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RESEARCH ARTICLE



Socio-political barriers to sustainable urban water governance: the case of Cartagena, Colombia

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ABSTRACT

Socio-political factors shape urban water insecurity, yet are often not incorporated into urban water, sanitation and hygiene (WASH) planning. WASH service coverage rates in Cartagena, Colombia, suggest high water security, yet the history of water policy and governance in the city from 1991 to 2019 reveals a more complex reality of water insecurity that is not reflected in service coverage indicators. This case study bridges scientific enquiry with policy to demonstrate how weak institutions and governance at municipal levels undermine local water security and the implementation of national sustainable development policy.

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Introduction

The world continues to urbanize, leading to widespread societal transformation. As of 2020, 56% of the world's population lived in urban areas, and approximately 63% of the world's population is projected to live in cities by 2035 (UN-Habitat, 2020, p. 12). Cities prepared for population growth and sustainable urbanization provide many opportunities for increased well-being, such as access to basic resources (Crane et al., 2021). However, when cities are unprepared, many aspects of well-being are compromised, especially within low-income and slum communities (Adams et al., 2019). Among the most important consequences for human well-being of unplanned urban growth is inadequate water, sanitation and hygiene (WASH) services, which is an important contributor to the global burden of disease (Prüss-Ustun et al., 2019). In urban areas globally, approximately 630 million people lack access to safely managed drinking water, 1.7 billion lack access to safely managed sanitation and about 2.3 billion in total do not have handwashing facilities with soap and water at home (Joint Monitoring Programme, 2020).

Good water governance within cities is key to sustainable development and to provide basic WASH services to growing populations (Aguilar-Barajas et al., 2015; Miller et al., 2020). Conversely, weak municipal-level governance may perpetuate water insecurity despite strong national-level governance (e.g., Furlong, 2012; Lebek et al., 2021). Latin America and the Caribbean (LAC), despite being among the most urbanized and water-

secure world regions, experiences stark intra-urban inequities in access to safe water that have been attributed to urban governance challenges (ECLAC, 2015; Trimble et al., 2021; United Nations, 2018). Knowledge of governance, policy and urban water security best practices is critical to transitioning from the general status quo of Latin American cities – where water security and governance are typically disconnected from urban planning – to incorporating holistic water security approaches into urban plans (Aguilar-Barajas et al., 2015). The international development community emphasizes the role of promoting good water governance to achieve Sustainable Development Goal (SDG) 6 (e.g., International Decade for Action, ‘Water for Sustainable Development’, 2018–2028, 2016).¹ The United Nations (UN) also emphasizes the need to focus on mid-size cities because they are experiencing the highest urbanization rates globally (UN-Habitat, 2020).

Studies of urban water governance and politics have focused on topics such as macro-level governance, economic policies and service models (e.g., Budds, 2009; Harris & Roa-García, 2013; Wade, 2012); embodied and feminist approaches (e.g., Truelove, 2019); community-level governance (Adams et al., 2020); and the hydrological cycle and resource management (Carmon & Shamir, 2010). Scholars have applied critical political economy and ecology approaches to analyse service provision models in Colombia, often in the context of neoliberal and human rights theories and debates, from a national perspective or in major cities such as Bogotá and Medellín (Acevedo Guerrero et al., 2016; Furlong et al., 2018; Perera, 2015; Urueña, 2012). However, few studies have targeted the socio-political factors that impact household level water and sanitation services at the municipal level of governance.

In order to promote effective water governance, which would help mitigate water insecurity and contribute to sustainable development, it is important to understand not only the characteristics of water resources and services, but also the socio-political factors, such as history, politics and policy, that shape current access to water and water insecurity (Grasham & Neville, 2021; Jepson et al., 2017). Thus, this study implements a narrative literature review methodology and uses an urban water security territory framework to analyse how water policy and governance shaped water insecurity in Cartagena, Colombia, from 1991 to 2019, within broader national and international contexts. It provides a bridge for policymakers and scientists, within the water resources literature, by highlighting how political practices, policies, and international programmes can contribute to and transform water insecurity in urban settings.

Conceptual framework

We use an interdisciplinary and multilevel approach to connect water governance, urban planning and service provision, and water insecurity. We understand water governance as the institutions, policies, and administrative systems that develop and manage water resources and service delivery (Bakker, 2003). We define water security as ‘the ability to access and benefit from affordable, reliable, adequate, and safe water for wellbeing and a healthy life’; water *insecurity* occurs when any of these factors impedes well-being or health (Jepson et al., 2017, p. 3).

We connect these concepts using an urban water security territory framework (Empinotti et al., 2021), which integrates hydrosocial territorial (Boelens et al., 2016) and relational (Jepson et al., 2017) approaches to understand urban water security as the

‘urbanization of water–society relations’, as opposed to characteristics of water resources and services. This framework emphasizes the roles of territory, labour relations and citizens’ rights to the city, infrastructure, governance and power structures, and social action (p. 6).

Cartagena is representative of urbanization trends among mid-size cities throughout LAC and the developing world and provides a condensed timeline of global trends. For example, several developments in Cartagena were familiar to other mid-size LAC cities: the privatization of water and sewage services in the neoliberal era of the 1990s; new national- to municipal-level regulatory agencies that arose after the implementation of a new Colombian constitution; the growth, presence and systematic exclusion of slums in urban planning; and a recent decade of political instability and administrative changes at the municipal level (Aguilar-Barajas et al., 2015; Budds, 2004; Furlong et al., 2018; Harris & Roa-García, 2013; Urueña, 2012). This study builds on prior research by applying the urban water security territory framework to understand how political and administrative instability has affected Cartagena’s sustainable development agenda, the validity of its WASH coverage rates, and the role of local land-use plans in defining service coverage areas. Cartagena’s water governance history offers lessons for similar cities and can help WASH service practitioners and policymakers aiming to integrate water security goals into urban planning tools. This analysis also contributes to the academic literature through an interdisciplinary review of how policy and programmes originating at various levels of government – particularly the municipality – may simultaneously foment and mitigate urban water insecurity.

The remainder of this paper continues with a methodology section that describes the study site, analysis and data sources. Our findings are then organized into two broad sections: the first provides an overview of how Colombia’s national-level agendas and policies reflected global and regional trends, and the second section focuses on the municipal-level policies and challenges of Cartagena. Each section is further organized using three time periods that bracket Cartagena’s recent water-related governance and policy history (Table 1):

- New institutional and regulatory regimes that emerged between 1991 and 2000.
- Urban planning policies and institutions that were implemented between 2001 and 2010.
- The water insecurity territory in Cartagena as shaped and determined by events, reports, and policy between 2011 and 2019.

This review ends in 2019 due to the anticipation of a stable four-year mayoral government with the election of William Dau in 2019, and the onset of the COVID-19 pandemic in early 2020 which now shapes many public and environmental health discourses and is beyond the scope of this analysis.

Methodology

Study site

Cartagena is the capital city of Colombia’s Bolívar Department and borders the Caribbean Sea along the north coast of South America (Figure 1). While recognized

Table 1. Timeline of the policies and events, at local, national and global scales, that have influenced water insecurity in Cartagena, 1991–2019.

	1991–2002: New institutional and regulatory regimes	2001–10: Urban planning and environmental health policy	2011–19: Current water insecurity landscape
Local	Cartagena was the first city to use a private concession and bilateral investment treaty for a water and sewage service. Acuacar was created in 1994	Cartagena adopted its POT via Decree 0977 of 20 November 2001	Cartagena experiences governmental instability with 11 mayors over nine years. The POT remained outdated
National	Colombia adopted a new constitution. Law 388 of 1997 required all municipalities in Colombia to create land-use plans. The CRA was created	The Viceministry of Water and Sanitation was created within the Ministry of Housing in 2006. Activists led a referendum campaign to include the human right to water in the constitution	Colombia's Viceministry of Water and Basic Sanitation released its national strategic plan for 2018–30, highlighting water security, governance and institutional improvements
Global	Neoliberalism and 'neo-constitutionalism' were widespread. The UN implemented the MDGs in 2000	The UN recognized the human right to water in 2010, and fuelled protests in the Latin America and the Caribbean region	Updated approaches to WASH are captured by the UN's SDGs, Water Action Decade, and scientific conceptualizations of water security

Note: Acuacar, Aguas de Cartagena; CRA, *Comisión de Regulación de Agua Potable y Saneamiento Básico*; POT, *Plan de ordenamiento territorial* (urban development plan); MDGs, Millennium Development Goals; SDGs, Sustainable Development Goals; UN, United Nations; WASH, water, sanitation and hygiene.

nationally as a 'special district' for its touristic, cultural and economic significance, Cartagena is less known for having one of the highest levels of socio-economic disparity among Colombian cities: about 25.9% of the estimated 1 million residents live in poverty (DANE, 2019). Many of these residents lack access to basic services and live in slum or informal communities. Yet, as with many rapidly growing cities, there is limited information about the human experience of water insecurity, which may not be captured by government indicators typically used in policy decisions. As shown in Figure 1, piped water service generally corresponds to the 'urban zone' of the city. This research underscores the lack of information beyond this zone and how this may undermine water insecurity throughout the municipality.

Analysis and data sources

This study employed a narrative review methodology. The narrative literature review is best suited for emerging topics with limited published scientific literature, as it allows the author to review all available data including periodicals, governmental and non-governmental reports, among other documents (Ferrari, 2015; Snyder, 2019). In contrast, systematic literature reviews are more suitable to narrow research questions and well-researched topics, as they require strict, predefined inclusion criteria, and frequently include quantitative analyses of vetted data from select literature, often via meta-analyses (Snyder, 2019). In our review of Cartagena's historical WASH policies, we consulted English and Spanish language peer-reviewed articles and publicly available grey literature such as legal documents, news periodicals, government reports, non-governmental organization reports, population censuses and spatial data. Searches for topics related to *water security*, *water and sanitation services*, *water and sanitation access*, *water governance*, *water policy* and their derivatives paired with *Cartagena* and *Colombia* were

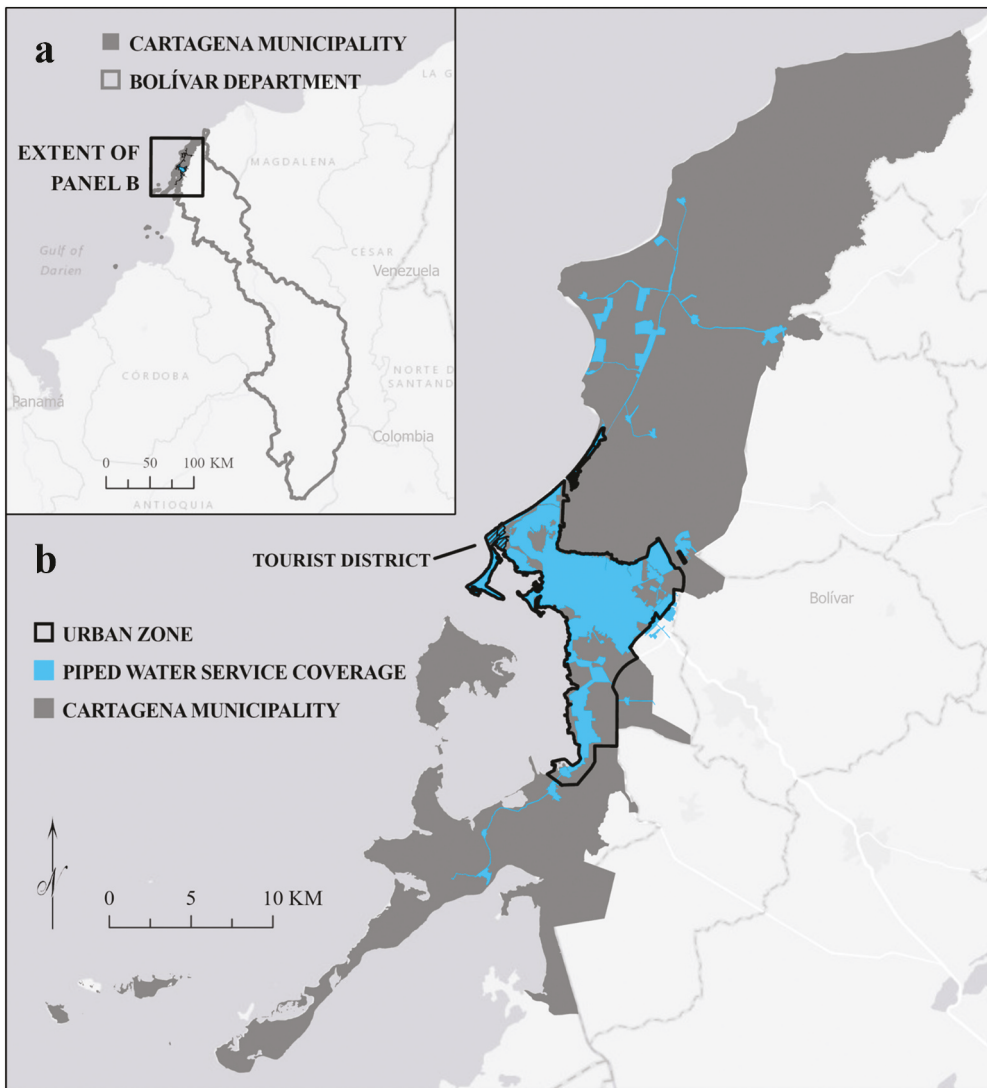


Figure 1. The 2019 municipal boundary of Cartagena: (a) within the Bolívar Department in Colombia; and (b) depicted with the urban zone, and piped water service coverage extent. The deficit of water service access beyond the network is blurred by ambiguous or unavailable data.

conducted in Google, Google Scholar and ExLibris' Primo library discovery service which includes over 1000 electronic databases. Similar searches were also conducted on several national and local institutional websites: Departamento Administrativo Nacional de Estadística (DANE), Departamento Administrativo de Salud (DADIS), Establecimiento Público Ambiental (EPA), Corporación Autónoma Regional del Canal del Dique (CARDIQUE), Aguas de Cartagena, Secretaria de Planeacion Distrital, Alcaldía de Cartagena, Cartagena Cómo Vamos and Colombia's Ministerio de Vivienda, among others. Personal communications with stakeholders in Cartagena provided additional clarification.

Colombia's alignment with global and regional trends

1991–2000: Colombia's water governance framework

We begin at the onset of Colombia's modern constitutional state in 1991, which also marked the onset of water governance reform (Trimble et al., 2021). The 1990s marked a global era of neoliberalization, decentralization, municipalization and constitutional reforms, all of which shaped the development of LAC in the 1990s. In fact, it is rare to discuss governance trends within the region without referring to the wave of decentralization and privatization, specifically of electricity, water and sanitation (Bakker, 2007; Harris & Roa-García, 2013; Urueña, 2012; Loftus & McDonald, 2001; Meehan, 2014). Along with the wave of decentralization and marketization brought about by neoliberalism, was a period of constitutional reform, sometimes called 'neo-constitutionalism', that aimed to minimize the levels of government corruption and failures with regime change and new regulatory standards (Harris & Roa-García, 2013; Urueña, 2012). The transition to marketized and privatized services and decentralized government also went hand in hand and led to multiple place-based successful, unsuccessful, and modified models for service provision and access regionally. Colombia is one of several South American countries that implemented major constitutional reforms during this period (others include Chile, Argentina, Brazil and Ecuador).

Within Colombia's central government, the Ministry of Housing, City, and Territory, or *MinVivienda*, is the most directly related to WASH provision. Law 142 of 1994 established Colombia's regime of domestic public services via the Superintendence of Public Utilities, which is the ultimate enforcer of public service regulation controlled directly by the president, as well as multiple regulatory bodies such as the *Comisión de Regulación de Agua Potable y Saneamiento Básico* (CRA), or Regulatory Commission of Potable Water and Basic Sanitation, which is an autonomous administrative unit within the *MinVivienda* (Shaffer, 2016; Urueña, 2012). The CRA administrates and controls the efficiency of domiciliary public services for water, sewage and sanitation, according to Decree 1524 of 1994. Its principal objective is to 'improve the market conditions of the country's water, sewage and sanitation services and contribute to the well-being of the Colombian population' (translated from CRA.gov.co, n.d.).

In Colombia, water and sewage service providers include public, private and public-private management models with varying coverage areas and users, from small-scale artisanal providers to regionalized models that incorporate multiple municipalities. Contrary to many LAC countries, corporatization of water services did not initially coincide with neoliberalization in Colombia (Acevedo Guerrero et al., 2016). Bogotá led the transition in 1910 when its water service was municipalized in response to inadequate water service provided by a completely private water company, leading to Law 4 of 1913, through which the central government gave all Colombian municipalities the legal authority to assume control of (or municipalize) water and electricity networks (Furlong et al., 2018, p. 191). Local governments, however, did not have the resources to purchase the private companies, resorted to private investment loans, and eventually public services became mixed corporations with independent boards consisting of members of the banks that provided loans and the city council members. Thus, utility corporatization in Bogotá followed municipalization as a means of protecting private investment in utility providers. Throughout the 20th century, major Colombian cities

including Bogotá, Medellín and Cali incorporated mixed management models into their public service provision with the intention of depoliticizing public service operations and operating as efficiently as private companies (Acevedo Guerrero et al., 2016; Furlong et al., 2018).

Management models of major water service providers before the 1990s underscore the significance of the neoliberal era within Colombia. The influence of the neoliberal era and mass privatization on water governance in Colombia is not as much reflected in corporatization of utilities as much as it is reflected in the transition of water understood as a public good to water understood as a commodity (Urueña, 2012). The adaptation of neoliberalism and depoliticization of governance in fear of corruption within the water sector is reflected in Colombia's 1991 constitution, specifically in the creation of the CRA and Superintendence of Public Utilities:

These reforms can be plausibly read as a move away from the electoral politics of Congress towards a technocratic model where either judges or bureaucrats at independent agencies would make the major decisions of the country. [...] The underlying logic [...] was that politicians (especially those in the municipalities) could not be trusted with taking water tariff decisions. Surely, or so it was thought, they would reduce tariffs or expand subsidies just before local elections, thus threatening the financial stability of the system. Moreover, there was a clear incentive not to reinvest in water network sustainability; after all, mayors do not get elected by investing in sunk costs, but by providing new services to potential voters. [...] The solution was to create a technocratic non-electoral institution that would set tariffs on the basis of sustainability of investments and, to a lesser extent, the redistributive effects of price structures. (Urueña, 2012, p. 285)

At the end of the decade, Colombia implemented another major policy in line with global development trends that was pivotal to the municipal-level water security territory. Law 388 of 1997 required all municipalities in Colombia to create a land-use plan called the *Plan de Ordenamiento Territorial* (POTs). POTs are defined in the law as political-administrative and normative physical planning actions with a set of objectives, guidelines, policies, strategies, goals, programmes, actions and standards adopted to guide and manage the physical development of the territory and land use within its jurisdiction in harmony with the environment and historical and cultural traditions (translated from Law 388 of 1997). The most important components of the POT include land use and occupation, housing, risk zones, public services, and financial planning (MinVivienda, 2016). Provision of water and sewage service to residents, formalization of neighbourhoods or slums, area of the water service network, and expansion of infrastructure such as installation of pipes are included in and dependent upon the POT.

POTs are valid for at least three mayoral administrative periods from the onset of adoption which coincide with short-, medium- and long-term goals (MinVivienda, 2016, p. 6). The short- and medium-term goals within a POT may be reviewed and modified at the beginning of each mayoral term if the completion period for the component in review has culminated. At the end of the three terms, the structural and long-term components of the POT are revised, and a committee is granted a timeframe to propose and accept new structural and long-term goals for the following 12 years (MinVivienda, 2016). The municipal-level administration is responsible for creating the plan, the regional and departmental environmental authorities revise technical components related to the environment, and the departmental- and national-level bodies aid and advise throughout

all processes (Arbeláez & Vargas, 2010). This time period throughout the LAC emphasized constitutional reform and urban planning. In the following time period, WASH policy takes on greater significance following grassroots activism around the human right to water.

2001–10: The human right to water

In 2000, global sustainable planning and poverty eradication agendas advanced with the UN's Millennium Development Goals (MDGs). Target 7C was to 'Halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation' (United Nations, 2015). In 2010, the UN formally recognized the human right to water and sanitation, fuelling protests to the marketization of services and resources that stemmed from neoliberal policies of the 1990s. In the early 2000s, activists in Colombia joined the global human right to water movement. Following similar regional trends such as the Cochabamba 'Water Wars' in Bolivia, Colombian human rights advocates contested the commodification of water by politicians via constitutional adaptations (Perera, 2015, p. 205). From 2007 to 2011, water activists led a constitutional referendum campaign to incorporate the human right to water into Colombia's constitution, but the referendum was dismissed due to minimum guarantees of water that were already in place. Perera (2015) applied the notion of Tsing's 'engaged universals' to explain the value of the campaign despite its dismissal. While the human right to water was not adopted formally by Colombia's constitution, in part because of financial and infrastructural challenges, the government acknowledged the rights of rural communities to manage their own aqueducts.

Thus, despite the dismissal of the referendum, the human rights movement shaped water–society relations by heightening attention to WASH at all levels of governance. In 2006, the Viceministry of Water and Basic Sanitation was created within the *MinVivienda*, and tasked with 'promoting sustainable development through the formulation and adoption of policies, programmes, projects and regulations for the population's access to drinking water and basic sanitation' (translated from www.MinVivienda.Gov.Co in August 2020). When a municipality could not meet the investments required for WASH services, the Viceministry created programmes, issued regulations, and provided financial support. The Viceministry of Water and Basic Sanitation also coordinated with other ministries on policy and regulation related to water insecurity such as the Ministry of Environmental and Sustainable Development; the Ministry of Health and Social Protection; and the Ministry of Agriculture and Rural Development. Despite this coordination, Colombia's progress in expanding WASH services was beset by challenges.

2011–19: National-level challenges

Ultimately, Colombia's progress in achieving the WASH component of the MDGs was blurred by drastically uneven progress: national-level indicators stated that 97% of urban areas had WASH coverage, but department-level indicators varied from 49% to 100% (United Nations Development Programme (UNDP), 2015). In 2015, at the conclusion of the MDG period, the UN launched 17 SDGs as the next 15-year global development plan to be achieved by 2030. SDG 6 aspired to ensuring access

to water and sanitation for all, which highlighted the advancement of water insecurity as a global priority (United Nations General Assembly, 2015). Throughout the 2010s, scholars critiqued the UN and other international organizations' WASH indicators; reconceptualized water security as multidimensional and holistic; and highlighted the need for better indicators and adequate measurement tools, and the need to incorporate improved WASH and water governance into policy and development agendas (Jepson et al., 2017; Miller et al., 2020; Satterthwaite, 2016; Wutich et al., 2017).

In 2018, Colombia's Viceministry of Water and Basic Sanitation released its national strategic plan for 2018–30, in accord with the SDGs. The plan addressed water security,² urban planning and population growth, and inter-agency and multilevel governance cooperation and information-sharing. The plan proposed achieving the SDGs via short-, medium- and long-term strategies that will:

1. Promote intersectoral information systems for evidence-based decision making; 2. Strengthen institutions of the [water] sector from a broad perspective including: the regulatory adaptation to current and future challenges, a critical analysis of the sector's organizational arrangement, and the construction of the providers' business capacities; 3. Articulate public policies and planning of the drinking water and basic sanitation sector between different levels of government and with other sectors; 4. Raise awareness in a holistic way among water users so that they recognize and value environmentally, socially and economically, the availability of this resource, and use it efficiently and rationally, and; 5. Promote the use of sustainable infrastructure adapted to the differential needs of the territories and implementation of innovative and efficient technologies. (translated from MinVivienda, 2018, p. 9)

The Viceministry later implemented several policies, such as Law 1977 of 2019, which required water service producers to report coverage rates, water quality, pricing, etc., to a single information system that would be monitored, regulated, and controlled by the national government. The Viceministry also announced its plan to provide greater access to water services via regionalization by consolidating small-scale service providers and helping them structure sound technical and business plans to receive financing (MinVivienda, 2020). Within the LAC region, regionalization of water and sanitation services was highlighted as a method through which to achieve SDG 6, in contrast to the status quo approaches of centralization, decentralization, and municipalization (FIAR XII, 2019). The objective of regionalization, as stated by Frone, is 'to optimize the performance of the operations and quality of supplied services, by using joint resources and facilities [of two or more local drinking water supply and wastewater systems]' (Frone, 2008, p. 185). This process was further discussed at the 2019 Iberoamerican Forum on Regulation (FIAR) hosted by the Association of Regulatory Agencies of Water and Sanitation of the Americas (ADERASA) in Cartagena.

As the national strategic plan for WASH suggested, there was a need for improved water governance and management in order to achieve sustainable water security. Other national-level reports highlighted faults in Colombia's WASH sector during this time period. The World Bank identified the lack of standardized measurement tools and indicators, lack of inter-agency cooperation, and lack of integrated water management (World Bank, 2020). Forero Salazar et al. (2020) similarly proposed national-level WASH governance improvements, stating that Colombia's institutions have the capacity to

measure SDG indicators, but lack uniformity of data, inter-agency collaboration and focus on marginalized rural communities.

During this decade (2011–19), Colombia's water policies and governance evolved from dualistic or unidimensional approaches to more holistic and interdisciplinary approaches. Policies about economic, human rights, land-use tools and finally calls for improved water governance, concepts and intersectoral collaboration emerged to reflect aspects of the 'hydro-social territory' and 'water–society' approaches to mitigating water insecurity (Boelens et al., 2016; Empinotti et al., 2021).

Within the context of national trends, the next section shifts to the municipal level of Cartagena, where we expand upon the World Bank's and Forero Salazar et al.'s (2020) arguments to include urban areas and municipalities within the development frameworks for improved WASH information, policy and governance. We use the 'urban water security territory' to reveal how municipal-level policies and governance shaped water access and distribution more acutely than national-level policies.

Cartagena: privatization, planning, and instability

1991–2000: Cartagena's privatization of WASH services

Amidst the 1990s backdrop of neo-constitutionalism and neoliberalism, Cartagena became Colombia's first city to privatize water and sewage service provision upon the passage of Law 142 in 1994 (Beato & Díaz, 2003). In 1994, only 70% of Cartagena's population was connected to municipal water services and 55% to municipal sewer (Water Action Hub, 2018, p. 7). Fees were collected from less than half of legally connected users, and untreated sewage was commonly dumped directly into the Ciénaga de la Virgen marsh and Bay of Cartagena causing environmental damage (Erml, 1999). In addition to insufficient coverage of services, revenue did not cover costs and inexplicably disappeared. Non-revenue water (NRW) losses were estimated to have accounted for up to 60% of the city's provided water (Water Action Hub, 2018, p. 7). NRW – which is still an issue today, although not as severe – was, and still is, the result of informal and illegal connections to pipes, outdated infrastructure and other system damages.

All these shortcomings served as justification for outsourcing Cartagena's water and sewer services. In response to inadequate public water services, as well as the central government's support of private investment in the service sector as a solution to insufficient local resources, Sociedad Aguas de Barcelona (Grupo Agbar), a Spanish company, was awarded the water and sewage service contract via Colombia's bidding process for various large-scale service contracts (Beato & Díaz, 2003; Erml, 1999). A public–private partnership (PPP) was established in 1994 and the corporation *Aguas de Cartagena S.A. E.S.P. (Sociedad Anónima, Empresa de Servicios Públicos Domiciliarios)*, or *Acuacar*, initiated operations in 1995. Ownership distributions established in 1994 were unmodified as of 2020: the private operator Grupo Agbar owned 45.9% of Acuacar, the District of Cartagena owned 50%, and private stakeholders owned the remaining 4.1%. Aguas de Barcelona was initially responsible for the transfer of technology for operational, administrative, and technical efficiency. In 2019, the district maintained ownership of the infrastructure and was responsible for

its funding and expansion. The operator, Agbar, remained responsible for providing water and sewage services, improving the service system and collecting tariffs.

Between 1995 and 2017, daily service continuity increased from 14 to 24 h, service fee collection increased from 40% to 99%, aqueduct coverage increased from 74% to 99%, and service to lower income users grew from 34% to 80% (Aguas de Cartagena, 2018). According to Acuacar:

Cartagena has 99.91% coverage in aqueduct service, 93.6% coverage in sewage service, a continuity of service of almost 100% (i.e., 24 hours per day), and additionally has adequate pressure in its networks and a quality of water that meets international standards. (translated from <https://www.Acuacar.com/Acuacar/Acerca-de-Acuacar>, September 2020)

Acuacar's reported improvement of service quality, environmental restoration via improved sanitation, and coverage as a PPP service provider have been well documented as a successful service model resulting from neoconstitutional and neoliberal policies (e.g., Erml, 1999; World Bank, 2014; Water Action Hub, 2018). However, these traditional parameters of water quality and quantity alone have led to an incomplete understanding of water insecurity in Cartagena.

2001–10: Water and Cartagena's POT

Cartagena's water governance and policy during this period aligned with the MDGs and national development policies. The district created new agencies such as the *Establecimiento Público Ambiental*, or environmental protection agency, and implemented its POT via Decree 0977 on 20 November 2001. Cartagena's POT encompasses four of Empinotti et al.'s (2021) key entry points for analysing urban water security – territory, citizen's rights to the city, infrastructure and governance – and inadvertently undermined hydro-social relations despite the best of intentions. Overall, the ineffectiveness of the POT in Cartagena as an urban planning tool to address water security challenges highlights the importance of comprehensive and adaptable approaches in urban water management.

The POT was intended to be in effect until 2011 and consisted of a 232-page document with four components: (1) a technical support document that includes diagnostics; general, urban and rural components; and financing, management and execution strategies; (2) a summary document; (3) the legal decree that adopts the plan; and (4) the cartography of the plan (POT Cartagena, 2001). In the POT, public services were used to define land-use zones within Cartagena: urban, urban expansion, suburban, rural. Articles 117 and 118 define the urban zones of Cartagena as 'the areas of the district destined for urban uses [...] which have road infrastructure and primary energy, aqueduct and sewerage networks, enabling their urbanization and construction, as the case may be' (translated from the Spanish; p. 64). Article 122 defines the urban expansion zones as:

the land adjacent to the built city or urban land of the district, which has not yet been urbanized and does not have residential public service networks [...] the land may not be urbanized until public service providers conduct comprehensive studies about network expansion with master plans.

Suburban zones are zones within rural areas that may provide their own access to public service networks (p. 114). Rural zones are areas that are designated as not apt for urban use and are generally areas used for agriculture, livestock, forestry, exploitation of natural resources, and similar activities (p. 112). The POT identifies high-risk and natural conservation areas throughout the land-use zones where human settlement is prohibited.

Within the POT, we searched for the terms *agua* (water), *hídrico/a* (hydraulic), *acueducto* (aqueduct), *alcantarilla* (sewer), *Acuacar, potable* (potable), *tubería* (pipelines) and their derivatives. The majority of *potable* [water] references were discussed in the context of environmental conservation, protection and restoration, for example, managing untreated wastewater dumped into the local watershed and coastal ecosystems such as the Ciénaga de la Virgen marsh and the Cartagena Bay (e.g., Articles 94³ and 95⁴). There were several references to improving, upgrading and legalizing neighbourhoods within the city. For example, Article 102 discussed a housing programme that entailed relocating families living in areas designated as immitigable high-risk zones,⁵ and incorporating services such as potable water and sewage services in new locations where families may be moved (POT Cartagena, 2001, p. 59).

The UN recognized Colombia's POTs as leading examples in sustainable urbanization (UN-Habitat, 2020). However, Baud et al. (2019) criticized POTs throughout LAC for often negatively impacting marginalized communities through their dualistic nature (e.g., rural versus urban). The dualism is explicit in Cartagena's spatial delineation of the public service provision zones, and it led to the systematic exclusion of slums and informal communities from water and sanitation coverage decades after the zones were defined. Cities' systemic neglect of marginalized communities, such as slums or informal neighbourhoods, often confers an 'urban penalty' in which urban migrants and slum-dwellers are excluded from urban amenities, may subsequently experience lower living standards than in rural communities, and are often subject to expropriation and displacement (Freudenberg et al., 2005; National Research Council, 2003). By spatializing its urban slums into non-service territories, Cartagena's POT most likely amplified neighbourhood effects on health and well-being, effects that typically – and conveniently, for the municipality – tend to be obscured in local censuses and health surveys that ignore slum status (Ezeh et al., 2017).

Despite these shortcomings, at the time of implementation in 2001, the POT aligned with the MDGs and was intended to be updated and revised to accommodate governance plans and other developments over time. Unfortunately, Cartagena's POT was not revised as intended due to political instability, poor governance and opaque indicators, which impeded decision-making. The city's outdated land-use policies left it unable to integrate new approaches to addressing long-term water security and effective governance.

2011–19: Political instability and institutional weaknesses

From 2011 to 2019, Cartagena experienced a period of political instability that hampered its ability to improve urban water governance. Macro-level water governance has historically focused on dualisms that shape water provision, such the public good versus commodity debate in the 1990s, or the commodity versus human right debate in the 2000s (Perera, 2015; Urueña, 2012). Although these factors shaped water governance in

Cartagena from 2011 to 2019, they were ultimately not the immediate drivers of water insecurity. As conceptualizations of water security and approaches to water governance advanced during this decade (i.e., Empinotti et al., 2021; Forero Salazar et al., 2020; Grasham & Neville, 2021; United Nations, 2021), national and international institutions did not measure the drivers or impacts of water insecurity at the urban scale. In fact, Colombia's national government and the UN were among the organizations that applauded POTs and service coverage levels, when these two factors, in addition to political instability, ultimately exacerbated water insecurity in Cartagena. This section emphasizes the role of governance and power structures in shaping the water security territory (Empinotti et al., 2021).

During this period, Cartagena had 11 different mayors: each administration implemented its own governance plans and infrastructure budgets, and none was capable of renewing the POT (e.g., Alcaldía Mayor de Cartagena & Secretaría de Planeación Distrital, 2011; Fenalco Bolívar, 2013). As of December 2019, the original 2001 POT was not updated and the city's land-use plans, including zoning for water and sewage provision, environmental protection and housing plans, were based on a document that was outdated by at least eight years.

Administrative plans must work within the regulations of the POT, thus the renewal and adaptation of the POT to demographic and land-use changes over time were necessary for mitigating water insecurity and improving infrastructure in slum communities. Individual government agencies such as the district environmental agency, government officials, periodical accounts and local policy experts stated that updates to the POT were necessary for urban development (Alcaldía Mayor de Cartagena & Secretaría de Planeación Distrital, 2011; Fenalco Bolívar, 2013; Miranda Batista, 2019a; Morales Gutierrez, 2020). Updating the POT takes years and requires stable and reliable governance, from the onset of studies, to stakeholder input and participation, to the power-politics of district approval, and finally national approval – a process that effectively paralysed Cartagena's urban development and ability to incorporate multidimensional approaches into the urban territory such as those used in this study. The period of political instability in Cartagena that facilitated delays and denials to POT updates began after the resignation of Mayor Campo Elías Terán in 2012 due to medical issues less than one year after being elected into a regular term. The central government placed Carlos Otero Gerds to serve from 2012 to 2013. Dinonio Vélez Trujillo was elected for a special shortened term from 2013 to 2015. In 2014, the administration of Dionisio Vélez Trujillo began initial revisions to the POT but Vélez Trujillo's irregular shortened term length did not allow for the completion of plans. Vélez Trujillo's successor, Manuel Duque Vásquez, was elected for a regular term, however, in 2017 Duque was arrested for conspiracy to commit a crime, bribery during the election process and influence peddling of public servants, and he eventually renounced his position as district mayor (Semana, 2017). The central government then selected Sergio Londoño Zurek to serve as mayor until popular elections could take place in May 2018. In May 2018, Antonio Quinto Guerra Varela was elected, and then removed two weeks later under the premise that he was ineligible to run for mayor due to conflict of interest for having signed a contract with the Ministry of Housing one year prior (Taborda Herrera, 2019). The central government then assigned the position of mayor to Yolanda Wong from June to September 2018, followed by Pedrito Pereira until December 2019.

In 2019, Pereira's POT update attempts were refuted and denied by City Council members for not including enough public and stakeholder participation (Morales Gutierrez, 2020). Additionally in 2019, Accord 033 of 2007, which provided the only update to the POT, was nullified due to lack of open consultation and adequate study prior to implementing the modification (Miranda Batista, 2019b). While stakeholder participation has been found to increase the value of local knowledge, improve inclusivity of minoritized groups and mitigate exploitative practices, among other benefits (Roque et al., 2022), participatory decision- and policymaking was not possible amid inadequate leadership and political instability.

In addition to political instability, we identified other institutional weaknesses that shaped the urban water security territory. As discussed in previous sections, Acuar's high service coverage rates only applied to coverage within Cartagena's urban zones as delimited by the POT in 2001, with service gaps in the remaining land-use zones that are not reflected in the coverage rates (Figure 1). Areas within the urban zone that did not receive household-level services in 2019 were mostly natural conservation or high-risk areas, many of which remained populated by the same slums and informal settlements referenced in the POT in 2001 (e.g., the Cerro de La Popa o Ciénaga de la Virgen zones). In addition to perpetuating the urban penalty inflicted by the POT's dualisms (Baud et al., 2019) and systematic exclusion of marginalized populations, this land-use policy ultimately allowed public service coverage indicators to omit entire spaces within the municipality, thus obscuring existing territories of water insecurity.

In addition to providing misleading indicators, water service data collection and methodology also lacked transparency and uniformity. According to an Acuar representative, the cited coverage rates accounted for the area within the urban zone that was covered by service pipeline networks; or the areas within the urban zone where connection to the main aqueduct network was *possible* without necessarily accounting for *actual* connections (personal communication, 2019). Cartagena Cómo Vamos, a local organization that tracks quality of life indicators, reported that Acuar coverage rates were calculated differently starting in 2018, reducing aqueduct and sanitation coverage to 96.35% and 86.32%, respectively. According to Cartagena Cómo Vamos publications, which are based on information submitted by Acuar, the new coverage rates were calculated based on the number of households as opposed to people (translated from Cartagena Cómo Vamos, 2020, p. 24), without further clarification. Acuar's 2020 report did not include a proportional coverage rate; instead, it included total users which amounted to 301,333 (Aguas de Cartagena, 2020). Beyond the coverage zone, there are multiple varying estimates of the unserved population. Cartagena Cómo Vamos (2019) reported that approximately 25,898 people in rural zones do not have access to WASH services. Other sources have estimated that about 40,000–70,000 residents within the rural zone may lack access to public services (Junieles Acosta, 2017). Additionally, official population estimates of Cartagena, as reported by different national-level institutions in the same year, fluctuated by almost 200,000 people further obscuring WASH access and coverage data.

While water insecurity presents an ongoing challenge in certain pockets of Cartagena beyond Acuar's network, ambiguous data and inconsistent indicators make it difficult to identify the scale of water insecurity throughout the city. Lack of information, particularly within unserved and informal settlements, is

a common global barrier to WASH policy and slum upgrading around the world (Ezeh et al., 2017; Sinharoy et al., 2019). However, municipal, national and international reports citing high coverage rates potentially mislead stakeholders and decision-makers by suggesting that Cartagena does not experience water insecurity. Decision-makers' perceptions ultimately influence infrastructure investments to mitigate water insecurity and update slums or informal communities (Marlow et al., 2013).

This case study of Cartagena exemplifies themes from the urban development and water insecurity literature, highlighting both the utility and importance of the 'territorial' approach. Shortcomings and inaccuracies of traditional coverage indicators obscured water insecurity throughout the city (Jepson et al., 2017). Political instability and poor governance hindered urban development and perpetuated the growth and marginalization of communities without access to public services, such as slums or informal neighbourhoods (Ezeh et al., 2017). Finally, municipal level governance and political instability undermined national level policies (Furlong, 2012; Lebek et al., 2021). All these findings reinforce the UN's call for more focus on the sustainable development of mid-size cities, many of which are among the world's fastest-growing cities, yet receive disproportionate attention within the development field (UN-Habitat, 2020). This analysis also underscores the importance of revising urban policies, using more rigorous and standardized indicators, and addressing the most vulnerable areas in order to achieve SDG targets for water supply (Forero Salazar et al., 2020).

Discussion and conclusions

From 1991 to 2010, Colombia's policies aligned with global and regional neo-constitutionalism, neoliberalism and sustainable development trends. Colombia adopted a new constitution, created regulatory agencies for WASH services, allowed competitive bilateral bidding processes for public service provision, and required all municipalities to create extensive land-use and urban development plans. Despite the dismissal of the constitutional referendum to incorporate the human right to water, Colombia advanced WASH policy and governance in other ways such as the creation of the Viceministry of Water and Sanitation. Cartagena followed these trends and hosted the first public service provider in the country created with a bilateral investment treaty, created new district-level authorities such as the environmental protection agency, and implemented a comprehensive land-use plan that initially addressed public service expansion and potable water provision.

From 2011 to 2019, however, Colombia's multilevel governance challenges became more pronounced as conceptualizations of water security, water governance, and the urban water security territory evolved. In line with scientific advancements, the Viceministry of Water and Sanitation and the World Bank both identified the need for improved water governance and institutions via data standardization, inter-agency collaboration and integrated water management (MinVivienda, 2018; World Bank, 2020). Cartagena's political instability, outdated POT, and ambiguous and fluctuating coverage rates reflected these needs but received little attention within the academic literature, especially compared to larger Colombian cities such as Bogotá and Medellín (e.g., Acevedo Guerrero et al., 2016; Furlong et al., 2018).

A closer examination of governance in Cartagena from 2011 to 2019 showed both the outsized and understated role of municipal politics in determining urban water security, despite international and national level policies and indicators. Political instability blocked WASH service expansion to vulnerable communities via the inability to update urban development and land-use plans that determined water infrastructure placement. Weak institutions facilitated the continuity of preventable administration changes (i.e., legally ineligible candidates), and misleading, unavailable and inconsistent demographic, spatial and WASH indicators. Despite Colombia's national-level policies, and Acuar's improved service operations and management, socio-political factors reshaped the urban water security territory: coverage rates in Cartagena reflected high water security, yet the city's persistent political instability, corruption, fluctuating demographic and service coverage indicators, and stagnant development plans hindered infrastructure expansion and equitable access to services.

Despite being in a water-rich country, Cartagena's water insecurity was undermined by socio-political factors such as misleading indicators and perpetuated by unstable politics and weak governance and institutions. In Cartagena, as in many cities globally, water insecurity was disconnected from urban development, politics, and governance, and indicators were not scrutinized or challenged. By framing Cartagena as an urban water security territory, we were able to review multiple scales of hydro-social dynamics and socio-political factors (territory, citizens' rights to the city, infrastructure, governance and power structure, and social action) that shaped water insecurity. We observed that the status quo approach to understanding urban water security, centred around Acuar's reported coverage within the urban zone and water quality results, perpetuated systemic exclusion of marginalized communities from public services, and did not reflect water-society relations in much of the city. Yet, this approach informed municipal and national-level policy.

Our first suggestion for Cartagena, specifically, is that indicators be made uniform across institutions, transparent in collection methodology and inclusion criteria, and easily accessible to the public – a tangible improvement that would facilitate inter-agency collaboration. We acknowledge the complexity of implementing change and improving social engagement with water security territories, as well as breadth and importance of work critiquing territorial ordination plans and water governance models in LAC and developing countries. However, our primary goal in this study was first to identify practical and immediate opportunities for adapting intersectoral and multidimensional approaches in current governance practices (Empinotti et al., 2021; Grasham & Neville, 2021; United Nations, 2021). We encourage researchers and policymakers to evaluate current WASH indicators, the relationship between urban development plans and water provision, and the roles of politics and governance in shaping water insecurity. Cartagena is one of many mid-size cities where interdisciplinary research can provide tangible, sustainable solutions for policymakers to help mitigate water insecurity.

Notes

1. The UN addresses water insecurity in SDG 6: 'Ensure availability and sustainable management of water and sanitation for all' (UN, 2015).

2. As defined by UN-Water: ‘Water security is defined here as the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability’ (UN-Water, 2013).
3. Article 94 calls for sustainable availability of potable water from the Ciénaga de la Virgen marsh and Dique Canal for the needs of the city and region. Article 95 calls for watershed and environmental management and to assure clean water for potable use (POT Cartagena, 2001, p. 54).
4. Article 95 calls for watershed and environmental management and to assure clean water for potable use (POT Cartagena, 2001, p. 54).
5. An immitigable high-risk zone is an area under threat from natural disasters such as landslides and is deemed unsuitable for living (POT Cartagena, 2001, pp. 60–66).

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