

# **Pricing Determinants in the Water and Sanitation Sector**

## A Quick View of Heterogeneity in Latin America and the Caribbean

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# **PRICING DETERMINANTS IN THE WATER AND SANITATION SECTOR:**

A quick view of heterogeneity in  
Latin America and the Caribbean

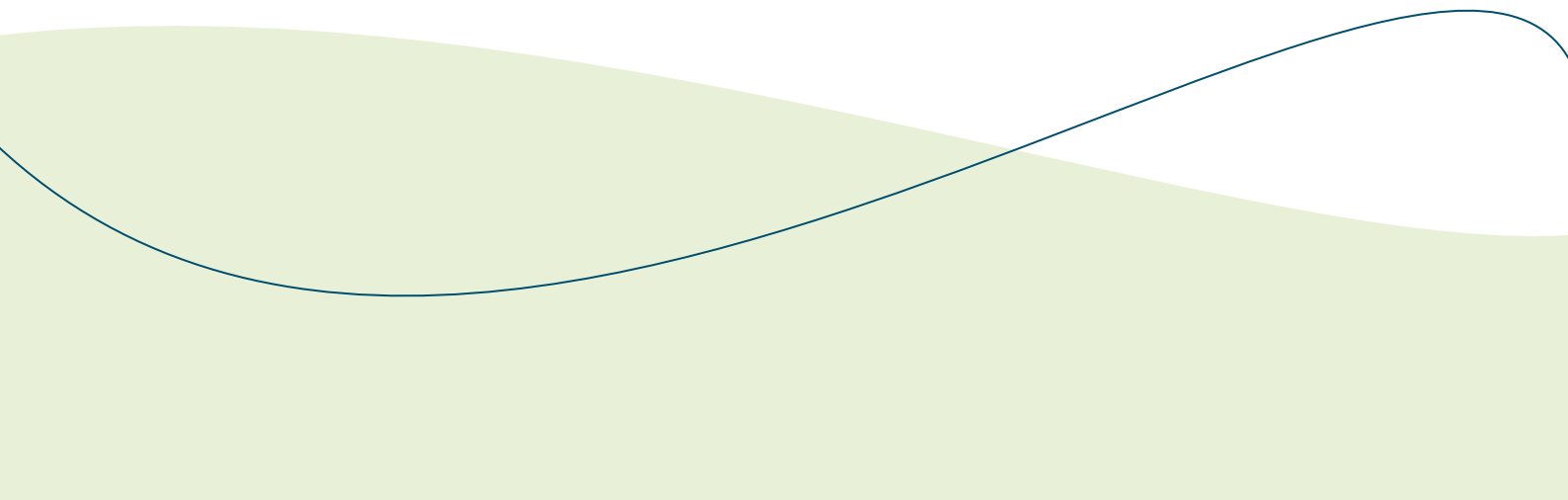
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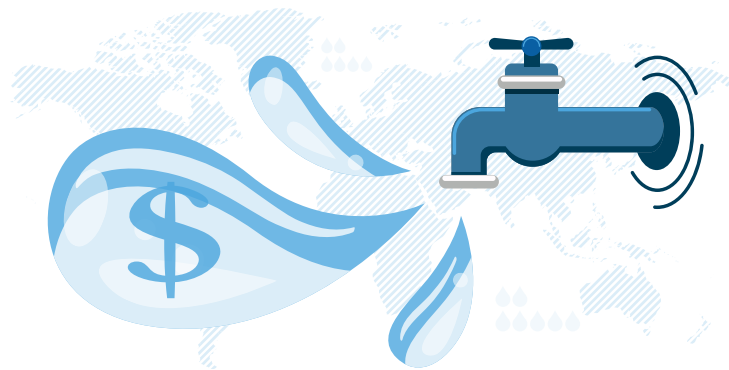
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## Pricing determinants in the water and sanitation sector: A quick view of heterogeneity in Latin America and the Caribbean



### Informative note

The dual nature of water as a finite resource and as a basic human right creates a tension that presents important implications for water pricing. Water tariffs are a key tool used by policymakers to create incentive structures that promote efficient use; at the same time, they can create barriers to access and ignore water's socio-cultural value if not calibrated properly. This conflict between pricing to reduce over-consumption and to guarantee accessibility exposes the difficulty of optimizing residential water pricing, and the importance of progressive tariff structures in building more resilient communities.

Water policymakers view tariffs as an instrument to balance various objectives, such as efficiency, equity, cost recovery, and environmental preservation. However, these competing objectives mean that effective water tariff structures must be acutely customized to local contexts, a reality that is especially pertinent to Latin America and the Caribbean (LAC) due to its geographic and temporal heterogeneity in terms of water availability and demand. Prices can also be influenced by other factors. Four primary factor categories were identified as influential to water prices based on a comprehensive review of the price determination literature: (1) environmental factors, (2) urban factors, (3) political and ideological factors, and (4) management and institutional factors. The present brief examines how these factors theoretically impact pricing and what their status is throughout LAC, with the ultimate goal of providing a framework for future research.

## Primary factors influencing prices in the water and sanitation sector

The dual paradigm of water as a finite resource and a human right has multiple international precedents. The Dublin Statement on Water and Sustainable Development, established at the 1992 International Conference on Water and the Environment (ICWE), recognized the "social and economic value [of water] in all its competing uses" (ICWE, 1992). The First Principle of the Rio Declaration on Environment and Development, a short document produced by the 1992 United Nations Conference on Environment and Development, implicitly states that humans are entitled to a safe and sufficient amount of water for "a healthy and productive life in harmony with nature" (Dinar, Pochat, & Albiac-Murillo, 2015). More recently, ensuring universal access to clean and affordable water was articulated as number six of the 17 mandates of the UN's Sustainable Development Goals (SDGs) for 2030. This emphasis on water as a human right can characterize access as the bare minimum level for human consumption. Still, additional nuances associated with the non-economic value of water, often valued for its role in cultural, religious, and social -- rather than commercial -- activities, make guaranteeing access an important goal (UNESCO, 2021).

Considering SDG #6 in the current context of increasing water availability, effective water resource management is essential to ensure resilient water systems. From an economic perspective, water resource management can take the form of supply-side policies, such as the expansion of water infrastructure systems or the incorporation of new sources, and demand-side policies, which can be further categorized into non-pricing, such as education and information campaigns to discourage water overconsumption, and pricing policies. Supply-side solutions may be costly and require a long-time horizon. Consequently, demand-side policies have gained popularity, especially as these are considered a "no regrets" solution to address water scarcity, that is, an option that would generate social benefits with low capital costs, even in the absence of climate change impacts (Bates, Kundzewicz, & Wu, 2008).

Among demand-side options, pricing policies have become increasingly popular since the 1990s (Dinar et al., 2015). Policymakers have come to view water tariff design as an important instrument for balancing the competing objectives of water management: efficiency, equity, cost recovery, and environmental preservation. Since this complex process is strongly affected by multiple factors, there is no one pricing strategy that works in all contexts. This observation is especially relevant in the case of Latin America and the Caribbean (LAC), as the countries in this region can be highly heterogeneous in several aspects key to structuring water tariffs.

There exist other factors that may play a role in price-determination apart from the abovementioned water management objectives. This document offers a brief research-oriented discussion of factors affecting water prices, as identified in the water economics literature (González-Gómez & García-Rubio, 2018), and the status of these factors in the region. Understanding that prices are not set in a vacuum, we enumerate four factors that are particularly salient in this discussion: environmental, urban, ideological and political, and management and institutional factors. The first two of these factors affect water pricing because of their direct impact on the cost of water provision, while ideological and political factors and management and institutional factors represent external forces that affect pricing, including political expediency, degree of institutional oversight, and management structure. Although this discussion is not meant to be exhaustive, it contextualizes a series of research questions to frame the WSA knowledge team's agenda on water and sanitation prices.

## 1. Environmental factors

From an economic rationality point of view, environmental factors play a crucial role in determining water prices. Annual precipitation and seasonal variability are key variables that influence water availability and contribute to scarcity. Scarcity, in turn, often leads to the implementation of higher water prices per unit volume, due to the scarcity of the resource, increased cost of provision, and the management objective of encouraging efficient use.

Distribution of Renewable Internal Freshwater Resources per Capita by Region

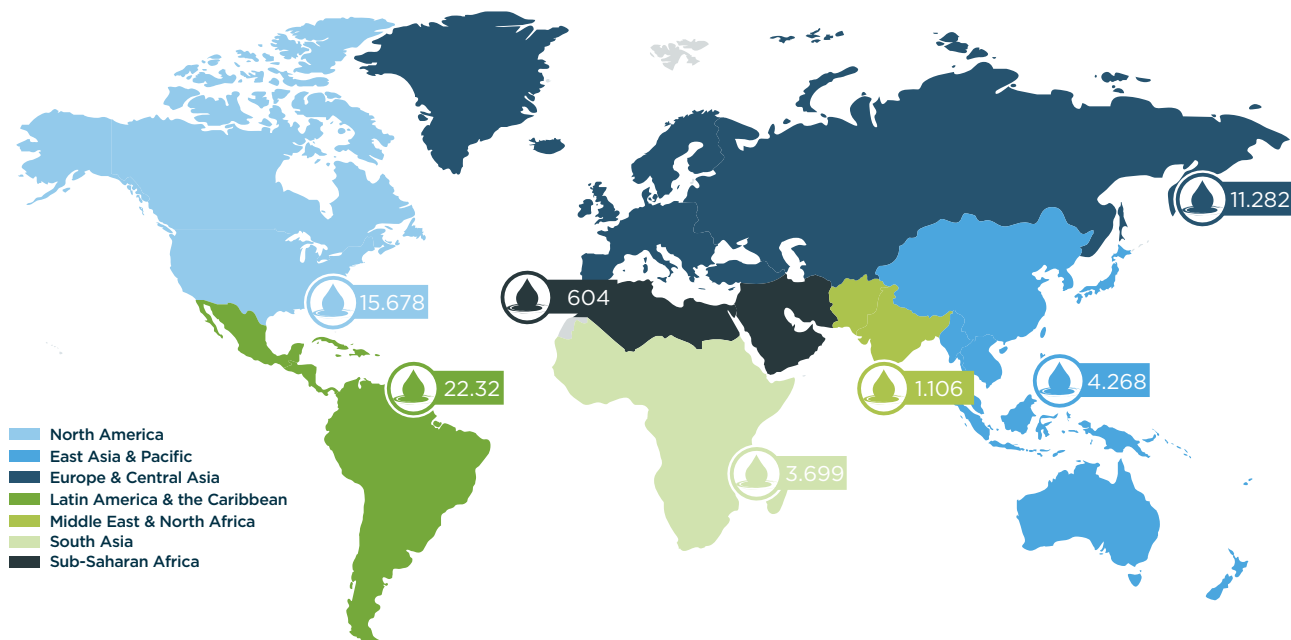


Figure 1: Distribution of Renewable Internal Freshwater Resources per Capita by Region  
Source: FAO AQUASTAT Core Database (FAO, 2021).



While LAC holds around 33% of the world's renewable freshwater and has 22,342 m<sup>3</sup> in annual renewable freshwater resources per capita, distribution of these water resources is not uniform. Precipitation is often highest in areas that have low population density and demand. In contrast, areas with high population density often experience very low annual precipitation or uneven rainfall throughout the year, making them susceptible to droughts, despite reasonable yearly precipitation averages.

Figure 2 lists LAC countries by the Drought Risk classification based on the indicator computed by the World Resources Institute. This Drought Risk Indicator ranks countries based on the likelihood of drought occurrence, the level of population and assets' exposure to the drought, and the vulnerability of the population and assets to its effects for the period 2000-2014 (Hofste et al., 2019). This measure considers not only drought hazard, but also the extent to which drought risk affects countries from a social and economic perspective. Most of the region's countries fall into the medium to medium-high drought risk categories. However, viewing data at a country level hides important variation at the subnational level. For example, Chile has 55,640 m<sup>3</sup> per capita per year of renewable freshwater resources, but resource distribution varies widely throughout the country; the sparsely populated southern portion of the country enjoys water availability of more than 2 million m<sup>3</sup> per capita, while the northern portion has a water availability of only 510 m<sup>3</sup> per capita (OECD, 2017).

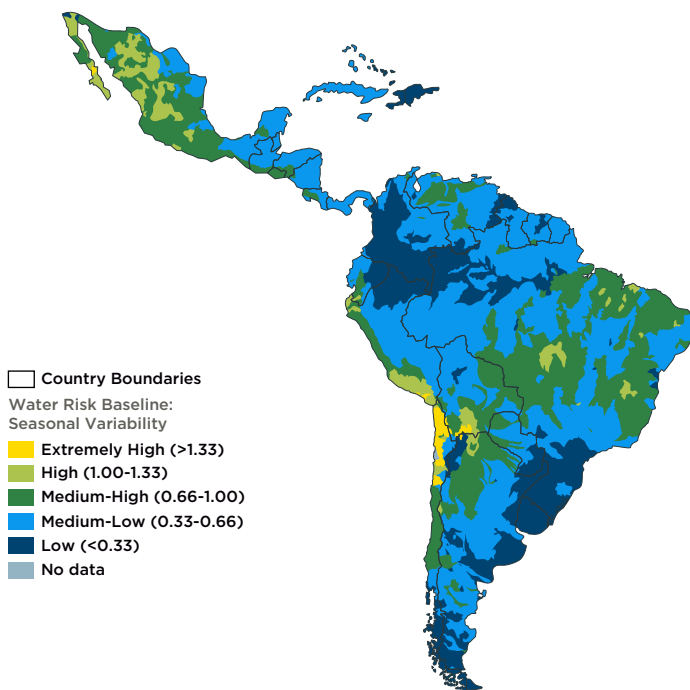


**Figure 2: LAC Countries by Drought Risk Indicator, assessed for the period 2000-2014**  
 Source: Authors' own elaboration using data from the World Resources Institute's Aqueeduct 3.0

Mexico's four largest basins cover 10% of the country's geographic area but capture 50% of annual average flow volume (Guzmán-Arias, 2016; OECD, 2017). Looking at sub-national water stress throughout LAC reveals that over 35% of the population lives in areas with high water stress (Libra, Collaer, Datshkovsky, & Perez Urdiales, 2022).

Water pricing is usually determined regionally or locally, meaning that this sub-national variation in water stress is important to consider. Local pockets of water stress in areas with high levels of industrial, agricultural, or human demand, such as northwestern Mexico, northern Chile, and northeastern Brazil, often result in higher water prices or in water tariff structures aimed to discourage over-consumption, such as increasing block tariffs.

Variation in water availability across time may also impact pricing, as it generates several water management challenges. Seasonal variation in precipitation means that water managers and policy makers must balance a variable water supply with a relatively consistent demand, a challenge that can become especially difficult in areas with large populations and long dry seasons. Seasonal variation also adds pressure on storm-management infrastructure. Flooding during the wet season and high sediment loads in runoff after long dry periods can damage drainage infrastructure and create water quality problems. These negative effects can result in higher prices due to higher costs of water provision.



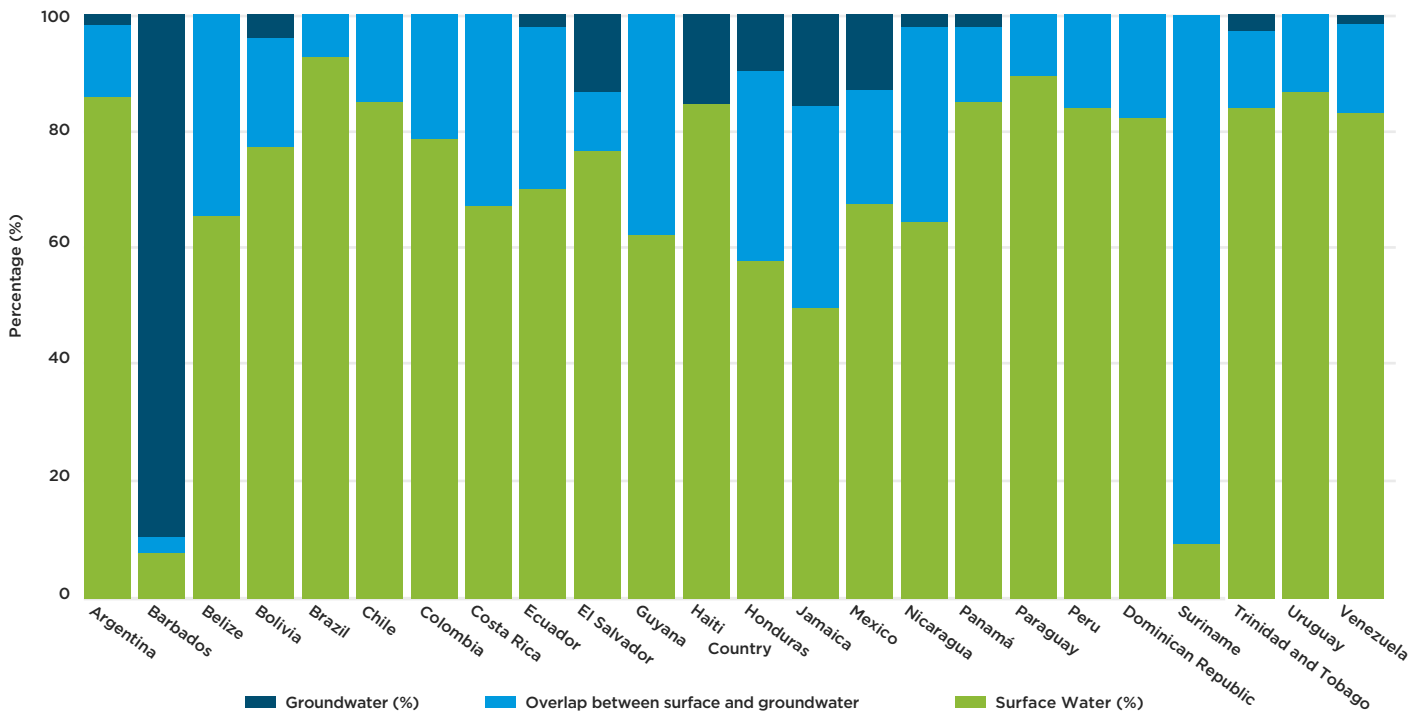
**Figure 3: Seasonal Variation by Hydrological Sub-basin Computed for the Period 1960-2014**  
 Source: Authors' own elaboration using data from the World Resources Institute's Aqueeduct 3.0

Seasonal variability and its impact on water pricing is highly heterogeneous throughout LAC. High seasonality is observed in the sub-region of Mexico, Central America, and the Caribbean, where 49.3% of stream flow takes place between August and October, and only 7.3% from February to April. Seasonal rainfall variability is less pronounced in South America, but is still relevant: 34.6% of stream flow occurs between May and July, and 17% between November and January (Libra, Collaer, Datshkovsky, & Pérez-Urdiales, 2022). This variability can be reflected in the choice of water tariff structure, as in Chile. There, the usual structure is a uniform rate, but they implement an Increasing Block Tariff structure during the summer months to prevent overconsumption.

Another important environmental factor in water pricing is the proportion of water supply that comes from groundwater sources versus surface water sources

(Martínez-Espiñeira, García-Valiñas, & González-Gómez, 2012). This directly impacts the cost-of-service provision; however, the magnitude and direction of impact depends on the local situation. For example, surface water is more susceptible to contamination and therefore requires more intensive treatment than groundwater, while groundwater requires energy for pumping, which represents a substantial cost. Energy costs for pumping groundwater depend on water table elevation and local aquifer characteristics, while surface water treatment costs vary depending on seasonal variability in rainfall, local soil types, and local land use paradigms.

While most of the available water in LAC is surface water, there is a data gap with respect to the extent to which water utilities depend on groundwater.

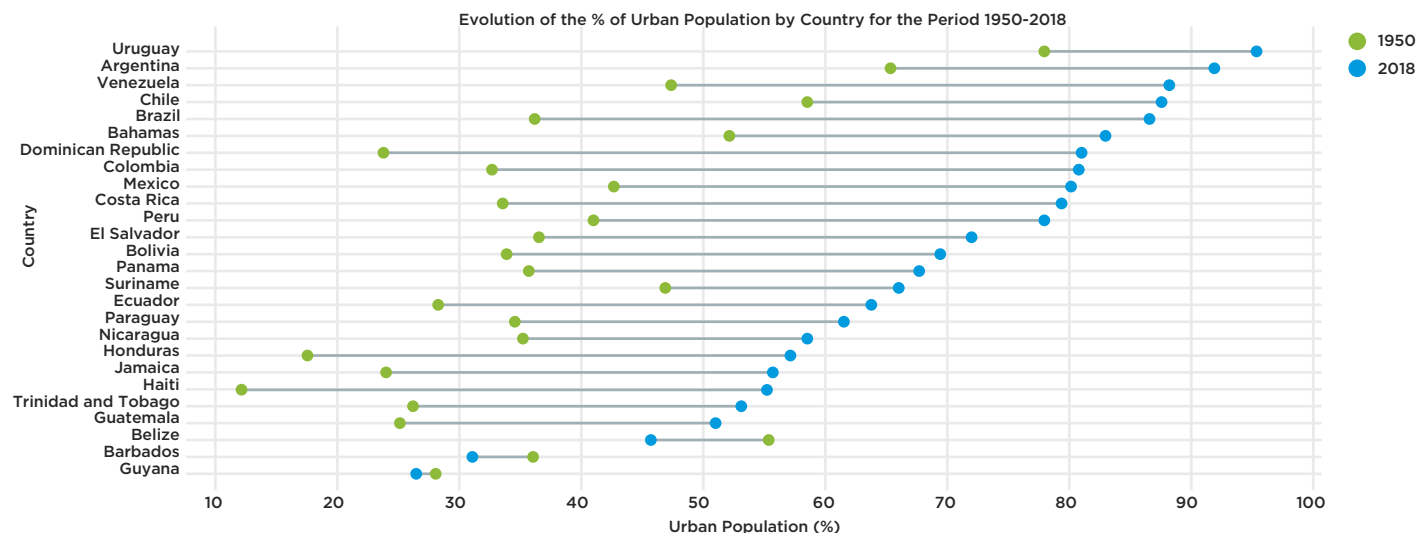


**Figure 4: Distribution of Surface and Groundwater by Country in 2018**  
 Source: Authors' own elaboration using data from the FAO's Aquastat

## 2. Urban factors

LAC has experienced rapid urban growth in recent decades. The region contains four of the world's 20 cities with more than 10 million inhabitants and has numerous emerging small and mid-sized cities. Consequentially, around 80% of LAC's population lives in urban areas, and this increasing urbanization has

important ramifications for water provision and water pricing. On the one hand, as the size of cities increases, average cost of service decreases due to economies of customer density and scale. On the other hand, providing water to a larger population implies a larger distribution network, exposing service providers to higher network maintenance costs and increasing the system's vulnerability to losses.



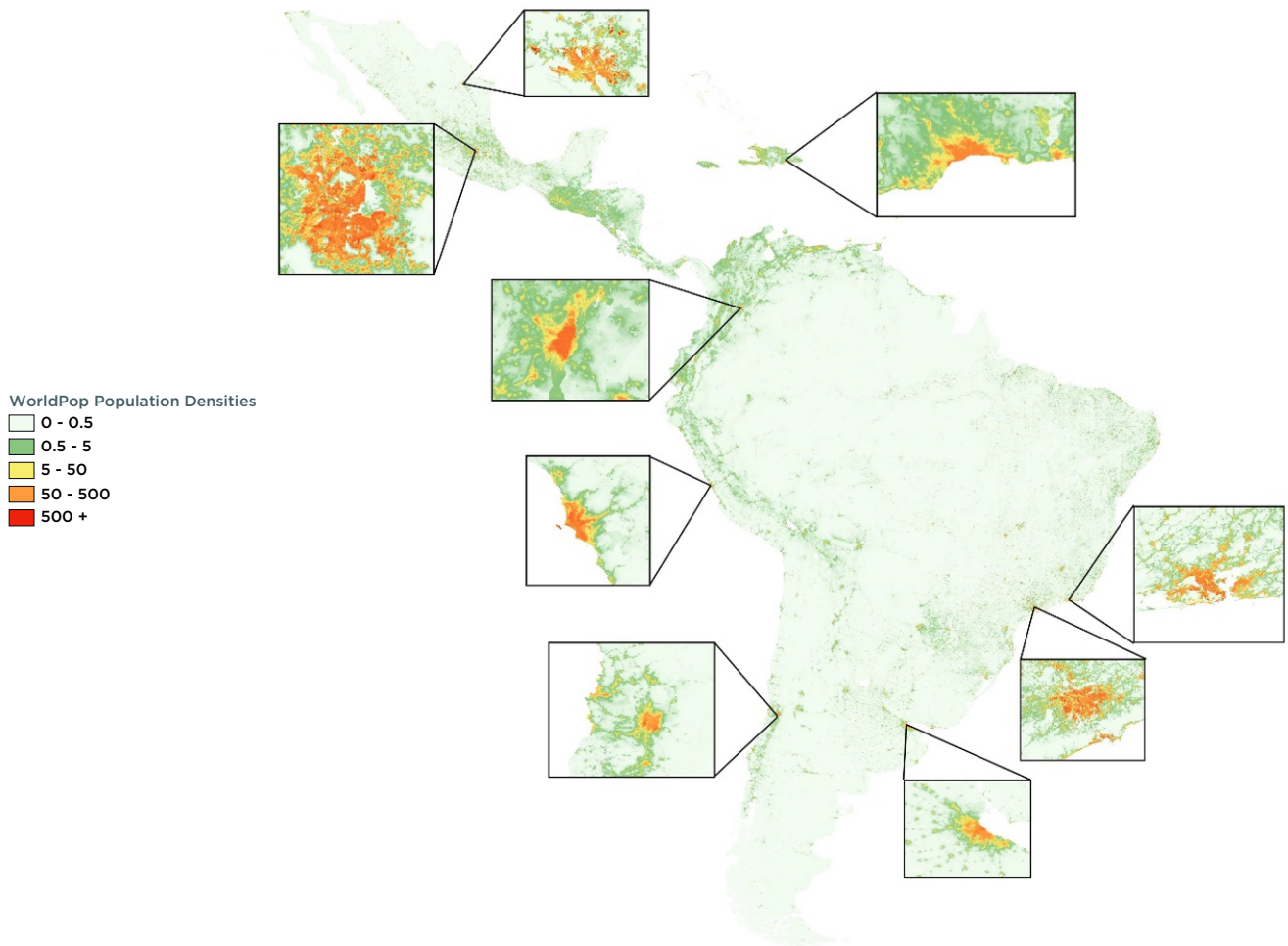
**Figure 5: Evolution of the % of Urban Population by Country for the Period 1950-2018**  
**Source: Authors' own elaboration using data from World Urbanization Prospects: 2018 revision by the United Nations Population Division**

As seen in Figure 6, the population is not evenly distributed among countries, and while population densities are generally low, especially in the Southern Cone, there exists a huge amount of variation sub-nationally. For instance, Brazil's Amazonian states are among the least densely populated regions in the world, whereas coastal states are some of the region's most densely populated. Caribbean countries, such as Barbados, Haiti, Jamaica, and Trinidad and Tobago, show the highest population densities. While these countries have high annual rainfall, the high population density leads to low per capita water availability; consequently, water prices may be higher. Significant cost-benefits provided by economies of scale balance against the lower water availability per capita, making the magnitude and direction of population densities' impact on prices difficult to determine and highly location specific.

## 3. Ideological and political factors

Ideological and political factors have a significant effect on pricing. The political viability of adjusting water prices is heavily influenced by public perception and the idea that water is a fundamental human right, which is codified in many countries throughout the region.

Public perception of water prices may affect the political feasibility of water price reforms in multiple ways. Generally, there is a pervasive appreciation of water as a necessity combined with an overarching lack of prioritization of water services or consumer awareness of costs. Results from the 2018-2019 AmericasBarometer survey, which captures public opinion throughout Latin America on a suite of issues, suggest that water is a salient issue in the eyes of respondents in the region compared to other infrastructure categories, yet less than 10% of respondents per country prioritize it (Figure 8). Moreover, when asked how much they would be willing to pay for water services, most respondents would prefer to pay less; this result is consistent across samples and years (Gomez-Vidal & Cabezas Navarro, n.d.; Gomez-Vidal, Machado, & Datshkovsky, 2021). Different groups of water consumers may have divergent preferences and interests regarding prices (Hall, 2009). High-volume consumers may tend to support tariff structures that allow for static or decreasing prices per unit volume as consumption rises, such as a fixed charge, uniform volumetric tariffs, or decreasing block tariffs. In contrast, consumers who are more environmentally or socially aware may favor a pricing structure that privileges conservation and equity, such as increasing block tariffs.



**Figure 6: Population Density by Country in 2018**

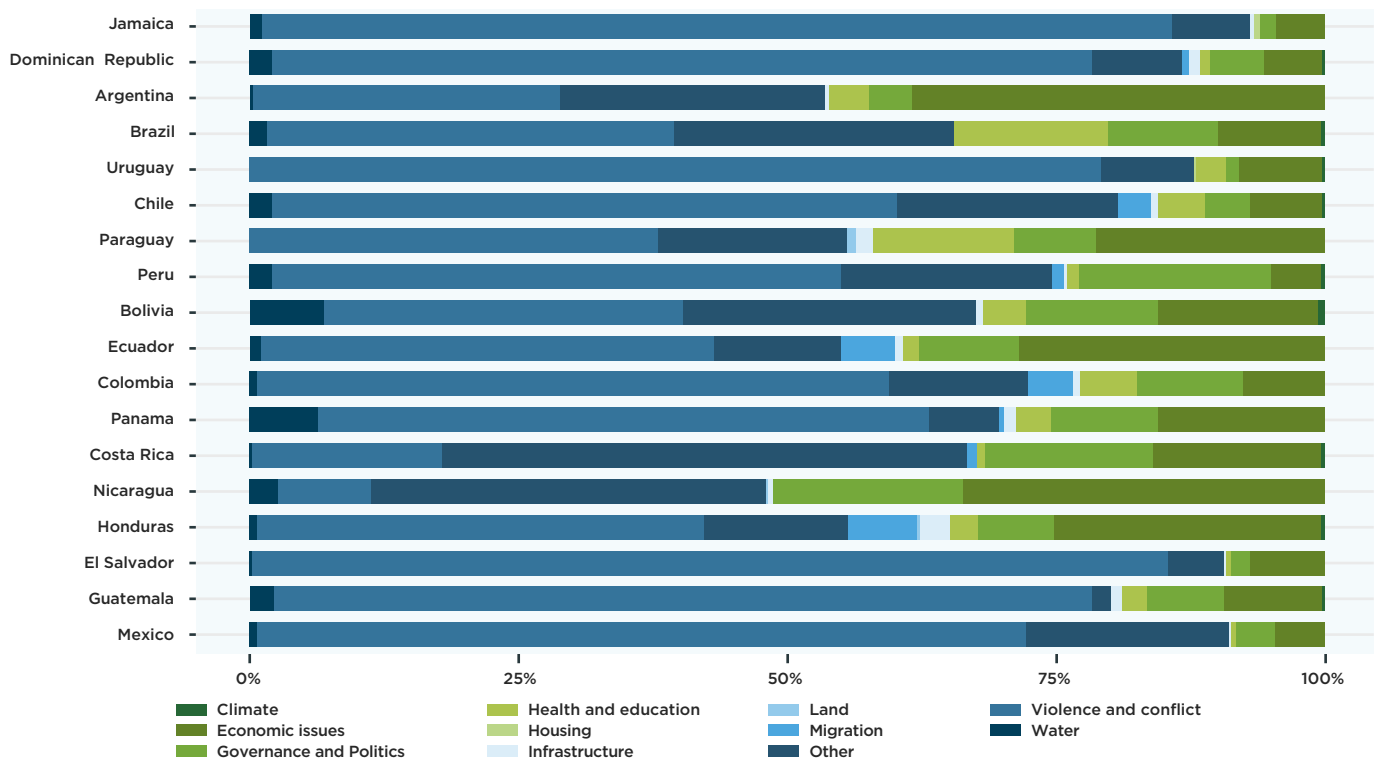
Source: Authors' own elaboration using data from the WorldPop Project (Sorichetta et al, 2015)

Recent evidence has suggested that voters do not prioritize water services, and including them in campaign platforms does not increase voters' interest in candidates (Huberts, Machado, & Kearney, n.d.). This is further exacerbated by a set of results that suggests that consumers often lack information or awareness about their water bill (Perez Urdiales, Libra, Machado, Serebrisky, & Solis Sosa, 2022), or who to hold accountable for (Gomez-Vidal et al., 2021). In combination, these results would suggest that, given consumers' lack of information and lower prioritization of water services, adjustments to water pricing would not be highly politicized.

However, the Latin American region has stood out for its tradition of water conflicts. The Cochabamba Water War of 2000 might be the most popular water conflict in Latin America, but protests over water access and provision models have been recurrent in the region (Spronk, Crespo, & Olivera, 2012). Larocque (2020) offers a comparative analysis of water conflicts in four countries between 2000 and 2011. This analysis suggests that mobilization for water access can be the result of water scarcity, but is also sometimes a response to political promises to increase water coverage levels, which raise expectations among the general population. At the same time, specific strategies such as privatization often prompt different reactions

from civil society, as the number of protests based on privatization varies greatly and is often lower than other causes, such as water coverage and competing water demands (Larocque, 2020).

The varied reasons for these protests reflect the multidimensional nature of water access and water justice. Water-related protests can result from water scarcity (Bolivia), unequal distribution of water access (Ecuador), or the potential impact of other industries, such as mining, on water supply (Peru). Ultimately, protests focused on water are broader than service pricing, but water pricing can play an instigating role, as in the case of the 2000 Cochabamba Water War.



**Figure 7: “What is the Most Serious Problem Faced by the Country?”**  
 Source: Authors’ own elaboration using data from LAPOP’s Americas Barometer 2018-2019

**Box 1: The 2000 Cochabamba Water War and the Role of Prices**

In 2000, Bolivia granted the concession for water provision to the international conglomerate “Aguas del Tunari”. Once established, the conglomerate decided to increase tariffs between 30% and 300%. This decision, along with additional policies oriented to privatizing water access (like Ley 2029), made the new model of water provision socially and politically unviable. As a result, public opinion increasingly questioned the transparency of these agreements, and civil society from urban and rural areas mobilized in what we know as the “Cochabamba water war” (Ducci, 2007; Sauras, Lill & Bertelli, 2015).

The protests gathered hundreds of thousands of citizens and resulted in the death of one protester. The protests successfully stopped the implementation of the tariff increases, and the concessions were cancelled within less than five months, with control being returned to local authorities. The protests also triggered additional protests that led to the ousting of other private companies from the sector, like Aguas del Illimani S.A., which provided services in El Alto and La Paz (Ducci, 2007).

From a political perspective, water pricing may also be influenced by the ruling party’s ideology, and such effect might be disparate within ideological positions. Areas governed by left-wing parties with a climate change agenda might resort to higher water prices to promote conservation (Valero, 2015). On the other hand, left-wing parties may also be more socially concerned, favoring artificially low water prices to ensure access to basic water consumption (Herrington, Newborne, & Saade-Hazin, 2003; Martínez-Espiñeira et al., 2012). More broadly, regime type also plays a role in water pricing, as it has been argued that democratic governments are more likely to promote productive

efficiency of providers (Krause, 2010), which can foster lower water prices. In contrast, some have also argued that water utilities may be seen as a political instrument for clientelism in democratic systems (Foster, 2005).

**4. Management and institutional framework**

Institutional frameworks and management structures are a key element in water pricing. Some of the factors that shape and determine these structures are water rights, regulatory structures, political (de)centralization, utilities, government capacity, and regime type.

The heterogeneity of structures and policies in Latin America and the Caribbean make it particularly challenging to identify the direction and magnitude with respect to these dimensions and water pricing.

For example, multiple countries in the region have codified in their constitution that access to water is a human right, and water for consumption should be prioritized in its distribution among uses, but the implementation and enforcement of policies that guarantee water access vary greatly across levels of government within and across countries. The legal framework for water management also has a large impact on the effect that political and ideological factors have on water pricing because it determines the entities responsible for approving water tariffs and tariff structures. The governmental level of these entities –whether centralized or decentralized– in turn, influences the impact of political forces or technical realities on water prices. Generally, countries with more robust frameworks that determine and regulate water prices based on technical factors such as provision costs, efficiency needs, environmental protection, and social equity, are less vulnerable to political and ideological influence.

Countries with centralized governments may tend to regulate water policies, including pricing, at the national level, while federal countries choose to delegate competencies to other levels of government. For some, this could represent a potential advantage, as they may benefit from a better understanding of heterogeneity in price sensitivity within a specific geographical area (Perez-Urdiales & Baerenklau, 2020). However, there is not a direct relationship between institutional organization and water policy in all LAC countries. In federal countries such as Argentina, Brazil, or Mexico, the central government still retains significant decision-making power on water policy reforms, but these countries delegate relevant water responsibilities to state or local authorities. The institutional organization of water policy in centralized governments is also heterogeneous. Costa Rica and the Caribbean islands have highly centralized decision-making in water policy, whereas countries like Chile, Guatemala, Nicaragua, or Peru have transferred most functions to lower government levels (Akhmouch, 2012).

The architecture of the state and distribution of power is only one source of its effect on water pricing. As mentioned in the previous section, the ideological leaning of those in government can also have a direct impact on water pricing through a set of decisions. For example, existing work has suggested that ideology and the relative weight of political parties in the ideological spectrum is associated with whether services are contracted out at the local level (Picazo-Tadeo et al., 2012; Alonso, Andrews, & Hodgkinson, 2016; Beuve & Le Squeren, 2016).

In addition to the locus of power for formulating, implementing, and enforcing water policies within countries, another key dimension of institutional and managerial frameworks is the existence of a regulatory body, and the scope of that body's work.

For example, some regulatory bodies may establish and oversee the compliance of regulatory norms regarding service provision only for water and sanitation, while others may serve as regulatory bodies for public utilities in multiple sectors. At the same time, the scope of regulatory bodies may not include all stages of the water cycle, since they may have power over service provision, but not over water resource allocation. This decentralization may impact how far water tariff structures can go in achieving competing demands, such as improving water conservation while also ensuring affordability.

An additional layer of complexity is introduced by the relationship between regulation and government, and how that can impact water pricing. For example, many water and sanitation utilities in the Latin American and the Caribbean region are state-owned. This leads to what is traditionally known as “government regulating government”, a scenario in which regulatory bodies may encounter pushback on regulatory efforts or lose regulatory instruments due to political incentives (Peci et al., 2017).

## External shocks

The previously discussed factors are identified in the literature as the primary determinants of variation in water pricing, but they are not exhaustive. External shocks, such as conflicts, recessions, and pandemics, can also influence water prices. COVID-19, for example, has had a range of impacts on water use and water pricing. Residential water consumption increased as people spent more time in their homes and engaged more in water-intensive safety measures, such as handwashing. Simultaneously, water use in non-residential sectors such as commercial and industrial decreased due to business shutdowns and confinement measures.

Confinement measures have also had a negative economic impact on large portions of the population, exacerbating water affordability issues for many who were already struggling to pay water bills. To address this problem, many water utilities in the region offered temporary moratoriums on water service cut-offs and exemptions from water bill payments to low-income groups.

These policy measures and the likely increases in non-payment have had a negative effect on water utilities' revenue. While price increases may not be feasible in the short run, they may be needed in the long run to mitigate the current situation and build resilience for confronting future crises, such as extreme droughts, the failure of key infrastructure, or other health threats.

## Box 2: COVID-19 Emergency Policies Offered by Water Agencies in LAC

Several water agencies in the region have implemented policies to support consumers during the COVID-19 pandemic. Aguas Andinas, the water utility in charge of water and sanitation in Santiago de Chile, offered a deferment of bills from March 2020 to December 2021 to residential consumers older than 60, who receive unemployment benefits, or fall within 80% of the economic vulnerability indicator set by the Ministry of Social Development. Residential consumers adopting this program will repay the accumulated amounts in equal installments during up to 48 months after January 2022. By July 2021, more than 15,000 households had benefited from the deferment (Aguas Andinas, 2022).

SABESP, a Brazilian water utility, engaged in several actions to contain the spread of the Coronavirus and mitigate the negative economic impacts of resulting lockdown measures. SABESP installed public washbasins in socially vulnerable areas in São Paulo so that the population can wash their hands, and disinfected public spaces with a high concentration of people, health centers, and charitable restaurants in São Paulo Metropolitan area and approximately 300 municipalities in inland and coastal regions. SABESP also exempted low-income households from paying water and sewage bills for three months and distributed more than 5,500 water tanks to households in poor neighborhoods (Butler, Pilotto, Hong, & Mutambatsere, 2020).

## Final remarks

The interplay of institutional, political, economic, and social dimensions makes water pricing as a means of increasing efficient use and equitable access challenging. While access to water is a human right, the disparate realities of the sector within and across countries make it essential to delve into these nuances to properly assess the best path forward. In past decades, many LAC countries have addressed these complexities by separating the functions of policymaker, regulator, and service provider (Bertoméu-Sánchez & Serebrisky, 2019). But there is still a governance deficit in the region's water sector (García de Durango, 2019), which can lead to arbitrariness in water pricing (González-Gómez & García-Rubio, 2018). Since water prices are one piece within the multi-layer puzzle of water management, it is essential that future work addresses the institutional, political, and social context in which pricing structures are formulated.

This document provides a review of the determinants of water prices and their context within LAC. This brief highlights the need to acknowledge in future research the region's heterogeneity in tariff design and factors related to pricing. We identify four key determinants of water pricing from the water economics literature and explore how these factors differ throughout the region:

**1. Environmental factors:** LAC is considered a water-rich region, but water stress is still a concern. Areas with high water availability often have low water demand, and vice versa, while seasonal extremes in availability, notably in areas such as the subregion of Mexico, Central America, and the Caribbean, pose water management challenges. In the coming years, the region is expected to experience more seasonal variation and increased

drought susceptibility, potentially diminishing supply and increasing overall prices, as well as the prominence of pricing schemes aimed at efficiency and conservation.

**2. Urban factors:** The region has experienced fast urbanization, resulting in 80% of the population living in urban areas. This phenomenon may influence water prices in opposite directions due to economies of customer density and scale, and higher vulnerability to water losses. Areas with lower density may suffer from diseconomies of customer density, and therefore, higher prices.

**3. Ideological and political factors:** The political feasibility of water price reforms is affected by consumers' perception and dominant political ideology. Survey data indicates that, while water pricing and access are generally not priority issues in the political sphere, there is strong ideological support with respect to democratization of water access across countries. In fact, there have been several water conflicts associated with water price increases.

**4. Management and institutional framework:** There are a wide set of factors that can impact water pricing from the institutional and managerial perspective. Some highlighted here are whether water rights are codified in the Constitution or any other instrument, the ideology of governing parties, the existence of a regulatory body and its scope, the (de)centralization of pricing-decisions, and the relationship between state-owned utilities' regulatory bodies.

While this is by no means an exhaustive list of all factors, the variables mentioned here represent an interesting starting point for exploring their relationship with, and impact on, water pricing in the region. This discussion note represents an opportunity to open the space for a more extensive, deeper analysis of the context in which water pricing structures are decided in LAC and the ways they are impacted by technical and economic realities, as well as how elements of a country's institutional framework affect price vulnerability to political, social, and ideological pressures.

Future research from the WSA knowledge team will shed light on the extent to which the factors discussed in this note affect water pricing in the region. It would be particularly important to compare water prices across countries in LAC while controlling for their environmental, urban, ideological, and political factors, and their management and institutional frameworks. Moreover, additional research analyzing whether water prices in the region provide users with the right signal about water scarcity while complying with different pricing objectives will also be valuable.

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