Public Policy and Water Regulation: Some examples from the Americas

vol. 19 I n°4 I 2017

« au service de l'analyse » — since 1998

networkindustries quarterly

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Network Industries Quarterly - Vol 19 - Issue 4 (December 2017):

Public Policy and Water Regulation: Some examples from the Americas

Editorial Introdution by the Guest Editor

Water supply and sanitation are essential for socioeconomic and environmental sustainability. The adequate provision of these services is full of complexities and involves a great many challenges. Growing population and economic activities, plus soaring energy generation, environmental concerns, and climate change will exert great pressures on water security. It is not surprising that water has climbed to the top of the political agenda. The requirement of appropriate public policies to deal with these challenges is self-evident. Sound water regulation is a major component of this design.

The unfolding of water regulation, however, reveals a wide and complex kaleidoscope of affairs, which involve different actors, dimensions and spatial scales. Surface and groundwater provides another set of challenges in discussing water regulation. More particularly, transboundary waters – within and between countries – impose, in addition to technical challenges, the need for diplomatic skills in the handling of their issue and the proposal of solutions.

This issue of Network Industries Quarterly (NIQ) is linked to the *Public Policy and Water Regulation International Forum*, which was organized by Tecnologico de Monterrey, the Water Center for Latin America and the Caribbean, and Cervecería Cuauhtémoc Moctezuma – Heineken México in May 2017. The Forum had an academic framework plus perspectives from practitioners working in the field of water regulation in Latin America. Other selected contributors were invited to complete this issue with its focus on the Americas. The papers on Canada and Texas are a reflection of this inclusion.

The following are the themes included in this issue of NIQ:

- Science, policy and management of groundwater in Canada
- Groundwater regulation in Texas
- Regulation of water and sanitation services in Latin America
- Incorporation of natural infrastructure in water management in Latin America
- The water guarantee fee in Mexico

Guest editor: Dr Ismael Aguilar – Barajas (Professor, Department of Economics and Research Associate at the Water Center for Latin America and the Caribbean, Tecnologico de Monterrey, Mexico).

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dossier

Network Industries Quarterly | Published four times a year, contains information about postal, telecommunications, energy, water, transportation and network industries in general. It provides original analysis, information and opinions on current issues. The editor establishes caps, headings, sub-headings, introductory abstract and inserts in articles. He also edits the articles. Opinions are the sole responsibility of the author(s).

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Cover image | Courtesy from Servicios de Agua y Drenaje de Monterrey

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Science, policy and management of groundwater in Canada

Alfonso Rivera*

Canada is a very large confederation composed of 13 different jurisdictions; each jurisdiction manages water resources separately. There is no Canadian water policy; rather, there are water laws and water regulations for each jurisdiction and, until very recently not every jurisdiction had groundwater regulations. A common vision for groundwater resources assessment and management is slowly emerging.

Introduction

Canadians are blessed with a plenitude of freshwater resources, with the generous presence of lakes, rivers and aquifers. Yet the abundance mentality that used to prevail in the past decades has changed to a mentality of protection, preservation and sustainability. A recent national survey indicated that water is the number one issue for Canadians (Ipsos Reid, 2009). Water is widely recognised as a resource not only in the service of Canadians but also in support of a very vast number of ecosystems (such as wetlands). In addition to domestic use and nature's use, Canadians use water for economic development in a large number of industries and for agriculture. In fact, the use of water resources in Canada is much larger in the economic sector than in the domestic sector. Mining, energy and agriculture are the three main sectors using both surface and groundwater.

Canada's total freshwater withdrawals (surface water and groundwater) by all sectors is roughly 45 km3 per year, which is small compared to the total yearly "renewable" freshwater in Canada (3,281 km3) (Rivera, 2014). Nevertheless, we should be careful when considering these numbers because of geography, population distribution, and other factors. Most of the runoff from Canadian rivers (60%) drains north and is "lost" into oceans, while most of our population (85%) lives along the southern border with the United States. Furthermore, Canada does not have the installed dam's capacity, with its present infrastructure, to capture runoff. That is one of the reasons why the use of groundwater for domestic purposes has increased so much over the past three decades—from 10% in the late 1960s to 30% in the 2000s (Fig. 1).

Most water withdrawals come from surface water with ca 44 km3 per year, while total groundwater use in Canada is ca 1 km3 per year (Rivera, 2014), mostly withdrawn for domestic and agricultural purposes. Nearly 30% of the Canadian population uses groundwater for domestic drinking water, and trends indicate that future groundwater use will continue to increase at a rate faster than that of surface water use (Fig. 1). Possible explanations for such an increase are (a) abundant freshwater at shallow depths, (b) generally good water quality in aquifers, and (c) the fact that acquisition facilities for groundwater are faster and cheaper to build and maintain.

The single largest disadvantage about groundwater, as compared to surface water, is that there is not enough information at regional scale. The knowledge gaps at regional and national scales are groundwater recharge and discharge, its interactions with surface water and ecosystems, its volume in storage, vulnerability, and sustainable yields. However, at the local level (well scale), where groundwater is critical for economic development, the resource is studied in more detail and is better understood.

The yearly use of 45 km^3 of water by Canadians does not come without issues. Water quality, climate variability, climate change, point source and distributed contamination, water-use conflicts, and transboundary issues are amongst the problems Canadians need to take into consideration, on a yearly basis. Thus, it seems that the main concern of Canadians is not water quantity but water quality, sustainability and vulnerability. A trend is slowly emerging whereby alliances involving scientists, civil society and policy makers are considering a common vision for groundwater resources assessment and management and protection against pollution. This article describes science, policy and management aspects and issues of groundwater in Canada. We discuss how we are enhancing sustainable groundwater resources management in Canada in an integrated manner (all jurisdictions) with cooperation, knowledge generation, shared management and governance.

Application of Water Sciences in Canada

Groundwater is defined as water below the water table, which moves in response to gravity and hydrostatic pressure. It results from precipitation and surface water that seep into the ground, filling voids and fractures in rocks

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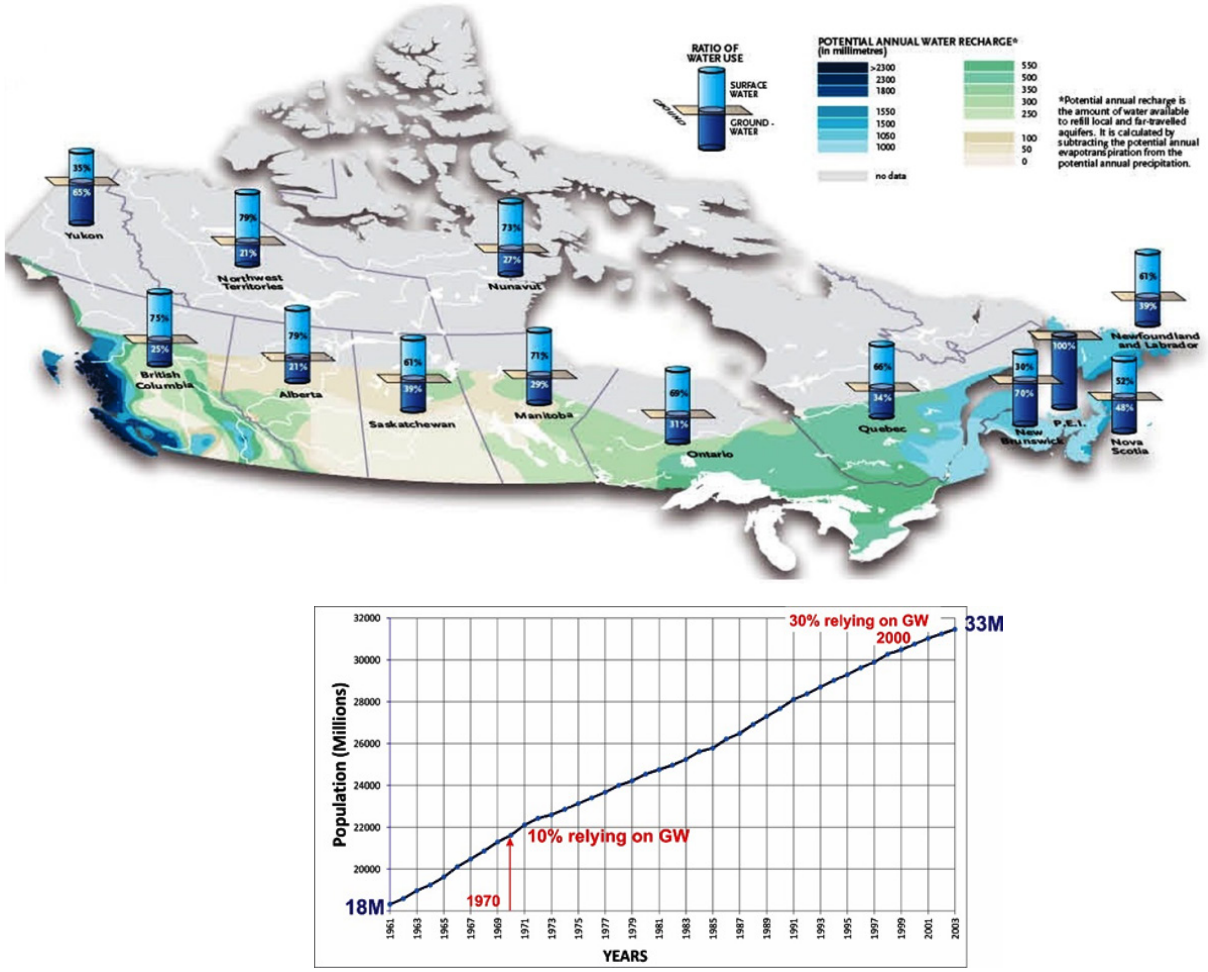

Figure 1. Canada's groundwater resources (A); and groundwater use (B).

Source: Canadian Geographic, adapted from Rivera (2014)

to form aquifers. Ground and surface water are inextricably interconnected since the amount and availability of groundwater influence surface water availability via groundwater discharge into rivers, lakes, wetlands, and reservoirs. For many Canadian rivers, groundwater plays an important role in sustaining base flow in rivers. Groundwater is generally measured at local (individual wells) or aquifer scales (hundreds of km^2). In Canada, the principal source of data originates from most provincial government agencies consisting of water well records, hydrogeological maps, groundwater levels, information on groundwater extraction, and geophysical logs (CCME, 2010). Although provincial wells represent direct data for the estimation of aquifer recharge, they are localized and typically short (around 30 years with none longer than 50 years) (Rivard et al., 2009). They are not always located near climate and/or streamflow stations, making comparisons with surface conditions difficult; they can also be affected by groundwater pumping (Rivera et al., 2004). Recently, however, aquifer-mapping remote sensing - based has become significant and shows great potential (Rivera et al., 2015).

In Canada, groundwater recharge rates typically are not more than 7% of annual precipitation, but are difficult to quantify. Normally, the measuring of precipitation is required followed by the performance of a water balance through the estimation of all the other surface water fluxes (runoff, evaporation, transpiration). There are regional differences clearly marked in groundwater recharge across the Canadian landmass. Groundwater recharge in eastern Canada varies between 1000 and 1500 mm/yr.; the Prairies region between 50 and 400 mm/yr; western Canada averages 500 to 2000 mm/yr.; and there is not enough information for northern Canada (Allen et al., 2014). Groundwater discharge occurs through direct discharge to surface water bodies, flow through formations, or pumping from a well. In semi-arid regions such as the Canadian Prairies, direct evaporation and/or evapotranspiration from the shallow water table is the primary discharge mechanism. Discharge is also difficult to quantify, especially in areas dominated by well pumping or evaporation.

Resource assessment, modeling, monitoring and mapping

Federal government and most of the provincial governments use a wide set of tools to assess groundwater resources: hydrogeology, geomatics, geology, geophysics, geochemistry, groundwater modeling, isotope fingerprinting, aquifer mapping, and groundwater data management and dissemination. Currently the department of Natural Resources Canada is the lead for aquifer mapping and groundwater quantity and assessment strongly relaying in geology, geophysics and geomatics as its main tools.

Modeling of the Canadian water cycle, water resources and disasters (drought and flood) are among the most advanced studies at regional to national scales using remote sensing (Wang et al., 2013; Huang et al. 2012). Multi-satellite, interdisciplinary approaches to assessing water balance closures, groundwater storage changes and environmental change impacts (including climate change) are part of the current scientific endeavors of federal government, together with the strong cooperation of universities and provinces.

Furthermore, great efforts are being developed to generate national and international hydrographic networks and standardized data on aquifer and groundwater, which are easily accessible through the Internet using a Groundwater Information System (GIN, 2017). New activities are underway to include groundwater data on transboundary aquifers located along the Canada-US international border.

Policy and Management Water Issues in Canada

Being such a large Federation represents a challenge for Canada: close to 10 million km2 of landmass, 10 Provinces, 3 Territories, 3 Oceans, and ashared water management mandate. Water resources management is shared by 13 jurisdictions, divided in four levels of government. At the Federal level, there are at least 20 federal departments involved in water management. The top five departments leading some aspects of water resources are: Environment and Climate Change Canada (surface and groundwater quantity and groundwater quality), Natural Resources Canada (groundwater quantity), Agriculture and Agrifood Canada (surface and groundwater quantity and quality), Health Canada (surface and groundwater quality), and Fisheries and Oceans (Water regulations for federal lands).

Provinces have the principal lead on water management and protection within their boundaries, though they have delegated certain water activities to municipalities or local agencies. As a result of multiple players and responsibilities, data and knowledge are dispersed across jurisdictions and entities. This makes management and access to data for decision-making one of the most important challenges.

The importance of water -environmentally and strategically- justifies a federal presence. The Government of Canada has broad powers over environmental issues. It also has authority when it comes to "peace, order and good government", when there is an issue of "national concern" (Côté, 2006). Shared federal-provincial responsibilities include water issues relating to agriculture, health, and the environment. Various regional and national workshops, as well as reports from expert panels, have recognized that gaps in groundwater knowledge might hinder good groundwater management and governance (CCA, 2009).

Social participation

Participation of society on government-related decisions has always been a Canadian trait. It has been recognized that the best management practices on groundwater governance require the review of socioeconomic and cultural issues. For instance, current activities led by CCME (2010) incorporate shared rights and obligations with a common vision for sustainable use of groundwater, in promoting science in the decision-making process. Frameworks of public governance supported by regulations are slowly emerging to build trust and increase cooperation. For example, the Quebec PACES program (Programme d'Acquisition de Connaissances sur les Eaux Souterraines (MDDELCC, 2009) addresses groundwater sustainability and provides useful context for the implementation of the CCME's Groundwater Sustainability Assessment Approach (GSAA). The Quebec PACES program is creating local groups with specific mandates and technical and administrative support.

Conclusions

The aim of this article was to describe science, policy and management issues of groundwater in Canada. There was also the intention to show how the country is enhancing sustainable groundwater resources management in an integrated manner. Canada is a very large confederation composed of thirteen different jurisdictions where each jurisdiction manages water resources separately. Gaps in groundwater knowledge are recognized by all governments. There is no single institution in Canada dedicated to all aspects of groundwater; nonetheless, the last decade has seen an emerging trend where institutions and organizations have been including groundwater in their plans more explicitly (research, management and governance). Strong science-based regulations are the preferred choice of most provinces for water management and governance. Public

consultation, collaboration, shared management and governance are Canadian traits of applying a code of values and ethics in all aspects related with governance. Despite the scale and diversity of the country, and its highly decentralized government, Canada seems to be coming together as a country with the same (almost) water resources vision, management and governance. The future for acquiring data and knowledge on the aquifers and groundwater resources of Canada looks promising.

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Groundwater Regulation in Texas

Mary E. Hilderbrand*

Texas groundwater regulation aims to conserve the resource to ensure sufficient future supply. Local Groundwater Conservation Districts, with authority to issue permits and limit production, vary in how and how much they regulate groundwater withdrawals. Piecemeal, local regulation and a property-rights approach limit the effectiveness of efforts to manage groundwater.

Introduction

Groundwater is a critical source of water for Texas; it accounts for about 60% of the water used in the state. While there are nine major and 21 minor aquifers, 90% of the supply comes from only three: the Ogallala, Carrizo-Wilcox, and Gulf Coast aquifers. More than 75% of existing supply goes to agriculture, mostly for irrigation. By contrast, municipal use, as well as manufacturing and mining, depends primarily on surface water, with groundwater providing only 27% of water for these uses state-wide (TWDB 2016: 65-71; Lesikar 2011: 3). Nevertheless, aquifers supply water to numerous municipalities, including San Antonio, and there are about 22,000 wells for public water supply in Texas (TWDB website).

There are serious concerns about future availability of sufficient water. Demand for water is projected to rise 17% by 2070, due to population growth, while total water supply is falling. Groundwater supply is projected to decline 24% over the next fifty years. In a historic shift, around the middle of the 21st century, municipal demand for water will begin to exceed that of agriculture (TWDB 2016: 53). Furthermore, Texas has experienced droughts periodically throughout its history, and recent droughts have been particularly severe and widespread. Climate projections are for less rainfall, creating uncertainty and putting additional pressure on groundwater.

As a common pool resource, groundwater is subject to overuse in the absence of collective management or regulation to ensure that the resource is preserved. This has, in fact, been the case in Texas, where the mining of aquifers has led to problems with subsidence in some places and compromised quality in others. Thus, the question of its regulation is pertinent. This brief article will discuss first the underlying law and policy context, highlighting the tension between its two guiding principles. It will describe existing regulations and the local-state relationship. Then it will discuss several issues that arise around regulation of groundwater, including its limitations, its piecemeal approach, and emerging markets for water. It argues that Texas' approach to groundwater rights, together with a reliance on local regulation, compromise the state's efforts to manage and conserve groundwater.

Law and policy context

In Texas, two conflicting principles underlie policy and regulation over groundwater. First, under what is known as the "rule of capture", landowners have the right to withdraw all the water that they can from under their land. There are few limitations—only that the pumping must not be done with malicious intent, be intentionally wasteful, cause subsidence of neighboring land, or involve drilling sideways under a neighbor's property. The principle, derived from English common law, was adopted by the Texas Supreme Court in 1904. While other western US states have abandoned it, Texas has continued to use it and state courts have upheld the rule. In essence, it gives landowners property rights over the water they withdraw. (See Opiela 2002 and Torres 2012.)

Notably, this approach differs from that for surface water, which is held in trust by the state and for which the right of prior appropriation applies (TWDB 2016:121-22). It also differs from the treatment of oil and gas, for which a "correlative rights" approach is used, with landowners having property rights to the resources beneath in proportion to the amount of land owned (Opiela 2002: 114).

The second principle behind Texas water law is conservation, articulated in an amendment to Article 16 of the Texas State Constitution, passed in 1917: "The conservation and development of all the natural resources of this state… and the preservation and conservation of all such natural resources of the State are each and all hereby declared public rights and duties; and the legislature shall pass all such laws as may be appropriate thereto (Texas Constitution)."

Building on that 1917 "conservation amendment",

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in 1949 the state legislature authorized the creation of groundwater conservation districts (GCDs), thereby establishing the initial framework for regulation of groundwater. That framework has gradually been strengthened, most significantly in 1997 and 2005. While GCDs were created only slowly at first, in 1997 the legislature got serious about them: Senate Bill 1, which lays out the water code, designated GCDs as the "preferred mechanism" for regulating groundwater. Then, in 2005, the legislature increased the GCDs' role in water planning, requiring them to define "desired future conditions" within their areas. For the first time, the 2017 State Water Plan was created from the bottom up, based on the GCD-defined desired future conditions, as well as locally defined water management strategies to reach those conditions. Thus, the GCDs have become increasingly significant in planning, management, and regulation of groundwater (TWDB 2016: 122; TWDB website).

The private property basis of groundwater rights—stemming from the courts—and the conservation principle in the Texas constitution, with its corollary policy and regulatory framework—developed by the state legislature—coexist uneasily. But both have to be taken into account. GCDs increasingly regulate groundwater and have the authority of the legislature to do so, despite resentment and even resistance from some landowners. Conflicts between the two principles end up in the courts for resolution. Despite various interpretations of, and qualifications to, rule of capture, it is that principle that has consistently been upheld in the face of challenges to regulation, and the legislature has declined so far to take action to change it.

Local-level regulation

It is the state that has created the framework for groundwater regulation and state law that gives the GCDs the authority to regulate. The state water code lays out what aspects of groundwater production can be regulated and establishes parameters for doing so. But the legislature has devolved regulation itself at the local level. The GCDs are local governmental units with considerable latitude in terms of what, how, and to what extent they regulate groundwater within their districts.

As of 2017, there are 100 GCDs in Texas. These include all or part of at least 174 counties, but many of them are single-county districts (TWDB, 2016: 120). Thus, Texas is a patchwork quilt of mostly small GCDs. Some areas still do not have GCDs; for the most part, they are unregulated and the rule of capture applies without limitation.

There are several districts that are set apart due to particular characteristics, problems, or history. The Harris-Galveston Subsidence District was created in 1975 in response to significant subsidence and thus increased risk of flooding along the Gulf Coast. The nearby Fort Bend Subsidence District was established in 1989 due to a risk of subsidence there. Both function as GCDs but with the particular purpose of reducing withdrawals from the Gulf Coast aquifer in order to prevent further subsidence.

The Edwards Aquifer Authority (EAA) regulates groundwater over the Balcones Fault Zone of the Edwards aquifer. Its creation in 1993 was to preempt a threat by the federal government to take over management of the aquifer in order to protect several endangered species. The EAA has the goals of preserving the aquifer, preventing its pollution, and managing spring flows so as to protect endangered species that depend on them (EAA website). Although it was created separately, it functions as a GCD but with more restrictive regulation than most.

Whereas in early years GCDs were created voluntarily by landowners at the local level, most are now established by legislative action. In some instances, the state pushes areas into forming GCDs. This is especially the case with areas that have been identified as experiencing, or at risk of experiencing, problems with water quantity or quality, or subsidence. These areas are labeled Priority Groundwater Management Areas (PGMAs). If local stakeholders within these priority areas do not form a GCD within two years, TCEQ is required by the water code to come in and form one. Nevertheless, there are still some areas within the eight designated PGMAs that do not have groundwater districts (TCEQ website).

The purpose of regulation is to conserve and manage groundwater in order to ensure that adequate water is available under drought conditions and that the "desired future conditions", as determined by each GCD and included in the state water plan, are attained. To that end, GCDs have the authority to require and issue well permits, impose production limits, regulate well spacing, and regulate export from the district. Significantly, though, there are two major categories of wells that the state water code exempts from regulation by GCDs. First, wells for domestic use, or for livestock or poultry use, on land larger than 10 acres and with wells that cannot produce more than 25,000 gallons per day, are exempt. Second, water wells drilled for the use of rigs engaged in oil or gas exploration or production, including fracking, are not regulated unless they are drilling through or affecting aquifers that supply fresh water. In addition, a GCD may exempt other wells, as long as it has established clear criteria for doing so. (TX Water Code 36.117. See also Lesikar 2011: 18-20.)

GCDs must have a program for issuing permits for drilling, and they can regulate well spacing in order to prevent reduction in the water table. They may limit production of regulated wells in several different ways, such as by setting production limits on wells, limiting pumping based on acreage, or setting an overall cap on production. Permits are also issued for exporting groundwater out of the district (TX Water Code, 36.113 and 36:116. See also Russell, 2014: 2-4; Lesikar, 2011:18-20).

In practice, there is considerable variation across GCDs, perhaps most significantly in terms of production limits. Approaches range from establishing an annual withdrawal cap, such as one acre-foot (or more) per acre per year, basing production on reasonable use, to not limiting production at all (Russell, 2014: 3-4). The Edwards Aquifer Authority regulates production based on a combination of historical beneficial use and an annual overall withdrawal cap tied to water availability. That approach has been challenged for its potential, under historical usage, for preventing landowners who had not previously withdrawn groundwater from drilling a well at all and thus benefitting from the groundwater under their property (Torres, 2012: 6-9).

Issues and challenges

Although the extent of regulation has grown over time, it remains quite limited. GCDs are in place throughout much of the state, but there are substantial areas without them and thus with essentially no regulation or efforts to limit overproduction. Furthermore, even within GCDs, many wells are exempted. Water used in the oil and gas sector—a major economic activity in Texas—is not regulated; state wide that does not amount to a significant proportion of water used, and much of what is used is brackish, but it can be significant in particular areas (RCT website). GCDs vary in the extent to which they attempt to manage or limit production; many do not require the use of meters or reporting of water use by owners of permitted wells (Hardberger, 2016: 18). In the case of the Edwards Aquifer Authority, which has some of the strongest regulations in place, court challenges have called its limits into question (Torres 2012:9).

With the state divided into more than one hundred mostly small, mostly squarish pieces, GCDs do not correspond to aquifer boundaries. Multiple GCDs have jurisdiction over their own bits of the same aquifer, each imposing its own rules that may be quite different from those of the GCD next door. The state recognizes this problem, and has provided a mechanism for coordination, especially with regard to planning: Texas is divided into sixteen Groundwater Management Areas (GMAs), which more closely approximate the boundaries of aquifers. The GCDs within each GMA work together to develop the desired future conditions for the area and are expected to coordinate their management. Despite these efforts, regulation of groundwater is fundamentally fragmented and piecemeal.

An emerging challenge concerns the development of markets for water. With growing municipal demand and either physical or regulatory limits on how much groundwater can be withdrawn, municipal authorities and private water companies are looking for sources outside their own areas. In unregulated areas outside GCDs, municipal authorities can buy a small plot of land, drill a well, and pump as much as the well can support. Within GCDs, however, permitting and production restrictions foreclose that option, and buying water from other sources becomes attractive. An analysis of the market in groundwater in Texas found that currently such agreements are made individually and privately, and there is not a clearinghouse of information about potential suppliers and buyers to allow for a statewide market to develop, or for prices to reflect market value (Hardberger 2016:15-21). An additional barrier to developing such a market is the lack of infrastructure for conveying water from one area of the state to another. Yet the existing regulatory framework makes that difficult to overcome—GCDs' understandable preference for granting short-term withdrawal permits and reluctance to make long-term commitments, given their need to adjust to aquifers' changing conditions, are at odds with investors' need for long-term contracts and financing in order to commit to large infrastructure projects (Russell, 2014: 4).

There remains, ultimately, the contradiction between the rule of capture and private ownership of groundwater, on one hand, and the conservation imperative of the Texas Constitution, on the other. The importance of conservation is magnified by drought, expectations of reduced water supply, and population growth that means greater demand and a shift from agricultural to urban predominant use. Despite that, the rule of capture and the preference for local regulation together result in weak regulation and continued overuse of Texas' groundwater resources.

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Regulation of Water and Sanitation Services in Latin America

Óscar Pintos*

This article presents an overview of regulation of water and sanitation services in Latin America and the Caribbean. Particular attention is placed on the evolution of the regulatory frameworks, as well as on key requirements for good regulation. The role of ADERASA is presented at the end.

Introduction

As in any economic activity regarded as a natural monopoly, water and sanitation (W&S services must have specific regulation. This regulatory framework needs to recognize the essential nature of these services for population well-being, with social and economic sustainability criteria. This article presents, in four parts, the Latin American and Caribbean (LAC) experience in this regard. The first part addresses the evolution of the W&S in the region, using a comparative perspective that links the infrastructure of these services with their institutions and regulatory representative models. The second section deals with the indispensable requirements for an effective regulation. The third part touches upon the measurement of efficiency in water utility entities. Finally, this contribution centers upon the role of the Association of Regulatory Entities of Water and Sanitation of the Americas (ADERASA), in the institutional strengthening of regulation in this region.

Evolution of physical and institutional infrastructure

Systems of water and sanitation develop along three stages. The first relates to *water quantity*, in which the focus is on increasing coverages of water and sanitation through major infrastructure works. This phase has been completed in developed countries (DC) and is still pending in LAC. In this stage, institutional infrastructure responds to a traditional model characterized by the involvement of (mostly) State operators in the planning, formulation and policy implementation of water regulation. In this model the State has an active role; users have a passive function and are without major rights before the water operator.

The second stage refers to *water quality*. In addition to physical infrastructure, there is an emphasis on the improvement of the quality of services (water quality, continuity, and physical pressure, for instance). There appears the concern with managerial efficiency, regardless of the nature of the operator (State or private). The tasks of policy definition and planning, and those of operation and regulation are carried out by different organisms. This creates a new model in which water users acquire rights and play a central role in the provision of services. Regulatory entities are technical, highly specialized organisms of the State but with autonomy from the Government. These new bodies must care for the sustainability of the W&S services (through fair and reasonable rates). Another major function is to make sure water users´ rights are respected by operators of an essential service, which also happen to enjoy a natural monopoly and have more power – technically and economically – than users. This stage has been concluded in most DC and is relatively consolidated in some countries of LAC.

The third phase is a deeper version of the second and centers on the *management of both demand and the environment*. In this stage, quality of services has a more prominent role through different actions: control of losses, management of sources, treatment and reuse of residual waters. This is a more holistic approach to guarantee public health and general well-being. There are also efforts to improve the environmental sustainability of water services. There is also a greater professionalization of the water sector. Tariffs are closer to the costs of provision. This stage is in course in more developed nations while in LAC countries the impact of water services on the environment is a major concern.

Overall, developed nations show a more sequential and coherent evolution. In LAC countries there has been a gap in the development of these two infrastructures. The commitments and challenges associated with the 2030 Development Agenda, particularly with Objective No. 6, imply that large investments will be required. The latter involve not only physical infrastructure (networks, plants) but also institutional strengthening of all actors.

Table 1 contains the construction of the water institutional framework for selected LAC countries. The latter were grouped according to two criteria: 1) territorial ex-

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Country	Creaation of national company	Descentralization	Introduction of regulation	National legislation
Unitary countries of small geographical extesion				
Costa Rica	1942	Limited	1996	1942
Cuba	1962	2001	No hay	2001
Ecuador	1965	1992	2001	2014
El Salvador	1961	Limited	None	Pending
Guatemala	None	Limited	None	Pending
Haití	1977	2010	None	2009
Honduras	1961	1991	2003	2003
Nicaragua	1998	Limited	1992	2007
Panamá	1961	Limited	1996	2001
Paraguay	1966	2000	2000	2000
R. Dominicana	1962	1973	None	Pending
Uruguay	1952	None	1996	1952
Unitary countries with large geogrpahical extension				
Bolivia	None	None	1997	2007
Chile	1977	1998-2001	1989	1988
Colombia	None	1974	1992	1994
Perú	1981	1994	1992	1993
Federal countries				
Argentina	1912	1981	1992	Pending
Brasil	None	1988	2007	2007
México	None	1983	None	Pending
Venezuela	None	2001	None	2001

Table 1: Chronology of the Institutional Construction of Water and Sanitation Services in Latin America and the Caribbean

tension, and 2) political organization (unitary or federal). The second criterion relates to the characteristic of the regulatory authority. The table shows that among the largest countries, Mexico is the only one that does not have a regulatory entity. On the other hand, the access to water is not only in the national regulatory frameworks; in 2010 the General Assembly of the United Nations passed resolution 64/292 that granted this access the character of right.

This transcendental resolution has characteristics which make this right different from other rights. It is a reaction against the mercantilist vision of water provision. It is not the result, like other rights, to stop the advancement of the State over the individuals. It is rather a recognition that water is not a transactional good in the market and that, as a result, needs special regulation. This resolution is also a reaction to the authoritarian vision of State provision of water, by changing the passive role that these models give to users. A point worth clarifying is that the human right to water does not mean the service is provided free of charge. What it means is that no human being should be denied access to water in the light of economic insufficiency. Instead, the responsibility of removing this obstacle is allocated to the State, not to the operator (public or private). The solution should come from subsidies (direct or indirect) and from any other remedy that the legal framework allows in each case. By being part of the State, regulatory organisms also have the obligation of promoting the fulfillment of this right.

Requirements of a good regulation

The good and effective work of a good regulator is associated with indispensable requirements, legal and institutional. For instance, the performance of a regulator is a function of clearly defined policies and roles. On the other hand, the regulatory entity must meet the following conditions:

- Independence from the government of the day
- Stability of management (mandates for pre-determined periods)
- Economic and managerial autonomy
- Transparency
- Previsibility
- Proportionality
- No discrimination

In Latin American and the Caribbean, the emergence of regulatory entities was the result of the policies for water and sanitation of the 1990s. Within the fashion of the Washington Consensus, countries of the region granted concessions for water and sanitation to private companies. Driven by macroeconomic decisions, and not by the maturity of national and subnational water systems, there were separated functions that used to be at the hands of national or subnational governments. Although these governments retained the authority for these systems, they handed the

operation to these companies and the regulatory functions to technical agencies created for this purpose.

Although the results of privatization were not the expected ones, and often states ended up recovering the operation of these services – through agreements or judiciary processes – this movement increased, substantially, the quality of institutional performance. It brought about changes in the entrepreneurial culture of operators that remained, including the new state operators. There was also progress in the consideration of users as a collective with rights, and in the capitalization of the experience of regulatory agencies.

The re-involvement of water services provision by the State led to questioning whether there was still a role for regulatory agencies, created to oversee the performance of private companies. An objective and non-ideological perspective, plus more than two decades of experience, confirm the need to maintain and strengthen these agencies, regarding their attributions, human and material resources.

Some of the most prominent reasons are the following:

- Independent of the operator (public or private), every natural monopoly tends to inefficiency.
- The state character of the water company does not guarantee the public or general interest.
- The solution to complaints from users cannot reside in the willingness of the state operator; in the absence, or insufficiency, of a proper response, there are administrative mechanisms prior to embarking on judicial avenues.
- It is difficult that the State (owner of the operator) impose self-control and self-sanction measures in the light of complaints from a weaker third party (water user).

Then, even if the operator is an entity of the State, there must be a specialized organism (regulator) that:

- enjoys autonomy from the executive power;
- protects the rights of water users from the monopolistic power of the operator;
- audits, externally, the state operator, in accordance with the existing regulatory framework and informs the executive and legislative branches;
- promotes citizen participation and control (public audiences, right to information).

Measurement of efficiency in state water and sanitation companies

Water and sanitation utilities are natural monopolies; therefore, efficiency depends more on their institutional design (type of judiciary status, regulatory framework) than on the nature of their functioning (private or public). It is obvious that private firms tend to gain commercial efficiency and economic benefits. Regulation plays a key role concerning rates and quality of service. On the other hand, public operators may include non-commercial objectives (social benefits and equity) above objectives of economic efficiency.

This does not mean that efficiency and equity necessarily confront each other. At the end of the day, inefficiency conspires against social objectives (equity). Therefore, in a modern, State-led firm, the achievement of both efficiency and equity are worth pursuing. This is why knowing and applying good practices (between operators and regulators) is a good idea. Sharing information and strengthening institutional capacities of all actors are fine examples of this interchange of experiences. The role of ADERASA regarding these necessities is worth discussing.

The role of ADERASA in the institutional fostering of regulation in Latin America and the Caribbean

ADERASA, founded in 2001, is composed of 19 countries (Map 1). This organism organizes its work through Regional Working Groups. The following are the themes addressed by these groups: benchmarking, drinking water quality, green regulation, small operators, public operators, and regulatory accounting. Regulatory entities collaborate with the groups of their interest. There is an annual meeting and teleconferences. The working documents of these groups are discussed and approved in an Assembly. The group of benchmarking publishes an annual report, which has become a reference for the international community.

One of the primary functions of ADERASA has been to promote and consolidate debate and information sharing among the water regulators of LAC countries. Undoubtedly, this is of high value in the light of the great challenges the region is and will face, especially in connection to the access and affordability of water and sanitation services. Not only in quantitative terms but also in quality.

Needs and opportunities to incorporate natural infrastructure in water management in Latin America

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Latin America is a water - rich region; however, water security is being challenged. This is due to increased stress and the effects of climate change. Natural infrastructure can help mitigate some of these water risks in a cost-effective manner. Yet, regulatory and policy frameworks are not generating adequate incentives to do so.

Introduction

Most future scenarios indicate that water risks in Latin America will increase over the coming years. On the one hand, demand for water is growing due to increasing population, economic activity and energy generation. On the other, climate change is affecting the patterns of rain. These climate changes show acute events, more often, both in terms of droughts and floods. In spite of the need to increase investments in traditional build infrastructure solutions such as dams, aqueducts and treatment plants to face these challenges, their magnitude and the size of the investments needed are beyond the current financial capacity of the Region. Bringing nature back as part of the solution may prove to be a cost-effective addition to complement traditional approaches. However, regulatory and institutional frameworks need to be adapted to allow for an effective inclusion of nature based solutions. This article will describe the challenges and opportunities present in the regulatory frameworks of various Latin American countries, to benefit fully from these alternative solutions as complements to traditional grey infrastructure.

Background

Latin America accounts for more than thirty percent of the available freshwater in the world, while it houses less than ten percent of the population. Globally, the average per capita availability is among the highest in the world. Despite the relative abundance, water is not adequately distributed. The Amazon basin accounts for more than fifty percent of the water reserve, while population living in water stressed areas will more than double in the coming years. Additionally, Latin America hosts some of the most exposed regions to climate change in the world. For example, since 2000 Central America has endured climate related disasters with an approximate cost of 39 billion USD, equivalent to 19% of the sub region´s GDP (The International Disaster Database, 2017).

The majority of the Latin American countries have shown significant improvements in the access to water and sanitation services over the last few years. To do these improvements, the annual investment has averaged between 0.1% and 0.4% of GDP (Anderson, 2007). The Development Bank of Latin America (CAF) estimated that over the period 2010-2030, US$80 billion will be spent on sewerage infrastructure, and US$30 billion on waste water treatment (Rodriguez, 2017). Furthermore, in a context of rapid urbanization – in 2014 around 80% of population was urban and in 2050 it will be 86% (United Nations, 2014) –', there is also a growing demand for energy and food. This demand will increase with the occurrence of climate related events. Therefore, optimizing investments in water and sanitation will be a necessary condition to preserve and increase standards of living. Maintaining sources of water in this context also plays a fundamental role.

Whereas there is a case for continuous investments in traditional grey solutions for water and sanitation - such as dams, aqueducts and treatment plants -, there is mounting evidence of the benefits that natural infrastructure can provide in a cost-effective manner. Natural infrastructure is defined as a "strategically planned and managed network of natural lands, such as forests and wetlands, working landscapes, and other open spaces that conserve or enhance ecosystem values and function and provide associated benefits to human populations" (Benedict, and McMahon, 2006). In a recent study published by The Nature Conservancy (TNC) it is estimated that 1 in every 4 cities out of a sample of 2,000 around the globe could benefit from natural infrastructure solutions and the Return on Investment would be positive. If we add some other benefits such as climate change adaptation and health, the economic case could be made to even 1 in every 2 cities (Abell., et al. 2017).

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Figure 1: High Andean paramo provides the city of Quito, a regular flow of quality water

The case for regulation

The most cited case for the use of natural infrastructure is New York and the Catskills. Since the intake was being threatened by non-point pollution, the Environmental Protection Agency (EPA) mandated the City to safeguard the quality of water. The estimated investment to the City was in the order of 8 billion USD. In an unprecedented decision, the City´s authorities opted to target the non-point sources of pollution, thus reducing the influx of sediments to the intake. Among the activities performed were land acquisition, to eliminate productive activities, and changing agricultural management practices. The City has so far invested nearly 1.5 billion USD in this program, and has been able to avoid further regulation by the EPA. Complementary to this paradigmatic example, the World Resources Institute (WRI) has made a compilation of economic cases from various cities and water security challenges in the US. (Gartner, et al. 2013)

The regulatory threat by EPA induced a non-traditional response by the City, which allowed for significant savings. Given the current regulatory framework in most countries in Latin America utilities are not responsible to protect their sources of water; when they are, they do not have the mandate to invest in natural infrastructure solutions, even when economic gains would be achievable. Furthermore, regulation of watershed management is scattered among various authorities, effectively discouraging water utilities to including source water protection as part of their portfolio of solutions.

TNC is currently developing a study to better understand where the responsibility for source water protection lies, as well as the sources of financing for such a responsibility. Some preliminary findings are presented below. Table 1 contains a comparative framework about the type of government, responsibility over source water protection, and challenges to incorporate natural infrastructure in water management.

Argentina

Water management as well as finance and protection of water sources are the responsibility of the Secretariat of Public Works, through the Undersecretary for Water Resources. To facilitate coordination between the national and provincial level, there is the Federal Water Council (Consejo Hídrico Federal). In addition to this structure, the current Government has included inventorying and protecting sources as one of the axes of water policy by upscaling the monitoring network of the country, and adapting to climate change (Presidencia de la Nación Argentina, 2016).

Like in other countries reviewed, there is little clarity regarding the alignment of roles with respect to water protection policies. Besides the Undersecretary for Water Resources, the National Environmental Committee and the National Park Administration have policy and financing roles in this regard. As for the provinces, the regulatory framework grants them a high degree of autonomy to manage water resources, which represent a significant portion of the total available sources. Utilities and provincial regulators have not included natural infrastructure as part of their strategies.

Brazil

The Federal Constitution (1988) divides water resources management responsibility between the Federal government and states. In 1997 National Water Resources Policy and National System for Water Resources Management were established in the Water Law, - Law 9433 (Congresso Nacional do Brasil, 1997). The System defines the coordination framework for different stakeholders to work together under the Watershed Committees, where they define policies, plans, actions and funding mechanisms at the watershed level. The National Water Agency (ANA) was established in 2000 to implement water policy.

Regardless of a relatively well-defined framework, perhaps the most significant challenge is alignment. Federal, state and even local authorities often have different if not conflicting interests, which makes implementation complex. In addition to this complexity, lack of sufficient financial resources have also been an issue. Just a few Watershed Committees raise sufficient funds to have impact on the water resources. Given these complexities, water utilities may find it costly, and with low probability of success, to consider including green infrastructure projects in their solution portfolios.

Chile

Over the last few years the country has shown rapid progress towards universal provision of water and sanitation services. In 2017 a bill was submitted to Congress to reform the National Water Code which was originally published in 1981 (Contraloría General de la República, 1981) to incorporate some elements that would allow for better management and protection of water resources. Among others, the bill seeks to amend the concept of water rights, to: limit its exercise; make them temporary; limit the exercise of some water rights on scarcity situations; establish caducity hypothesis for water rights; facilitate intervention of hydrological areas by the State; and reform the non-use fee payment system.

Even though the country shows high levels of technical capacities to deliver water services, efforts to protect sources of water and including these initiatives into mainstream public policy are not apparent. The approach so far has been to advance based on voluntary agreements on specific watersheds, such as in the Maipo river, where nearly 20 actors from government, private sector and NGO communities have gathered around the preservation of perhaps the most economically important source of water in the country. Private companies have invested their compensation funds in natural infrastructure, but in most cases without the participation of the utility to maximize impact.

Colombia

The decree 2811 of 1974 established the National Code of Renewable Natural Resources and Environmental Protection (Ministerio de Agricultura, 1974). Since then it has built a sophisticated legal and regulatory framework to safeguard water and its sources. Notwithstanding these long traditions, implementation remains a challenge, which has undermined the effectiveness of the system. In 1993, 33 regional environmental authorities were established, with financial and administrative autonomy, responsible for managing natural resources, including water. Although these authorities are responsible for executing policy and implementing projects, they have lacked the financial resources to do so. In this regard, coordination and alignment with local water utilities has been a challenge, hence limiting their impact. In addition to that, few utilities have incorporated natural infrastructure in their strategies.

Mexico

Environmental and natural resource protection resides within the Ministry of Environment, as in the case of most other countries in the region. The National Water Commission, in turn, is a de-concentrated institution of this Ministry. The country implemented a watershed approach to managing its water resources, much like the Brazilian model. Watershed committees have a design to enable the participation of stakeholders as consultative bodies for policy design and to set priority actions. In theory, resources to finance such committees would come from water rights paid for by users. However, there is no clear appropriation rule for these resources to the committees. Lack of financial resources has resulted in the weakening of technical capacities of the committees. This has thus limited their ability to plan and execute projects at the watershed level, leaving these responsibilities to authorities such as the National Forestry Commission or state agencies. Water utilities rarely ever act on the protection of their sources, beyond being part of watershed committees.

Conclusions and recommendations

There is mounting evidence that natural infrastructure provides significant hydrological ecosystem services such as maintaining and improving quality, regulating flows

Country	Responsibility over source water protection	Challenges to incorporate natural infrastructure in water management
Argentina	Federation, States and municipalities	Alignment and coordination, financial resources, inclusion of natural infrastructure in regulators and utilities´ strategies.
Brazil	Federation, States and municipalities	Alignment and coordination, inclusion of natural infrastructure in regulators and utilities´ strategies
Chile	National government	Incorporating natural infrastructure into water policy
Colombia	National government	Alignment and coordination between levels of government and with utilities acting on the watersheds
Mexico	Federation, States and municipalities	Alignment and coordination, inclusion of natural infrastructure in utilities´ mandate

Table 1: Protection of Water Sources and Natural Infrastructure Management in Selected Latin American Countries

Source: Own elaboration.

and facilitating infiltration. When seen from an economic perspective, utilities could reduce their operational and capital expenditures, thus improving their financial condition by including ecosystems into their strategies. When considering other co-benefits such as biodiversity as well as resiliency, TNC estimates that one in every two cities around the world would show a positive return on investment (ROI) were they to include these types of solutions to their current portfolio of water management projects and policies. Yet, in Latin America protecting the sources of water still faces major challenges. The most recurrent relate to horizontal and vertical alignment among various levels of government and ministries. Also relevant is the fact that the majority of utilities and cities have not incorporated natural infrastructure into their strategies and investment portfolios.

There are some good examples of initiatives to adopt an integrated water management approach in the various countries. In Brazil, the Water Producer program has been gaining popularity among municipalities and utilities. In Argentina, source water protection has been elevated as one of the four strategic axes for the Government. In Colombia, utilities and local authorities have utilized the Water Fund model to this end (Alianza Latinoamericana de Fondos de Agua, 2017). In Chile, voluntary agreements are occurring. In Mexico, some watershed committees are turning to the protection of their natural infrastructure, and some cities are also adopting the water fund model.

These are some examples of how to accelerate the adoption of natural infrastructure:

- Increase impact by mapping the various initiatives that governments have around environmental and natural resources management and align them with water management objectives.
- Incorporate natural infrastructure as an element in the earlier stages of project planning to ensure complementarity with traditional grey solutions and maximize social, economic and environmental returns on public investments.
- Create regulatory and institutional environments that facilitate the adoption of natural infrastructure by all relevant actors in water management, in particular regulators, utilities and large water users.
- Develop evidence via business and policy cases to socialize the benefits of natural infrastructure and to address finance and economic ministries to incorporate them into the discussion, as well as to inform legislators and other relevant decision makers.
- Include source water protection into the water financial system, which includes tariffs, taxes and rights, in order to reveal the cost of nature, incentivize its protection and generate financial resources to invest in source water protection.

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The water guarantee fee in Mexico

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This contribution focuses on the water guarantee fee in Mexico. This instrument has been designed to aid the sustainability of water use. In practice, however, it has been functioning as a fiscal collection mechanism. It is concluded that this initiative is not an adequate means to reach the end. Legal complexities are pointed out.

Introduction

Today more than ever water becomes essential to the viability of civilization in general. Much has been written about its scarcity and its growing demand by the population. Mexico is not exempt from these challenges and today according to the National Water Law ("LAN") is a national security matter. The over-exploitation of groundwater reserves is among the factors that caused this situation (16% of reserves are currently over-exploited). [1] In this context, the Mexican State has recently shown a higher degree of regulatory activity regarding water issues. In 2004, with a broad reform to the LAN, the incremental process of the creation of legal norms started albeit unfinished and with clear room for improvement) in order to promote the moderate use of water resources.

In this reform an unknown concept within the legal concepts called "Guarantee Fee" was introduced, which could not be understood until the "Rules for the Determination and Payment of the Non-Expiration of National Waters Rights Guarantee Fee" (the "Rules") were published in 2011. The rational of this "Guarantee Fee" is to pay an amount of money in order to avoid the loss of water volume not used by the licensees. The adoption of this new concept within the legal framework, far from providing clarity to the individuals, has produced insecurity and unrest in the governed, mainly because it is perceived as a mechanism for tax collection purposes, even though it was implemented as a public policy response for the sustainable use of water in the country.

Understanding the Guarantee Fee

A general rule in the Mexican legal water system is that the authorized volume of water must be used in its entirety; otherwise, the administrative authority, that is the National Water Commission (CONAGUA), has the power to extinguish and recover the water that has not been used by the title-owner in a period of the past two consecutive years. However, the LAN allows the title-owner to keep unused volumes of water, among other considerations, if he pays the guarantee fee.

The Rules establish how the guarantee fee is calculated which is the product of the multiplication of two factors:

1. Of the "authorized fee by m3" set by the Mexican Tax Authority, Secretaría de Hacienda y Crédito Público; and
2. Of the "unexploited, or unused minimum volume of water for a period of two consecutive years" which is the minimum volume obtained by comparing two differences: (i) that which results from the total volume of annual licensed water minus the volume of water used during the first 12 months of the observation period of two years; or (ii) that which results from the total volume of annual licensed water minus the volume of water used during the second 12 months of the observation period of two years.

For better clarity, the "unexploited, or unused minimum volume of water for a period of two consecutive years" can be shown with an example of a water title-holder of 100m3 per year, which has not been used in its entirety. Table 1 shows Case 1. There is an exploited volume of 90 m3 in the first 12 months and of 80 m3 in the second period of 12 months. Thus, the minimum volume is 10 m3 and it is located in the first 12 months of the period. Case 2 is also shown. There is a total annual concession volume of 100 m3 and an exploited volume of 70 m3 in the first 12 months and 95 m3 in the second period of 12 months. The minimum volume is 5 m3 and it is located in

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Case 1	Minimum Volume	Vol. = 100 m^3 – 90 m^3 **Vol. = 10 m^3**	Vol. = 100 m^3 – 80 m^3 Vol. = 20 m^3
Case 2	Minimum Volume	Vol. = 100 m^3 – 70 m^3 Vol. = 30 m^3	Vol. = 100 m^3 – 95 m^3 **Vol. = 5 m^3**
Period (time)		First 12 months	Second 12 months
		Observation Period of 2 Years	

Table 1: Illustrative example of how the minimum volume is calculated for a period of two years.

the second period of 12 months of the observation period.

Some notes for a better understanding of the guarantee fee and its determination are:

1. The minimum volume starts in the period in which there is a greater exploitation of water. Therefore, in Case 1, the minimum volume is the one corresponding to the first 12 months, since that is when the most volume of water was used from the entirety of the concession; similarly, in Case 2 the minimum volume corresponds to the second period of 12 months.
2. The result obtained by subtracting the volume used from the total volume of licensed water, is the volume of water not used during the observation period of 2 years.

Thus, by multiplying the "unexploited, or unused minimum water volume for a period of two consecutive years" by the "authorized fee by m3", the guarantee fee is obtained.

The guarantee fee is more expensive than the ordinary extraction of water, and therefore does not generate efficient use incentives.

Since its first publication in 2011, the amount of the guarantee fee has been higher than that corresponding to the fees of extraction of waters, whether these are underground or surface waters. The rationale used by CONAGUA in order to justify the higher cost of the guarantee fee in relation to the cost of the fee of the water extraction is based on the fact that it represents the cost of social opportunity that means "keeping a certain volume of water inactive". In this regard, the CNA establishes that the social opportunity cost is estimated based on the economic resources that were ceased to be generated by economic activity and the income that the State failed to receive.

The opportunity cost, understood as the value of the most valuable good or service which is rejected is, first of all, a concept of economic nature that has been developed broadly by the specialized literature in that area, with broad content and applications in ordinary life. This concept illustrates the cost associated with decision making, when a good or service is chosen and another is abandoned, which has helped to understand the behavior of consumers when deciding on the acquisition of goods and services from a microeconomic aspect.

In this sense, CONAGUA assumes that the licensed volume that is not being used by an individual has an opportunity cost insofar as another potential licensee cannot take advantage of it, given the scarcity of vital liquid. This presumption of the administrative authority is partially valid but incorrectly applied in the legal field. It is partially valid because the national demand for water has increased behaviors and there is the over-exploitation of some underground waters, which further accentuates water shortage. However, it is not correct to consider that if a licensee (or even a hypothetical and future licensee) can do so. This is because the water volumes are not permanent and their availability is calculated on the basis of studies and procedures of hydrological nature, which are not necessarily accurate. This means that the administrative authority grants the concessions based on an approximation of the availability of water, without having a certain accuracy over their actual quantity. Even the LAN recognizes this situation.

From the LAN perspective it is clear that CONAGUA, even when granting a concession to an individual, does not guarantee the existence or invariability of water . In other words, these are virtual volumes of licensed water, over which there is no absolute certainty of their existence, unless the individual performs the corresponding exploration and drilling work. Due to this situation, it is considered that the application of the economic concept of "opportunity cost" has been inadequately extrapolated to the legal field. This is because, according to the economic literature, the opportunity cost implies the cost of choosing an alternative, when another option is really available. That is, the opportunity cost implies that there are two alternatives, real and available, at the time when the decisions are made. This situation, of course, does not occur in this case, since the licensee is not sure that (i) it exploits all the licensed volume at a specific time, or whether it may continue to do so in its entirety in the future; or (ii) if it exploits a part of the licensed volume, it may have the rest of the available volume in the future.

In other words, it is not really an opportunity cost scenario, since there is no certainty that the non-chosen alter-

native (volumes of water not used by the licensee) is truly an option available to the individual. That is, there are no mechanisms to guarantee that if the CNA extinguishes the rest of the volume not used by a licensee, it may be available to another user interested in obtaining a concession. This is due to the difficulty implicit in the calculation and updating of water availability (at least in the case of groundwater).

Based on the above, the CNA justifies why the guarantee fee must be higher than the fee of water extraction. The main reason provided by the authority is the opportunity cost, an unfortunate application for the case study, as noted above. This produces incentives contrary to those contemplated by the regulation. The above is because for a private person that does not use all the volume of licensed water and wants to avoid the expiration of those volumes, it could be more attractive to pay the cost of water extraction than the guarantee fee. Thus, even within the period of two years, anyone could avoid the expiration of unused volumes or the payment of the guarantee fee, through the indiscriminate and wasteful use of volumes of licensed water. This is radically opposed to the intention to encourage the efficient use of water.

Judicial criteria

During August of 2016 the Second Chamber of the Mexican Supreme Court of Justice published mandatory criteria regarding the guarantee fee, as a result of several lawsuits filed against that measure. Despite the comments above mentioned regarding the incentive of water waste, the Court considered that the guarantee fee:

1. Is not contrary to the human right of access to water and, therefore, does not encourage waste, but efficient use, since it does not allow the liquid to be misused.
2. It is not a fine, because its payment is voluntary.
3. It promotes the rational and efficient use of water because (i) it allows the authority to grant unused or exploited volumes of water to other interested persons; and, (ii) it implies an economic outlay to maintain those unused volumes that may have meant the generation of "benefits and payments rights (contribution)".
4. It promotes the reflection of the user so that, after paying the guarantee fee, he uses those volumes in the future.
5. It is a measure to preserve the national hydrological balance and favor the protection of water resources

It is believed that the Court's resolutions are unfortunate as they support a mechanism that, far from providing clarity to the Mexican legal system, favors its deficiency, since it causes legal uncertainty to individuals and discourages the efficient use of water. Unfortunately the court's criteria are not surprising, considering the last years in which it has adopted "pro-government" decisions when they are linked to economic aspects. The foregoing, often aligned with the budgetary pressures in which the public sector is involved and the rationale of the Ministers become more inclined to adopt political decisions and, subsequently, raise them with a legal veil.

It is also important to mention that these criteria did not address the discussion of water and legal policy. They only solved the legal aspects of common order that are used in any other litigation, without having made a real statement in those judgments about the management and planning of public water policy within the constitutional limits. Although the outcome of the trials is often the cause of the arguments of the parties, it would have been desirable to have judicial resolutions with a view to solving the water problem.

Conclusions

After having analyzed what the guarantee fee is and how it has been implemented in Mexico, it is possible to offer the following conclusions:

1. *It is not an adequate means to reach the end*. The guarantee fee may promote the indiscriminate and irrational use of water resources, in the understanding that it does not promote economic inducements for those concessionaires that have been efficient and that have not used the water volumes in their entirety.
2. *Legal complexity*. The understanding of the guarantee fee is not affordable for the average user, partly due to the technical level of the tax matter applied to water issues, but also, to a large extent, due to the deficient regulation.
3. *Collection purpose*. Even when the Federal Public Administration intends that the guarantee fee to be conceived as a mechanism to promote the proper use of water, it is clear that the underlying purpose is tax collection.

Competition and Regulation in Network Industries: a new Journal by Sage

Commencing in 2017 SAGE is delighted to be the new publisher of Competition and Regulation in Network Industries.

We are building on the **16-year tradition and strength** of the existing Intersentia Journal *Competition and Regulation in Network Industries*, yet strive to evolve it into an even higher quality journal, addressing the increasingly urgent challenge of governing (including regulating) **complex and dynamic socio-technical systems** (e.g., energy, transport, water, communication, urban systems), especially in light of pervasive digitalization.

Network industries are caught between technological developments, evolving competition and regulation. At the same time significant innovations – especially in the field of ICTs – offer new opportunities for infrastructure operations and governance. Exploring this **combined technological and institutional dynamics between competition and regulation** provides a fascinating field of research that challenges academics, managers and policy-makers alike.

The new Journal *Competition and Regulation in Network Industries* is resolutely interdisciplinary in nature, favoring articles that combine economic, legal, policy and engineering approaches and seek to link theory with practical relevance. It is a **double- blind peer-reviewed** journal that offers leading specialists opportunities to provide an in-depth and forward-looking view on the evolving network industries.

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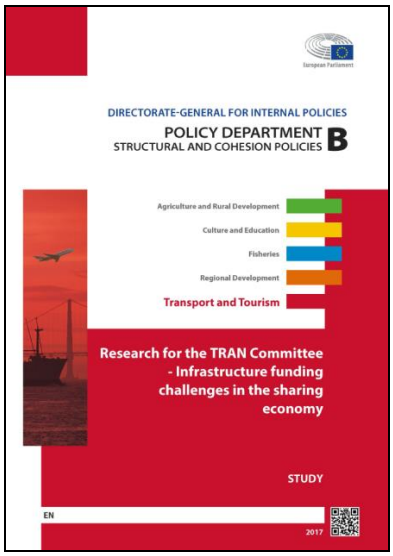
Publication process:

The Journal welcomes submissions and engages in a **collaborative discussion with the authors** so as to produce the highest possible quality articles. Each article is double-blind peer reviewed. After acceptance, articles are published online on a rolling basis. 4 paper issues are published each year, containing each 4 to 6 articles.

The Journal holds an **annual conference** at the European University Institute in June each year. Papers presented there are offered a fast-track review process.

Editor in chief:

Prof Matthias Finger, École Polytechnique Fédérale de Lausanne and European University Institute



Research for the TRAN Committee - Infrastructure funding challenges in the sharing economy

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Finger, Bert, Kupfer, Montero, Wolek, 2017, Research for TRAN Committee – Infrastructure funding challenges in the sharing economy, European Parliament, Policy Department for Structural and Cohesion Policies, Brussels

89 pages

About the Study

The study analyses the disruption created by shared mobility in the funding of transport infrastructure. While recognizing the benefits of shared mobility in terms of reduction of private car use, the study identifies that there might be short term negative effects on the revenues of long distance railway and coach operators. It also points out other potential risks, which include capturing the revenues through commissions charged by platforms mediating mass-transit services (Mobility as a Service), freeriding and lower tax contributions. The study makes recommendations to reduce these risks.

About the Series

The *Directorate-General for Internal Policies of the Union* is responsible for organising the work of European Parliament's committees in the field of internal policies and contributing to the exercise and development of the legislative and control powers of the European Parliament. Among its main tasks, DG IPOL is providing the committees, other parliamentary bodies and the President's Office with briefings, background notes and long-term studies on all aspects of Parliament's activities in the field of internal policies. Directorate B is the responsible one for Structural and Cohesion Policies.

Download the study

Video highlights

Prof Juan Montero, team member of the research group that produced the study, presents the issues and the main results of the project.

Watch the video

Presentation of the study at the European Parliament

The European Parliament's Transport and Tourism (TRAN) committee invited the project leader, Prof Matthias Finger, to present the study. The presentation followed by a discussion with Members took place on Monday 4 December 2017.

Watch the video

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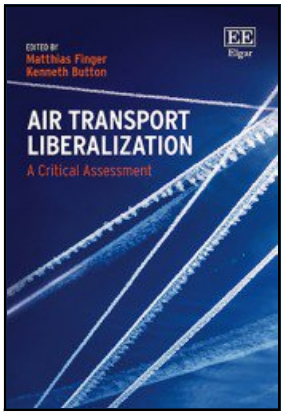
Air Transport Liberalization

A Critical Assessment



Edited by Matthias Finger, Professor, Management of Network Industries, Ecole Polytechnique Fédérale Lausanne, Switzerland and Kenneth Button, University Professor, Schar School of Policy and Government, George Mason University, US

This groundbreaking book offers a critical and wide-ranging assessment of the global air transport liberalization process over the past 40 years. This compilation of world experts on air transport economics, policy, and regulation is timely and significant, considering that air transport is currently facing a series of new challenges due to technological changes, the emergence of new markets, and increased security concerns.

'The 30th anniversary of the start of the liberalization of air transport in Europe, leading to the creation of the successful EU internal aviation market, is an excellent time to review the transformation of the aviation industry which has taken place throughout the world over the past few decades. This book brings together ten studies of how markets have changed in different countries. But it does more than that. It also reviews broader, generic topics such as safety, small community services and hub domination and the impact liberalization has had on each of them. Finally, it looks at future challenges, particularly in air traffic control and security. The wide range of topics covered helps to put the subject of air transport liberalization into context and reveals the full extent of the remarkable journey the aviation industry has taken in most people's lifetimes, as well as how much more there is to do.'
– Barry Humphreys CBE, Aviation Consultant, UK

'Professors Finger and Button have assembled an impressive array of informative, insightful, and useful chapters that, taken together, offer a compelling endorsement for liberalizing air transport. Although a scholarly collection, there is much in this volume of direct relevance to aviation practitioners in both the private sector and governments.'
– John Byerly, Former Deputy Assistant Secretary of State and Principal U.S. Aviation Negotiator, US

'Air transport liberalization has led to a substantial increase in the level of economic activities and traffic growth. This is an excellent book providing a comprehensive view of the topic and covering airline liberalization in the US, Canada, Latin America and the Caribbean, as well as the sustainability of competition. This book also explores aviation safety in the age of liberalization, and the domination of hub-and-spoke networks. The eighteen chapters in the books are written by and for practitioners and academics.'
–Bijan Vasigh, Embry-Riddle Aeronautical University, US

December 2017 c 400 pp Hardback 9781786431851 ~~£105.00~~ £94.50 ~~$170.00~~ $153.00
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EUROPEAN UNIVERSITY INSTITUTE (FLORENCE), 21-22 JUNE 2018

7th Florence Conference on the Regulation of Infrastructures

New network structures: decentralization, prosumers and the role of online platforms

CALL FOR PAPERS

Introduction

The de- and re-regulation of the different network industries is an on-going process at both the national and global levels. As this process unfolds, ever new phenomena emerge, necessitating a constant reassessment of the content and objectives of regulation.

The rapidly evolving Information and Communication Technologies (ICTs) have significantly challenged the traditionally stable landscape of infrastructure services provision. The new data layer over the traditional infrastructure and service layers is transforming network industries: online platforms create new indirect network effects, they allow new service providers to enter the market (prosumers, sharing economy providers, etc.), and they challenge the central role of traditional infrastructure managers/service providers as entities ensuring the coordination of the sectors.

Offering traditional and new services in an innovative way is a growing trend among public authorities, traditional providers as well as new private operators, prosumers and platforms. However, together with great opportunities, disruptive innovations also give rise to new regulatory challenges, especially when it comes to infrastructure financing and the coordination of operations.

This *7th Florence Conference on the Regulation of Infrastructures* aims at taking stock of the **major challenges infrastructure regulation is currently facing** as a result of technology, indirect network effects, **newly emerging network structures** (decentralized networks, distributed networks, sharing economy), and **new actors** (prosumers, OTTs, platforms, etc).

Papers will be presented in different parallel sessions dedicated to the following infrastructure sectors:

- **Communications and media**
- **Energy and Climate**
- **Transport and mobility**
- **Water distribution**
- **Wastewater and waste management**

We encourage contributions that link **different infrastructure sectors, especially in light of the ICTs.** Contributions utilizing **multidisciplinary as well as interdisciplinary approaches** to regulation are welcome. Papers **linking academia and practice**, as well as policy research papers are particularly encouraged.

The conference is intended for **academics** such as PhD students, PostDocs and Assistant/associate/full Professors as well as **academically minded practitioners**.

Conference structure

The format of the Florence Conference on the Regulation of Infrastructures is unique:

- Each presenter has 45', which includes 20' of presentation, 10' of qualified feedback and 15' of discussion with the audience (there are only 2 papers per session, guaranteeing high quality discussions);
- Feedback will be given by senior professors associated with the Florence School of Regulation who are specifically knowledgeable about the topic athand;
- Papers that will be retained for publication will receive additional feedback beyond the Conference.

Timeline

- Submission of the abstract by **15 January 2018** (word format download the guidelines) using the online form. For any issue regarding the submission, please contact Ms Nadia Bert at fsr.transport@eui.eu;
- Notification of acceptance by **19 February 2018**;
- Submission of the full paper by **26 May 2018**; participants who fail to submit a full paper by this deadline will be automatically removed from the programme;
- Conference on **21-22 June 2018** in **Florence (Italy)**.

Conference fee

- 150 EUR - Partial fee waivers for PhD students are available. Please contact Ms Nadia Bert at fsr.transport@eui.eu for further information.

Guidelines for the abstract

- 600-1000 words
- Title of the paper & keywords
- Name of the author(s) and full address of the corresponding author
- The aim and methodology of thepaper
- Results obtained or expected

Publication opportunities

Papers will qualify for the Journal *Competition and Regulation in Network Industries*, which is published by Sage as of 2017.

A summary of the 4-5 best papers will have the chance to be published in the dedicated issue of the *Network Industries Quarterly* (Issue 20, Vol 3, September 2018).

Organizing Committee

- Prof **Simone Borghesi** (EUI, Part-time professor, Energy & Climate Area of the FSR. Siena University, Professor)
- Prof **Matthias Finger** (EUI, Part-time professor and Director of the Transport Area of the FSR. EPFL, Professor and Director of the Chair of Management of Network Industries)
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networkindustries quarterly

Network Industries Quarterly, Vol. 20, issue 1 (March 2018)

"Governing Energy Transitions: strategic challenges of local utility companies in the Swiss energy transition""

Presentation of the next issue

Currently, many countries are firmly committing to a transition towards a more sustainable energy system, each facing their own unique challenges. The Swiss energy transition is particularly challenging due to a combination of commitments: (1) a gradual phase-out of nuclear energy, currently about a third of the country's electricity production, is expected by 2034, (2) construction of new renewable energy sources such as solar PV, wind and micro-hydro, (3) electrification of heating and transportation, (4) energy saving, and (5) stringent CO2 emission targets.

Utility companies play an important role in the realization of the Swiss energy transition, but are also facing numerous strategic challenges as a consequence of a rapidly changing playing field. The commitments necessary to transition towards a more sustainable energy system are not necessarily aligned with the current operations of local utility companies. For example, the lack of incentives for energy efficiency programs, market opening, smart grids and renewable energy has utilities looking for new business models.

The next issue of Network Industries Quarterly (NIQ) is linked to the *Certificate of Advanced Studies (CAS) in Governing Energy Transitions*, a continuing education program organized by the Chair Management of Network Industries at the École Polytechnique Fédérale de Lausanne (EPFL). The program has a strong practical component, embedded in an academic framework of multi-level governance. Participants of the program were invited to contribute to this issue, sharing their insights on the strategic challenges of local utility companies in the Swiss energy transition.

The following are some of the themes to be included in the next NIQ:

- An overview of urban utility companies' strategic responses to the energy transition: comparing Swiss and German utilities.
- Implementation of a local demand-side management program in Switzerland.
- An international perspective on demand-side management programs, and policy-recommendations for a Swiss governance model.
- A broader identification of new business opportunities for utility companies, arising from the ongoing energy transition.

Guest editor: Reinier Verhoog

(PhD student, Chair Management of Network Industries, Institute for Technology and Public Policy, College of Management of Technology, École Polytechnique Fédérale de Lausanne).

The guest editor of this special issue is Reinier Verhoog (B. Sc. And M. Sc.: Delft University of Technology, Delft, the Netherlands). Reinier Verhoog is currently a PhD student and the program manager of the CAS in Governing Energy Transitions at the École Polytechnique Fédérale de Lausanne (EPFL). He is also an advisory editor for the Competition and Regulation in Network Industries Journal. His most recent published work appears in *Environmental Modelling and Software and International Journal of Complexity in Applied Science and Technology.*

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Open Call For Papers

Implementation of the liberalization process has brought various challenges to incumbent firms operating in sectors such as air transport, telecommunications, energy, postal services, water and railways, as well as to new entrants, to regulators and to the public authorities.
Therefore, the Network Industries Quarterly is aimed at covering research findings regarding these challenges, to monitor the emerging trends, as well as to analyze the strategic implications of these changes in terms of regulation, risks management, governance and innovation in all, but also across, the different regulated sectors.
The Network Industries Quarterly, published by the Chair MIR (Management of Network Industry, EPFL) in collaboration with the Transport Area of the Florence School of Regulation (European University Institute), is an open access journal funded in 1998 and, since then, directed by Prof Matthias Finger.

Article Preparation

The Network Industries Quarterly is a multidisciplinary international publication. Each issue is coordinated by a guest editor, who chooses four to six different articles all related to the topic chosen. Articles must be high-quality, written in clear, plain language. They should be original papers that will contribute to furthering the knowledge base of network industries policy matters. Articles can refer to theories and, when appropriate, deduce practical applications. Additionally, they can make policy recommendations and deduce management implications.
Detailed guidelines on how to submit the articles and coordinate the issue will be provided to the selected guest editor.

Additional Information

More Information

- *network-industries.org*
- *mir.epfl.ch*
- *florence-school.eu*

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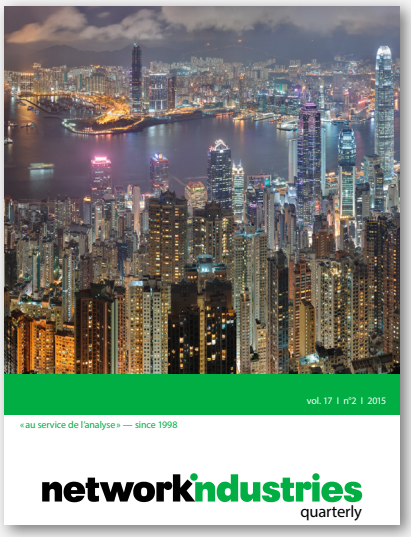
Published four times a year, the **Network Industries Quarterly** contains short analytical articles about postal, telecommunications, energy, water, transportation and network industries in general. It provides original analysis, information and opinions on current issues. Articles address a broad readership made of university researchers, policy makers, infrastructure operators and businessmen. Opinions are the sole responsibility of the author(s). Contact *fsr.transport@eui.eu* to subscribe. Subscription is free.



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