

Chapter 6

Water Utilities: Is Their Sustained Financial Efficiency Achievable? – The Mexican Case



Ricardo Sandoval-Minero

Abstract Mexico reached the Millennium Development Goals (MDGs) in terms of access to water and sanitation infrastructure, but the quality of service provision is still unsatisfactory. In face of the new Sustainable Development Goals (SDGs), whose reach is much wider and ambitious, the country faces a huge financial and technical challenge. Besides facing growing problems due to the scarcity and bad quality of water sources, the gap between demand and supply also widens because of rapid and messy urban growth in metropolitan areas, a lack of investment in infrastructure rehabilitation and extension, and limited capacities for managing and operating the water and sanitation systems. The sector's infrastructure development has relied on a centralized financial system where federal subsidies have been allocated according to operating rules, designed to induce water utilities' performance improvement, but in the end, without any linkage to improvement commitments or ex post performance assessment. From a general analysis, it appears that institutional dysfunctions and instability have impeded the sustainable operation of these services, despite the financial and technical efforts deployed; in a way, the continuous and discretionary allocations of subsidies seem to reinforce negative loops of service deterioration, users' unwillingness to pay or collaborate, political interference, and external "rescue" of failing systems. In the present context of financial scarcity, climate variability, impacts of global commercial trends on local resources, and social inequality, Mexico could finally be forced to undertake a profound institutional reform to give water services the stability, professionalism, resilience, and creditworthiness they need, to attract alternative financial resources and ensure a more sustainable operation. Such a reform faces huge cultural and legal obstacles, but the stakes leave no space for inaction.

Keywords Sustainable development goals · Urban water · Water utilities · Financial performance

R. Sandoval-Minero (✉)
Sextante Consultores SC., Mexico City, Mexico
e-mail: rsandoval@sextanteconsultores.mx

6.1 Introduction

In Mexico, almost eight of every ten people live in urban localities (INEGI 2010), while 73% of the total gross production¹ is generated in 56 metropolitan areas (ONU HABITAT 2011). Despite an apparent high water and sanitation coverage, Mexican cities face growing problems for providing potable water with proper continuity and quality, replacing aging infrastructure and supporting urban expansion.

Federal, state, and municipal authorities have set up different measures in order to reinforce the resource's preservation, build new infrastructure, improve technical and economic efficiencies, create public awareness, and set up accountability and transparency frameworks. In a context of climate variability, growing water scarcity and financial limitations, a lot remains to be done, especially to set up better institutional arrangements which could lead urban systems toward higher quality and performance instances, attract alternative financial sources, and ensure a more sustainable and resilient operation.

In this chapter, an overall assessment of the performance of urban water and sanitation systems is presented; a call for setting up a new model is made, consistent with the need to guarantee equal access to water to urban and rural population while preserving the environment, to reach the Sustainable Development Goals (SDGs).

6.2 Overall Assessment: Urban Water and Sanitation Problems and Capabilities in Mexico

6.2.1 *State of the Problem*

Mexico is a federal republic, with an extension of 1964 million square kilometers; 76.8% of its population is considered “urban” (living in towns with more than 2500 inhabitants). Water and sanitation coverage in urban areas is relatively high, and a huge effort has been made to build wastewater treatment plants and to support municipal utilities with financial and technical resources to develop new water sources, improve technical and commercial efficiencies, and extend the services coverage. Some of the utilities serving bigger cities perform with acceptable indicators and are based on best international practices. Nevertheless, there are big challenges still to be resolved:

- In 30 years, the pollutant load from point sources has increased in 42%, while groundwater, which accounts for 75% of water supply for public uses, is not

¹Total gross production means the value of all the goods and services commercialized by the economic units of a municipality. Gross domestic product is not reported for the municipal or city scale (ONU HABITAT 2011, p. 39).

being properly protected against salt intrusion, overexploitation, wastewater infiltration, and other impacts (Aboites et al. 2008).

- Water availability per person has diminished because of the population growth, but in Mexico's case, this is worsened by the concentration of most of the urban, industrial, and agricultural zones of the country in the central and northern regions, where less water is available (Saltiel 2008).
- It has been reported that in Mexico, 95.7% of households have access to water supply infrastructure in urban zones (CONAGUA 2016); nevertheless, only 80% of them have the service inside the house, only 75% have reported receiving water every day (INEGI 2016), merely 62.1% have constant supply, and only 25.3% believe they can drink from the tap without getting ill (INEGI 2015).
- In urban localities, only 51.7% of the respondents of a survey considered water service to be "satisfactory" (INEGI 2015).
- At the country level, 91.0% of households have sewage or sanitation infrastructure, 96.6% in urban zones and 74.2% in rural localities (CONAGUA 2016). Still, 8% of households share their sanitary installations with other households in rural areas, and 5% do it in urban ones (INEGI 2016).
- Wastewater treatment capacity was doubled in 15 years; it is estimated that 91.5% of sewage is collected, and 57% of that volume can be treated with the existing installed capacity of 57% (CONAGUA 2016). Nevertheless, in a study performed by the Engineering Institute of UNAM in 2015, only 54% of the wastewater treatment plants (WWTPs) smaller than 100 l/s are working, but less than a half work properly. From bigger WWTPs, 82% are working, but only 41% work right. Almost 50% of WWTPs in the country are classified in the range of "awful" or "bad" performance (Morgan 2016). Among the causes of this deficiencies, the study proposes public expenditure with no proper planning, leading to hasty investment decisions, as well as design and construction mistakes, lack of resources for operation and maintenance, and excessive rotation of the personnel.

It's estimated that more than 70% of water bodies in the country show some degree of pollution, while economic activity and public supply in numerous cities depend on overexploited aquifers and degrade environmental flows (UN-Water 2013).

- Although Mexico has one of the largest irrigated areas in the world, close to 6.5 million hectares, a large part of this infrastructure continues to operate under irrigation systems whose efficiency could be significantly improved in addition to the lack of maintenance that has damaged its capacity (CONAGUA 2015, p. 77). Almost 77% of the cultivable area is not irrigated; since the 1990s, the expansion of the area under irrigation has been very limited, since the country has concentrated on improving water productivity. At this point, the economic feasibility of new irrigation schemes depends to a large extent on the capacity of the country to achieve improvements in agronomic practices (UN-Water 2013).

All these figures suggest a common explanation: while there has been a huge financial and human effort, deficiencies in planning, resource allocation, construction and operation of the infrastructure, and distribution of responsibilities and

accountability have hindered the reduction of coverage gaps and caused the loss of installed capacities for obsolescence, lack of maintenance or improper operation.

Clearly, the problem for achieving sustainable urban water services in Mexico is more complex than having budget to build water or sewage connections or to import water from other basins; urban areas require to be served from farther sources and to collect and treat wastewater in more extended areas; aquifer recharge areas are being paved and riversides invaded, while climatic variability increases the risks of flooding with more intense precipitation events.

6.2.2 Institutional Framework

In Mexico there are three governmental “orders” (with no hierarchical relationship between them): federal, state, and municipal. While the Constitution enacts federal government, through the National Water Commission (CONAGUA by its Spanish acronym), to take charge of the administration of the national waters within the country, the National Waters Law also gives CONAGUA relevant capacities in at least two important issues: first, to support financially and technically the extension of services coverage through budgetary allocation and the definition of execution rules and norms and, second, to promote efficient practices, in physical and financial processes, among public water suppliers and productive users. Within this framework, CONAGUA can also build and operate water supply and sanitation infrastructure in coordination with states and municipalities. In the other hand, since 1982, Article 115 of the Constitution gives the municipality the responsibility for the provision of water and sanitation services, with the assistance of the state if needed. This has given place to a very varied set of institutional arrangements, with some states having a wider intervention (even a direct participation as water suppliers) and others setting aside of predominantly municipal utilities. Before 1982, bigger cities had been managed as federal organisms or had a more important federal participation, since they needed bigger infrastructure works which were normally financed and built by the national government since the late nineteenth century. There is no formal mechanism for economic regulation of water services (formal and technically sound mechanisms to ensure a proper balance between price and quality of water and sanitation services), with the exception of private participation schemes. In most cases of public utilities, there is a board in charge of the government system and a group of directors in charge of the operation. The board presents a tariff proposal to the municipality (city council), which then presents a revised proposal to the State Congress; the common practice is to set an upper limit according to general inflation rate, but without analyzing the utilities’ cost and technical structures, and disconnect from the investment programs. In the absence of a formal supervision, it is common that utilities operate inefficiently and lack of resources for sustaining appropriate levels of operation and maintenance, transferring the costs of this inefficacy through resource overexploitation and capital improvement deferral. In most cases, political interference in staffing, administration, public works bidding processes, and even in

operational decisions blocks even the most committed staff from getting higher sustainable performances. It can be stated that along with the lack of a planned and effective control of land use, institutional instability is a key root problem, leading to unsustainable provision of water and sanitation services.

6.2.3 The Performance of Urban Water and Sanitation Systems in Mexico

There are different systems in place to collect and analyze performance data from water and sanitation utilities; none of them, though, is based on audited data but on the information provided by the operators themselves.

The Citizens Council for Water, an autonomous consultative organization set by the National Waters Law at the national level, organized in 2009 and 2010 a survey and classification effort, to try out a method of prioritization while promoting a benchmarking experience. Fifty cities were surveyed and their data analyzed and classified. Here we review some of the major findings (CCA 2011), in spite of some criticisms and possible improvements:

- Services coverage, measured in terms of household connections which make possible the supply of potable water and the discharge of wastewater, appears to be high, as reflected in national statistics; nevertheless, when it comes to continuity, numbers vary a lot, with less than 40% of the utilities reporting 100% of connections with continuous service. Sewage coverage does not match either the capacity of wastewater treatment.
- There are noticeable differences in terms of labor productivity and commercial efficiencies. It seems to be a geographical discrimination, where cities located in the northern part of the country show better indicators, with the exception of metered connections, where more dispersion is present.
- Although some utilities declare to have relatively high technical efficiencies, that is, low leakage ratios, it must be noticed that with a limited metering capacity, this figure should be questioned. The lack of appropriate measurement and invoicing of flows also hits the financial health of utilities or affects the users economy, since many of the cities not having adequate metering ratios usually charge fixed charges per household, which discourages efficient use at the home level and can cause a decrease in the available income of the families, without relationship to the cost structure of the utility and to the quality of service.
- An outstanding issue addressed by the CCA survey was a set of questions related to the existence of seven good governance practices: long-term planning, governing board, users' participation in the board, audited annual reports, management autonomy, independent tariff setting, and customer service systems. Once more, the best performing utilities seem to have also the best practices, and they are mainly located in the central and northern parts of the country.

The report concluded, from the weighted addition of all the indicators (a method partly contested by the utilities themselves), that the cities of Leon, Saltillo, Monterrey, Aguascalientes, and Cancun ranked the best five utilities in Mexico. The authors try to point out how those utilities with private sector participation seem to show consistently better indicators, but a caveat should be stated in this direction: first, most of them already had good indicators and a local tradition inclined toward efficiency and, second, the availability of a long-term arrangement including relevant federal subsidies, along with agreed tariff formulae, has provided these utilities with an income stability not usual in the sector. Nevertheless, it does seem to be a relationship between good governance arrangements and good performance, though further research is desirable.

Beyond these findings, it seems worrying that even among the best urban utilities in the country, there are important challenges in terms of their internal efficiency and functioning, worsened by the growing need of funding to bring water from new sources, protect existing ones, and collect, treat, and dispose of wastewater, with limited management and financial autonomy. Many factors which worsen the scene haven't been considered in CCA's assessment, such as the existence of impoverished neighborhoods and sections within and around some of the best performing cities, in which many users wouldn't afford much higher tariffs. The stakes for the future development of the country are huge, considering the relevance of urban economies for national wealth.

6.2.4 Public Policy Responses

As it was stated before, Mexican Constitution gives the state order the capacity to intervene in the regulation, operation, and control of municipal water supply and sanitation services where municipalities lack the capacity to assure adequate levels of service. Historically, though, the states have only taken part of public works planning and construction programs, and only recently there have been some states whose water commissions or similar organizations set up capacity building programs. There is still no formal economic regulation, although some state organisms have a role in analyzing and supporting the approval of water tariffs; states set up investment programs, along with federal ones, in one hand to support the extension of services coverage and in the other to promote the improvement of water and energy use efficiencies, as well as managerial development and training. The lack of continuity in the utilities' managerial staff due to political interference, along with a wider lack of accountability (where a municipal government can receive a well-working utility and leave a broken one to the next administration, and no one is called to respond), has systematically blocked any long-term development program in most of the cities. State programs usually mirror federal ones, which has given CONAGUA's criteria a central role in defining actual policy orientations, because of its budgetary and political strength, accentuated by frequent negligence at the state level in taking a wider role in water and sanitation regulation and capacity building,

beyond public works execution. This distance between the operator and the government sphere where policies are defined has important consequences, as it is discussed later in this chapter.

CONAGUA, whose central role is *resource regulation*, should therefore concentrate on guarding the integrity of national waters in terms of quality and availability, by measuring, registering, and controlling water extraction and discharge permits and rights. Nevertheless, it is also entitled to promote the expansion of water and sanitation services and their efficient operation, as it was mentioned before. While results in terms of resource regulation are far from being effective (with growing problems of water pollution and overexploitation), substantial resources are being dedicated to the development of big infrastructure projects called “strategic projects.”

6.2.5 *Water and Sanitation Capital Finance in Mexico*

Federal policy investment on water and sanitation infrastructure seeks to act as a catalyst of the state and local or private funding, achieving a wider reach by raising these funds in face of the lack of public funds available (CONAGUA 2012), even when these local funds usually come from federal fiscal collection, which is redistributed to states and municipalities through funds or programs. CONAGUA assigns federal funds by means of investment programs, each one with operating rules that usually vary slightly from one year to the other and must adjust to the rules defined also by state authorities.

Most of the funds are allocated by transferring the resource to state or local authorities, under a coordination agreement where executors commit to follow federal rules; in some states, local programs are set up to support specific goals and targets. Most of the municipalities take part only with 25% or less of the funds requested.

A salient characteristic of water and sanitation services capital financing in Mexico is the concentration of resources and decision-making at the federal level. In the period 2007–2011, CONAGUA contributed nearly half of the total budget on water and sanitation, although it participates also defining rules and through incentives in 80% of the total investment (World Bank 2016); the rest of the investment comes from other areas of the government and the private sector. Between 2010 and 2015, resources exceeded the needed amount to cover gaps in coverage (Campanaro and Rodriguez 2014), but due to the economic situation of the country, between 2015 and 2017, such federal resources were drastically reduced; in 2017, the reduction was greater than 70% (Montoya 2017).

Financing capital investments in urban water and sanitation sector in Mexico rely mostly on federal subsidies, which suffer from some deficiencies:

- *Fairness* – States or cities that have projects and resources, to capture federal subsidies in a timely manner, end up receiving more support; money does not

always benefit those that most require the help and gets allocated without reference to any performance commitments.

- *Efficiency* – Allocating resources to municipalities and states around the country involves a complex job which does not always guarantee the best allocation of resources and the achievement of greater social and economic benefits, despite the existence of mechanisms for performing ex ante evaluation of bigger federal investments. Hasty bidding processes and the lack of information contribute to an inefficient allocation of resources.
- *Stability* – Infrastructure investments come from resources that are passed annually by the Congress, without a multi-year scheme or guaranteed medium-term continuity. An operator is unable to know, at the time of preparing its tariff proposal, if there will be resources for capital investments next year, with which the utility could improve its efficiencies and lower the burden on the user. Similarly, when local resources are required to get federal funds, operators must revise their financial planning and sometimes use operating income for investment purposes as matching funds, deferring maintenance, or tolerating gaps in service.
- *Sufficiency* – Investments in the sector represent a minimum proportion of the GDP, compared with countries that have similar coverage but invest more (World Bank 2016). As noted before, federal subsidies don't cover the estimated minimum amount to correct the gaps. Many new connections are financed by the users themselves directly through connection rights or by real estate companies, transferring the cost to users.

A relevant feature of the institutional framework in the water and sanitation sector is the absence of formal mechanisms of economic and performance regulation. As subsidies are granted without performance improvement commitments, water utilities do not develop the administrative and financial expertise that they would, if they were competing for funding on capital markets. In terms of operating income, the rates are approved in municipal councils normally without bonding the income plan with the investment plan.

This establishes three conditions that constitute the core institutional problem of urban water and sanitation services in Mexico:

- *Virtual impunity*. There is no formal commitments or responsibilities associated with performance; bad operation or investment decisions can occur without consequences on public servants who operate an organism at a given moment; the controlling or auditing mechanisms focus in reviewing the compliance with regulations in the field of administration and expenditure, but not on qualifying the performance nor the impact of the services. Many utilities, however, have achieved sustained improvements, but their capacities can be dismantled in no time. This has led to the municipal authorities to use operators as instances to pay favors with political jobs, contracts, and benefits to individuals and private groups. Despite the presence of remarkable achievements in some urban water and sanitation systems, instability and vulnerability are the rule in the industry.

- *Bailouts.* The possibility of obtaining federal resources through lobbying or political pressure by partisan affinities, in the absence of clear allocation criteria and thanks to the flexibility to transfer resources between beneficiaries and programs, reinforces the tendency to operate the systems without a long-term strategy for improvement. An operator that falls in “bankruptcy” but has sufficient political or economic relevance can expect successive events of “bailout” by the state and federal government. And agencies with more capabilities for generating projects and resources capture more funds. The better performance of big cities comes in part from these conditions, as well as from the availability of more qualified human resources, diversified economies, and higher incomes.
- *Interferences.* Operating costs are recovered through tariffs, which are usually calculated based on the historical record of operating costs plus the general inflation rate. Water utilities are usually affected by political interference in their technical, administrative, and legal decisions. Different timings in resource availability and the lack of predictability of resources for capital expenditures provoke constant interferences and disruptions in the operation of the utility.

The allocation of funding has sought to be a lever to induce efficiency in service through rules of operation in the subsidy programs, but it cannot avoid interfering with the dynamics of the operation. The municipality, which should verify the consistency between goals and resources of the utility, neglects to play this role, partly because of the specialized nature of the sector but also because they can get political earnings without committing municipal resources, nor being accountable. There is a lack of clarity in the boundaries of roles and responsibilities.

In short, lack of incentives and trained personnel, coupled with corruption and improvisation in the public service (presence of more political than technical managers), causes deficiencies in the administration, operation, and management of the assets. Therefore, the quality of the service worsens and infrastructure gets inadequate and obsolete. This translates into indifference or even social rejection (users refuse to fulfill their obligations because they can’t exercise their rights easily either), which leads to a high vulnerability and instability of organizations (Lentini and Ferro 2014). Even though tariffs are showing an increasing trend and new governmental accounting rules are being implemented, guaranteeing the constitutional right to water is still difficult in the present context. With incomes insufficient to sustain operational costs and an acute lack and intermittence of funds to finance the expansion of coverage, the weakness of the operators cannot guarantee the rights fulfillment of users, nor the achievement of SDGs.

It is clear that reaching a sustainable operation of water and sanitation services is more than a cashflow problem. It requires timely, efficient, equitable, and stable financing. This will not happen under the present institutional framework.

On the other hand, international trends also show an inability of the actors of the sector to attract alternative sources and to realize the benefits of investments in the long term. In a context of growing financial scarcity and competition, this becomes a major threat to the development of sustainable water and sanitation services.

6.2.6 Private Investment in Water and Sanitation in Mexico

Possibly as a reflection of the lack of conditions to attract private capital in a stable and sustainable way, private investment in water and sanitation in Mexico has had an erratic behavior, usually linked to major projects by special vehicles and financial structures tailored to each case; the participation of private capital in projects occurs in many different proportions and through varying mechanisms.

The main financial vehicle to support private investment in the sector is the National Fund for Infrastructure (FONADIN), but it has only contributed about 5% of its funds to water infrastructure projects. Other options that have been used are investment and property trusts, public-private partnerships, and contracts for the provision of services.

Private participation in the operation of water systems has also undergone different stages of development, stagnation, and relapse. The first systems operated under a concession agreement (Aguascalientes, Cancun, Navojoa) were followed by a successful experience of a public-private joint venture in Saltillo and later by its extension to Ramos Arizpe; more recently, concession agreements in Puebla and Medellin took place, but public management was restored in Navojoa and Ramos Arizpe. There are several BOT (Build-Operate-Transfer) and similar contracts for the construction of water and sewage treatment plants, as well as some contracts for the provision of services to outsource specific functions, as it is the case of commercial operations in Mexico City. Another scheme that has been sought to implement is the “integral improvement of the management” or MIG, for its Spanish acronym, in San Luis Potosí, which has remained limited by administrative difficulties and is in the process of redesign.

It should be noted that at the municipal level, part of the distribution and connection infrastructure is often being projected and built by real estate developers and individual users.

Visibly, there is no unified public policy to promote and structure private involvement in financing water and sanitation infrastructure. Schemes are decided case to case, using vehicles and structures ad hoc, sometimes without sufficient transparency and often in response to initiatives from the companies themselves, rather than following a national comprehensive strategy.

6.2.7 An Assessment of the Current Model

Undoubtedly, important goals in terms of coverage extension and efficiency improvements have been and will be achieved by means of the implementation of the federal programs for the expansion of infrastructure and the improvement of efficiency in the water and sanitation sector.

Nevertheless, there are some aspects that deserve to be revised:

- Most funds are allocated disregarding the outputs, performance, and evolution of water utilities; those utilities having stronger administrative and financial capacities are better placed to get funding from federal programs, leading to a somehow “regressive” scheme, where weaker utilities receive less support than those already stronger.
- In some cases, the origin and destination of the funds are not consistent, which leads to a lack of accountability and economic rationality. For instance, in the Valley of Mexico, the rights paid for the wholesale water supply are derived into a trust fund, where they are used to build flood control infrastructure, while operating funds for assuring proper maintenance of the system come from general budget and have to compete against many other projects throughout the country. Another example comes from the PRODDER program (Program for the Refund of Water Rights), in which water extraction rights are returned to utilities if they present an investment plan and matching funds, on a yearly basis. This poses two problems. First, water extraction rights have been designed to promote efficiency and prevent overexploitation, but now they are seen as a means for financing infrastructure expansion, instead of perhaps being used to ensure the protection of the integrity of national waters in quality and availability. Second, the refunds depend on the behavior of tax collection and national policies set by the Ministry of Finance, which has often led to late, incomplete, and partial refunds, causing the delay or cancellation of the programmed water works.
- In general, funding through existing programs is subject to yearly modifications in the operating rules and to delays in the actual transfer of the resources. It is especially difficult for the utilities to implement midterm financial planning when they are unaware of how much money they will get and when and under which conditions; sometimes funds are allocated very late in the fiscal year, leading to hasty bidding processes.
- A better framework for the allocation of existing funds is needed, in which bigger support to the weaker utilities would be provided, rewarding verifiable improvements with financial incentives. The participation of the state authorities must be effectively encouraged with concrete incentives and penalties, not only as a part of the funding sources but most importantly as the catalysts for achieving better institutional arrangements in the municipal settings.

In a way, the current model considers that, since most of the urban water utilities show low economic and technical performances, it is necessary for the federal government to subsidize infrastructure financing and performance improvement. This approach seems to be correct or unavoidable in the short term, but in the long term, it appears to be perpetuating a vicious cycle, where municipal authorities rely on federal and state funds to periodically “rescue” their systems, thus refusing to give the utilities the institutional freedom, stability, and accountability they need for a sustainable operation.

6.2.8 SDGs: More Ambitious Goals in a Complex Context

In the year 2000, the “Millennium Goals” were agreed at the United Nations, with specific goals to the year 2015. Goal 7c consisted of halving the proportion of people without sustainable access to improved drinking water sources and to improved sanitation between 1990 and 2015. The results were apparently outstanding: access to “improved water supplies” increased worldwide from 76% in 1990 to 91% in 2015; 58% of the world’s population already has an outlet of water running to his house; 2100 million people also gained access to improved sanitation (UN 2015). Even so, many countries could not meet these goals, especially in sanitation.

Just 151 countries, out of 225 met the goal on access to water and sanitation (CONAGUA 2016). Mexico reported having fulfilled both goals in water – from 82% to 96% in the period from 1990 to 2015, with an increase of 14%, well above the agreed 9% – as well as sanitation – which rose from 66% to 85% coverage (Ferro 2017, p. 10). These indicators do not reveal, however, deficiencies in the quality of the provision of services.

By 2015, the resolution called “Agenda 2030 for sustainable development” was adopted, in which 17 goals were included, called sustainable development goals (SDGs), expressed in 169 targets and 230 indicators.

In 2011, the CONAGUA estimated that achieving universal coverage of water and sewerage would require investments over \$ 215 billion, over 114 billion to increase the percentage of wastewater treatment, letting aside other investments for flood control or water resource management (CONAGUA 2011). According to other calculations, the cost to close the coverage gap has been estimated in \$32,200 million per year (ANEAS 2016). If we added the cost of replacement of obsolete infrastructure, these needs would grow considerably.

Today, water sector financing in Latin America goes through a complex circumstance. Countries are investing at a very low rate in infrastructure, in relation to the size of their economies. Despite having achieved remarkable progress, accumulated shortfalls exacerbate within the SDG’s framework, since water and sanitation services will be measured not only in terms of their coverage (access) but their quality and affordability also, where countries will have to assure social and gender equity, within an integrated water resource management model, and preserve water quality and aquatic ecosystems, with greater involvement of local communities.

In the words of Gustavo Ferro, the attainment of the SDGs “will require a significantly greater effort than that carried out to achieve the MDGs, and most likely within less favorable economic conditions.” Only the goals for urban areas of the Latin American region would require tripling the historical allocations, with investments close to 250 billion dollars between 2010 and 2030, which would be unsustainable if not complemented with enhanced institutions, with sufficient technical capacity, mandates, powers, and budgets (Ferro 2017, p. 12).

In synthesis, achieving the SDGs and the commitments on climate change, and doing so under a model of sustainable development, will only be possible if

innovative financial mechanisms are implemented, through a transformation of the institutional framework of water management and services.

This works in both directions: to make sustainable investments, it is not enough to gather the financial resources required, but it is also necessary to improve the policies and institutional frameworks, which today are not conducive to the efficient operation of the systems.

But also, inversely, to attract the financial resources that are needed, it is essential to have institutions that correct the distortions in the current framework, achieve an efficient and equitable allocation of investment resources, induce a sufficient collection of operating revenue, and generate more stable and sustained financial flows. This institutional reform has to include better governance systems, where the informed participation of the society gradually leads to achieve better results and an effective fulfillment of the rights and obligations of both citizens and public servants.

6.3 Overall Assessment and Policy Questions

6.3.1 The Challenges for a Sustainable Operation of Urban Water and Sanitation Systems

As it has been shown, sustainability of services is being threatened because of the lack of an adequate supply and management of the different assets or resources involved. According to the Economic Commission for Latin America and the Caribbean (ECLAC 1991), sustainability requires the balanced use of six kinds of assets or forms of capital: natural, physical, financial, human, institutional, and social, taking into account their relationships of complementarity and substitution. Within this framework, bigger cities face also bigger challenges, not only because of the lack of regular and enough access to the different forms of capital (in some cases, big cities have clear advantages to get resources due to their greater economic and political influence) but because of their very diverse capabilities to administer and use those assets. In general:

- Natural capital is being compromised because of the deterioration of water sources, watersheds, and aquifers, worsened now by climatic variability and growing competition among sectors.
- Physical capital, that is, infrastructure, equipment, and systems, are also subject to two ways of pressure: the need to extend their coverage due to the cities ongoing growth while replacing the assets which have largely surpassed their lifespan.
- Financial capital should be analyzed in two parts. First, investment capital depends heavily in Mexico of the capacity of cities and state governments to get federal subsidies; several programs exist and it becomes a matter of

negotiation. Second, operating capital relates to the capacity of each system to measure, invoice, collect, and administer operating revenues, but it also depends on each utility tariff setting and approval framework, where only a few big cities have been able to reach a virtuous cycle of good services with adequate tariffs. In recent years, it has been more frequent that state governments and even water operators themselves are asked to commit to repay part of the capital financing, as well as setting up efficiency improvement programs, which is shifting the rules toward a more incentive-based framework. Nevertheless, in Mexico a lot remains to be done to effectively link the performance of water operators to their creditworthiness.

- Human capital is usually easier to access by bigger utilities, because they operate in cities where a richer and wider job market exists and they have larger revenues to pay for better salaries; in this direction, the most important threat is the lack of stability and professionalization, due to the excessive intervention of political instances and the lack of effective accountability mechanisms.
- Institutional assets would comprise the set of rules determining whether the relationship between the quality of services in a broad sense and their price is adequate for each city characteristics, establishing clear boundaries between the tasks, capacities, rights, and obligations of the political authority (which beholds the system property in the name of the general population), the operator, and the public, with a proper balance between goals and means. In Mexico there are several institutional settings, but in general there is a lack of a well-structured regulation framework, with the exception (to some extent) of the very few private participation schemes; political authorities are in charge of the process of revision, approval, and implementation of tariff structures and investment programs, but tariffs tend to be kept below inflation rates with no further considerations, while it is usual that utilities provide bad quality services trying to “finance” their operation by delaying maintenance and distributing water intermittently to cope with growing demands with the same (or less) water and financial resources.
- Last but not least, social or civic capital would be the capacity of every system to obtain from their users or customers a level of commitment beyond their formal or contractual responsibilities toward the service, by means of a proper communication and influence on the people’s knowledge, behavior, and habits. While most of the utilities have implemented communication programs, only a few have effective mechanisms for getting feedback and being transparent to their users. Citizens outside the utilities governing bodies usually find it difficult to access its information and to get their demands and expectations answered in a structured manner. Citizen observatories, implemented in the cities of Xalapa, Tuxtla Gutierrez, Saltillo, Ecatepec, and San Miguel de Allende, did not succeed in having concrete incidence on the practices and results of water utilities.

Clearly, many of our urban water and sanitation systems are operating under vulnerable circumstances, and it is hard to identify the key elements, which would bring them to a sustainable path. Even if the federal authorities achieved to balance water budgets and to assure every water system, as a national waters user, a reliable

access to good quality water in their sources, other challenges would prevent our systems to be sustainable. The most difficult one seems to be the institutional instability, along with the pressure coming from the lack of a planned and effectively enforced land use development. Since these three issues seem to be beyond the scope of utilities – assuring an effective water resource regulation and preservation, getting a more balanced institutional arrangement, and controlling land use development – a double effort needs to be done: first, promote a sectorial reform to change the external rules which define the way water and sanitation systems access natural and financial resources and are forced to show results and, second, keep on working on the internal strengthening of water utilities.

6.3.2 Some Guidelines to Improve the Sustainability of Urban Water and Sanitation Systems

In the same terms presented in the former section, the next guidelines are proposed to improve the sustainability of our urban water and sanitation systems:

- Mexico needs an authority fully committed and devoted to the custody, restoration, and preservation of its national waters and related public goods. Water rights should serve primarily to set up a strong capacity to measure, register, and administer water usage and discharges, to enforce law and to supervise the state of the nation's watersheds and water bodies. It is true that public and productive systems often need financial and technical support to be efficient and thus to reduce extraction, but having this task assigned to the same authority could be leading to a conflict of interest. The recourse to coordination mechanisms such as basin or aquifer councils has been thought as a means to promote consensual solutions to specific issues, such as temporary limitations to water extractions during droughts, or water uses prioritization for administrative purposes; but users participation does not exempt federal authority of the fundamental responsibility for preserving and maintaining the quality and availability of the national waters.
- Water supply and sanitation are capital-intensive activities. So, infrastructure and equipment are instrumental to have sustainable and reliable services. Water utilities and municipalities should be forced to have an updated registry of all the water and sanitation assets they operate, so they can get accountable for their conservation, improvement, and expansion. Specific responsibilities over the state of the assets should be assigned to municipal authorities and utilities. Setting up proper registry, accounting, and asset management procedures is urgently needed in order to be capable to design a national strategy for infrastructure renewal and expansion.
- Financial system for water and sanitation development needs to be revised and restructured. Mexico needs to leave the current discretionary subsidy-based system, where federal and state programs operate as "relief funds" for rescuing

eternally developing utilities, with a financial support that is often variable, unpredictable, and insufficient. Concrete steps must be taken to set up a financial system that promotes performance improvement, creates real responsibility on the side of the municipality, and operates under clear, equitable rules. Those utilities with better institutional arrangements and managerial practices should get incentives; those showing clear trends of performance improvement should also get advantages. Funding should act as a catalyst for financial self-sufficiency and not as a life saver. This restructuring of the financial system goes along with a deep institutional reform.

- Human capital is perhaps a key element in this puzzle. In spite of the existence of several regulations trying to set up a civil service system in the sector, there is a lot to be done to achieve this goal. Funding programs could also set more stringent conditions to the utilities and municipalities in terms of the profiles and certification credentials of their staff, as a condition to get the funds. In the other hand, federal, state, and municipal authorities need to commit to give water and sanitation services the professional level that is already given to health or security services. It is true that unions sometimes block any effort to set up more efficient staffing practices, but this is also a matter of negotiation and, in the long term, of designing a financial and political solution. Water and sanitation utilities are fundamentally operating enterprises which rely on their ability to manage capable, well-trained, and committed personnel. Capacity building programs are necessary, but not sufficient, to strengthen the human capital of this sector. An effective accountability framework should drive the sector toward its professionalization, where political interference would find it hard to support improvised or incompetent managers.
- Institutional reform could be the key to develop every other improvement. The National Association of Water and Sanitation Utilities (ANEAS) has proposed to enact a national reference law in order to set up the minimal conditions to have, at the state and municipal levels, a well-structured arrangement, where goals match the resources available, the quality of service corresponds with its price, and the relationships between political authorities, utilities, and the public reach an adequate balance, that is, to set up proper economic regulation structures. For some bigger and well-performing systems, new financing mechanisms should be explored, as well as the implementation of better corporate governance mechanisms. Urban water utilities should operate within a proper regulatory framework, with a clear contractual agreement between political authorities, service providers, and users, under an appropriate law enforcement environment and, most importantly, responding and promoting a more informed and active citizen participation. Information must be the key to restore the capacity of the system to acknowledge its current problems and to design the path toward a more sustainable operation. The enactment of a constitutional reform, recognizing the constitutional right to water, should spur all the actors on to find effective ways to ensure an equitable supply for all.

- Finally, sustainable urban water and sanitation services call for a more informed and participative user. It is true that people cannot devote to take part of the decisions regarding every aspect of their lives as citizens, since they have already delegated the responsibilities of taking charge of public services on their municipal authorities, through their political representatives. But there is a general rule in management science: authority can be delegated, but responsibility remains. Citizenship implies sharing responsibility with authorities, which means to be informed, understand, and have incidence in the decisions. Utility managers must also realize that transparency and openness to dialogue can act in favor of the system stability, protecting it from political and influence group intervention. Citizen observatories should be supported and encouraged, as well as public communications that go beyond the messages for promoting water savings; civic culture is a fundamental asset for every modern utility.

On the other hand, utilities can do a lot to promote improvements in the three areas mentioned before, as framing conditions normally out of their scope:

- They can help federal authority to better measure, supervise, and control extractions of other users within the same watershed or aquifer. They can set up agreements with other users to help them use the water more efficiently, if possible to promote exchange agreements of water for treated wastewater, but mainly as a stewardship function for which they are especially well positioned. Water is the main input of every utility: anything they can do to support its conservation works in favor of their sustainable operation.
- Water utilities should strive for having proper regulation mechanisms and social participation schemes, whether it could seem contradictory. A better set of rules would favor the foundations of the utility to work with more stability, gain creditworthiness, and create a space for professional development for its members. Water utilities need to have a leading role in the discussion of the mechanisms that need to be set in place to ensure human right to water, instead of regarding these efforts as a threat.
- Finally, water utilities should also participate in every initiative in order to set up better rules for a better control of land use and development. In the context of climate change, the presence of more frequent droughts and intense precipitation events poses additional challenges to our utilities. New urban design patterns and the use of sustainable urban drainage systems should be a part of our land use regulations.

These proposals call for the effective adoption of the integrated urban water cycle management model, where every part of the cycle is designed considering the full cycle, and land use and design become part of the water and sanitation management system within cities.

6.4 Conclusion

Cities represent a fundamental link in the economic chain of a country. In Mexico, their importance will grow in terms of their economic contribution to national wealth but also as development centers where an equitable access to water and sanitation can help fulfilling every citizen's right to health and work.

Federal, state, and local authorities have implemented huge financial and administrative efforts to support the expansion of urban water and sanitation systems and to improve their performance. Infrastructure has grown at an unprecedented pace, and many programs have been put in place to give water utilities several ways of getting financial and technical supports. But the challenge is also huge, which calls for a profound reform in the way water resources and services are being managed in Mexico.

First, there is an urgent need to set up an effective resource regulation system which leads to the restoration and preservation of water balances in many of our watersheds and aquifers. No infrastructure or money will suffice if we run out of clean water sources.

Second, a deep institutional reform must take place to set up the proper incentive framework to ensure an appropriate relationship between political authorities, utility operators, and citizens. Utilities must be empowered and provided with enough resources to achieve their goals but also must be obliged to be accountable and transparent. Water users must be encouraged to be informed, understand, and participate in the decisions affecting them. Good corporate practices must be implemented in the boards, so they effectively defend the people's interests. Local political authorities should be fully accountable for the state of the assets and processes associated to water and sanitation services. A more mature and informed dialogue should take place between authorities, operators, and citizens.

Third, the financial system should be revised and restructured to become a catalyst for efficiency and accountability. Performance improvement should be rewarded, and funds should be equitably and transparently allocated. Funding should become more predictable, stable, sufficient, equitable, and productive for water utilities. Budgetary support programs should promote self-sufficiency and responsibility. Better management models and capacities are needed in order to achieve a more efficient use of financial funds within the utilities and their regulatory counterparts. To close the financial gap arising from the commitment to achieve the SDGs, attracting alternative sources of capital financing will be mandatory, thus pushing the sector to perform a profound institutional reform.

And finally, water utilities must take part of the political efforts seeking for a more effective land use planning and development. New urban design practices must be implemented into the utilities' processes for the approval of new developments, taking into account the need to better manage precipitation events, to favor rainwater infiltration and detention, and to contribute with the proper management of urban rivers and water bodies.

Integrated urban water management needs to become the model for urban water management in Mexico. Demand management needs to be taken seriously, since public policies in this sector remain clearly in the supply management side. A lot of well-intended negotiation and communication between federal, state, and municipal authorities must occur in order to achieve a new institutional framework. The size of the threat calls for an unprecedented coordination effort.

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Ricardo Sandoval-Minero is a Consultant on water resources management, as well as water and sanitation technical and institutional development. He is a civil engineer with a master in science from the University of Paris-Dauphine, and a master in science in Operations Research from the National Autonomous University of Mexico (UNAM). He was Former General Director at the Guanajuato State Water Commission and at the Guanajuato City Water and Sanitation System, and has worked also at the federal level in Conagua and for private consulting firms, international organizations, and development banks as a consultant. He is presently a contractual for the Inter-American Development Bank as Water and Sanitation Consultant.