases, but with high variability as reflected in the broad error bars.

Figure 3. Average service-level score as a function of service provider performance with 95% confidence interval.



An analysis at the level of individual indicators showed that the only one for which the difference was statistically significant was water quality, with the better-performing service providers having higher scores on the water-quality indicator. Above all, this is explained by the presence of information on water quality. Almost all service providers with a score of 60 or higher provided data for this indicator, whereas the worst performing service lacked such data.

### **Presence of support**

It was found that all but two service providers had received some external support over the last year. In the group of service providers classified as 'with no support' some received ad hoc support, where they went to seek support from a support agent (such as the municipality) to solve a problem but there was no ongoing relation between the service provider and municipality. Even, ad hoc support involved significant numbers of visits. The median of the number of ad hoc support visits was 4 (in the last year), whereas the median of the number of support visits to systems linked to one of the support agents was higher, at 6 visits over the last year.

As mentioned in the methodology section, in about half of the cases, the agents providing support were different from those that had been pre-classified and expected. Some systems nominally linked to a support agent had not received support from that agent. This was mainly the case with the systems pre-classified as being supported by Aguas Manantiales de Pácora and Aguas de Manizales. In some cases, service providers indicated that other entities had been providing support, typically their respective municipalities. Notably, ten of the 40 communities had not had any contact at all recently with their respective municipalities around water-related issues, indicating a weak link between community-based service providers and the municipalities that should formally guarantee sustainable service delivery.

Finally, it was found that most communities received support from more than one source – on average, 2.6 entities per community. Even those communities receiving ad hoc support, did so from different agencies.

### **Impacts of support**

Table 6 shows the scores for water systems that were linked to a support agent and those without such support on three indicators: 1) service levels, 2) performance of service providers, and 3) status of infrastructure. Systems linked to a support agent scored better in all three areas than those not getting any support or get it only in an ad hoc manner. However, it is only for the performance score of the service providers that this difference is significant at a 95% confidence interval. This finding thus confirms those from some of the other studies mentioned (e.g. Whittington et al., 2009; Kayser et al., 2010; Schweitzer and Mihelcic, 2012; and Adank et al., 2013) that the impact of support is mainly seen in the performance of the service provider. This is the more direct relationship of course. There may be a rather weak correlation between performance of the service provider and service level because service levels (and infrastructure status) depend not on the performance of the service provider alone. There may be other influencing factors, such as the time lag or the original quality of the construction: a well-built system might perform well for a while with a weak provider; conversely, if the original system was not developed properly, the service level is likely to be low, even if the service provider meets most of the O&M criteria.

Table 6. Scores for performance of the service provider, service level and infrastructure status for systems with and without structured support to service providers.

|   | Average service-level score (with 95% confidence interval) on a scale from 0 to 5 | Average score for performance of service provider (with 95% confidence interval) on a scale from 0 to 100 | Average score for infrastructure status (with 95% confidence interval) on a scale from 0 to 1 |
|---|---|---|---|
| Systems linked to support agent (n=29)      | 3.63 (0.23)   | 61.1 (5.4)  | 0.84 (0.09)   |
| Systems not linked to support agent (n =11) | 3.52 (0.33)   | 48.1 (5.9)  | 0.77 (0.15)   |

### Factors explaining impact of support

One hypothesis of this study was that there would be a difference in impact between the different support agents, as they are organised and operate in different ways. After the required reclassification the number of systems per support agent was very low, so for this analysis we grouped the scores of the service providers by type of support agent, as shown in Figure 4. This analysis revealed that there is a difference in the score of the performance of the service providers attended by different types of support agents, even though variability within each group is high as reflected in the large error bars indicating the 95% confidence interval. The scores of the providers supported by the two specialised agencies – Aguas Manantiales de Pácora and Aguas de Manzales – were just above 50 and, in fact, only marginally higher than those without support. The service providers with the highest score were those supported by government (Housing Secretariat Caldas and MAVDT), with an average score of 75. Those supported by local government (UES Cali) and civil society (AQUACOL and Coffee Growers' Association) have similar scores, and almost equal to those supported by others, which was mostly the municipality.

One factor that seems to explain performance of service providers is the frequency of support from agents, as shown in Figure 5. The greater the frequency of the support visit to a service provider, the higher the average performance score. The systems supported by MAVDT and AQUACOL had a relatively large number of support visits (median of 8.5 and 8.0 visits, respectively, per year) and the systems concerned had higher performance scores. The only exceptions were the systems that received a very large number of visits (more than once a month), as these were all systems undergoing physical intervention at the moment of research, and they received many visits related to these physical works. It was not possible to differentiate these visits to the physical works from the service delivery support visits and to include them properly in the analysis.

In addition, an analysis was made to investigate whether any of the nine identified indicators for the performance of the support agent explained the observed performance level of the service provider. A positive relation was found between the degree of formalisation of the support agent, the portfolio of support activities that it provided as well as the use of standardised working methodologies and tools, and the performance of the supported service providers, though not statistically significant at a 95% confidence level. This points to the importance of the support agent having a certain degree of institutional capacity, in terms of having a clear mandate and institutional structure, working methodologies and the possibility to offer a full portfolio of support activities.

Figure 4. Average scores for performance of service providers with different support agents, with a 95% confidence interval.

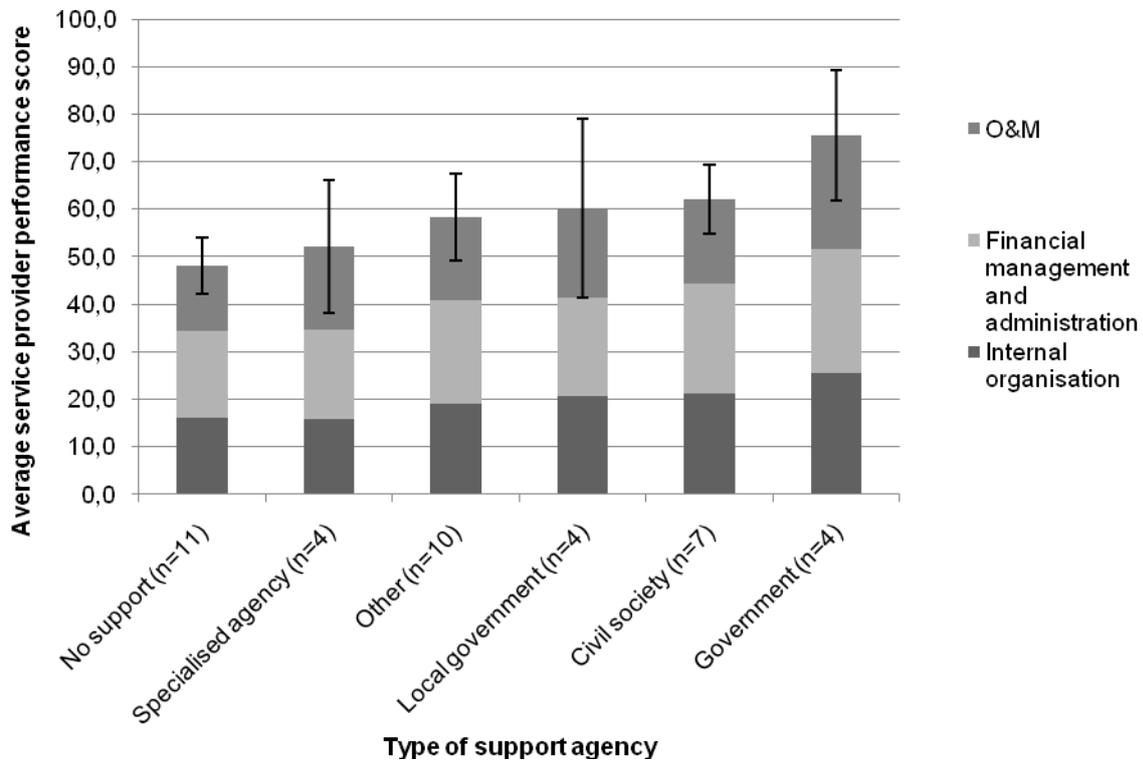
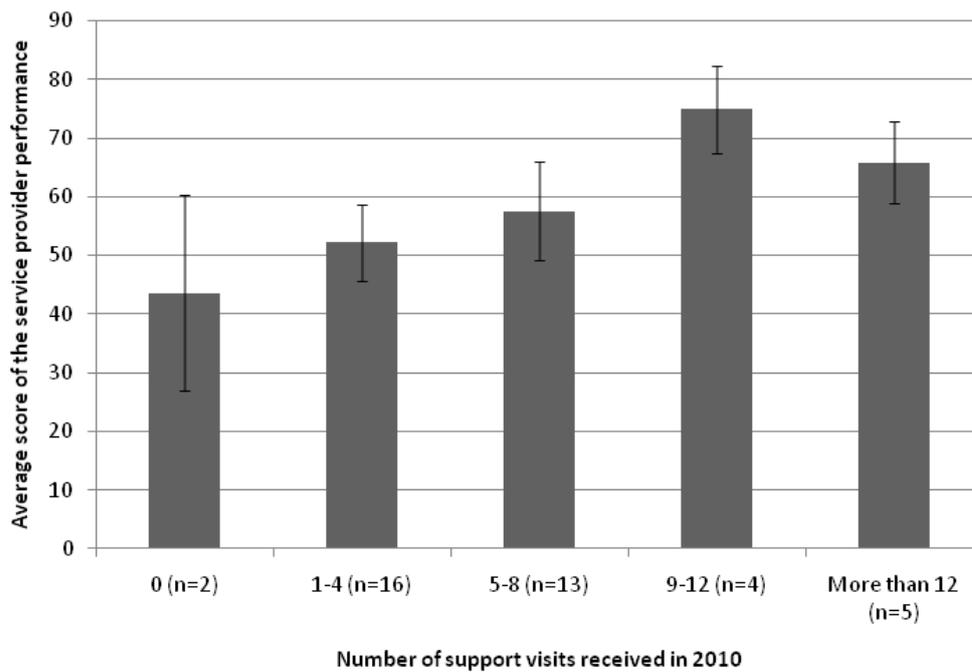


Figure 5. Average scores for the performance of service providers as a function of the number of support visits received in 2010, with a 95% confidence interval.



This was followed by an analysis of the characteristics of the systems that received support, to see whether support was targeted at particular types of systems. This showed all systems without support were small (defined as having less than 300 connected subscribers); those with more than 300 subscribers were all linked to a support agent. Systems with complex technology (meaning either with treatment plant or pumping station) received more frequent support (19 out of 24 systems), whereas only ten out of 16 with simpler technology (gravity-fed schemes without treatment plants) received such support. And support was geared more towards older systems: the average age of systems with support was 14 years, whereas for those without support it was ten years. A possible explanation for the skewed focus of support on bigger, older and more complex systems is that these present both a bigger need and opportunity for support. Service providers may need more support in managing a more complex technology for a larger group of users. In systems that have been operating for a long time, the service providers may have been able to build up a stronger relationship with support agents. However, in bigger villages, the service provider may be better able to find and hire qualified staff and operate as a more professional service provider which actively seeks support.

A paired analysis of service provider performance scores for systems with and without support with each of these factors (number of users, technology type and age) gave some insights into how these may affect service provider performance. The smaller systems without support had the poorest scores for the performance of service providers, as can be seen in Table 7. The bigger systems with support also had better service provider performance scores than the smaller ones with support. Also older systems with support had better service provider performance scores, as did those which received support and had more complex technology (having a water treatment plant), but neither was found to be significant at a 95% confidence level. Finally, a multiple regression analysis was done to assess any compounding between these factors (of age, settlements size and type of technology), which showed that only 29% of the variation of the provider performance scores was explained by these factors, and none of the individual factors was found to be statistically significant at a 95% confidence level. The observed correlations are therefore only indicative and must be interpreted with caution. But they do point towards the possibility that the older and bigger systems start performing better, as they are supported by their respective support agents. Smaller and simpler systems remain unattended and lack the capacity to mobilise the support needed.

Table 7. Impact of support on the performance of service providers in relation to system size.

|   | Average score for performance of service providers<br>(with a 95% confidence level) |
|---|---|
| Systems with less than 300 subscribers not linked to support agent (n=11) | 48.1 (6.5)  |
| Systems with less than 300 subscribers linked to support agent (n=19)     | 54.8 (8.5)  |
| Systems with more than 300 subscribers linked to support agent (n=10)     | 73.0 (6.2)  |

## CONCLUSIONS

The study sought to provide insight on the impacts of assistance by support agents to rural water supply service providers. Analysis related levels of service to consumers, performance of service providers against a list of expected functions and infrastructure asset status to the different types of support agents and water systems that go without support.

Only about half the surveyed water systems obtained what can be considered an acceptable score for the level of service they provide, and also only about half of the service providers perform adequately in their responsibilities of internal organisation, administration and O&M. These relatively low scores are partially a consequence of the fact that many service providers did not have any information on key service characteristics like water quality, which in the chosen scoring method, led automatically to low scores. These scores should not be surprising either, as they reflect a situation found in many countries: a majority of community-based service providers providing services that meet national standards or performance indicators, but a significant percentage that are failing. In Honduras, only about 40% of the service providers scored an 'A' (on a scale from A to D, with A being the highest performance level, and D the lowest) on their O&M and administrative responsibilities (SANAA, 2009); in one of the better performing districts in Ghana, only 1 in 3 water systems provided a service level that met national benchmarks (Adank et al., 2013); the European Court of Auditors (2012) concluded for an audit of European Commission-funded water projects in six countries in Africa that more than half did not deliver the expected results and about a third did not have service providers with the capacity to perform their duties.

These kinds of values provide the rationale for the provision of support to service providers. Almost three quarters of the service providers in this study sought and obtained support, albeit in an ad hoc manner in some cases. The study also found more and different support agents than those originally considered: about eight of the 40 systems received support from an agent who was not the expected one, typically from the municipality in which he is located. Many systems received support from more than one agency, the median being three support entities per water system. This might be because Colombia has not clearly defined the institutional mandate for support, or because service providers, when not receiving adequate support from one agent, actively source it from other agents. The municipality, as the overall authority, is then often the first port of call for service providers. Where municipalities do not provide support, initiatives for obtaining support have been organised by civil society, for example through associations of community-based service providers.

The evidence for the impact of such support is mixed. Service providers who do receive support have statistically and significantly better performance scores (61 out of 100 versus 48 out of 100), and particularly perform better in financial and administrative functions. However, service levels in systems with support are only marginally higher than in systems without such support, as are the scores for the status of infrastructure. The impacts observed on the performance of the service provider do not directly translate into an impact on service levels. Possibly, this is because there are factors outside the scope of the service providers that affect the service level, for example those related to the original design or construction of the water system, such as over- or under-design.

One reason for the modest impact of support on the performance of the service provider is that not all support agents perform well. In fact, the systems linked to some of the support agents performed worse than those without any support. The study sought to identify characteristics of the support agents that may explain the difference in impact. The frequency of support was found to be one of those factors: service providers that received more regular support performed better. In addition, the institutional capacity of the support agent seems to be important, as measured by variables such as having a clear mandate and institutional structure, working methodologies and the possibility of offering a full portfolio of support activities, though none of these was statistically significant. The type of institutional arrangement (government, civil society or specialised agency) was not found to be an explanatory factor within this study. The impact of support is also determined by characteristics of the receiving water system, such as the number of subscribers, the age of the system and the type of technology. Bigger systems and those with more complex technology received support more often and had better performance indicators. This is probably explained by the fact that such systems represent both a bigger need for support and an opportunity to use the support more effectively.

## DISCUSSION ON IMPLICATIONS FOR FUTURE SUPPORT TO SERVICE PROVIDERS

The provision of support represents a subsidy or transfer of resources to rural service providers, and indirectly to the users, who otherwise would have to pay for support through tariffs (and who actually do so in the case of the civil society models of support). Against the findings of this study that support is only partially effective, questions may be raised on whether such transfers of public funds to support rural water service providers are well-spent. In this light, three scenarios might be sketched for future support to service providers in the study area.

One scenario, and the most radical, would be abolishing public funding support to service providers altogether because of its mixed results. Probably only those funded through tariffs, being AQUACOL and the Coffee Growers' Association, would actually continue. Such a scenario might come about in government expenditure reviews if support cannot be shown to have value for money. Stopping support programmes could save some expenditure (on subsidies for support agents) but might well result in poorer service delivery, as shown by the poorer performance of providers without support in this study. Further research is needed to assess how much is currently spent on support (a value we could not obtain in our study) and whether this represents a value-for-money investments in support agents. Given the level of investments involved in support compared to the value of assets, this would be a high-risk option.

A second scenario would be to continue with support but organise their financing differently. Existing transfers might be replaced by a more explicit monetary subsidy from the State to rural service providers, who may use these resources to hire the expertise needed. This option could not be studied as it is not present in the current Colombian rural water policy framework. To our knowledge, there are no such arrangements in the broader Latin American region. Although not a feasible option in the short term, this option could be researched to examine possible benefits and drawbacks that may exist, such as the capacity of community-based service providers to identify support agents, the transparent use of such funding and the actual role of the State in service delivery.

A third scenario might be one of further professionalising the support agents. This would entail strengthening those support agents whose impact is currently low, for example by targeting efforts at the various municipalities that now fulfil that role in an ad hoc manner, and clarifying and formalising the role of municipalities as support agents in the policy and institutional framework. In addition, the two urban utilities (Aguas de Manizales and Aguas Manantiales de Pácora) should be targeted, in terms of strengthening their institutional capacity and increasing the frequency with which support is provided. The support agents that already perform well, such as the civil society ones and the one of national government, could share their experiences, methodologies and tools with others, so that the different support agents can have similar levels of effectiveness in their activities. In addition, this scenario would imply targeting those service providers that do not receive support or where support makes less impact, particularly those in smaller communities, younger systems and with simpler types of technology, as these seem to be under-attended so far.

There are various arguments to make on why the third option is likely to be the most relevant course of action, at least in the short term. Firstly and foremost there is a clear policy mandate, as the importance of support is increasingly recognised in national strategy and planning documents (e.g. DNP, 2011). Secondly, the study has shown that there is strong demand for support from community-based service providers, as we found many – more than expected – support agents, and communities sourcing support from different institutions. Thirdly, there is ample scope to improve the effectiveness of some of the support agents, particularly those who fulfil this role in an ad hoc manner. None of the measures mentioned above to strengthen some of the support agents and better target their support seem infeasible. The first scenario of dismissing support to service providers for its mixed results should only be done if there is more conclusive evidence that it does not provide value for money. But such evidence is lacking. The second scenario could be explored but it will take more time and research to

test its effects. Therefore, professionalising the work of support agents seems the most realistic short-term scenario, so that they can fulfil their potential in contributing to the improvement of rural water service, and thereby responding to the policy mandate and demands from service providers.

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