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Water and Sanitation in Latin America and the
Caribbean: An Update on the State of the Sector

Salvador Bertoméu-Sánchez and Tomás Serebrisky

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Abstract

The purpose of this paper is to provide with an updated snapshot of the water and sanitation sector across Latin American countries, focusing of its key policy characteristics. Access to water and sanitation in the region has improved since the 1990s, decade during which almost every country adopted major reforms of the sector, consisting mainly in increasing private sector participation and the creation of autonomous regulatory bodies. We find that challenges remain in tariff design, service quality, financial health of the sector, and in governance issues related to a lack of coordination between the level of decentralization of the regulation and management of the sector. Finally, the paper provides with a review of the related empirical literature.

Keywords

Water, sanitation, Latin America, privatization, regulation, tariffs, service quality.

JEL Codes: L33, L38, L43, L51, L95, O13, O18, O54

Introduction*

Latin America and Caribbean (LAC) is endowed with abundant fresh water: In 2014, it accounted for 32 percent of the world's internal renewable water resources (FAO 2016). Historically, however, access to improved water and sanitation services in the region was unequal, service quality was poor, and financing of the sector was inadequate.

To deal with such issues, starting in the early 1990s, countries adopted major reforms of their water and sanitation sectors. By the end of the decade, almost every country in the region had undertaken such sector reforms (Foster 2005). The objectives of these reforms were to extend access to water and sanitation services to 100 percent of the population and improve the efficiency and financial viability of the sector.

To achieve these objectives, most LAC countries introduced legislation focused on financing and governance. Efforts were made to attract private participation to the sector, in order to fill the financing gap. Initial aggressive efforts in some countries led to very high levels of private participation by the end of the 1990s (86 percent of total financing of the sector in Chile and 62 percent in Argentina). By the mid-2000s, however, private participation had returned to its earlier (low) levels (Foster 2005).

Many countries also created autonomous regulatory bodies to supervise the activities of the private sector, in order to ensure that quality standards were met in a cost-effective manner. These reforms went farther than the private sector participation reforms: By the end of the 1990s, more than half of the countries in the region had created a regulatory body in the sector (see appendix table A.1 for a list of the regulators in each country). Incongruences between the level of government at which the sector was regulated (centrally) and managed (more locally) limited the positive impact of such reforms, however.

Thus, following the reforms that started during the early 1990s throughout LAC countries, progress in access to water and sanitation services was made, but there is evidence that such progress has been significantly constrained by affordability and governance issues. This chapter describes the key characteristics of the sector in LAC. The next section looks at sector performance (access to water and sanitation and tariffs in the water sector). The following sections describe governance (regulation and the role of private participation), briefly review the empirical literature, and summarize the chapter's main findings.

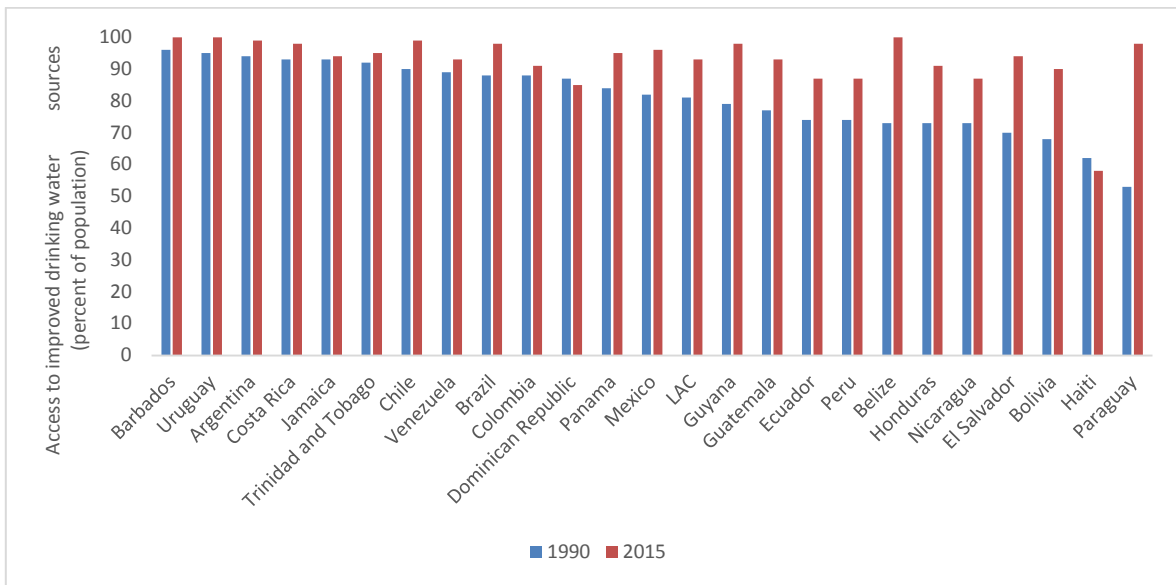
Sector Performance

Access to Improved Water Sources

Access to improved drinking water sources has increased since the beginning of the reform waves that started in the early 1990s. For the region as a whole, access increased from 81 percent of the population in 1990 to 95 percent in 2015 (figure 1). All but two countries (the Dominican Republic and Haiti) increased access during this period. Belize, Bolivia, El Salvador, Honduras, and Paraguay, which had very low access rates in 1990, increased access to more than 95 percent.

* We are grateful to Antonio Estache for comments and suggestions. Any mistake or misinterpretation is our responsibility and ours only and should not be attributed to any of the institutions we are affiliated with.

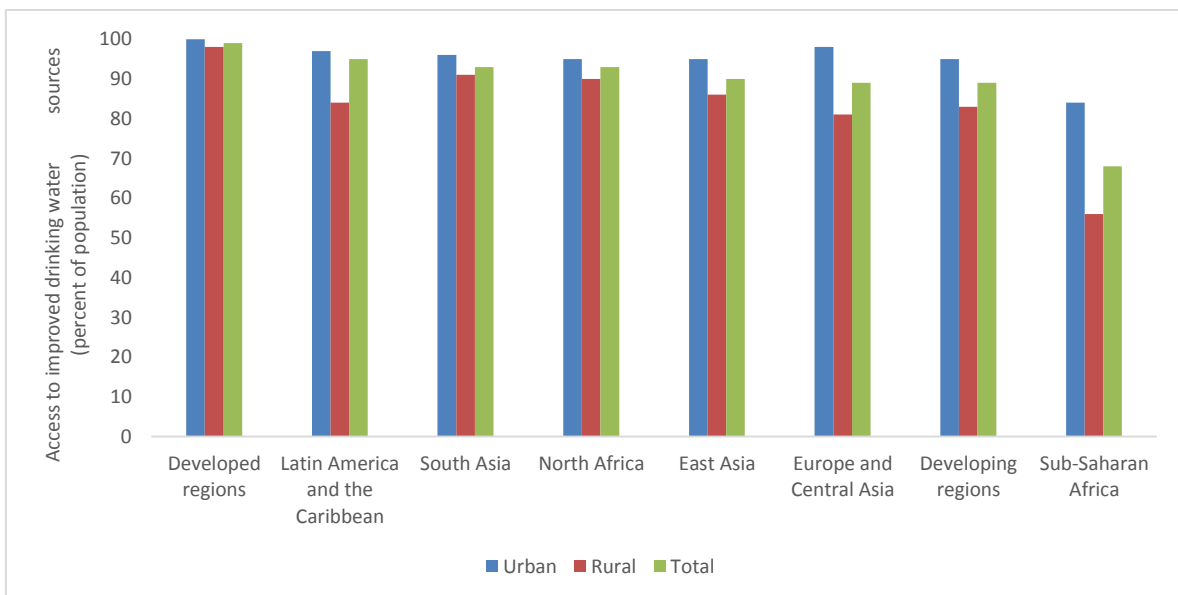
Figure 1 Access to improved drinking water sources, by country, 1990 and 2015



Source: World Health Organization (2016) (accessed on July 4, 2017).

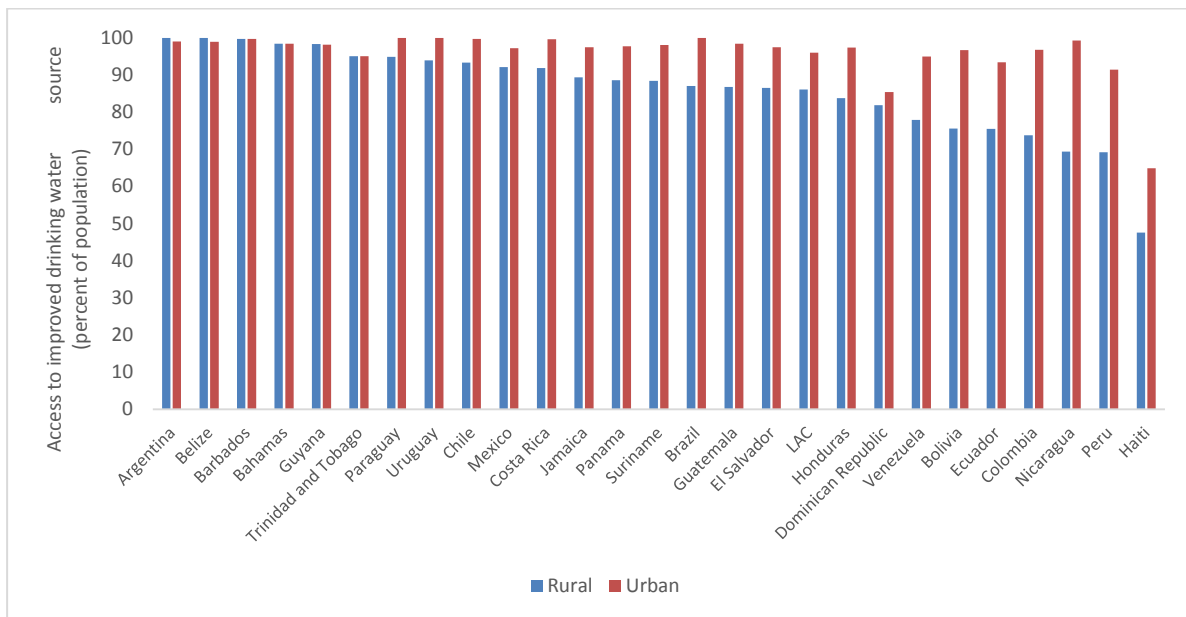
Progress in LAC was remarkable by world standards. So great was the improvement that in 2015, the only set of countries that had a higher access rate than LAC were developed countries, where 99 percent of the population had access to improved drinking water (figure 2).

Figure 2 Access to improved drinking water sources in rural and urban areas, by world region, 2015



Source: World Health Organization (2016) (accessed on July 4, 2017).

Figure 3 Access to improved drinking water sources in urban and rural areas, by country, 1990 and 2015



Source: Joint Monitoring Programme of the World Health Organization and UNICEF (2016) (accessed on July 4, 2017).

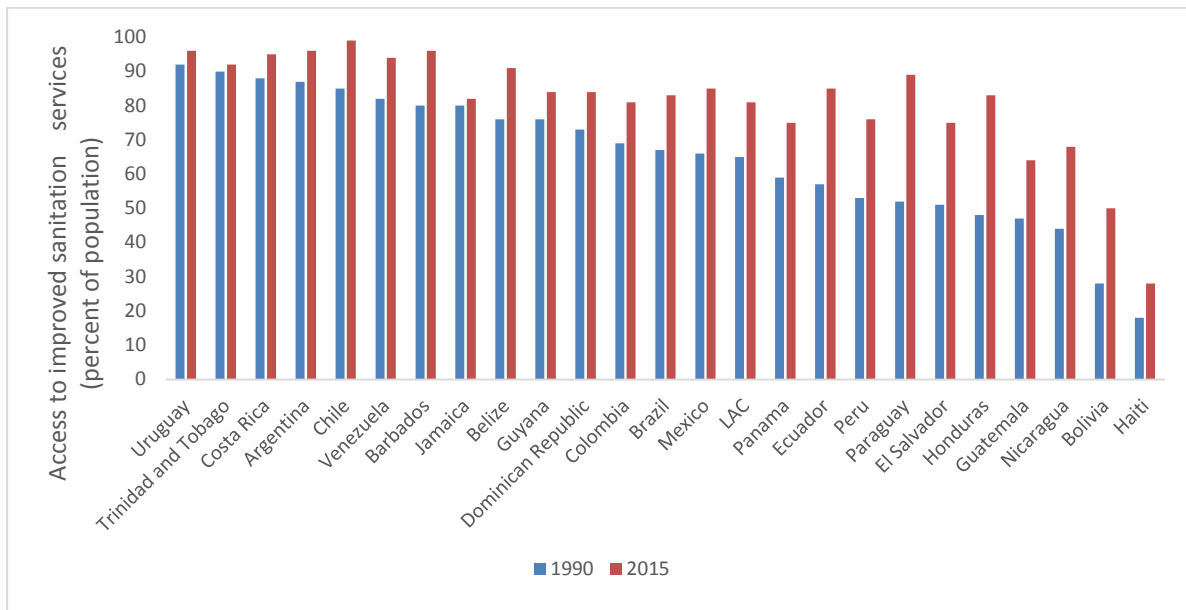
Improvement was fueled by increases in urban access. Rural access remains low: The region performs better than Sub-Saharan Africa and Europe and Central Asia and better than the average for developing countries (84 percent versus 83 percent), but it lags well behind developed countries, where 98 percent of the rural population has access (figure 2). In some countries, such as Argentina, Paraguay, and Uruguay, rural rates are close to urban ones. In others, such as Bolivia, Colombia, Ecuador, Nicaragua, Peru, and Venezuela, rural access rates are below 80 percent, considerably below urban rates (figure 3). Efforts to improve access have focused on urban areas, possibly because of their high growth rates in terms of population and increasing demand for water services.¹

Access to Improved Sanitation Services

Access to sanitation improved in LAC between 1990 and 2015, but the average figure reached just 81 percent (figure 4). Some countries made good progress: Between 1990 and 2015, access increased from 28 percent to 50 percent in Bolivia, from 48 percent to 83 in Honduras, and from 57 percent to 85 percent in Ecuador. However, and though important improvements, some countries were in 2015 at worryingly low levels, such as Bolivia, Guatemala, Haiti or Nicaragua.

¹ LAC is the most urbanized region in the world, having increased its urbanization rate from 73 percent in 1995 to 80 percent in 2014 (Arroyo, Ballester, and Mejia 2015).

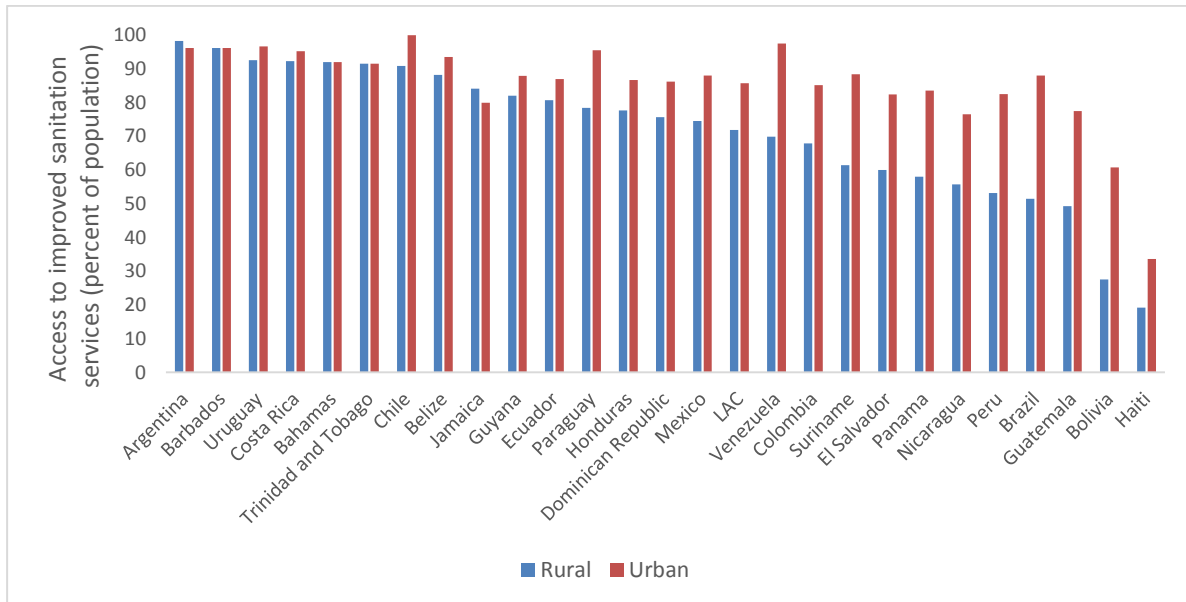
Figure 4 Access to improved sanitation, by country, 1990 and 2015



Source: Joint Monitoring Programme of the World Health Organization and UNICEF (2016) (accessed on July 4, 2017).

Access to improved sanitation services exceeded 90 percent in urban areas of most countries in the region in 2015 (figure 5). It was much lower in rural areas: In some countries (Guatemala, Bolivia, and Haiti), less than half the rural population had access to improved sanitation.

Figure 5 Access to improved sanitation services in urban and rural areas, by country, 2015



Source: Joint Monitoring Programme of the World Health Organization and UNICEF (2016) (accessed on July 4, 2017).

Overall, access to sanitation services is lagging and there are important inequalities in terms of rural versus urban access. It is worth highlighting, however, that though efforts are still needed and that there is a clear urban bias, there have been significant improvements, driven by essentially by Bolivia (28 percent in 1990 and 50 percent in 2015), Honduras (48 percent in 1990 and 83 percent in 2015), or Ecuador (57 percent in 1990 and 85 percent in 2015).

Water Tariffs

Water tariffs play a key role in improving the efficiency of water use. On the demand side, they determine the price water users pay for water, thus having social equity consequences. On the supply side, they determine the extent to which water utilities can recover costs, thus having financial sustainability consequences.

Increasing block tariffs (IBTs) have traditionally been the choice of water regulators and policymakers in developing countries, because they supposedly protect the poor. In such an IBT set-up, consumption is structured in blocks, with the first block corresponding to the lowest level of consumption and the last block corresponding to the highest level of consumption. Water users are charged a fixed unit price for the units consumed in the first block, a higher price for units consumed in the second block, and so on. In terms of policy, three decisions must be taken when setting up an IBT structure: (i) the number of blocks, (ii) the volume of water associated with each block, and (iii) the unit price of water associated to each block.

Increasing block tariffs were long thought to be efficient, pro-poor, thus attending to equity concerns, and environmentally advantageous for the following reasons:

- Wealthier households and industrial firms cross-subsidize poor households, promoting equity.
- Higher prices associated with higher blocks of consumption discourage irresponsible water use, supporting environmental objectives.
- Block charges are consistent with marginal cost pricing, which promotes economic efficiency.

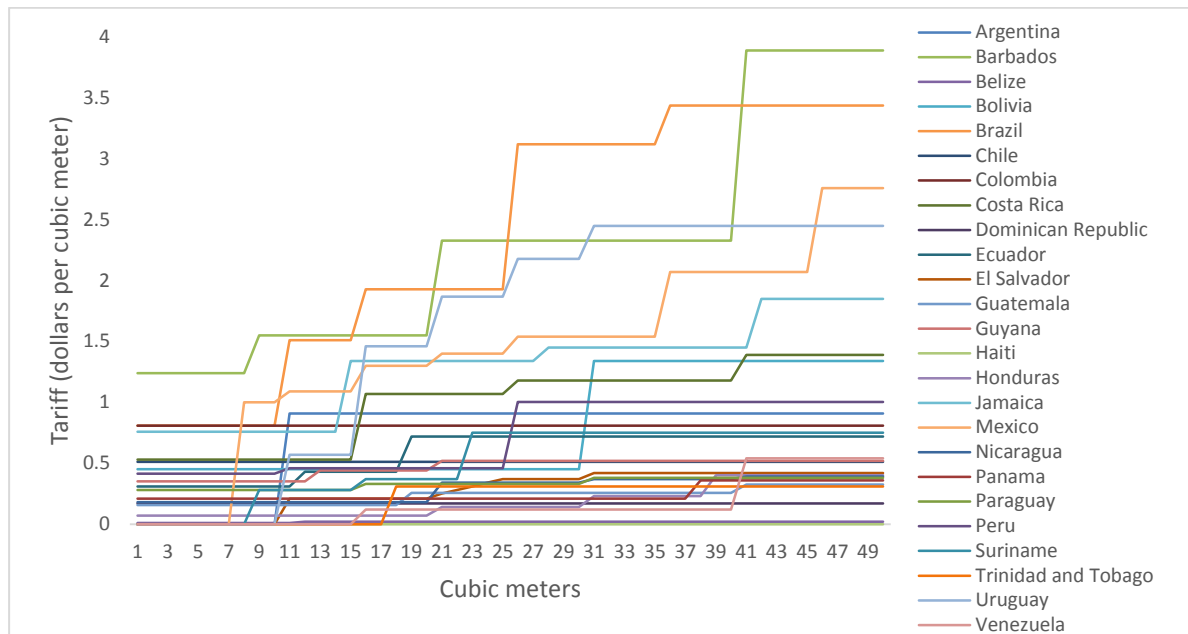
But doubts have been raised about their effectiveness in developing countries. Boland and Whittington (1998) conclude that they increase inefficiency, inequity, complexity, opacity, and instability and create forecasting difficulties. They claim that simpler structures—such as two-part tariffs, which charge a fixed price per month plus a variable amount based on the volume consumed—can achieve better results.

Increasing block tariffs are the most common water tariff structure in LAC. Capitals² in all countries except Chile, Colombia, and the Dominican Republic, which have two-part water tariffs, and Haiti, which has a simple linear tariff, use increasing block tariffs (figure 6).³ However, the design of IBT structures vary significantly across countries in terms of level of fixed and variable charges, and number and width of blocks.

² For some countries, due to unavailability of data on its capital cities, the analysis has been done on the most important city, in economic and population terms.

³ The Bahamas has not been included in the figures due to their considerably higher tariffs with respect to the rest of the region, creating graphical distortions.

Figure 6 Water tariffs in selected capitals, 2016

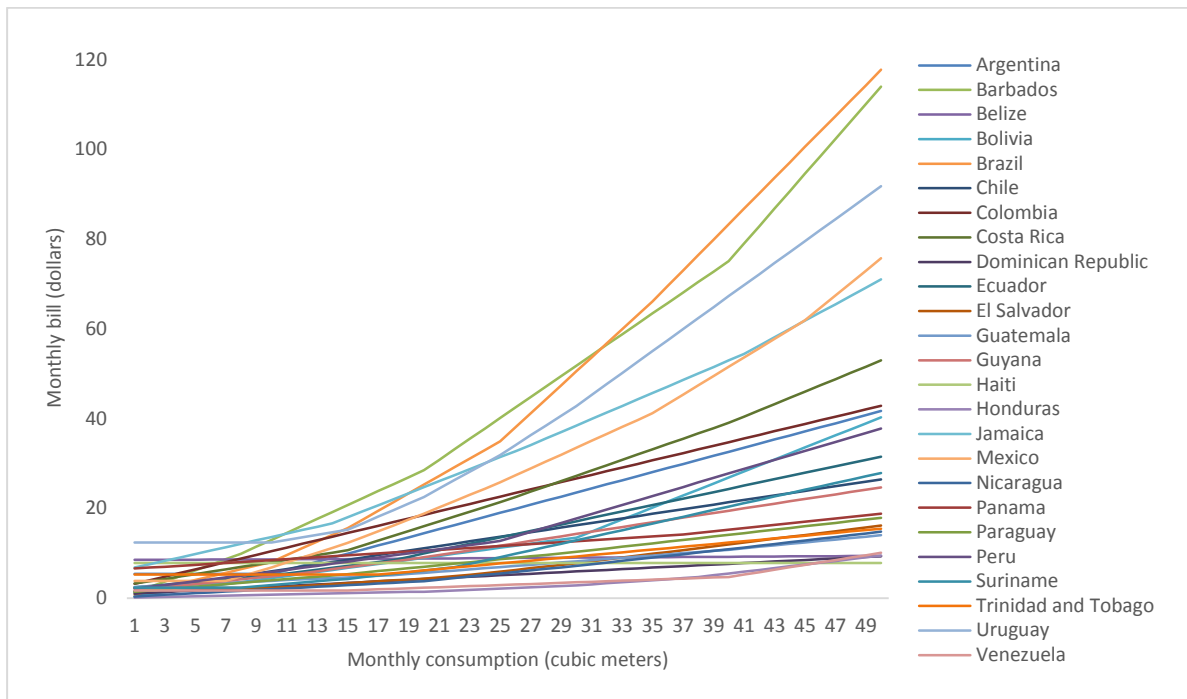


Sources: Data from the International Benchmarking Network for Water and Sanitation Utilities (IBNET) and Global Water Intelligence (2016).

These differences in the level of fixed and variable charges, the number and width of blocks imply that monthly water bills vary widely across countries (figure 7). For low levels of monthly consumption (3 cubic meters), the difference between the lowest (Honduras) and highest (the Bahamas and Uruguay) bill is about \$12. At the highest level of consumption (50 cubic meters), this difference grows to \$230. Excluding the outlier in the sample (the Bahamas), significant differences in water bills start appearing at consumption levels of 15 cubic meters. The average bill for consumption of 15 cubic meters a month, considered to be the minimum amount of water required at the household level to satisfy basic needs, is \$8.50 in LAC (see appendix figure A.1),⁴ slightly less than in other developing regions, such as Sub-Saharan Africa (\$9.90) or the Middle East and North Africa (\$10.40). LAC households less, on average, than these two developing regions' households for the minimum level of consumption to cover for basic needs. But prices vary widely across countries. In most countries in LAC, the unit price is slightly higher for higher levels of consumption, pointing towards a tariff structure penalizing high levels of consumption.

⁴ At 15 cubic meters of consumption, the lowest bill is in Honduras (\$1.12) and the highest is in the Bahamas (\$53.87).

Figure 7 Monthly water bill in selected capitals, 2016

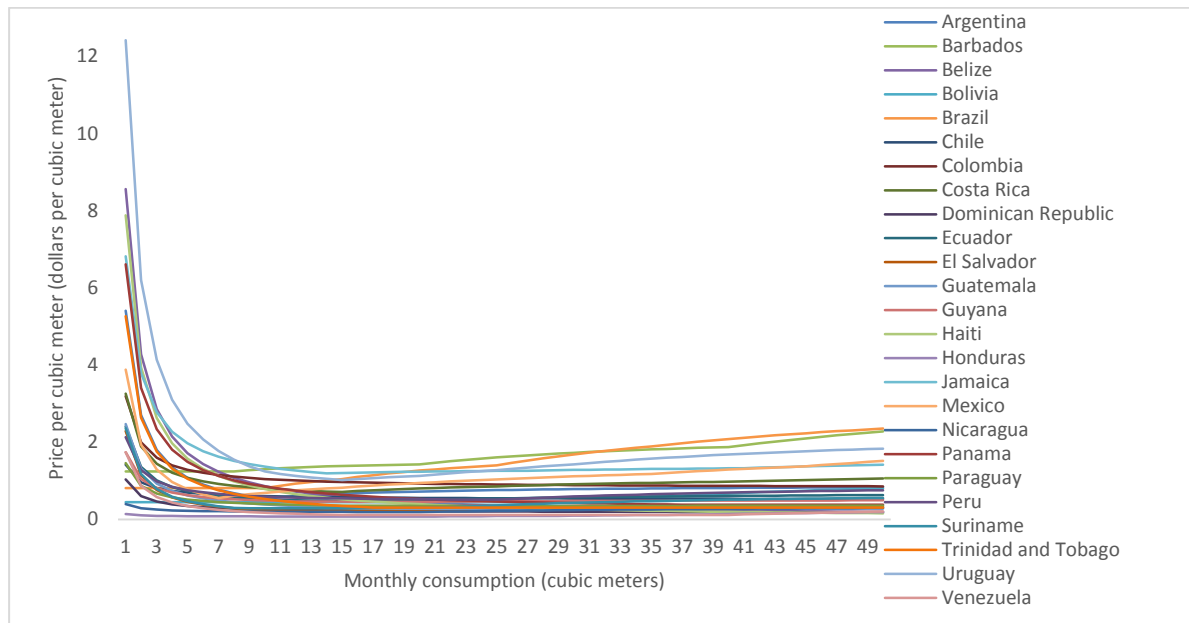


Sources: Data from the International Benchmarking Network for Water and Sanitation Utilities (IBNET) and Global Water Intelligence (2016).

Another indicator that reveals the heterogeneity in water prices in LAC is the average price per cubic meter (figure 8). In most LAC capitals, the average price per cubic meter increases as a function of the consumption level, albeit not steeply. Some countries charge the same rate per cubic meter, regardless of the level of consumption. No country in LAC charges less per cubic meter for higher levels of consumption.⁵

⁵ In some countries outside the region, such as Spain, the average price of water falls as consumption rises.

Figure 8 Average price of water in selected capitals, 2016

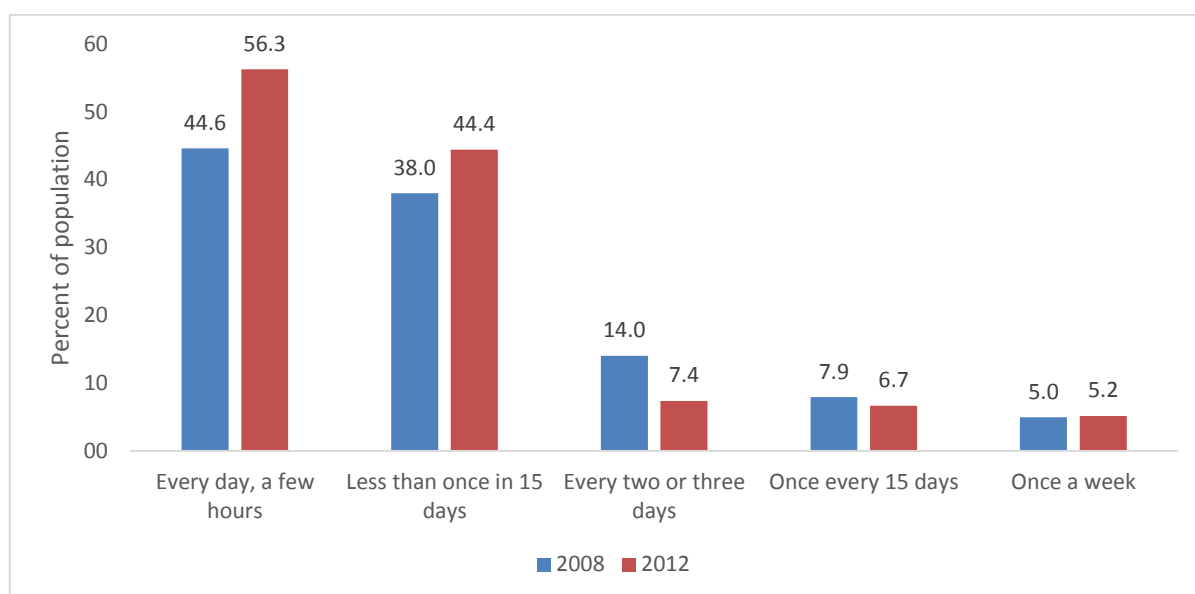


Sources: Data from the International Benchmarking Network for Water and Sanitation Utilities (IBNET) and Global Water Intelligence (2016).

Unreliable Access to Water

Urban access to water increased markedly after 1990, but the share of the population with continuous access actually declined slightly between 2008 and 2012, according to survey of selected cities in Argentina, Bolivia, Brazil, Colombia, Ecuador, Mexico, Panama, Peru, Uruguay and Venezuela, falling from 87.9 percent to 86.5 percent (CAF, 2014). Moreover, among the share of the population that does not have a continuous access to water services (13.5 percent in 2012), there was a significant increase between 2008 and 2012 in the share of users who had access less than once every 15 days, from 38.0 percent to 44.4 percent (figure 9). On the positive side, among people who lacked continuous water service, there was an increase in the share of people with access a few hours every day (from 44.6 percent to 56.3 percent) and a significant decrease in the share of users with access only every two or three days (from 14.0 percent to 7.4 percent).

Figure 9 Urban access to water in Latin America and the Caribbean, 2008 and 2012



Source: CAF (2014).

Note: Survey conducted by the Banco de Desarrollo de América Latina in cities in Argentina, Bolivia, Brazil, Colombia, Ecuador, Mexico, Panama, Peru, Uruguay, and Venezuela.

Health Consequences of Unsafe Water and Sanitation

Limited and unreliable access has negative effects on public health. The mortality rate attributed to unsafe water and sanitation is much lower in LAC (3.15 per 100,000 people) than in other developing regions (table 1). It is significantly higher than in developed regions, such as Europe (0.65 per 100,000 people) and North America (0.6 per 100,000 people), however. (See appendix figure A.2 for national mortality rates in LAC.)

Table 1 Mortality rates attributed to unsafe water and sanitation, by developing region, 2012

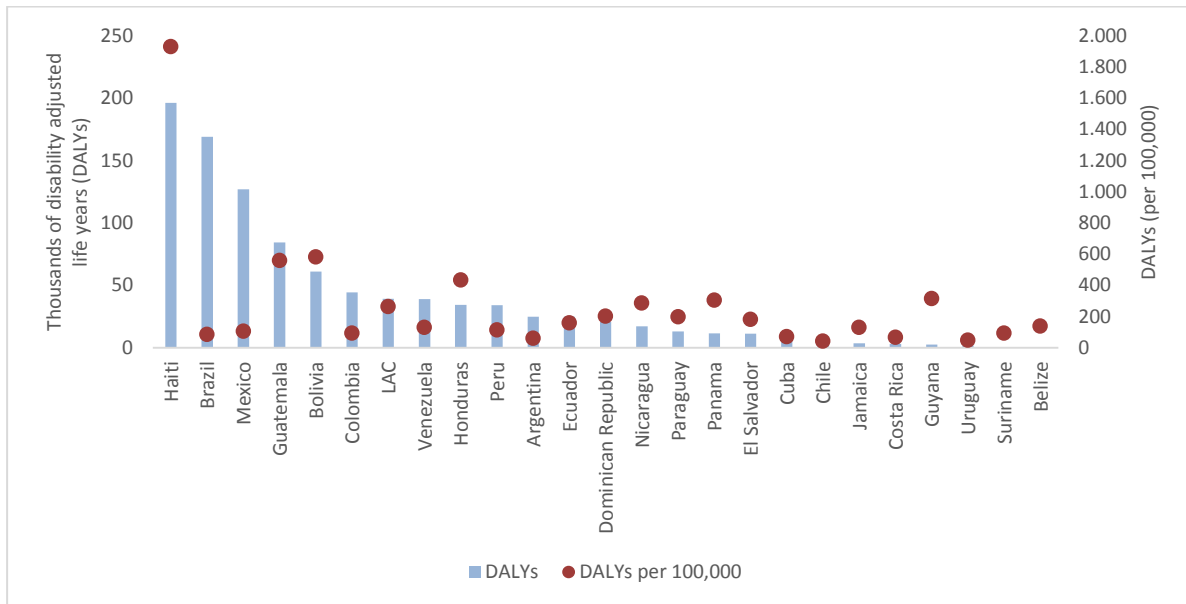
<i>Region</i>	<i>Mortality rate (deaths per 100,000 people)</i>
Sub-Saharan Africa	39.5
Middle East and North Africa	11.58
South-East Asia	7.73
Latin America and the Caribbean	3.15

Source: World Health Organization (2016) (accessed on July 4, 2017).

Another measure of the burden imposed by inadequate water and sanitation services is disability adjusted life years (DALYs).⁶ In 2012 LAC countries collectively lost 980,000 DALYs. The highest absolute figures were in Haiti, Brazil, Mexico, Guatemala, Bolivia, and Colombia (figure 10). On a population-adjusted basis, the heaviest burdens were in Haiti, Bolivia, Guatemala, and Honduras.

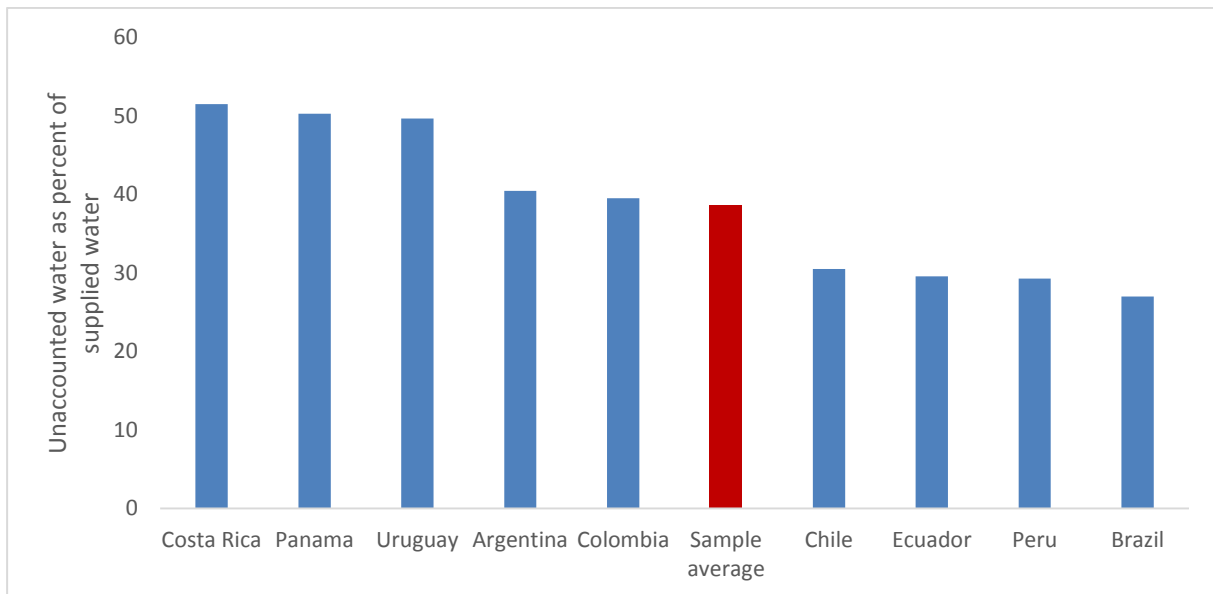
⁶ One DALY can be thought of as representing one lost year of healthy life. The sum of DALYs across the population can be thought of as a measure of the gap between the current health status and an ideal health situation, in which the entire population survives to old age, free of disease and disability.

Figure 10 Disability adjusted life years (DALYs) lost as a result of inadequate access to water and sanitation, by country, 2012



Source: World Health Organization (2016) (accessed on July 4, 2017).

Figure 11 Unaccounted water as percent of supplied water in capitals of selected countries, 2012



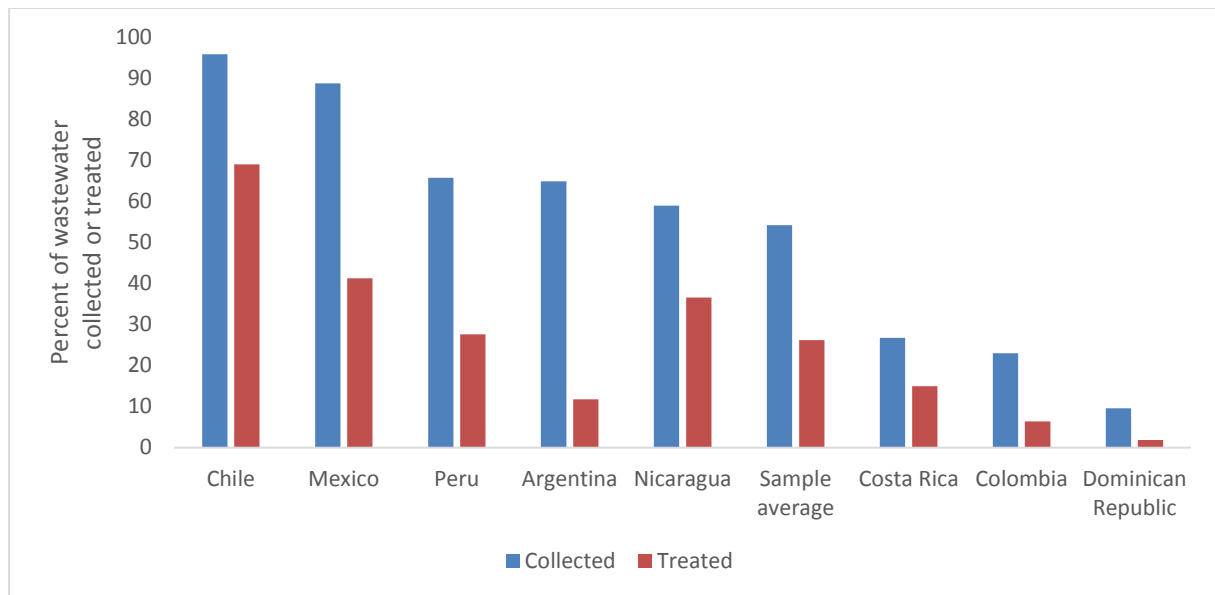
Source: Asociación de entes reguladores de agua potable y saneamiento de las Américas (ADERASA) (cited in Lentini 2015).

The share of unaccounted water is also high in LAC. In 2012, 39 percent of total water supply was unaccounted for (it leaked or did not make it to its destination for some other reason) (figure 11). In Costa Rica, Panama, or Uruguay, the figure exceeded 50 percent.

Untreated wastewater is pumped into rivers and oceans, with severe consequences for both the environment and health. Even in urban areas, on average only 54 percent of wastewater was collected between 2008 and 2012 (the figure ranged from 10 percent in the Dominican Republic to 96 percent in Chile) (figure 12). Worse yet, only 26 percent of urban wastewater was treated (the figure ranged from

2 percent in the Dominican Republic to 69 percent in Chile). Data are not available for rural areas, but the problems are much worse there.

Figure 12 Share of wastewater collected and treated in capitals of selected countries



Source: AQUASTAT database of the Food and Agriculture Organization (accessed on July 31, 2017).

Note: Data are averages for 2008–12.

Sector Financing and Governance

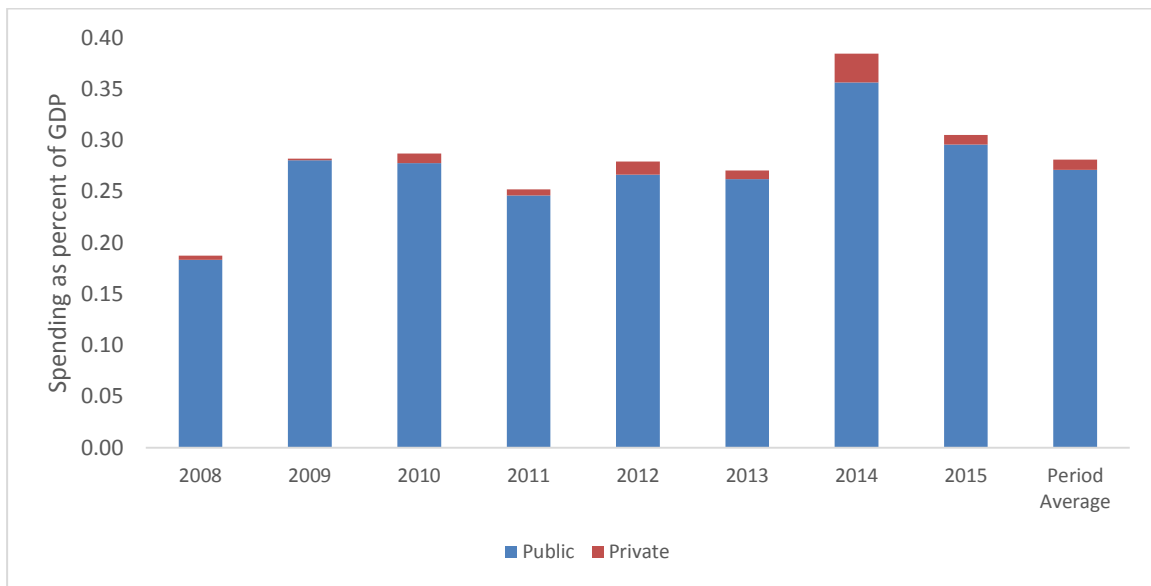
Performance of the water and sanitation sector is closely related to its financing and governance. This section examines the evolution of public and private financing of the sector over the past decade, the financial performance of sector operators, and the characteristics of the sector’s governance on a country-by-country basis.

Investment in Water and Sanitation

LAC needs to spend 0.30 percent of GDP a year until 2030 to meet the water and sanitation needs in order to maintain actual access rates in urban areas and improve access rates in rural areas by closing on the coverage and quality gaps (Arroyo, Ballesteros, and Mejía 2015). Average annual investment in the water and sanitation sector over this period range from 0.19 to 0.38 percent of GDP, with an average of 0.28 percent of GDP (figure 13). Almost all of this spending was public.

Moreover, new infrastructure put in place to close on the coverage and quality gaps, directly imply additional maintenance and operating costs. Thus, the necessary spending in water and sanitation should be above 0.30 percent of GDP, and an effort is then needed to increase the sector’s financing, whether the source is public or private, with respect to recent years in LAC.

Figure 13 Average spending on water and sanitation in Latin America and the Caribbean as percent of GDP, 2008-2015



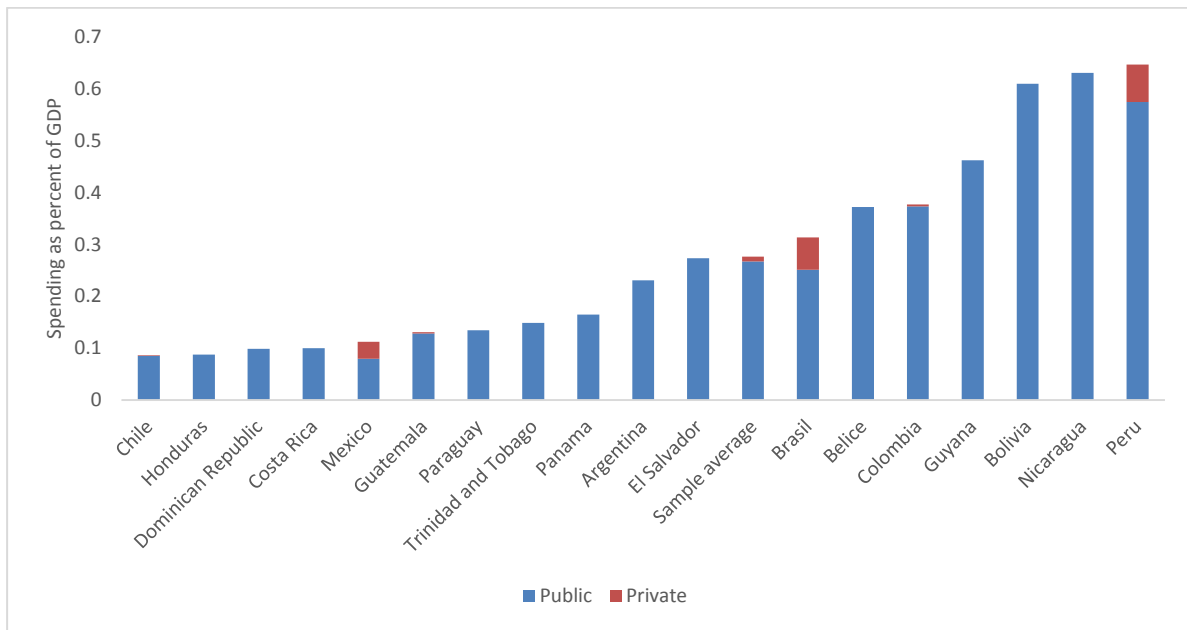
Source: Infratam (accessed on July 19, 2017) and World Bank PPI database (accessed on May 12, 2017).

Note: Data are for 2008–15.

Spending varied widely across countries (figure 14). It was lowest in Chile (0.086 percent of GDP) and highest in Peru (0.65 percent of GDP).

The relationship between spending and access is not clear. El Salvador, Guatemala, Honduras, and Panama spent considerably less than average and had below-average access rates for both water and sanitation and suboptimal service quality. But other countries, such as Argentina, Chile, Costa Rica, Mexico, and Paraguay, spent significantly less than the sample average and had high rates of access to both water and sanitation, and in yet others (including Bolivia, Colombia, Nicaragua, and Peru), access to water and sanitation was considerably weak, but spending was well above average, which could indicate that the necessary steps are being taken to close on the coverage and quality gaps.

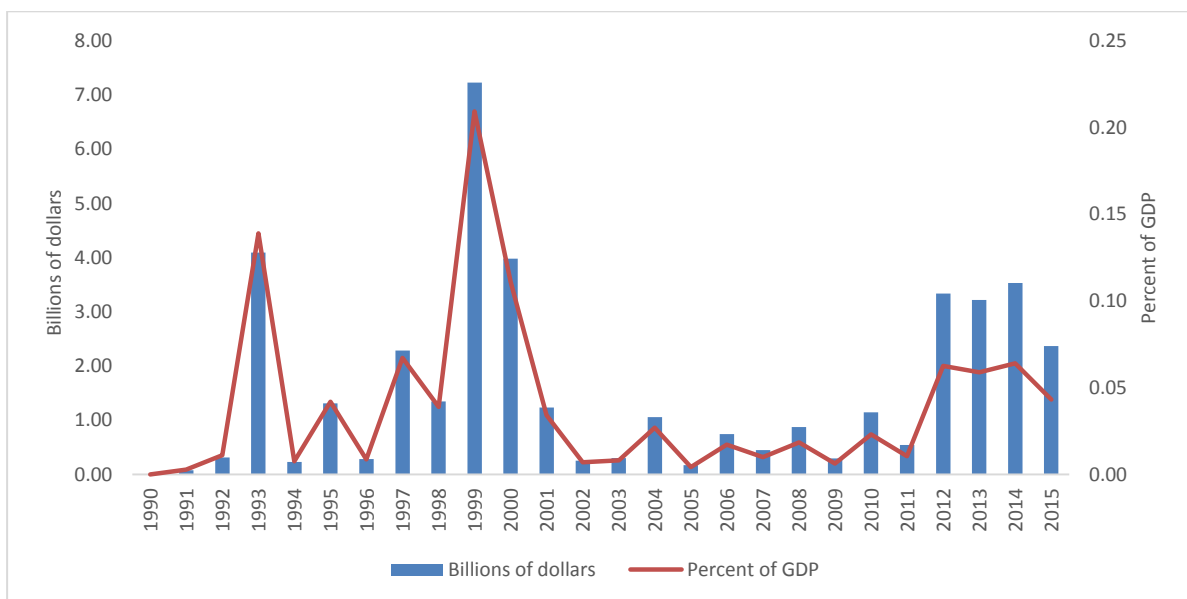
Figure 14 Average spending on water and sanitation as percent of GDP in selected countries



Source: Infratam (accessed on July 19, 2017) and World Bank PPI database (accessed on May 12, 2017).
 Note: Data are for 2008–15.

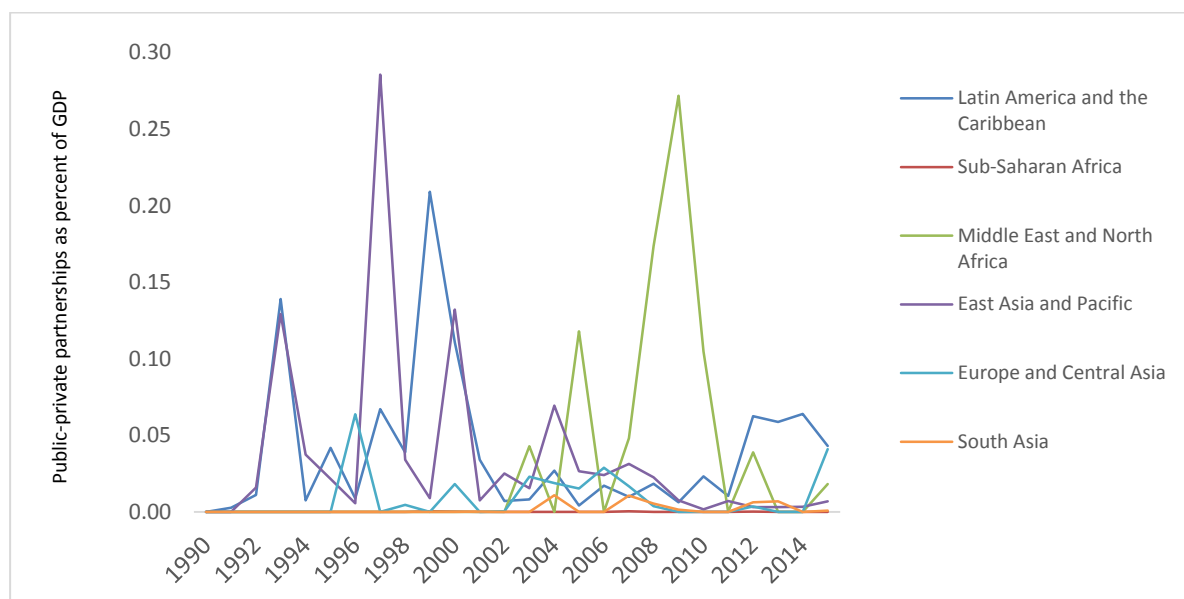
The private sector has an important role to play in LAC, particularly given the constraints on government budgets. After declining considerably between 2000 and 2011, it increased in 2012–2015 (figure 15), making LAC the leading region in the world for private participation in the sector (figure 16). More than three-quarters of commitments were concentrated in a few countries, however (including Argentina, Brazil, Chile, and Mexico). Efforts are thus needed in the region to increase private participation throughout the region, not only to reach the necessary investment levels in the sector, but also to release pressure on government spending.

Figure 15 Investment in public-private partnerships in water and sanitation in Latin America and the Caribbean, 1990–2015



Source: World Bank PPI database (accessed on May 12, 2017).

Figure 16 Investment in public-private partnership in water and sanitation, by region, 1990–2015



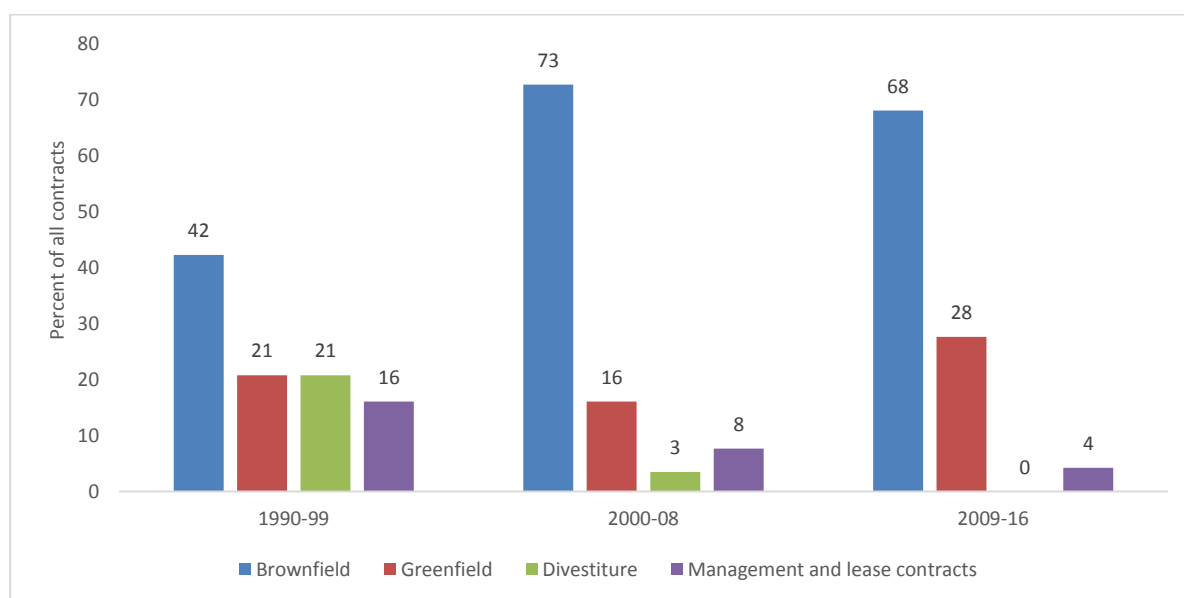
Source: World Bank PPI database (accessed on December 5, 2017).

The nature of private sector involvement in the sector has change since 1990. During the 1990s, 42 percent of projects were brownfield, 21 percent were greenfield, 21 percent were divestitures, and 16 percent were management and lease contracts (figure 17) (See Box 1 for a description of these types of contracts). From the early 2000s until the beginning of the financial and economic crisis in 2008, brownfield projects accounted for 73 percent of all commitments. In 2009–16, 68 percent of projects were brownfield projects, 28 percent were greenfield, and 4 percent were management and lease contracts. The private sector thus appears to be increasingly attracted to contract types entailing new investments and increased power of decision. Divestitures and management and lease contracts seem to have lost their appeal, as they do not imply new investments and have a higher dependence to the public sector.

Box 1: Summary of characterization of contract types (The World Bank PPI Database)

1. **Management and lease contracts:** Take-over of the management of a public asset by a private firm for a fixed duration (the ownership and investment decisions remain with public sector).
2. **Greenfield projects:** Construction and operation of a new facility by a private operator or a partnership between private and public actors for a duration specified in the project contract.
3. **Brownfield projects:** Take-over of the operations, improvement, expansion and/or rehabilitation of an existing asset by a private firm or a public-private partnership.
4. **Divestitures:** Full or partial transfer of ownership of a public asset to a private firm through a direct sale or a public offering.

Figure 17 Distribution of public-private partnership contracts in water and sanitation in Latin America and the Caribbean by type, 1990–2016



Source: World Bank PPI database (accessed on July 31, 2017).

Throughout the last decade, financing in the sector has not reached the necessary levels to fill in the coverage and quality gaps, and efforts should be made in that sense during the next 15 years; in that sense, not only the public sector should increase the spending in water and sanitation, but efforts should be made to increase attractiveness of the sector to private participation, as current spending does not totally cover necessary financing in terms of new infrastructure, but consequently neither in terms of new maintenance and operation costs.

Financial Performance of Water Operators

Insufficient financial resources prevent operators from expanding the network and increasing the coverage rate and quality of service, thus having negative consequences in terms of efficiency and equity. Excessive dependence on the government creates financing uncertainty and opens the door to political interference and clientelism (Ducci and García Merino 2013).

Two financial measures—the operating cost coverage ratio and the leverage rate— reveal the financial performance of water operators. The operating cost coverage ratio is the ratio of operating revenue over operating costs (excluding depreciation). The leverage rate (total liabilities over net worth) is an indicator of indebtedness.

Information on these indicators is scarce in LAC. The very limited data available suggest that very few countries have water utilities with adequate operating cost coverage ratios.

An operating cost coverage ratio of 1.30 allows a private operator to cover depreciation costs, taxes, and net financial results. A ratio above 1.30 allows it to invest in new infrastructure to improve coverage, or better quality). A ratio below 1.30 implies the need to find external financing sources, generally government funding (Ducci and García Merino 2013).

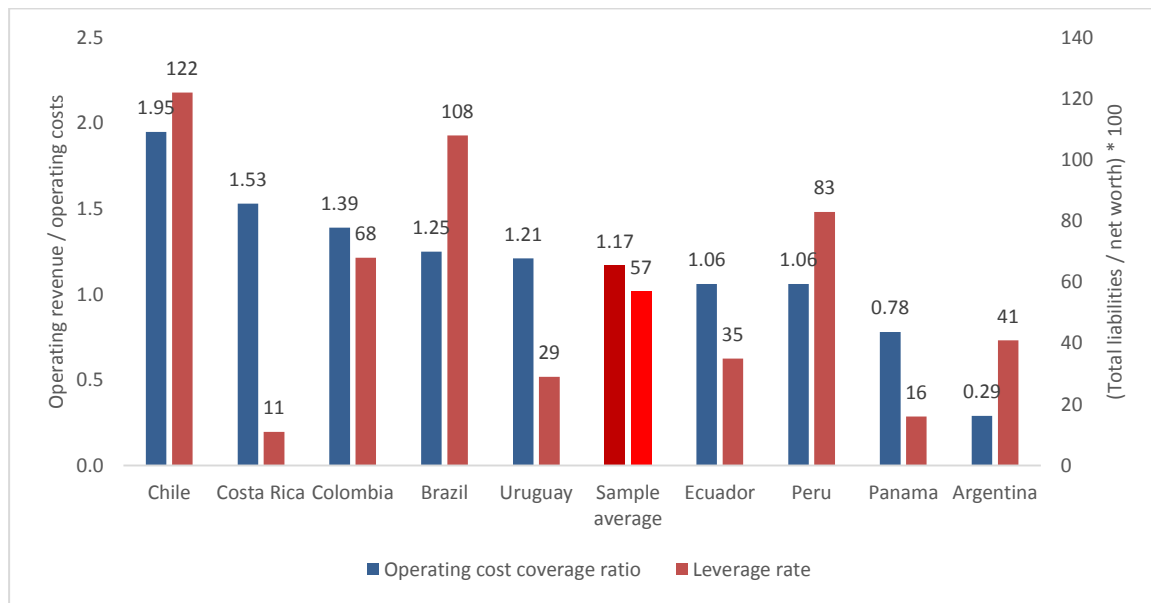
Operating cost coverage ratios vary widely across countries (figure 18).⁷ Chile, Colombia and Costa Rica have operating cost coverage ratios that are well above 1.30. Argentina and Panama do not

⁷ There appears to be little variability within countries, although the sample is small (see table A.2).

cover their operating costs with their operating revenues. On average, operating revenues cover operating costs, but the average ratio (1.17) is below the recommended level of 1.30.

Ducci and García Merino (2013) recommend that leverage not exceed 100 percent of net worth. The sample average leverage rate is 57 percent (see figure 18). Some countries have much higher averages, however. Brazil and Chile exceed 100 percent, but these high ratios reflect the easier access to financial markets that these countries' operators have. Other countries are well below the sample average, such as Costa Rica, Uruguay or Panama. These low leverage rates show a significant room for maneuver in terms of accessing financial markets, but to do so, they should complement this room with enough attractiveness to investors

Figure 18 Financial performance of water operators in capitals of selected countries, 2012



Source: Asociación de entes reguladores de agua potable y saneamiento de las Américas (ADERASA) (cited in Lentini 2015).

The financial performance of LAC capital cities' water operators shows a significant variability between the region's countries. On the one hand, some countries show operating cost coverage ratios considerably high, implying a higher financial capability that will allow them, not only to cover their operating and financial costs, but also to invest to improve the service quality and coverage. Other countries find themselves in the opposite situation, not being able to cover their operating costs. Likewise, these countries appear to have considerably low leverage rates, which could indicate that their dependence on government financing is rather high, as they are not appealing enough to financial markets. Indeed, if operating revenues do not manage to cover operating costs, consequently, returns on investment should be relatively low, thus unattractive to potential investors.

Regulation of the Water and Sanitation Sector

To improve the governance of the water and sanitation sector and enhance its attractiveness to the private sector, many countries in LAC decentralized the provision of water and sanitation services in the 1990s and created independent regulatory agencies.⁸ By the mid-2000s, however, service provision

⁸ The term *independence* does not imply complete independence from the political power but rather that financial, administrative, and operating autonomy limits political interference.

was decentralized but regulation was carried out at the central level. This model created conflicts that endangered the well-functioning of the sector and limited the positive effects of reforms. It also made the sector unattractive to the private sector (Foster 2005).

Today, about 75 percent of LAC countries have independent agencies regulating their water sectors, and about 70 percent have private participation in the water and sanitation sector (table 2). About a quarter of countries with independent regulatory agencies do not have private sector participation, and about 20 percent of countries with private participation do not have regulatory agencies.

Very few LAC countries have subnational independent regulatory agencies which, without having analyzed the decentralization level of water management (see below) would imply that no solution has been brought to the central regulation versus decentralized water management conflict described by Foster in 2005. It is thus worth analyzing whether centralization or decentralization levels of the water and sanitation sector regulation and its management coincide, or as was the case more than a decade ago, diverge, creating conflicts and affecting negatively the well-functioning of the sector.

Table 2 Presence of independent regulatory agency and private participation in water and sanitation sector, 2017

<i>Item</i>	<i>Independent regulatory agency</i>	<i>Public-private partnership (PPP)</i>	<i>Independent regulatory agency and PPP</i>	<i>PPP but no independent regulatory agency</i>	<i>Independent regulatory agency but no PPP</i>	<i>No PPP and no independent regulatory agency</i>	<i>Subnational independent regulatory agency</i>	<i>Multisector independent regulatory agency</i>
<i>All countries</i>								
Number	19	18	13	5	6	2	3	7
Share (percent)	73	69	50	19	23	8	12	27
Sample size	26	26	26	26	26	26	26	26
<i>Developing countries</i>								
Number	17	17	13	4	4	2	3	5
Share (percent)	74	74	57	17	17	9	13	22
Sample size	23	23	23	23	23	23	23	23
<i>Developed countries</i>								
Number	2	1	0	1	2	0	0	2
Share (percent)	67	33	0	33	67	0	0	67
Sample Size	3	3	3	3	3	3	3	3

Sources: Bertoméu-Sánchez, Camós, and Estache (2017) and data collected by the authors.

Of the 19 countries in LAC that have independent regulatory agencies in the water sector, 10 have the same level of centralization in the regulation and management of the sector (table 3). These countries have kept the decision making of both areas at the central level. In the other nine countries, regulation of the sector is carried out at a less decentralized level (typically the central level) and management of the sector at a highly-decentralized level (typically the local level).

Table 3 Level of government handling regulation and management of the water sector in countries in Latin America and the Caribbean with independent regulatory agencies, 2017

<i>Country</i>	<i>Regulation</i>	<i>Management</i>
Argentina	Regional	Local
Barbados	Central	Central
Belize	Central	Central
Bolivia	Central	Local
Brazil	State	Local
Chile	Central	Regional
Colombia	Central	Local
Costa Rica	Central	Central
Dominican Republic	Central	Central
Ecuador	Canton	Local
El Salvador	Central	Central
Honduras	Central	Local
Jamaica	Central	Central
Mexico	Central	Local
Nicaragua	Central	Central
Panama	Central	Central
Paraguay	Central	Central
Peru	Central	Local
Uruguay	Central	Central

Sources: Herrera and Post (2014) and data collected by authors.

Incongruences thus remain between the level of decentralization of sector regulation and management. They could be one factor behind the limited quality of service, the poor financial performance of water utilities, and the very low coverage rates in rural areas.

Brief Review of the Empirical Literature

Recent studies of LAC have confirmed the positive effects of higher-quality infrastructure on the economy and living standards documented in Aschauer's seminal 1989 paper. Lanau (2017), for instance, shows that better infrastructure raises growth and investment and that improved infrastructure could yield substantial economic benefits in the region.

Empirical studies focus on four areas:

- performance indicators
- the effects of privatization on sector performance
- governance and policy aspects of the sector
- tariff schemes and their linkages to performance indicators and governance characteristics.

Performance Indicators

Performance of the water and sanitation sector is traditionally studied through its effects on the economy, public health and the environment. In their 2017 report, Fay et al. describe that water access has improved significantly over the last years but that sanitation coverage is an increasingly urgent challenge; likewise, inefficient public spending is one of the causes behind the challenges in the sector. Gamper-Rabindran, Khan, and Timmins (2010) find strong positive correlations between the introduction of piped water and reductions in the infant mortality rate in Brazil. Schady (2015) reviews the literature and finds that the stronger evidence on the relationship between access to water and sanitation infrastructure and child outcomes in LAC is for extensions of coverage and is limited to child mortality; it does not cover other health aspects, such as morbidity, nutritional status, or development. Grafton et al. (2011) analyze a 10-country household survey. They find that concerns about the environment have a significant effect on some self-reported water-saving behaviors. Molinos-Senante and Donoso (2016) propose a water rate for Chile that creates incentives to improve water use sustainability.

Effects of Privatization

In their study of Brazil, Barbosa, De Lima, and Brusca (2016) argue that privatization is a consistent manner of ensuring accessibility to water services, as the private sector provides with the financing that the public sector does not have the capacity to cover. Clarke, Kosec, and Wallsten (2009) find that following the introduction of private sector participation in Latin America, the share of households connected to piped water and sewerage rose significantly and the introduction of the private sector did not have any negative effects on the poor. Galliani, Gertler, and Schargrotsky (2005) show that child mortality in Argentina fell by about 8 percent in areas that introduced the private sector in their water services; the reduction was largest in the poorest areas. In their study of all infrastructure sectors in nine Latin American countries, Sirtaine et al. (2005) find that the financial returns of private investment were modest and that returns to many concessions were below the cost of capital. Andrés, Schwartz, and Guasch (2013) find that the performance of water utilities in LAC is not highly correlated with the type of ownership (public or private).

Effects of Governance

Bardhan and Mookherjee (2006) show that, for developing countries and infrastructure in general, the effect of switching from centralization to decentralization depends on the financing mechanism of local governments. Herrera and Post (2014) find that decentralization does not necessarily stop political interference in the water and sanitation sector. Barde (2017) concludes that access rates in Brazil increased considerably between 2000 and 2010 in areas in which local governments were responsible for service. Barbosa, De Lima, and Brusca (2016) show that utilities operate best at the metropolitan level.

Bertoméu-Sánchez, Camós, and Estache (2017) find that globally, though having an independent regulatory agency has positive effects on the functioning of the sector, such an agency is not a necessary or sufficient condition for attracting private sector participation, although in LAC having an independent regulatory agency increases the odds of attracting private financing to the sector. Estache, Gómez-Lobo and Leipziger (2001) for Latin America, and Andrés, Schwartz, and Guasch (2013) conclude that although private participation has been crucial in increasing sector performance, it must be accompanied by transparent and accountable regulation, which significantly improves performance, and makes the poor better off as a result. Ferro, Romero, and Covelli (2011) highlight that regulation can have positive effects on efficiency as long as information is available, quality standards are well specified, and other conditions are met.

Tariffs

Zetland and Gasson (2013) show that globally, higher water tariffs are correlated with lower per capita consumption, lower water availability, higher demand, and lower risk of shortage; at the national level, higher tariffs are also correlated with higher GDP and better governance. Jiménez, Serebrisky, and Mercado (2016) show that in Santo Domingo, in the Dominican Republic, regardless of the price they pay, consumers' satisfaction and willingness to pay is positively related to the quality of water service. Ferro and Lentini (2013) find that financial sustainability is strongly correlated with access to improved water rates.

Nauges and Whittington (2017) and Whittington et al. (2015) show that increasing block tariffs perform poorly in targeting subsidies to the poor. These tariff schemes also introduce price distortions that create economic efficiency losses, though welfare losses are relatively low. Barde and Lehman (2014) show that means-tested tariffs distribute more income to the poor than increasing block tariffs but that the share of poor consumers benefiting from water subsidies is lower than it is with means-tested tariffs. Molinos and Donoso (2016) propose a water rate that incentivizes water use sustainability and equity among consumers.

Concluding Remarks

Several important findings emerge from this study:

- Thanks to the reforms undertaken in the 1990s, access to improved water is now almost universal in LAC (95 percent). Efforts are still needed in the sanitation sector and in rural areas in both sectors.
- Increasing block tariffs, which part of the literature has strongly criticized and is the main type of tariff used in the region, do not penalize high consumption levels sufficiently. The average bill for 15 cubic meters of water (the minimum needed to cover basic needs) is lower in LAC than in the Middle East and North Africa or Sub-Saharan Africa.
- Service quality remains weak. The continuity of service has declined in recent years, and in urban areas (for which data are available) almost 40 percent of supplied water is wasted (the situation is worse in rural areas, although data are not available). Poor service quality affects the economy, and both human health and the environment.
- The financial health and sustainability of water utilities is weak. Access to capital markets is difficult for most utilities in the region.
- Most countries have independent regulatory agencies in the sector. The literature suggests that they improve the provision of water and sanitation services but do not necessarily increase private sector participation, which remains a challenge.
- The divergence between the level of decentralization of regulation and management persists in almost half the countries in the region, limiting the scope for improving sector performance.

References

- Andrés, L. A., J. Schwartz, and J. L. Guasch. 2013. *Uncovering the Drivers of Utility Performance: Lessons from Latin America and the Caribbean on the Role of the Private Sector, Regulation, and Governance in the Power, Water, and Telecommunication Sectors*. Washington, DC: World Bank.
- Arroyo, V., M. Ballesteros, and M. Mejía. 2015. *Inseguridad económica del agua en latinoamérica: De la abundancia a la inseguridad*. Caracas: Corporación Andina de Fomento (CAF).
- Aschauer, D. 1989. "Is Public Expenditure Productive?" *Journal of Monetary Economics* 23 (2): 177–200.
- Barbosa, A., S. C. De Lima, and I. Brusca. 2016. "Governance and Efficiency in Brazilian Water Utilities: A Dynamic Analysis in the Process of Universal Access." *Utilities Policy* 43: 82–96.
- Barde, J. A. 2017. "What Determines Access to Piped Water in Rural Areas? Evidence from Small-Case Supply Systems in Rural Brazil." *World Development* 95: 88–110.
- Barde, J. A., and P. Lehmann. 2014. "Distributional Effects of Water Tariff Reforms: An Empirical Study from Lima, Peru." *Water Resources and Economics*, 6, 30–57.
- Bardhan, P., and D. Mookherjee. 2006. "Decentralization and Accountability in Infrastructure Delivery in Developing Countries." *Economic Journal* 116: 101–27.
- Bertoméu-Sánchez, S., D. Camós, and A. Estache. 2017. "Do Private Water Utility Operators Care about Regulatory Agencies in Developing Countries?" Policy Research Working Paper 8045, World Bank, Washington, DC.
- Boland, J. J., and D. Whittington. 1998. "The Political Economy of Increasing Block Tariffs for Water in Developing Countries." EEPSEA Special and Technical Paper Sp199801t3, Economy and Environment Program for Southeast Asia, Laguna, Philippines.
- CAF (Corporación Andina de Fomento). 2014. *Encuesta de hogares 2013: Principales resultados*. Available at <http://scioteca.caf.com/handle/123456789/409>.
- Clarke, G. R., K. Kosec, and S. Wallsten. 2009. "Has Private Participation in Water and Sewerage Improved Coverage? Empirical Evidence from Latin America." *Journal of International Development* 21 (3): 327–61.
- Ducci, J., and L. J. García Merino. 2013. *Principales indicadores financieros de entidades prestadoras de servicio de agua potable y saneamiento en América Latina y el Caribe*. Inter-American Development Bank, Washington, DC.
- Estache, A., A. Gómez-Lobo, and D. Leipziger. 2001. "Utilities Privatization and the Poor: Lessons and Evidence from Latin America." *World Development* 29 (7): 1179–98.
- Fay, M., L. A. Andrés, C. J. E. Fox, U.G. Narloch, S. Straub, and M. A. Slawson. 2017. *Rethinking Infrastructure in Latin America and the Caribbean: Spending Better to Achieve More*. Washington, DC: World Bank.
- Ferro, G., and E. Lentini. 2013. *Políticas tarifarias para el logro de los objetivos de desarrollo del milenio (ODM): Situación actual y tendencias regionales recientes*. Inter-American Development Bank, Washington, DC.
- Ferro, G., C. A. Romero, and M. P. Covelli. 2011. "Regulation and Performance: A Production Frontier Estimate for the Latin American Water and Sanitation Sector." *Utilities Policy* 19: 211–17.
- Foster, V. 2005. "Ten Years of Water Service Reform in Latin America: Toward an Anglo-French Model." *Water Supply and Sanitation Sector Board Discussion Paper 3 (32027)*, World Bank, Washington, DC. Available at

- <http://documents.worldbank.org/curated/en/962281468269682959/pdf/320270WSSServiceReform.pdf>.
- Galliani, S., P. Gertler, and E. Schargrodsky. 2005. "Water for Life: The Impact of Privatization of Water Services on Child Mortality." *Journal of Political Economy* 113 (1): 83–120.
- Gamper-Rabindran, S., S. Khan, and C. Timmins. 2010. "The Impact of Piped Water Provision on Infant Mortality in Brazil: a Quantile Panel Data Approach." *Journal of Development Economics* 92 (2): 188–200.
- Grafton, R. Q., M. B. Ward, H. To, and T. Kompas. 2011. "Determinants of Residential Water Consumption: Evidence and Analysis from a 10-Year Country Household Survey." *Water Resources Research* 47 (8).
- Global Water Intelligence. 2016. *Global Water Intelligence 2016 Tariff Survey*, October.
- Herrera, V., and A. E. Post. 2014. "Can Developing Countries Both Decentralize and Depoliticize Urban Water Services? Evaluating the Legacy of the 1990s Reform Wave." *World Development* 64: 621–41.
- IBNET (International Benchmarking Network). <https://www.ib-net.org>
- Jiménez, R., T. Serebrisky, and J. Mercado. 2016. "What Does 'Better' Mean? Perceptions of Electricity and Water Services in Santo Domingo." *Utilities Policy* 41: 15–21.
- Joint Monitoring Programme of the World Health Organization and UNICEF. 2016. *WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation*. <https://washdata.org>
- Lanau, S. 2017. "The Growth Return of Infrastructure in Latin America." Working Paper 17/35, International Monetary Fund, Washington, DC.
- Lentini, E. 2015. *El futuro de los servicios de agua y saneamiento en américa latina: Desafíos de los operadores de áreas urbanas de más de 300.000 habitantes*. Inter-American Development Bank and Corporación Andina de Fomento (CAF).
- Molinos-Senante, M., and G. Donoso. 2016. "Water Scarcity and Affordability in Urban Water Pricing: A Case Study of Chile." *Utilities Policy* 43: 107–16.
- Nauges, C., and D. Whittington. 2017. "Evaluating the Performance of Alternative Municipal Water Tariff Designs: Quantifying the Tradeoffs between Equity, Economic Efficiency, and Cost Recovery." *World Development* 91: 125–43.
- Schady, N. 2015. "Does Access to Better Water and Sanitation Infrastructure Improve Child Outcomes? Evidence from Latin America and the Caribbean." Working Paper IDB-WP-603, Inter-American Development Bank, Washington, DC.
- Sirtaine, S., M. E. Pinglo, J. L. Guasch, and V. Foster. 2005. "How Profitable Are Private Infrastructure Concessions in Latin America? Empirical Evidence and Regulatory Implications." *Quarterly Review of Economics and Finance* 45 (2): 380–402.
- Whittington, D., C. Nauges, D. Fuente, and X. Wu. 2015. "A Diagnostic Tool for Estimating the Incidence of Subsidies Delivered by Water Utilities in Low-and Medium-Income Countries, with Illustrative Simulations." *Utilities Policy* 34: 70–81.
- WHO (World Health Organization). 2016. *UNICEF Water and Sanitation Coverage* http://www.who.int/topics/drinking_water/en/
- Zetland, D., and C. Gasson. 2013. "A Global Survey of Urban Water Tariffs: Are They Sustainable, Efficient and Fair?" *International Journal of Water Resources Development* 29 (3): 327–42.

Appendix

Table A.1 Regulators of the water and sanitation sector in Latin America and the Caribbean, by country

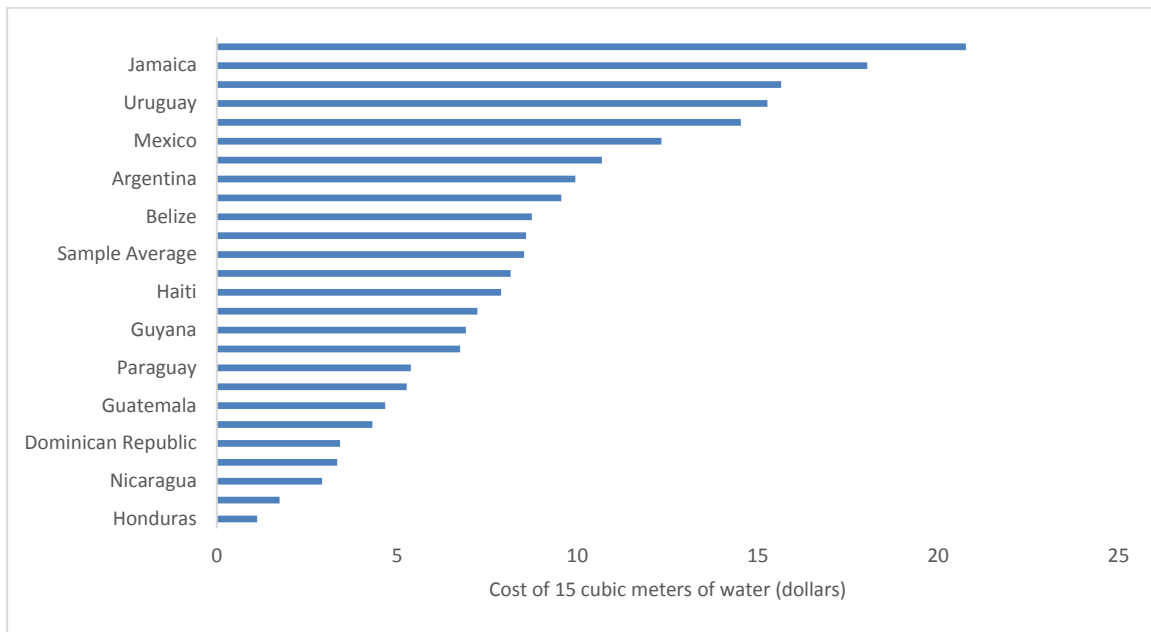
Country	Organization	Member of ADERASA ⁹	Separate regulatory body	Year of establishment	Level of regulation
Argentina	Asoiación de Entes Reguladores de Agua y Saneamiento de la República Argentina	Yes	Yes	1991	Province
Bahamas, The	Water and Sewerage Corporation	No	No	1976	National
Barbados	Fair Trading Commission	No	Yes	2001 (1955)	National
Belize	Public Utilities Commission	Yes	Yes	1999	National
Bolivia	Autoridad de Fiscalización y Control Social de Agua y Saneamiento Básico	Yes	Yes	2000	National
Brazil	Associação Brasileira de Agências de Regulação	Yes	Yes	1999	State
Chile	Superintendencia de Servicios Sanitarios	Yes	Yes	1990	National
Colombia	Comisión de Regulación de Agua Potable y Saneamiento Básico	Yes	Yes	1994	National

⁹ Asociación de Entes Reguladores de Agua y Saneamiento de Las Américas

	Superintendencia de Servicios Públicos Domiciliarios	No	Yes	1991	National
Costa Rica	Autoridad Reguladora de los Servicios Públicos de Costa Rica	Yes	Yes	1999	National
Dominican Republic	Instituto Nacional de Aguas Potables y Alcantarillados	Yes	Yes	1962	National (25 of 31 provinces)
Ecuador	Empresa Municipal de Agua Potable y Alcantarillado de Guayaquil	Yes	Yes	2001	Canton
	Agencia de Regulación y Control de Agua	No	Yes	2014	National
El Salvador	Administración Nacional de Acueductos y Alcantarillados	Yes	Yes	1961	National
Guatemala	Ministry of Public Health and Social Assistance	No	No	1944	National
	Ministry of the Environment and Natural Resources	No	No	2000	National
Guyana, CR	Public Utilities Commission	No	No	1990	National
Haiti	National Directorate for Water Supply and Sanitation (Ministry of Public Works)	No	No	-	National
Honduras	Ente Regulador de Servicios de Agua Potable y Saneamiento	Yes	Yes	2003	National

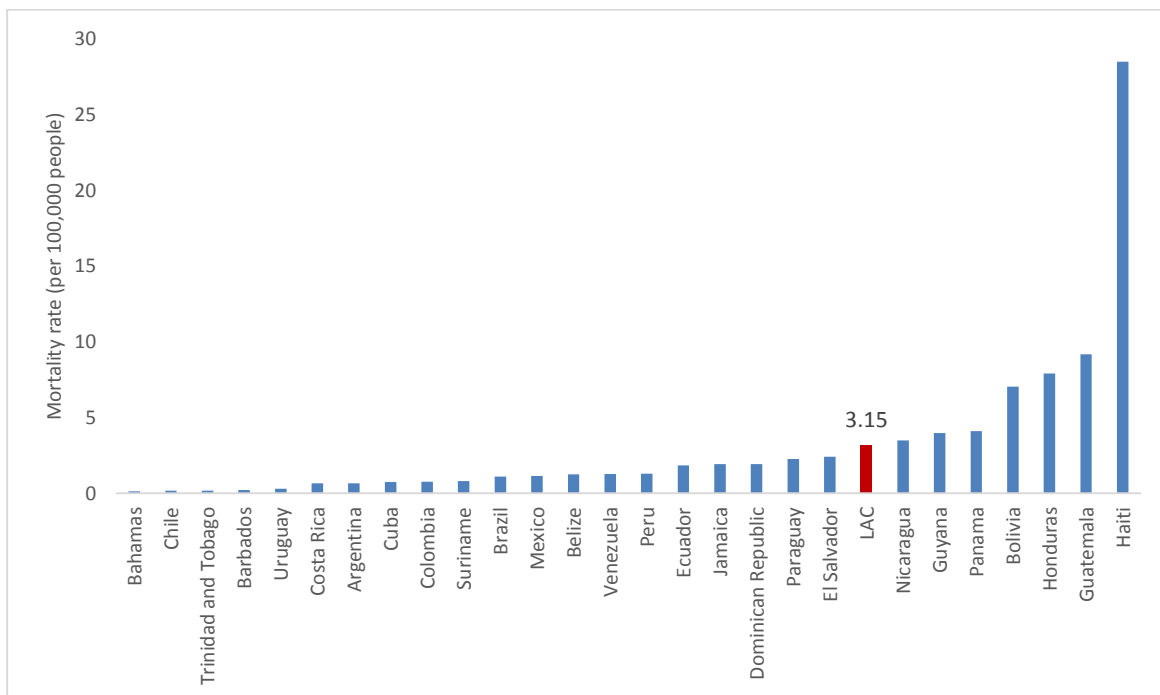
Jamaica	The Office of Utilities Regulation	No	Yes	1995	National
Mexico	Asociación Nacional de Empresas de Agua y Saneamiento de México	Yes	No	1992	National
Nicaragua	Instituto Nicaragüense de Acueductos y Alcantarillado Sanitario	Yes	Yes	1979	National
Panama	Autoridad Nacional de los Servicios Públicos	Yes	Yes	1996	National
Paraguay	Ente Regulador de Servicios Sanitarios	Yes	Yes	2000	National
Peru	Superintendencia Nacional de Servicios de Saneamiento	Yes	Yes	1992	National
Suriname	Ministry of Natural Resources	No	No	1991	National
Trinidad and Tobago	Regulated Industries Commission	No	Yes	1998	National
Uruguay	Unidad Reguladora de Servicios Energía y Agua	Yes	Yes	2002	National
Venezuela	Ministry of Popular Power for Ecosocialism and Water	No	No	2015	National

Figure A.1 Cost of water in selected capitals, 2016



Sources: Data from the International Benchmarking Network for Water and Sanitation Utilities (IBNET) and Global Water Intelligence (2016).

Figure A.2 Mortality rates attributed to unsafe water and sanitation, by country 2012



Source: World Health Organization (2016) (accessed on July 4, 2017).

Table A.2 Operating cost coverage ratios in selected countries

<i>Country</i>	<i>Average</i>	<i>Standard deviation</i>
Argentina	0.86	0.36
Brazil	1.43	0.17
Chile	1.54	0.22
Colombia	1.24	0.17
Ecuador	1.27	0.30
Peru	0.86	0.18

Source: Asociación de entes reguladores de agua potable y saneamiento de las Américas (ADERASA) (cited in Lentini 2015).

Note: Table includes countries for which data are available on more than one operator.

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