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Effect of Governance on Public Service Delivery in the Water Sector in Senegal

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Abstract

In 1995 the Government of Senegal launched wide-reaching reforms in the water sector. Still the enthusiasm seems to be limited among urban and rural populations with regard to the delivery of this service. We argue in this paper that accountability mechanisms matter in the delivery process. We examine qualitatively the effectiveness of three aspects of governance: participation, accountability and transparency. We then analyse the empirical relation between the governance variables and (a) the user's satisfaction with clean water provision by local councils and (b) some objective variables of water outcomes. We find that while systems of information and transparency are somewhat effective through meetings between councillors and water providers in both rural and urban areas, accountability mechanisms are more likely in rural communities. However, contrary to the case of urban hydraulic in municipalities, there is no significant effect of governance on water outcomes in rural communities. At the individual level, governance conditions are relevant in the satisfaction of people in the two zones. Our results suggest that local council accountability has greater relevance compared to transparency (through information) in explaining citizens' satisfaction with the provision of clean water. Some policy implications are presented at the end of the paper.

JEL Classification: H4; H7; R5

Keywords: Public services delivery; water sector; governance; Senegal

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1. Introduction

Social service delivery is still a major concern in developing countries that seek to reduce poverty and reach sustainable growth and Millennium Development Goal targets. Despite recent figures illustrating the increasing intervention of public institutions in social programs, underprivileged layers in many African countries are not yet recipients of these services. Actually social services can be conditioned by upstream resources resulting in limited access to these services. Even when available downstream, the quality of these services is questionable in some countries, resulting in poor outcomes.

Studies provide evidence that this dysfunction is related to the role of the institutions involved in the delivery of the services and is not attributed so much to their inadequate financing (Glewwe and Kremer, 2008). They point to the importance of understanding the incentives and constraints incurred by both service providers and users. Some authors stress that most of the incentives that affect social service outcomes are institutional. According to Ahmed et al. (2004), the success of service delivery depends on the accountability of the institutions of service provision to the citizens. In short, all these studies highlight the issues of governance in the process of social services delivery.

In this paper, we analyse the effectiveness of certain governance aspects in water delivery in Senegal, which, compared to education and health services, have received little attention in the literature. This disparity is probably due to the fact that water is a special public good, the management of the hydraulic sector is more difficult and the water service is generally supplied by only few providers, if not by the state. As a consequence, studies on water service are more limited to the governance reforms aspects that are related to decentralization, competition among providers, and diverse forms of public private partnerships (PPP).

Starting the early 1980s, the private sector participation in the management of public services in the water and sewerage sectors sparked a debate centered around whether or not the private sector can yield better results compared to the public sector (Straub 2009). Private sector participation in the water services management is in some cases found to be significant in reducing water rationing (Marin 2009) and water losses (Andrés, Guasch et al. 2008; Gassner, Popov and Pushak, 2008), and in improving the water quality (Barrera-Osorio et al. 2009; Borraz et al. 2011).

At least two observations emerged from these studies. First, they focus on the effect of the varieties of governance in a broad sense, mainly through a type of service providers and a public-private comparison scheme. Second, they narrow down their analysis to one actor — mainly the frontline provider — in the service delivery chain, thereby ignoring the accountability relationship that might exist in the chain of delivery. While these studies are informative with regard to the performance of the providers, it is found that their impact remains weak. It seems that in these studies, the public or private status of the operator is probably not the main criterion that might be considered. Dardenne (2006) argues that the social context and the institutional framework, for example, greatly influence the success of the service extension towards poor areas, irrespective of the ownership of the operator. Estache and Kouassi (2002) show that the institutional capacity of the country as well as governance are significant driving factors in terms of the performance of the service providers. According to Davis (2005), challenges persist in ensuring access to and affordability of services for low-income households, even in a privatized setting.

In this paper, we examine some specific governance aspects in different decentralized forms of water delivery in Senegal. The Government of Senegal launched wide-reaching reforms in the water sector in 1995. The reforms consisted of dissolving the state-run water

company and creating a new asset-holding company that owned all the fixed assets in the government's name and had a mandate to manage the sector. The distribution and production were delegated to a separate entity, and a private operator was committed to run the system, mainly in the urban areas. Senegal served as an example of good practice with regard to the mixture of public and private institutions for carrying out urban water supply infrastructure development and services provision (African Development Bank, 2008). In the rural areas, the populations have created the ASUFOR (*Associations des Usagers des Forages*) that are in charge of the production and distribution of water and the maintenance of the network.

Despite the relevant government endeavor in the provision of water, the enthusiasm seems to be limited among urban and rural populations in Senegal. The African Development Bank (2008) stresses that transparency and accountability remain important issues for the rural water supply sub-sector. It also stresses that Non-Government Organizations (NGOs) and user associations have acknowledged that the participative approach has given them opportunities to express their views, but they still consider their capacity to influence decision-making on key issues to be very low. This raises questions on the role of governance in the provision of water in Senegal. Therefore, a greater understanding of governance issues in water service delivery is necessary and needs to be documented. Mainly, our aim is to investigate which actors are involved in the water delivery chain and to examine the accountability relationships between them. We then assess the impact of the existing system of governance — through participation, transparency and accountability — firstly on the degree of satisfaction of water services users and then on some objective water outcomes.

The paper is organized as follows: Section 2 provides an overview of the water service delivery in Senegal. Section 3 discusses the conceptual framework on governance and accountability. The data is presented in section 4. Section 5 explains the methodology.

Section 6 discusses the results and section 7 provides the conclusion with some policy implications.

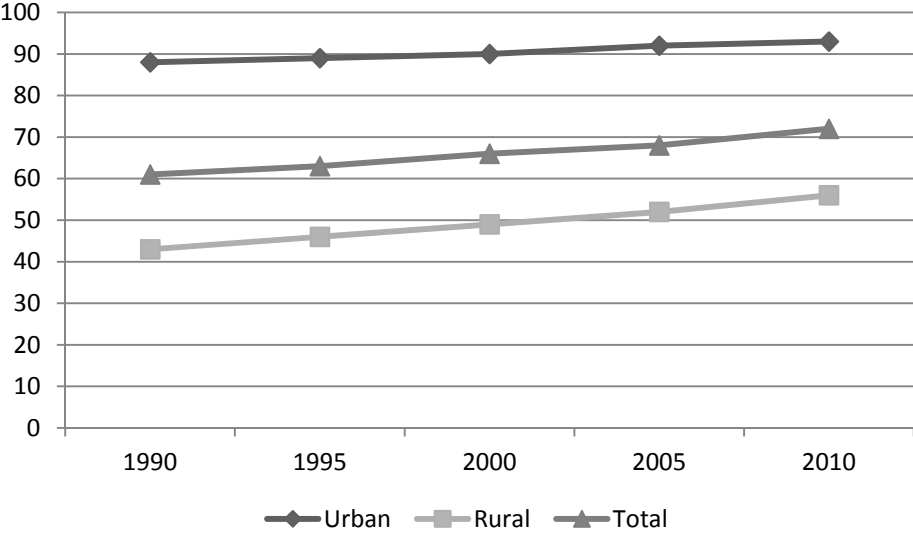
2. Water service delivery in Senegal: an overview

Water provision outcomes

Like many developing countries, access to drinking water is among the priority issues of Senegalese Government in order to reach the Millennium Development Goals (MDG). As the deadline for the MDG approaches, the objective to halve, by 2015, the percentage of people without sustainable access to drinking water is of utmost importance. In the last two decades, substantial efforts have been made in that direction despite there being significant disparities between regions as well as between rural and urban areas (Briceño-Garmendia et al. 2011).

Recent statistics show that the coverage rate of improved drinking water — piped water, stand posts, safe wells/boreholes — had been increasing since the 1990s. By 2010, the estimated coverage was about 93 percent in urban zones; a rate far from that estimated in the rural areas, that is 56 percent (Figure 1). Urban households in Senegal thus have greater access to drinking water connection, unlike their rural counterparts. Within the rural zone, there are apparent regional disparities between rural populations in terms of distance to drinking water points. Available statistics from village surveys conducted by the National Agency of Statistics reveal that by 2010, in only five regions the majority of the rural population had access to a source of drinking water located inside the village or less than a thousand meters to the village (ANSD 2011). In the rest of Senegal, i.e. in nine out of the 14 regions, a significant percentage (16 to 30 percent) of the rural population travels more than 1000 meters to reach a drinking water point. Another source of data at the household level confirms the scenario portrayed above (DGPRES report 2011).

Figure 1: Trend on improved drinking water coverage in Senegal (%)



Note: Improved water use includes piped water into a dwelling, yard or plot, public tap or standpipe, tube well or borehole, protected spring, protected dug well, rainwater collection.

Source: adapted from WHO-UNICEF 2012.

Despite the increase in access to water in both rural and urban areas over the years, disparities have also arisen in terms of the quality of the service in the two areas. First, it is evident from the above statistics that a share of the households in rural areas rely more on some main sources or modes of access to drinking water other than the private connections largely used in urban areas. Second, the private connection in the form of piped water is less likely to be subject to quality problems than other water sources such as dug wells, rainwater and even tube wells or boreholes generally found in the rural areas. Third, the quality of the water service is not specific to rural areas as shown in Table 1, but also to households that are in potentially advantageous positions in terms of access to private connections.

Table 1 : Perception and evidence on drinking water service in suburban areas of Dakar

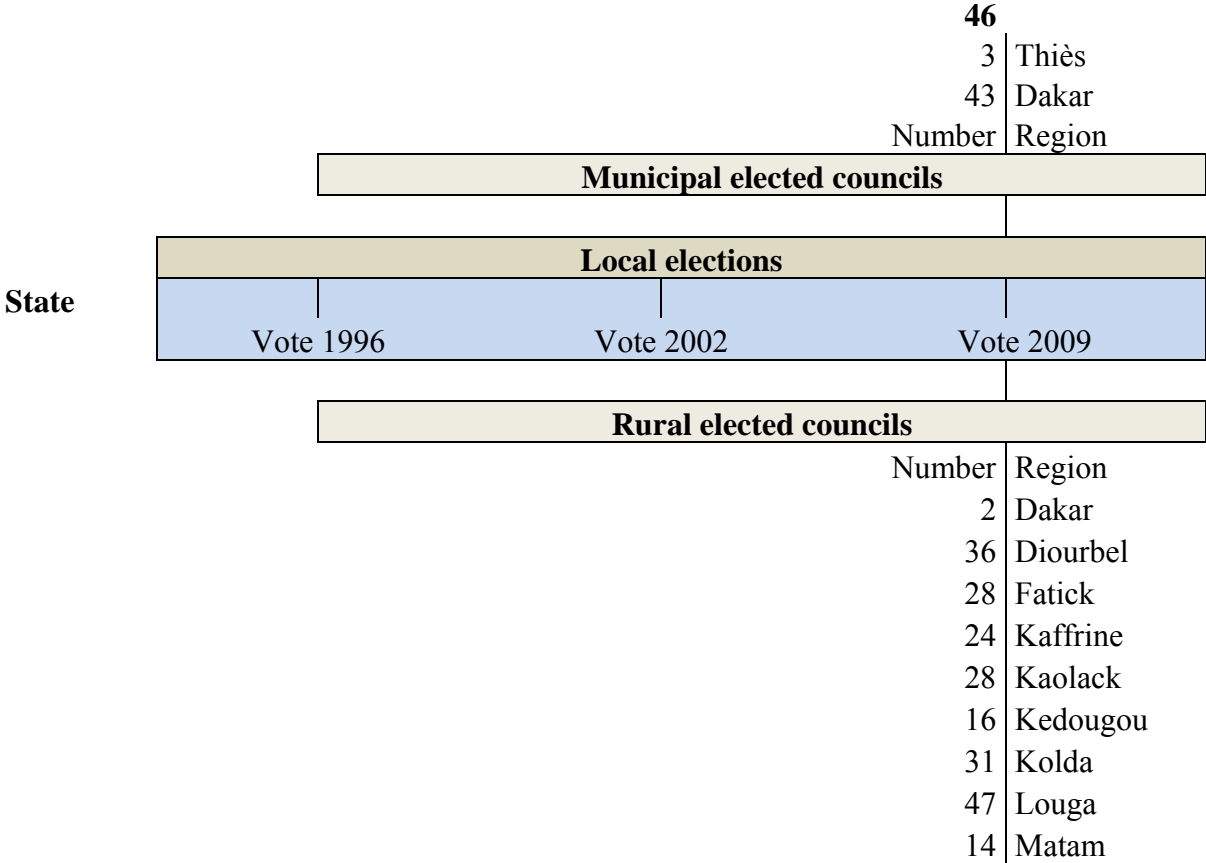
Efficiency of programs of access to drinking water	Quality of water and delivery service	Tariff of connection to private water
<ul style="list-style-type: none"> • Underprivileged neighborhood excluded from the extension of the water network by the main provider 	<ul style="list-style-type: none"> • Deteriorating water quality in terms of odor (like nitrate), color, debris (like iron) 	<ul style="list-style-type: none"> • High cost of water despite subsidized tariff (60% of full tariff on the first 20 m³ of consumption)
<ul style="list-style-type: none"> • Underprivileged neighborhood do not have access to private connection and thus do not benefit from social tariff 	<ul style="list-style-type: none"> • Frequent water shortage and fall in pressure at time of high consumption 	<ul style="list-style-type: none"> • Water from fountain costlier than social tariff intended for the vulnerable from private connection
<ul style="list-style-type: none"> • Several households share one connection and thus their water consumption is at a cost higher than the social tariff 	<ul style="list-style-type: none"> • Absence of clear rules for selling water at the (public) fountain 	<ul style="list-style-type: none"> • Rich households benefit from subsidized tariff due to the inadequacy of the eligibility criteria to social connections intended for poor households

Source: Adapted from Livre Bleu rapport pays: Senegal (2009).

Varieties of governance and actors

Since 1996 Senegal has worked towards a genuine politics of decentralization.¹ In addition to the legislative election at the national level, local elections have been organized, opening the door to decentralization of the central administration where locally elected representatives were chosen by the local population through a vote. New administrative divisions appeared under the forms of local collectivities: the administrative districts (*Commune d'Arrondissement CA*), managed by an elected municipal council and the rural communities (*Communauté rurale CR*) managed by an elected rural council (Figure 2). A CA is an ensemble of cities and a CR is an ensemble of the villages.

Figure 2: Decentralization scheme in Senegal



¹ Some politics of regional development and administrative reforms had been implemented before 1996 in order to favor local democracy and to bring the state closer to the people.

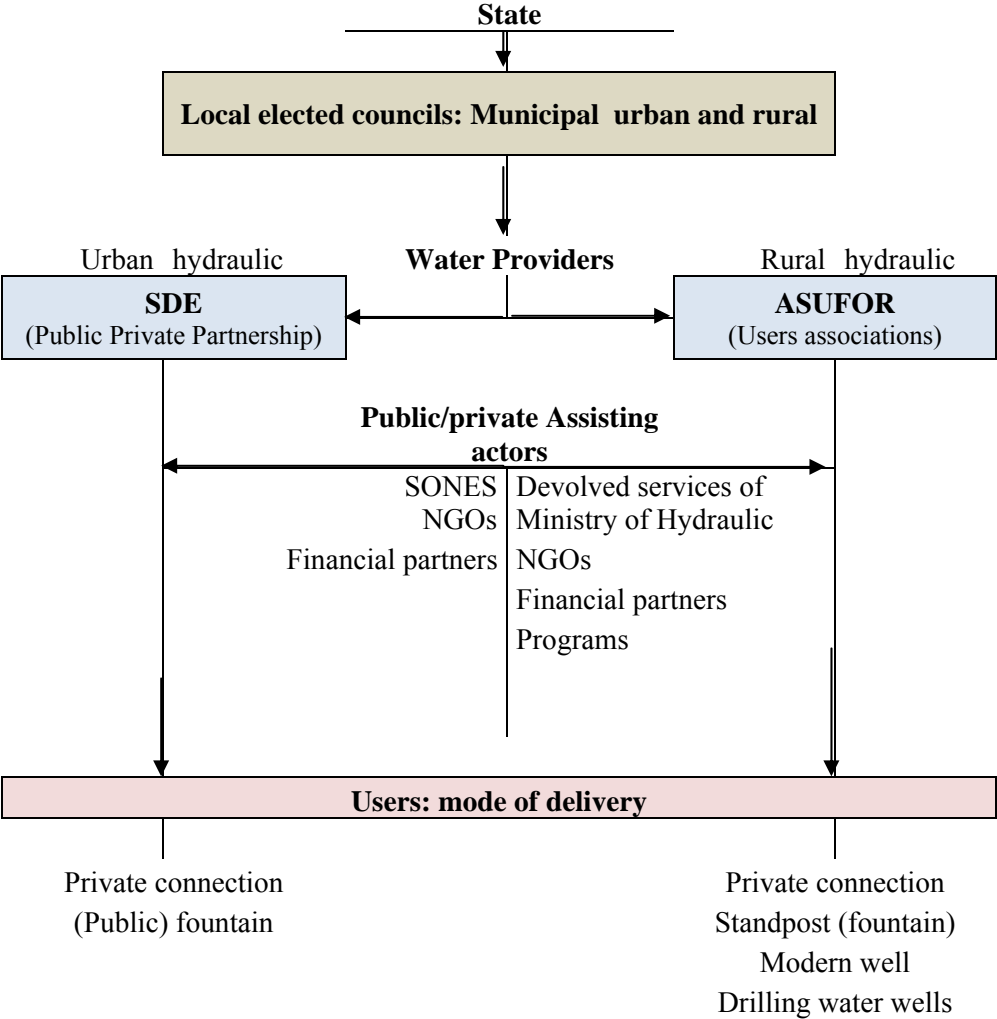
18	Saint-Louis
32	Sedhiou
38	Tambacounda
31	Thiès
25	Ziguinchor
370	

Source: Authors.

The Code of Local Collectivities in Article 3 defines the general role of local collectivities, that is, to conceive, program and to implement the economical, educational, social and cultural development initiatives with municipal or rural interest. The transfer of responsibilities to local collectivities thus implies an obligation towards the local population in terms of local development such as providing the basic social services including access to drinking water. The decentralization or this transfer of responsibilities also implies a potential accountability relationship that is likely to make local collectivities more accountable through vote as argued in the literature on decentralization. Although the responsibilities of collectivities are not explicitly confined to a specific basic social sector, we examine in this paper how accountability relationships are effective within this form of decentralization and with respect to the water service delivery.

Over the last two decades, structural changes in the water sector in Senegal have shaped the country's delivery chain. Different actors are involved in the water service delivery from the state to the users (Figure 3). As such, varieties of water governance have come about, making the sector particularly complex. There are two distinct features of water governance in the delivery chain. First, following the decentralization process, the state is represented by the local elected councils that manage municipalities and rural communities and cooperate with water providers on some water issues. Second, at the (frontline) provider level, water provision modes differ according to the area of delivery, i.e. the urban and the rural zone.

Figure 3: Water delivery chain in Senegal



Source: Authors.

Governance in water provision in the urban areas mainly takes the form of Public Private Partnership (PPP). At this level, the water provider is the *Senegalaise des Eaux (SDE)*, a private operator responsible for the operating, production and distribution of water as well as for the maintenance of the water system. The PPP is made effective through a series of contracts between the *Senegalaise des Eaux (SDE)* and the *Société Nationale des Eaux du Sénégal (SONES)*, a public agency primarily responsible for planning, development and regulation of the water supply infrastructure and services in urban areas (Brocklehurst and Janssens 2004; Water and sanitation program report, 2009). Both SDE and SONES have a

close working relationship with some NGOs and financial partners, without any rigorous contractual arrangement.

Governance in water provision in the rural areas takes a different form of private partnership and mainly involves the civil society. The *Associations des Usagers des Forages* (ASUFOR) are users associations — community-based groups — that manage and provide water with the permission of local councils that deliver the exploitation license (Repussard 2011). They are also in charge of the maintenance of the network with the help of devolved technical services of the Ministry, NGOs, financial partners and programs. One program that has been actively engaged in the rural sector since 2005 is the *Programme Eau Potable et Assainissement du Millénaire* (PEPAM). PEPAM was set up by the Senegalese authorities to achieve, by 2015, the Millennium Development Goals in water and sanitation. The program is based on the principles that only collective efforts from the state, local collectivities, NGOs, the private sector and development partners will contribute to achieving these goals. As such, PEPAM has a mandate, among others, to interconnect different water initiatives or programs and to distribute the roles and responsibilities between them.²

Governance issues in water service delivery

The governance of water and sanitation in Senegal is a shared responsibility of several actors at the national, regional and local levels. These are state actors (ministries, central and devolved departments, projects and programs), development partners, local communities, civil society, and the private sector. Various national and regional consultation frameworks attempt to promote the synergy of actions among themselves. However, it seems that this proliferation of actors, with an increasing number of responsibilities undermines the effectiveness of the services and increases the transaction costs (Livre Bleu Senegal, 2010).

² See <http://www.pepam.gouv.sn>.

Despite the significant progress displayed by statistics in terms of access, the water service delivery in Senegal is still far from satisfactory. Some observations drawn from studies and reports show that these imperfections are, to an extent, governance-specific. For example, there is evidence that though the local collectivities, particularly rural communities with limited means are able to take on the management of small-scale water and sanitation projects in cooperation with devolved technical services of the state, they are often unable to cope with investments in the implementation and the management of large-scale rural water infrastructures such as drilling and stations of water processing, a task that is left to the state (Livre Bleu Senegal 2010). As this situation largely calls for responsibility at the local level in terms of delivery of water to the users, there are clearly issues of accountability at the local collectivities' level.

Further evidence of accountability issues at the municipality level stems from, for example, the water service delivered at the stand posts, i.e. public fountains. It has been reported that there is no oversight of the users, or the community of neighbourhood where these stand posts exist because of the lack of clear rules with regard to the sale of water at the stand posts (Livre Bleu — Rapport pays: Senegal 2009). Moreover, there is no control of the quality of the service delivered at the stand posts while such responsibilities involve both providers and the municipal councils.

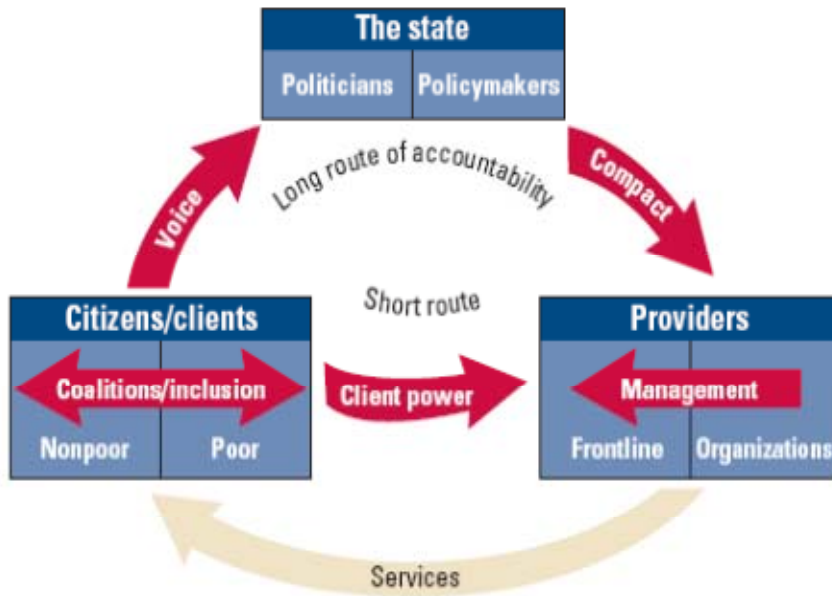
The above evidence imply that although the reforms in the water sector have resulted in significantly improved services, key issues of governance still remain to be solved (Table 1). Previous studies and reports mainly focus on results or statistics on some water output such as access. The overview of the case of Senegal, as portrayed above shows that it is necessary to go beyond the statistics and to analyze the water provision outcomes in relation to the varieties of governance within the chain of delivery.

3. A conceptual framework of governance and accountability

Governance is not unanimously defined across international organizations, governments and academic disciplines. The minimal common feature shared by the variety of definitions is that governance can be viewed in general as the process (or manner) whereby power (or authority) is exercised to manage the collective affairs of a community, a country, society, or a nation (Baron 2003; Gisselquist 2012). As this general view of governance incorporates the rules and processes, institutions and their interactions, a helpful framework for discussing governance is the one that considers the accountability relationships among the actors involved in the basic social service delivery (Bassett et al. 2012).

In this paper, we use the framework of accountability as defined in the 2004 *World Development Report* (Figure 4). The report describes accountability using the principal-agent relationship. There are four relationships of accountability which link four sets of actors. Through these four links in the chain of accountability, actors (as principals) *delegate* the obtaining of the social service for client to the accountable actors (agents) by *financing* the latter. The accountable actors should *perform* the task delegated to them. The principals exercise *enforceability* by getting *information* about the performance. The 2004 *World Development Report* defined accountability as a relationship with these five features that must be present in order to work (Reinikka and Smith, 2004). However, the agency problems such as adverse selection and moral hazard may often occur making these relationships more complex (Ricketts 2002; Collier 2007). For example, the principal and the agent may not have compatible interests and the principal may not be fully able to observe the behavior of the agent, i.e. the latter has the information advantage over the former. In that case, poor service delivery outcomes may occur (facilities at the wrong place, reduced accessibility, etc.).

Figure 4: The Accountability Framework



Source: 2004 World Development Report, p. 49.

Varieties of institutional mechanisms have been recommended to deal with the agency problem and to strengthen the accountability relationship in the delivery chain. It has been argued that various institutional arrangements such as public private partnerships (PPP), decentralization to localities or municipalities, participation of community or citizens in the local decision-making process can alter the quality of social services delivery and consequently the service outcomes (Girishankar 1998; Azfar et al. 2004; Reinikka and Svensson 2004). Particularly for the *short route* to accountability, such arrangements are perceived as a means to improve efficiency, responsiveness and to facilitate governance by allowing and empowering the local population to involve directly in the process of social service delivery. For the *long route* to accountability, devolving the responsibility for the public services to lower tiers of government improves the outcomes because physical proximity increases voter information, participation, and monitoring of performance, and the narrowing of the scope of responsibilities of each tier of government decision makers reduces

their ability to shirk some responsibilities through better performance on others (Ahmad et al. 2005).

Good governance encompasses these mechanisms or means of strengthening the accountability relationship. While the definition of the term varies and is understood differently, good governance, whether defined, for example, by the African Development Bank, the European Commission or the Organization for Economic Co-operation and Development, includes some effective and important aspects that are likely to influence the behavior of the actors in the basic services delivery (Gisselquist 2012). In this paper, we examine three of these aspects that are common in the different definitions: participation of the clients themselves, transparency, and accountability (enforceability) mechanisms.³ Accountability, participation and transparency are interrelated as the participation of citizens can make the providers more accountable, and thus can contribute to improving transparency (DeRaet and Subbarao, 1999; Andrés, Basani, Isham and Reilly, 2008; Guasch and Azumendi, 2011).

4. Data

Three data sources are used in this research. The first is the survey data at the individual (user) level drawn from *Afrobarometer*, which is a comparative series of public attitude surveys in many African countries based on representative national samples. Different rounds have been conducted over the years in each country. Our analysis in the Senegal case study is based on data from the Round 4 conducted in 2008.⁴ The *Senegal 2008*

³ *Participation* considers, for example, whether non-state actors are involved in water services delivery. *Transparency* considers whether effective information transparency mechanisms are available for the clients on the service delivery process. *Accountability* refers to the availability of effective enforceability mechanisms. It also considers whether clients have opportunities to report bad performance in the delivery of service through appropriate mechanisms, and whether their complaints are effectively considered.

⁴ Round 5 has already been implemented in 2012 but data are not yet available. Data and more details on the questionnaire and the sample design for round 4 can be found on the website <http://www.afrobarometer.org>.

Afrobarometer relied on personal interviews using a clustered, stratified, multi-stage, probability sample design. Households were randomly selected within each primary sampling unit and an individual respondent aged 18 years or older was then randomly selected from within each of these households. In order to ensure national representativeness of all voting age citizens, the survey was based on national probability samples and the sample size was stratified by key social characteristics in the population, region and residential locality (urban or rural).

In all, 1200 individuals were interviewed in 11 regions of Senegal in the rural (54.67 percent) and the urban areas. A summary of the sample is given in Table 2. Several questions were asked to these respondents in relation to their attitude to democracy, elections, markets, livelihoods, civil society, etc. Particularly relevant for our analysis in the survey are information on governance, e.g. questions related to satisfaction with social service delivery such as clean water provision by the local government, and individual views on performance under local governance (see below). The survey also provides some information on water service facilities as well as general data on respondent's demographic characteristics. Due to missing or unknown answers, not all of the 1200 observations in the sample are used in the analysis.

Table 2 : A summary of sample of cross-sectional data

	Number of respondents in		% of respondents potentially having access to the water service facilities		
	Region	Rural community	Piped water system ^a	Water location ^b	Lack of Water ^c
Dakar	256	16	100	88.98	54.3
Diourbel	128	48	93.75	80.95	54.69
Fatick	72	64	66.67	23.94	63.89
Kaolack	128	96	62.5	36.72	58.59
Kolda	96	80	33.33	48.94	60.42
Louga	80	64	70	66.25	52.5
Matam	56	48	57.14	21.43	70.91
Saint-Louis	80	56	90	52.5	47.5
Tambacounda	80	64	40	37.18	60
Thiès	168	96	71.43	61.82	52.1
Ziguinchor	56	32	57.14	39.62	66.07
	Zone				
Rural	656		51.22	33.38	65.95
Urban	544		100	89.41	45.49
Total	1200	664	73.33	58.82	56.68
Sample	1200	664	1200	1,185	1198

^a Respondents living in an area where a piped water system is present.

^b Respondents living in a house in which the main source of water for household use is situated inside the house or in the compound.

^c Respondents living in a house that faced, at least once the last twelve months, lack of clean water for home use.

Source: Calculated from Senegal 2008 Afrobarometer survey.

Senegal 2008 Afrobarometer survey data reveal that potential difference is likely in terms of access to clean water facility (Table 2). Of the number of individuals surveyed, 73.33 percent live in areas where a piped water system is present. All the houses surveyed in the urban areas could have access to piped water while only 51.22 percent of the rural houses could have access to this service. Overall, the main source of water for household use is easily available to about 50 percent of the households. However, in rural areas, about 66.62 percent of the households still have access to the main source of water outside the house or in the compound. The percentages are lower in the urban areas. The difference in the proportions is also noticeable when looking at the frequency of clean water provision. A question was asked to the individuals: “how often over the past year, if ever, have you or anyone in your family

gone without enough clean water for home use?” We recode the multiple choice answer to a binary variable indicating whether or not the household faced a lack of clean water for home use. The percentage of the households that have coped with irregularity of clean water is significant in both rural and urban areas and even more so in the former.

The second type of data used is the time series data that we collected at the municipality and the rural community levels in July and August 2012. Two regions of Senegal were purposely selected. The first, Dakar, is the capital, which is largely an urban area. The second region, mostly rural, is Kaolack. By 2010, Kaolack was at the bottom of the eight regions of Senegal where the percentage of the rural population with access to a drinking water source situated less than one kilometer ranges from 70 to 85 percent (ANSD, 2011). According to the administrative division, in 2009, the secondary and survey data were collected in the 43 municipalities (*Communes d'Arrondissement*) of Dakar and in the 28 rural communities (*Communautés rurales*) of Kaolack (Figure 2).

A questionnaire with six modules was used to collect information on the characteristics of the municipalities and of the rural communities, the composition of the municipal and the rural councils, some water outcomes and water-governance related information such as the relationships between the municipal/rural councils and water providers and users. Some of the questions were either answered by the municipal/rural secretary or a municipal/rural council. Much of the other information was archival, recorded by enumerators. Time series data are used to exploit, among others, information from the local (municipal/rural) elections that took place three times: in 1996, 2002 and 2009. However, we limit ourselves to the period 2000 to 2011 due to the difficulty in getting accurate recall data beyond 2000.

The third type of data stems from qualitative interviews addressed to the 43 municipal councils of Dakar and 28 rural councils of Kaolack that we visited. Structured questionnaires were used to get information about the accountability relationships between the municipal/rural councils in place and water providers. We also asked questions on the accountability relationships between the municipal/rural councils in place and the population concerning the provision of water. The questionnaire was answered, in majority of the cases, by the municipal/rural secretary.

5. Methods of analysis and variables

We use two types of analysis: a qualitative analysis and quantitative estimations. Table 3 summarizes the methods and data used. Details are provided subsequently.

Table 3 : A summary of the methodology

Type of analysis	Water outcomes	Governance variables	Type of data and sources	Sample
Quantitative estimation (model 1)	User's satisfaction with clean water provision	Involvement of citizens Consultation of the community Information on council program Information on council budget Complain Guarantee on the use of councils' revenue	Cross-sectional data Senegal 2008 Afrobarometer survey	1200 individuals
Quantitative estimation (model 2)	Access rate Water outage Tax on water	Meetings Report Rural provider member concentration Council member concentration	Unbalanced panel data (2000 to 2011) Secondary data and municipality/rural community survey	43 municipalities in Dakar 28 rural communities in Kaolack
Qualitative analysis		Relations between municipal/rural councils and population/providers in terms of participation, finance, transparency and accountability	Qualitative data Interviews with municipal/rural councils	43 municipalities in Dakar 28 rural communities in Kaolack

Note: The measurement of the governance variables are indicated in Table A1 and Table A2 (Annex).

Qualitative analysis

We use the qualitative analysis to analyze the effectiveness of governance/accountability relationships in water provision in Senegal, as highlighted in the conceptual framework. Information derived from the qualitative municipality/rural council surveys are suitable for this type of analysis.

Quantitative estimation at individual (user) level

The water outcome we consider as a dependent variable in this section is a qualitative variable: the degree of satisfaction of the users with respect to water services. Subjective wellbeing literature has shown the usefulness of the reported outcome data like life satisfaction, as a complement to quantitative outcomes variables. In the same vein, several studies have recently used perception data like citizen satisfaction with local public services — as a proxy for service quality — to assess the effect of accountability relationships (Lewis and Pattinasarany, 2009; Dasgupta, Narayan and Skoufias, 2009).

To explore the relationship between user i satisfaction with water provision by the local council⁵ — the dependent variable — and some governance conditions G_i as highlighted in the conceptual framework, we consider the following latent model:

$$S_i^* = \sum_j \alpha_j G_{j,i} + \sum_k \beta_k X_{k,i} + \varepsilon_i \sim \text{NID}(0,1) \quad (1)$$

where ε_i is an unobserved term and α and β are coefficients to be estimated.

A description of the variables used in the model (1) is presented in Table A1 (Annex).

We also consider a single-governance variable — *Governance* — that is the first principal

⁵ It is important to emphasize that local councils in Senegal do not provide clean water directly (see section 2). As such, the term “water provision by local councils” used here can be seen as their relationship with water providers concerning water-related services, to facilitate the delivery of clean water.

component of all governance variables used and derived from the principal component analysis. The first component explains on its own 78 percent of the total variance of the three governance aspects. The model (1) control for other variables X_i such as user's expectations or predispositions (DeNeve and Cooper, 1998; Gerdtham and Johannesson, 2001) and other variables related to water facilities.

We use different methods to estimate the model (1). We primarily use an ordered probit regression to account for the ordinal nature of the dependent variable. We use a linear regression model (OLS) by considering the dependent variable, satisfaction, as a continuous variable — as psychologists often do. In this way, we assume cardinal comparability in reported satisfaction.⁶ Due to the potential distribution of the dependent variable, we also consider an intermediate case where the model (1) is estimated by a probit regression. Finally we use the instrumental variable method (IV) to account for the potential endogeneity of the Governance variables — here, the single Governance variable derived from the principal component analysis.

Quantitative estimation at municipality and rural community level

We consider quantitative water outcomes as dependent variables. We complement the qualitative outcome above, due to the potential problem with using subjective measures. Moreover, the analysis at the municipality/rural community level is useful in the sense that it is not only restricted to users-local councils relationships — as is the case in model 1 — but rather users-providers-local councils relationships.

We consider the following model:

⁶ Besides the advantage of the robustness check, the use of the cardinality assumption becomes necessary when a mixed equations process is evolved in the econometrics in the case of endogeneity (see below).

$$\text{Water outcome}_{it} = \sum_j \alpha_j G_{j,it} + \sum_k \beta_k X_{k,it} + \varepsilon_{it} \sim \text{NID}(0,1) \quad (2)$$

Table A2 (Annex) gives the definition of the variables. G_{it} includes governance variables. Control variables, X_{it} , are exogenous characteristics for the municipality or the rural community i in the year t . α and β are coefficients to be estimated.

Three water outcomes are used as dependent variables in the case of the municipalities. As the main water provider concerning the urban hydraulic is SDE (Figure 4), the three water outcomes variables are related to this type of provider. The first dependent variable — number of houses connected to SDE — is a proxy for the accessibility to clean water. The second dependent variable — the total number of days of outage of SDE water — is a proxy for the frequency or the regularity of the delivery of clean water by SDE. The third dependent variable — the tax on SDE water received by the municipality — can be a proxy for the accessibility, the regularity and the quality of clean water, on the whole. The interviews with the municipal councils reveal that municipalities receive from SDE, as tax on clean water, a certain percentage of water consumption on each water bill. This can imply that the more the population has access to SDE piped network, the more the tax received by municipalities. Also, the less the consumption of SDE water — due to irregularity of the service or quality problems — the less the tax received by municipalities on SDE water.

In the case of rural communities, we use, as dependent variables, the percentage of the population having access to drinking water with a piped water connection and the percentage of villages connected to a piped drinking water facility.

Several questions were asked in the municipality/rural community survey about governance variables. However, those indicated in Table A2 (Annex), are used in model (2)

according to the information derived from the qualitative analysis (see below). They are the indicators of the accountability relationships between the municipal/rural councils and the population/providers. To explore the role of vote or local council election in explaining water service delivery, we use the variable *local council concentration*. This is the Herfindahl index of a political party member in the municipal/rural council.⁷ We hypothesize that a more diversified local council in terms of political parties (less monopoly of) can lead to effective accountability relationships between the local council and the population, and more effective social service delivery. As this index is an indicator of the amount of competition among the political parties within the local council, we expect that more competition (lower index) can favor effective social service delivery by the local council.

We estimate the model (2) using pooled Ordinary Least Squares (OLS) regression and fixed effects regression to account for time invariant unobserved municipality/rural community heterogeneities. We estimate the model (2) separately with the sample of the municipalities and the sample of the rural communities. In each case, we consider two specifications. A first specification A, that uses the time period between 2000 and 2011. In a second specification B, we include two additional governance variables — the Herfindahl index of political party member in the rural council and the Herfindahl index of political party member in the municipal council — and we estimate the model (2) for a period reduced to three years, 2001, 2008 and 2011. We particularly focus on these years to exploit information from the local (government) elections that took place three times: in 1996, 2002 and 2009. One of the mechanisms by which the population can monitor the government is the electoral mechanism. In this study we base on the assumption underlying a decentralized system of

⁷ The Herfindahl index is defined as follows: $\sum_{p=1}^N \left(\frac{m_p}{c}\right)^2$, with m^p the number of local councilors belonging to the political party p . c is the size of the local council and N , the number of political parties in the local council. A greater index means monopoly of a political party within the local council.

government that local elections will enhance accountability (Josie, 2008). We hypothesize that local elections, through the vote of the population, enhance local council's accountability when there is a less concentration (less monopoly) of a political party member in the local council.

6. Qualitative and quantitative results

6.1. Effectiveness of governance in water provision in Dakar and Kaolack

We provide a qualitative analysis on the relationship between local councils and providers and between local councils and the population in terms of water provision delegation, involvement, transparency and enforceability. In some municipalities, municipal councils delegate the public fountain management to a person or an economic interest group (EIG) through a contract. Municipal councils examine applications and authorize mayors to provide an administrative certificate to the person chosen by the population. Things are slightly different in rural communities. The main rural water provider, ASUFOR signs a contract with rural councils, even though the state — through the hydraulic service — gives the authorization. Water provision delegation is based on a call for tenders with criteria related to performance.

In general, there is no system of information and transparency to evaluate the performance of water providers in several municipalities. SDE does not inform the municipal council directly about its work in terms of water delivery, but through the media. However, if SDE operates public works, it informs the municipal council directly. Also some municipalities organize working meetings with SDE to discuss water-related issues, and create commissions that list SDE customers in order to identify the households that are not connected. Systems of information and transparency are likely in rural communities. A rural councilor represents the rural council in the executive committee of ASUFOR. Regular

meetings are held, during which the rural council is thus represented. ASUFOR produces and submits monthly reports to the rural councils.

In most cases, the municipal and the rural councils do not have any rigorous influence on water providers. In some cases, they can send letters to water providers and convoke them for explanations on some water-related issues. The municipal and the rural councils cannot, however, enforce sanctions against water providers. Other than the correspondence sent, the municipal councils do not really have at their disposal mechanisms to make SDE accountable, while in rural communities it is obligatory for ASUFOR to be accountable to the rural councils every end of month via detailed reports, the end of the year statement with a renewal every two years, and through regular follow ups and control of activities.

With regard to the effectiveness of governance aspects between local councils and the population, the municipal and the rural councils do not allow external persons — who are not members of the council — to participate in the decision-making process. However, the municipal council holds meetings open to the populations present only as observers; and before taking decisions the municipal/rural councils consult other persons such as the traditional village chief, the civil society, the district chief and the populations through district councils.

The municipal councils inform citizens about their acting program, through meetings open to the populations, district councils, media, and billpostings, but not about water issues. The rural councils too inform the citizens about their acting program, but including water issues, via the same channels. As per their opinion, the municipal as well as the rural councils, since they do not have the charge of the management of water, do not have to be concerned with performance in this context. Nevertheless, the populations have the opportunity to discuss water-related issues with the municipal and the rural councils through meetings open

to citizens or during district councils. In some municipalities, the mayor meets with the citizens every week, to take their concerns into account.

The municipal councils register verbal or written complaints of the populations — not related to water issues, but to issues such as sanitization, insecurity, floods. Some rural councils too register verbal or written complaints of the populations, including water issues related to the availability and regularity of water. The municipal/rural councils have technical commissions in charge of the examination of specific complaints. The municipal councils ensure good use of local resources by establishing an administrative account that explains how local resources are used. The rural councils do the same through a participative management involving the population. The population has the capacity to take sanctions against municipal and rural councillors through vote during municipal and local elections and by denunciation via demonstration and through the media.

6.2. Correlation between governance and user satisfaction with clean water provision in Senegal

Table 6 presents the proportion of the respondents who judged the local council governance procedures — as used in the model (1) and defined in Table A1 (Annex) — as effective. This proportion of satisfied respondents stands at no more than 29 percent with respect to *participation*, *transparency* and *accountability*. Depending on the size of the sample, the percentages vary between 17.62 percent for *accountability* to 28.94 percent for *participation*. Unlike the other aspects of local governance, accountability — either in the form of *complaint* or *guarantee* — has lower percentages, showing a slight difference between the rural and urban areas. In terms of encouraging participation and practicing transparency, the local council was judged more effectively in the rural than the urban zone. The figures suggest that the local council governance with respect to *participation*,

transparency and *accountability* is weak in general. However, it is important to note that these aspects of the local governance under study are not sector-specific. Their combination, in the econometric analysis, with information on respondents' satisfaction with clean water provision could provide greater insight into the effectiveness of the local council governance in this sector.

Table 6 : Respondents' perceptions on some local governance aspects

Zone	% of respondents who judged these governance procedures, practised by the local council, as effective					
	Allowing participation		Showing transparency		Practising accountability	
	Involvement ^a	Consultation ^b	Info program ^c	Info budget ^d	Complaint ^e	Guarantee ^f
Rural	23.58	32.57	31.39	25.43	19.89	17.69
Urban	14.03	24.17	20.51	12.86	18.09	17.54
Total	19.3	28.94	26.52	19.74	19.07	17.62
Sample	860	767	871	841	645	732

^{a, b, c, d, e, f} See the text for more explanation.

Source: Calculated from Senegal 2008 Afrobarometer survey.

The ordered probit regression results from model (1) are presented in Table 7. Different specifications of this model are used. Column (1) shows the regression results when we control only for the indicators of water service delivery. Column (2) adds socio-demographics variables that proxy for expectations and predispositions, as well as geographical fixed effects. The subsequent columns include further indicators of the main variable of interest, i.e. governance conditions.

One observation from the regression results is that multicollinearity is likely. For example, governance variables could also affect water outcome variables such as *Piped water system*, *Clean water lack* and *Location water*. In our case, municipalities with good governance (greater participation, transparency and accountability) may, as a result, have a

larger number of users with access to clean and piped water. While we cannot check this causality with the data and the sample that we have,⁸ we believe that the issue of multicollinearity in general is not a great concern in our estimations. Table 7 shows that adding the governance variables in the columns 3 to 6 does not dramatically change the coefficients of the indicators of water outcomes and socio-demographics variables, notably in terms of their significance and sign.

Table 7: Ordered probit regression results.

The dependent variable is: satisfaction with water provision by the local council

	(1)	(2)	(3)	(4)	(5)	(6)
Piped water system	0.641***	0.585***	0.677***	0.685***	0.611***	0.638***
Clean water lack	-0.584***	-0.623***	-0.516***	-0.541***	-0.663***	-0.512***
Location water	0.373***	0.373***	0.417***	0.416***	0.310**	0.416***
Water payment	0.027	0.013	-0.045	-0.014	-0.005	-0.041
Gender		-0.020	0.021	0.012	0.031	0.047
Size adult		0.030**	0.033*	0.039**	0.034**	0.036**
Age		0.000	0.001	0.000	0.001	0.001
Head household		0.050	0.017	0.012	0.022	0.014
Education		-0.123	-0.107	-0.172	-0.123	-0.110
Ethnic Wolof		-0.047	0.025	0.011	-0.099	0.048
Employment status		-0.122	-0.192*	-0.160	-0.209**	-0.201*
Urban		0.050	0.080	0.110	0.124	0.148
Governance aspects						
Involvement			-0.137			
Consultation			0.424*	0.476***		
Info Program			0.163			
Info Budget			-0.083	0.036		
Complaint			0.029			
Guarantee			0.821***	0.651***		
Average of (Involvement and Consultation)					0.110	
Average of (Info Program and Info Budget)					0.195	
Average of (Complaint and Guarantee)					0.649***	
Governance						0.190***
Threshold parameters						
cut1	-0.147	-0.395*	0.117	0.116	-0.158	-0.077

⁸ Checking the causality necessitates estimation with municipalities and rural communities as unit of observations and calculating governance variables for municipalities and rural communities from Afrobarometer data.

cut2	0.570***	0.337	0.979***	0.970***	0.619**	0.779**
cut3	1.808***	1.613***	2.467***	2.453***	2.007***	2.241***
Observations	959	945	526	580	669	526
Log pseudo-likelihood	-1140.61	-1109.233	-555.320	-612.806	-741.461	-559.902
Pseudo R2	0.092	0.102	0.161	0.161	0.138	0.154

Regional dummies are included in the regression. Significant effects are indicated with *** p<0.01, ** p<0.05, * p<0.10.

Source: Estimated from Senegal 2008 Afrobarometer survey.

Columns (3) to (6) of Table 7 present the results where the governance variables are taken into account in the model. At this level, different alternatives are possible. In column (3), we include all the governance conditions simultaneously. This specification assumes that each of the two governance variables, although representing respectively the same aspect of *participation*, *transparency*, and *accountability* as previously defined, may have different impact on the probability that people are satisfied with water provision. However, to avoid multicollinearity, we also perform regressions with different combinations of the governance variables. Column (4) reports the specification in which most of these variables are significant. The specification in column (5) includes the average of the two governance variables representing the same aspect of *participation*, *transparency*, as well as of *accountability*. The last column considers the single governance variable derived from the six governance indicators using the principal component procedures.

Considering the specifications with the governance indicators, only the variables *consult* and *account* significantly impact the likelihood of the citizens being satisfied with the provision of clean water. People who think that the local council has effective consultations with others (including traditional, civic and community leaders) before making decisions are more likely to be satisfied with clean water provision by the local council. In the same vein, the conviction that the local council provides effectively a guarantee that the local government revenues are used for public services and not for private gains, increases significantly the

probability of being satisfied clean water provision. It is worth noting that contrary to the first two aspects of governance considered in this study — *participation* and *transparency* — the significant effect of the third aspect of governance, i.e. *accountability*, remains robust to changes in specifications. This result suggests that local council accountability is of greater importance in explaining the citizen's satisfaction with the provision of clean water service. Column (6) shows nevertheless that irrespective of whether or not a specific governance aspect is considered, the likelihood of being satisfied with water provision by the local council increases as local governance increases.

The results from the ordered probit estimations, as shown above, are very similar to those obtained from the probit estimation — when we use a binary dependent variable — or the OLS regressions, i.e. when we assume cardinal comparability in the reported satisfaction as psychologists often assume in the subjective wellbeing literature. The latter confirms the conclusion of Ferrer-i-Carbonell and Frijters (2004) that assuming cardinality or ordinality in a subjective measure such as wellbeing does not change the results dramatically.

There is also no significant change in the results when we split the sample into two areas: rural and urban. As found with the entire sample, the governance variables *consultation*, *guarantee* and *governance* are positively and statistically significant in explaining the satisfaction with clean water provision in both the zones. These results indicate that there is no clear difference in the impact of governance variables between the rural and urban areas. Nevertheless, the main information from these results is that governance conditions are relevant in explaining the satisfaction of people with the provision of water in the two zones.

We report the results when the governance indicators are treated as endogenous variables. Table 9 presents first-stage results and second-stage results of the three methods used for the estimation of the model (1).

Table 9: Estimation results with governance as endogenous variable.
The dependant variable is: satisfaction with water provision by local council

	Second stage results			First stage results
	2SLS	ivprobit ^a	cmp ^b (ivoprobit)	Linear regression
Piped water system	0.400***	0.713***	0.625***	-0.040
Clean water lack	-0.369***	-0.874***	-0.511***	0.073
Location water	0.327***	0.254	0.401***	0.024
Water payment	-0.038	0.019	-0.035	-0.267
Gender	0.006	-0.139	0.032	0.250
Size adult	0.027*	0.058**	0.030	0.040
Age	-0.000	-0.014**	0.001	0.004
Head household	0.026	0.385**	0.033	-0.366
Education	-0.064	0.031	-0.098	-0.456**
Ethnic Wolof	0.068	0.019	0.058	-0.108
Employment status	-0.133*	-0.278*	-0.214**	0.104
Urban	0.106	0.147	0.172	
Governance conditions				
Governance	0.136***	0.238**	0.249***	
Exclusion restrictions				
Phone				-0.049
News radio				0.185
News television				0.002
Committee water				0.426*
Committee technic				0.797**
Manage problem				1.694***
Contact councilor				-0.488**
Member association				0.957***
Constant	1.875***	-0.161		0.239
Observations	509	509	543	-0.690
R-squared	0.328			526
Log likelihood		-1294.552	-1648.409	0.196
Endogeneity test				
Wu-Hausman	.00128			
Sargan	2.528			
Rho		0.060	-0.139	
Insigma		0.652***	0.652***	

^a Dependent variable is the dummy variable *Satsidum*. Marginal effects are reported.

^b Marginal effects are reported. Threshold parameters are not reported.

Regional dummies are included in the regression. Significant effects are indicated with *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Source: *Estimated from Senegal 2008 Afrobarometer survey.*

The first-stage estimation results show that most of the exclusion restrictions significantly influence the single endogenous governance variable: *governance*. Although the exclusion restrictions used are jointly significant and are valid instruments, the single variable *governance* appears not to be endogenous, as indicated by the different tests performed in the 2SLS estimation (Table 9). The rejection of exogeneity is also confirmed in the IV probit and the conditional mixed process regression. In these latter cases, the coefficient of ρ is not statistically significant, indicating that the test of exogeneity does not reject the independence between the error terms of the first-stage *governance* equation and the second-stage *satisfaction* equation.⁹ This result suggests that the model (1) in which the governance variable is taken as exogenous is probably appropriate. Nevertheless, correcting for endogeneity does not affect the significance and the sign of the governance variable and the other independent variables. As previously found with the ordered probit, the OLS and the probit estimation, the variable *governance* has a positive and significant impact on the citizens' satisfaction with water service provision by the local council when accounting for its potential endogeneity.

In general, our main finding is that, irrespective of its exogenous or endogenous nature considered, and holding water outcomes constant, governance condition matters in explaining client satisfaction with clean water provision by the local councils. These results imply that governance conditions have direct impact on user satisfaction, due to effects different from

⁹ We also ran regressions in which all the instruments variables are included directly in the second stage. None of these variables are found to have a significant impact on the dependent variable *satisfaction*.

water outcomes such as access to piped or clean water. As posited by Lewis and Pattinasarany (2009), in the case of education service, it might be that it is the user's experience with the local governance environment that affects their satisfaction with public service delivery. Our results add to some previous studies in other countries that find that access to an improved water source significantly raised household satisfaction with both quality and availability of water (Abebaw et al., 2011). We find that not only are water outcomes important for user satisfaction but their experience of governance conditions — such as their participation and the availability of information — seems significant for their satisfaction with clean water provision by local councils.

6.3. Correlation between governance and water outcomes at municipality and rural community level

The main estimation results are reported in Tables 10 and 11. Table 10 presents the fixed-effects regression results in the case of the urban hydraulic, i.e. results on the sample of the municipalities of Dakar. The fixed-effects regression results in the case of the rural hydraulic, i.e. on the sample of rural communities of Kaolack, are presented in Table 11. The corresponding results from pooled OLS are shown in Tables A3 and A4 (Annex). Each table reports results from the specification A and B. The first type of results in the columns A are the results when the full period of times is considered. The second type of results in the columns B include, as an additional variable, the local council concentration, and are regression results based on the years 2001, 2008 and 2011.

Results are different in terms of the magnitude, sign and significance between the fixed-effects regression results and the pooled OLS regression results, either in the case of the municipalities in Dakar or rural communities in Kaolack. For example, some variables, statistically significant in the pooled OLS regression, become insignificant in the fixed-effects

regression. Endogeneity and unobserved time-invariant municipality and rural community heterogeneities thus seem likely in the pooled OLS regression. Failing to account for time-invariant unobserved heterogeneities and the potential endogeneity of the variables may overstate or understate the effect of the governance variables in the OLS regressions. For example, some unobserved characteristics of local counselors or users or even providers, such as their managerial ability might influence both the accountability relationships — and then governance — and water service delivery. Also, governance conditions and water outcomes may both be influenced by some favorable or unfavorable conditions specific to the municipalities or the rural communities, causing an upward or a downward bias in the pooled OLS estimation. The direction of the bias, however, does not seem clear.

Table 10: Fixed-effects regression results on the municipalities data, Dakar, Senegal

	Ln (houses connected to SDE)		Ln (tax on SDE water per HH)		Days of SDE water outage	
	A	B ^a	A	B ^a	A	B ^a
Governance variables						
Meetings CA_pop	0.002	0.001	0.015**	0.016	-0.015	-0.273**
Report CA	0.020***	-0.002	-0.017	-0.022	0.569***	1.426***
Meetings CA_SDE	0.040***	0.057***	0.052**	0.069*	-0.335*	-2.229***
Municipal council concentration		-0.059		0.212		-0.326
Controls						
Ln (density)	0.465***	0.844***	-0.023	0.136	-2.901**	1.767
Ln (precipitation)	-0.004	-0.075	-0.045	0.331	-0.295	15.458***
Ln (CA resource per capita)	0.036***	0.015	0.226***	0.507***	-0.188	-0.420
Constant	4.559***	1.489	3.735**	-1.473	48.315***	-56.472*
Observations	471	105	433	96	479	106
R-squared	0.578	0.768	0.066	0.461	0.048	0.591
Number of ID_CA	41	35	43	35	43	36

^a Estimation results on the years 2001, 2008 and 2011.

The definition of the variables is given in Table A2 (Annex). Significant effects are indicated with *** p<0.01, ** p<0.05, * p<0.10.

Source: Estimated from municipality survey.

Results in Table 10 show that whatever be the specification, the number of meetings of the municipal council with SDE has (a) a positive and significant effect on the number of houses connected to SDE water, on the tax on SDE water received by the municipal council, and has (b) a negative and significant effect on the number of days of SDE water outages. Hence, the more the number of municipal council meetings with SDE, the greater the increase in the number of houses connected to SDE water. Also, the more the tax that the municipal council receives on SDE water, the less the disruption in the provision of SDE water.

The significance of the other governance variables varies according to the specification. In the specification A, the number of meetings of the municipal council with the representatives of the community significantly increases the tax on SDE water received by the former. In the specification B, the number of such meetings significantly decreases the number of days of SDE water outage. These meetings have no significant impact on the number of houses connected to SDE water. Although the coefficient of the number of times the municipal council reports to the population about its realizations is significant in the two specifications, it does not have the expected sign on the number of days of SDE water outage. In the specification A, the number of times the municipal council reports to the population has a positive and significant effect on the number of houses connected to SDE water. The variable *municipal council concentration* has no significant effect on the dependent variables, suggesting that the diversification of councilors in terms of political party member in the municipal council is irrelevant for the water service delivery in the municipalities.

Contrary to the case of the urban hydraulic in the municipalities of Dakar, we do not find any significant effect of the governance variables on the water outcomes in Table 11. Neither the number of meetings of the rural council with the representatives of the community, nor with the ASUFOR, has any significant effect on the access rate to piped

water and the village access rate to piped water. Likewise the variable *rural council concentration* has no significant effect on the access rate to piped water and the village access rate to piped water. Only the estimated coefficient of the variable *ASUFOR member concentration* is negative and significant at the 5 percent level. This suggests that village access to piped water increases when more villages are represented as members in the ASUFOR management committee.

Table 11: Fixed-effects regression results on the rural communities data, Kaolack, Senegal

	Access rate piped water		Village access rate	
	A	B ^a	A	B ^a
Governance variables				
Meetings CR_pop	-0.066	-0.364	0.584	-0.883
Meetings CR_Asufor	-0.414	-2.065	0.992	0.083
Asufor member concentration	20.390	53.987	-79.575**	-74.138
Rural council concentration		-28.811		18.910
Controls				
Water projects	0.072	-2.297	0.463	-6.440***
Ln (density)	33.328***	40.488	-4.472	64.212**
Ln (precipitation)	1.997	-4.692	5.487	-22.100*
Ln (CR resource per capita)	12.314***	16.054**	4.684*	0.531
Constant	-184.347***	-182.222	12.305	-71.289
Observations	142	40	139	41
R-squared	0.422	0.733	0.149	0.695
Number of ID CR	24	22	23	22

^a Estimation results on the years 2001, 2008 and 2011.

The definition of the variables is given in Table A2 (Annex). Significant effects are indicated with *** p<0.01, ** p<0.05, * p<0.10.

Source: Estimated from rural community survey.

7. Conclusion and Policy Implications

This research has investigated the effectiveness of critical governance mechanisms such as participation, accountability and transparency and how they affect public service delivery in the water sector in Senegal, both in urban and rural areas. Despite the significant progress in terms of access, as displayed by statistics, water service delivery in Senegal still

presents many challenges. Some observations drawn from various studies and reports suggest that these drawbacks are relatively governance-specific. There are clear pending accountability issues at the level of local collectivities such as rural communities. Further evidence of accountability issues at the municipality level stems from the example of the water service delivered at the stand posts due to lack of clear rules with regard to the sale of water at the stand posts, and due to a lack of unexpected control of tariff and the quality of the service delivered at the stand posts while such responsibilities involve both providers and the municipal councils.

Key issues of governance still remain to be solved in Senegal, showing the importance of examining water outcomes in relation to the varieties of governance within the chain of water delivery in this country. To explore these issues, this study has used two types of analysis: a qualitative analysis and quantitative estimations. We have used two sets of qualitative and quantitative analyses based on interviews and surveys conducted in 43 municipalities in Dakar and 28 rural communities in Kaolack — two regions of Senegal.

Summary results

The first qualitative analysis on accountability relationships between the local councils and water providers in Dakar and Kaolack have shown that water providers other than SDE are present only in few municipalities and that ASUFOR mainly provides water in rural areas. We also find that with regard to tax collection there is no support from the municipal council to SDE and from the majority of rural communities to ASUFOR. The qualitative analysis reveals that in majority, the municipal and rural councils do not have any rigorous influence on water providers. In some cases, they cannot take sanctions against water providers other than send them letters and convoke them for explanations on some water-related issues. While systems of information and transparency are somewhat effective through meetings between

councillors and water providers in both areas, accountability mechanisms are more likely in rural communities, as it is obligatory for ASUFOR to produce, at the end of every month, detailed reports and a regular follow up and control of activities.

The second qualitative analysis regarding the accountability relationships between local councils and the population in Dakar and Kaolack has shown that there is no involvement of outsiders — who are not members of the local councils — in the decision making process and no voice expression of the population during public meetings organized by the local councils. The qualitative analysis also reveals that the municipal council does not inform the citizens about the action program of the council related to water issues, unlike some rural communities. Accountability mechanisms seem more likely though in both areas: The municipal councils ensure good use of local resources by establishing an administrative account that explains how local resources are used; the rural councils do the same through a participative management involving the population. The population has the capacity to take sanctions against councillors through vote during the local elections or by denunciation via demonstration and through the media.

The study has also used two sets of quantitative analyses examining the relationship between some governance variables and some water outcomes. The first quantitative analysis is an econometric analysis at the individual (user) level and is based on data from *Senegal 2008 Afrobarometer*. Regression results have shown that, holding water outcomes constant, the governance condition matters in explaining client satisfaction with clean water provision by the local councils. Local council accountability is more important than participation and transparency in explaining user satisfaction with respect to the provision of clean water service. People who think that the local council is consulting effectively with others (including traditional, civic and community leaders) before making decisions are more likely

to be satisfied with clean water provision by the local council. The conviction that the local council provide effectively a guarantee that the local government revenues are used for public services and not for private gains, has a positive and significant impact on the probability of the user being satisfied with the provision of clean water by the municipal/rural council.

The second quantitative analysis is also an econometric analysis based on time series data at the municipality and the rural community levels for the period 2000 to 2011, from a survey conducted in 43 municipalities in Dakar and 28 rural communities in Kaolack. Regression results have shown that the number of meetings between the municipal council and SDE has a positive and significant effect on the number of houses connected to SDE water, on the tax on SDE water received by the municipal council, and leads to a significant reduction in the number of days of SDE water outages. The econometric analysis also reveals that the number of meetings between the municipal council and the representatives of the community significantly increases the tax on SDE water received by the municipal council, decreases the number of days of SDE water outages considerably, but has no significant impact on the number of houses connected to SDE water.

We also find that the number of times that the municipal council reports to the population has a positive and significant effect on the number of houses connected to SDE water. The results indicate that contrary to the case of urban hydraulic in the municipalities in Dakar, there is no significant effect of the governance variables — the number of meetings between the rural council and the representatives of the community, the number of meetings between the rural council and the water provider ASUFOR and the variable rural council concentration — on water outcomes such as access to piped water in rural communities in Kaolack. Only the variable ASUFOR member concentration — the Herfindahl index of

village member in ASUFOR management committee — is found to be negative and significant.

Policy implications

Six implications are drawn from analyzing the accountability relationships between the population, local councils and water providers in relation to some water outcomes. First, strong support from the local councils to providers vis a vis tax collection would help increase the latter's financial capacity as well as their water delivery capacity, thereby reducing the water price burden on the users. Second, the qualitative analysis implies that strong accountability relationships between the main provider SDE — in urban hydraulic — and municipalities are missing. On the one hand, water users are generally more inclined to be closer to the municipal councils because of the latter's status as decentralized institutions — in particular with regard to water-related issues — as these institutions give their agreement for the private (individual) connections to SDE water and also facilitate social connections to SDE water. On the other hand, as per the interviews, municipal councils have acknowledged receiving from SDE, as tax on clean water, a certain percentage on each water bill, but at the same time have also complained about the tax scheme.

Hence, there is an advantage for urban water delivery to strengthen the existing accountability relationships between SDE and the municipalities — with the latter playing an intermediary between SDE and the population — through formal innovative transparency and accountability mechanisms that go beyond meetings between both parties, and municipalities' correspondences and convocations. The effectiveness of this would result in greater access to SDE piped network for the population, and consequently to more taxes received by municipalities on SDE water. This specifically calls for, for example, the much needed supervision of SDE water management by the municipal councils; involvement of the

municipal councils as member of the SDE water management committee, and vice versa; and direct information from SDE to the municipal councils regarding water delivery.

Third, the qualitative analysis vis a vis the accountability relationships between local councils and the population in Dakar and in Kaolack suggests that greater participation of the latter in the affairs of the municipality/rural councils is critical to achieving greater transparency and enhancing the citizens' capacity to influence decision making related to key issues in the water sector. Hence, strong accountability relationships between these two actors are necessary in order to improve the performance of the water sector.

Four, and related to the above, the quantitative analysis implies that local council governance is important for user satisfaction in terms of water provision, and accountability is a crucial driver in this respect, in both rural and urban areas. This, suggests that governance conditions directly impact user satisfaction, due to effects different from water outcomes: it is not only water outcomes that matter for user satisfaction but also the users' experience of governance conditions — such as their participation and the availability of information — that seems significant for their satisfaction with clean water provision by local councils.

Five, as per the quantitative analysis regular meetings between the municipal councils and SDE and between the municipal councils and the representatives of the community are important in improving water outcomes. However, while the regular meetings between the municipal councils and the water provider SDE are determinants of better water services, there is a need to review the role of meetings between the rural councils and ASUFOR and the population, in this respect. The analysis also implies that accountability relationship — in the form of regular reporting of the municipal councils to the population — is crucial for better water services delivery.

Six, the diversification of councilors in terms of political party member in the municipal/rural councils is not relevant for the water service delivery in the municipalities and the rural communities. This result would suggest that there is a need to sensitize the population on the effective role of vote in social service delivery such as water provision. Another observation from the results is that ASUFOR member concentration appears to be a driver in terms of better access to water service in the rural areas. Village access to piped water would increase as more villages are represented as members in the ASUFOR management committee.

Annex

Table A1: Definition of the variables used in Model 1

Variable	Definition
Dependent variables	
Satisfaction	Ordered user's satisfaction on the provision of clean water by the Municipal/Rural Council (not at all satisfied=1 to very satisfied=4)
Satisdum	Dummy if respondent is satisfied with clean water provision by the Municipal/Rural Council =1; 0 otherwise
Governance variables	
<i>Participation</i>	
Involvement	Dummy if respondent perceive that the local council is allowing citizen participation in the assembly decisions =1; 0 otherwise
Consultation	Dummy if respondent perceive that the local council is consulting others (including traditional, civic and community leaders) before making decisions =1; 0 otherwise
<i>Transparency</i>	
Info Program	Dummy if respondent perceive that the local council is making the Assembly's program of work known to ordinary people =1; 0 otherwise
Info Budget	Dummy if respondent perceive that the local council is providing citizens with the information about the Assembly's budget =1; 0 otherwise
<i>Accountability</i>	
Complaint	Dummy if respondent perceives that the local council is providing effective ways to handle complaints about Assembly men/women or local officials =1; 0 otherwise
Guarantee	Dummy if respondent perceives that the local council is guaranteeing that local government revenues are used for public services and not for private gain =1; 0 otherwise
	Mean of variables: Complaint and Guarantee
Governance	First principal component of variables: Involvement, Consultation, Info Program, Info Budget, Complaint and Guarantee
Service delivery control	
Piped water system	Dummy if a piped water system is present in the urban/rural zone=1; 0 otherwise
Clean water lack	Dummy if household faced, in the last 12 months, lack of clean water for home use =1; 0 otherwise
Location water	Dummy if the main source of water for household use is located inside the house or the compound=1; 0 otherwise
Water payment	Dummy if households have to pay for using water from the main provision source =1; 0 otherwise
Socio-demographics control	
Gender	Dummy if respondent in the household is male=1; 0 otherwise
Size adult	Number of adults in the household
Age	Age of the respondent in the household
Head household	Dummy if respondent in the household is the head=1; 0 otherwise
Education	Dummy if respondent in the household has at least a primary schooling=1; 0 otherwise

Ethnic Wolof	Dummy if household belongs to Wolof ethnic=1; 0 otherwise
Employment status	Dummy if respondent of household does not have a job that pays cash income=1; 0 otherwise
Exclusion restrictions	
Phone	Dummy if respondent own a cell phone=1; 0 otherwise
News radio	Dummy if respondent receive information from radio every day=1; 0 otherwise
News television	Dummy if respondent receive information from television every day=1; 0 otherwise
Committee water	Dummy if respondent are a member of the management water committee =1; 0 otherwise
Committee technic	Dummy if respondent is a member of the technical committee of the local council =1; 0 otherwise
Manage problem	Dummy if respondent perceived a problem in the way the local council is run in the last 12 months =1; 0 otherwise
Contact councilor	Dummy if respondent contacted a local government councillor about some important problem or to give their views =1; 0 otherwise
Member association	Dummy if respondent is a member of an association or a community group =1; 0 otherwise

Source: Senegal 2008 Afrobarometer survey.

Table A2: Definition of the variables used in Model 2

Variable	Definition
Dependent variables	
<i>Municipality</i>	
Ln (houses connected to SDE)	Logarithm of the number of houses subscribed to the network of the urban hydraulic water provider, the <i>Senegalaise des Eaux (SDE)</i>
Ln (tax on SDE water per HH)	Logarithm of the tax on SDE water received by the municipality divided by the number of households in the municipality (in FCFA)
SDE water outage	Total number of days of outage of SDE water tap in the municipality
<i>Rural community</i>	
Access rate piped water	Percentage of the population having access to drinking water with a piped water connection in the rural community
Village access rate	Percentage of villages with piped drinking water in the rural community
Governance variables	
<i>Municipality</i>	
Meetings CA_pop	Number of meetings of the municipal council with the representatives of the community in the municipality
Report CA	Number of times the municipal council reports to the population about its realizations
Meetings CA_Sde	Number of meetings of the municipal council with SDE
Municipal council concentration	Herfindahl index of political party member in the municipal council (%)
<i>Rural community</i>	

Meetings CR_pop	Number of meetings of the rural council with the representatives of the community in the rural community
Meetings CR_Asufor	Number of meetings of the rural council with the rural community-based groups water provider, ASUFOR
Asufor member concentration	Herfindahl index of village member in ASUFOR management committee (%)
Rural council concentration	Herfindahl index of political party member in the rural council (%)
Control variables	
Water projects	Number of water projects undertaken by the rural council
Ln (density)	Number of persons per km ² in the municipality/rural community
Ln (precipitation)	Logarithm of average annual precipitations in the municipality/rural community (in mm)
Ln (CA/CR resource per capita)	Logarithm of the local council resource divided by the population in the municipality/rural community (in FCFA)

Source: Municipality/rural community survey, 2012.

Table A3: Pooled OLS regression results on municipalities data of the region of Dakar, Senegal

	Ln (houses connected to SDE)		Ln (tax on SDE water per HH)		SDE water outage	
	A	B ^a	A	B ^a	A	B ^a
Governance variables						
Meetings CA_pop	-0.035***	-0.004	0.038***	0.029**	0.106	-0.194
Report CA	0.097***	0.061**	-0.057***	-0.054**	0.515***	0.932***
Meetings CA_Sde	0.123***	0.041	0.085***	0.133***	0.764***	0.971*
Municipal council concentration		-2.096***		1.150**		2.487
Controls						
Ln (density)	0.292***	0.473***	-0.185***	-0.154**	2.399***	1.202
Ln (precipitation)	0.407***	1.048***	0.329***	0.394**	-0.383	-6.056***
Ln (CA resource per capita)	-0.686***	-0.465***	0.385***	0.433***	1.561***	0.266
Constant	9.565***	5.027***	2.610***	1.126	-19.344***	21.147
Observations	471	105	433	96	479	106
R-squared	0.659	0.746	0.533	0.606	0.122	0.289

^a Estimation results on the years 2001, 2008 and 2011.

The definition of the variables is given in Table A2 (Annex). Significant effects are indicated with *** p<0.01, ** p<0.05, * p<0.10.

Source: Estimated from municipality survey.

Table A4: Pooled OLS regression results on rural communities data of the region of Kaolack, Senegal

	Access rate piped water		Village access rate	
	A	B ^a	A	B ^a
Governance variables				
Meetings CR_pop	0.677	0.897	-0.578	-0.993
Meetings CR_Asufor	-0.263	-1.605	0.077	-0.772
Asufor member concentration	30.761***	38.123*	-81.461***	-124.339***
Rural council concentration		-69.045***		23.990
Controls				
Water projects	5.729***	6.774***	2.630*	0.146
Ln (density)	1.064	0.970	16.919***	19.737
Ln (precipitation)	15.344***	8.596	-1.091	-28.503
Ln (CR resource per capita)	7.714***	13.923**	6.300**	3.909
Constant	-113.884***	-70.361	-43.802	156.218
Observations	142	40	139	41
R-squared	0.273	0.376	0.410	0.528

^a Estimation results on the years 2001, 2008 and 2011.

The definition of the variables is given in Table A2 (Annex). Significant effects are indicated with *** p<0.01, ** p<0.05, * p<0.10.

Source: Estimated from rural community survey.

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