

**Institutional Capacity of the Water Utilities of Saltillo and Hermosillo, Mexico**  
**Capacidad institucional de los organismos de agua de Saltillo y Hermosillo, México**

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**ABSTRACT**

This paper reports on an evaluation of the management and performance of water utilities in the municipalities of Saltillo, Coahuila, and Hermosillo, Sonora, during the 2001-2015 period. The institutional capacity approach was used to analyze the political, administrative, and human resources management factors of both organizations and to compare their management outcomes. Our analysis indicated that the Saltillo organism has higher institutional capacity and has obtained better results than the Hermosillo organism. This study contributes to a better understanding of the factors that lead to effective practices among urban drinking water management organizations. These factors were found to be increased management autonomy, increased measurement coverage, indexation of rates, and staff training. The approach used during the study allowed for the identification of opportunity areas in both organizations, and it can be applied to the assessment of other organizations in the sector.

*Keywords:* 1. public management, 2. institutional capacity, 3. public-private partnerships, 4. Saltillo-Coahuila, 5. Hermosillo-Sonora.

**RESUMEN**

En este artículo se evaluó la gestión y el desempeño de organismos operadores de agua de los municipios de Saltillo, Coahuila, y Hermosillo, Sonora, durante el periodo 2001-2015. Se utilizó el enfoque de capacidad institucional para analizar los factores políticos, administrativos y de gestión de los recursos humanos de ambos organismos, y se contrastaron con los resultados de gestión. El análisis indica que el organismo de Saltillo cuenta una mayor capacidad institucional, lo que le ha permitido obtener mejores resultados que el de Hermosillo. Los resultados de este artículo contribuye a un mejor conocimiento sobre los factores que permiten obtener un mejor desempeño de la gestión urbana del agua potable; y que consisten en una mayor autonomía de gestión, una mayor cobertura de medición, la indización de tarifas, y la capacitación del personal. El enfoque utilizado permite identificar las áreas de oportunidad de ambos organismos y se puede aplicar al estudio de otros organismos del sector.

*Palabras clave:* 1. gestión pública, 2. capacidad institucional, 3. asociaciones público-privadas, 4. Saltillo-Coahuila, 5. Hermosillo-Sonora.

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## INTRODUCTION<sup>4</sup>

At the beginning of the twenty-first century, water utilities (WUs) in the municipalities of Saltillo, Coahuila, and Hermosillo, Sonora, modified their management schemes as part of a more general process aimed at decentralizing drinking water services. This process, which in Mexico began to take place during the 1980s, facilitated the entry of private investors into the drinking water sector with the publication of the 1992 National Water Law. In 2001, the organization responsible for water administration in Saltillo ceased to be a public municipal enterprise and became a mixed public-private enterprise (Aguas de Saltillo); for its part, the drinking water organism in the city of Hermosillo ceased to be under state administration and became the public municipal enterprise Agua de Hermosillo in 2002. Although the Hermosillo WU has remained a public entity, in 2011, it signed a contract to provide services with the support of a private company that took over the utility's commercial area to increase its collection capabilities. However, the contract was ended before the year, and the organization returned to its previous scheme without significant changes.

More than a decade after adopting its current operating model, Saltillo's drinking water utility has been better evaluated than Hermosillo's by the users themselves. Additionally, Aguas de Saltillo has consolidated its position as a self-sufficient and financially sound WU, whereas Agua de Hermosillo has operated at a deficit since it came to depend on the municipality. The deficiencies in water management in Mexico have been attributed to the poor institutional capacities (Martínez, Güitrón, & Bourguett, 2001; Tortajada, 2001) of WUs. Saunier (1991) suggests that private sector involvement can help to build these capacities, and it has been reported to help decrease the amount of wasted water and increase collection (Marin, 2009).

Mexican public-private partnerships have failed to meet expectations in terms of efficiency (Saade, 2005), but they have improved the quality of the services (Caldera, 2008) and collection (Haro & Salazar, 2016a; Haro, & Salazar, 2016b). The present study compared the management of drinking water services in Saltillo and Hermosillo based on the institutional capacity approach, which allowed for the analysis of the influence of the WUs' political contexts, human resources management, and available technological and administrative resources on management during the period from 2001 to 2015.<sup>5</sup> Despite their very similar socioeconomic, geographical, and demographic contexts, the different results obtained by these two WUs made it possible to compare both management models and identify the factors associated with the better outcomes of the joint venture

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<sup>5</sup>Not all items were evaluated for this period; the evaluation was based on available data.

management approach used in Saltillo in contrast with Hermosillo, where private involvement was transient and failed to yield its expected results.

The present study hypothesizes that Saltillo’s higher institutional capacity has resulted in better performance results. This paper is divided into five sections. The first section describes the general characteristics of the two cities and their WUs; the second section outlines the institutional capacity approach; the third section describes the method used for the analysis; the fourth section presents and discusses our results, and conclusions are proposed in the last section.

### CHARACTERIZATION OF THE MUNICIPALITIES AND THEIR WATER UTILITIES

Saltillo and Hermosillo are located in arid regions and their water is mainly supplied by groundwater.

Table 1. Water Production and Consumption in the Municipalities of Saltillo and Hermosillo

| <i>Production</i>  | <i>Saltillo</i>   |                           | <i>Hermosillo</i>   |                           |
|--------------------|---|---------------------------|---|---------------------------|
|                    | Source  | Volume (mm <sup>3</sup> ) | Source  | Volume (mm <sup>3</sup> ) |
| Surface            | None  | 0                         | Independencia Aqueduct, El Molinito Aqueduct**                                      | 30                        |
| Underground        | Aquifer:<br>Cañón del Derramadero*,<br>General Cepeda*, Saucedá*,<br>Saltillo-Ramos Arizpe*, and<br>Manzanera Zapalinamé<br>Region* | 51.53                     | Aquifers:<br>Hermosillo Coast*, Mesa del Seri*,<br>Zanjón*, Río San Miguel, La Poza | 78.2                      |
| Total production   |   | 51.53                     |   | 108.2                     |
| <i>Consumption</i> |   |                           |   |                           |
| Users              | Taps  | Volume (mm <sup>3</sup> ) | Taps  | Volume (mm <sup>3</sup> ) |
| Domestic           | 228,245   | 32.14                     | 259,168   | 45.81                     |
| Commercial         | 13,928  | 3.54                      | 14,841  | 6.41                      |
| Industrial         | 176   | 0.73                      | 305   | 0.82                      |

|                   |         |       |         |       |
|-------------------|---------|-------|---------|-------|
| Public            | 1,347   | 1.08  | 748     | 1.99  |
| Total consumption | 243,696 | 37.49 | 275,062 | 55.02 |

\*Overexploited. \*\*In 2015, water from the El Molinito Aqueduct was not used due to contamination in the Sonora River.

Source: Agreement by which the average annual availability of groundwater is updated (CONAGUA, 2015a), National Census of Municipal and District Governments (INEGI, 2017).

The municipality of Saltillo is located in the southeast of Coahuila, and Saltillo city is the state capital. Its climate is semi-warm and dry, with average annual precipitation ranging from 300 to 400 mm. Its average temperature is 18 °C, and in the summer, temperatures can exceed 38 °C. The total estimated population in the municipality was 807,537 inhabitants in 2015 (INEGI, 2015a). Its economy includes industrial activities, and it is the headquarters of the Saltillo Industrial Group, which operates in the auto parts, construction, and household appliances sectors (GIS, 2015). The average annual compensation per worker was 105,130 pesos in 2014 (INEGI, 2014).

Until 2001, the water service in Saltillo was provided by the public entity Sistema Municipal de Agua y Saneamiento de Saltillo (SIMAS). In that year, the municipality partnered with Spanish company Aguas de Barcelona (via its subsidiary, Interagbar de México S.A. de C.V.) and created the Aguas de Saltillo joint venture. The contract established an initial 51% ownership for the municipality and 49% for the operating partner. A 25-year technical assistance agreement was signed; it established payment to the private partner in exchange for managing the organization, and another part of the compensation was dependent on the attainment of performance improvement goals (Aguas de Saltillo, 2001).

The municipality of Hermosillo, where the state capital of Sonora is located, has average temperatures that range from 16.6 °C in January to 32.6 °C in July, and maximum temperatures are above 45 °C in the summer. Precipitation ranges from 200 to 300 mm. In 2015, it had a population of 884,273 inhabitants (INEGI, 2015a). It is an important industrial center where a major Ford Motor Company plant was opened in the 1980s. The average annual compensation per employee was 99,050 pesos in 2014 (INEGI, 2014).

The city of Hermosillo is located in the Sonora River basin, and until the 1990s, it was mainly supplied by the Abelardo L. Rodríguez dam. However, the dam’s storage levels were increasingly lower; therefore, underground water sources and a second dam called El Molinito, located 27 km from the city, were used instead. The “Acueducto Independencia” project is the city’s most recent water source. It was finished in 2013, and its purpose is to transport water stored in the El Novillo dam, located more than 150 km away from the city, in the Yaqui River basin. Until 2002, the state government was responsible for water management in Hermosillo, via the Commission of Drinking Water and Sewerage of the

State of Sonora (COAPAES). That year, the administration of the WU was transferred to the municipality, and Agua de Hermosillo was created as a decentralized public body (Pineda, 2007). In 2011, Agua de Hermosillo sought to improve the efficiency of its commercial area by means of a service provision company signed with Tecnología y Servicios de Agua (TECSA S.A. de C.V.) in response to a foreseeable increase in costs derived from the operation of the Independencia Aqueduct. After a year of operations, the results were unsatisfactory, and 10 Agua de Hermosillo's monthly payments to TECSA were due; therefore, the contract was terminated early (May 31, 2012) (Bahena, 2012), seven months before its intended expiration (Agua de Hermosillo, 2011).

### THE INSTITUTIONAL CAPACITY APPROACH

*Institutional, management, and administrative capacities*, as well as *capacity building*, among other terms, are used by different authors who seek to explain the characteristics that allow public organisms to effectively manage their available resources to transform them into quality goods and services for the citizenry. Since the 1990s, the term *institutional capacity* began to be used with increasing frequency in these studies. Savitch (1998) interpreted this capacity as the ability of organizations to absorb responsibilities, operate efficiently, and encourage accountability, whereas Nelissen (2002) relates institutional capacity with governance and states that public administration, in addition to being democratic, must be effective and fair. Other authors have focused on identifying its scope and defining it accurately, addressing it as a key element to analyze administrative processes taking place within governments. In this regard, Kneedler, Coleman, and Ingraham (2000) established a strong connection between management capacity and the implementation of public policies; for this reason, administrative processes have an effect on how program objectives are determined.

Grindle and Hilderbrand (1995) used the term *capacity building* in connection with the tasks and processes identified as the most vulnerable areas of government agencies, those opposed to adequate governance, and proposed an analysis scheme involving human resources (micro-level), the organization (meso-level), and the economic, political, and social context (macro-level). This multi-level analysis has become widely used because it allows for the simultaneous evaluation of organizational effectiveness and institutional capacity. As pointed out by Ostrom (2010), a three-dimensional analysis reveals that decisions generated at the macro-level have repercussions on the operation and decision-making at the other two levels, whereas at the micro-level, decisions are focused on operational decision-making because these decisions, in turn, are affected by collective election rules and constitutional choice, some of which are under the control of operational decision-makers. Similarly, Geels (2004) states that the actors (human beings and organizations) responsible for the operation of sociotechnical systems operate in a

context defined by institutions (rules) that restrict, but also facilitate, the exploitation of available technical and natural resources.

Rosas, Sánchez, and Chávez (2012) point out that events in one of the levels tend to affect the other two levels, to a lesser or greater extent, and suggest that the selection of analysis variables should follow the identification of the factors affecting how the policy performs. Rosas (2008) considers both human and organizational resources, as well as the institutional context of the public sector and the economic, political, and social environment around the organization. Any evaluation must first define what is understood by institutional capacity, and then establish its parameters in terms of two subtypes or components: administrative and political. The scope of this holistic vision of institutional capacity exceeds approaches that consider only the organizational aspects; including both the administrative and political components is necessary to understand the interaction of the organization with social groups that contribute or influence policy design and implementation (Rosas, 2008).

Specifically in the context of water management, different authors have identified factors associated with capacity at all three levels of analysis. Hartvelt and Okun (1991) state that capacity building depends on institutional strength (macro-level); an accurate evaluation of the amount and quality of available water; program planning, management, and evaluation (meso-level), and human resources development (micro-level). Martínez et al. (2001) point out that low capacity is reflected by deficiencies in infrastructure planning and maintenance, underregistration of expenses, low collection levels, inefficient collection practices, and rates that fail to reflect supply costs (meso), in addition to the lack of trained personnel and uncompetitive salaries to attract management talent (micro). Alaerts and Kasperma (2009) place emphasis on human resources knowledge and development (micro) and regard the administrative (meso) and sector (macro) policy as the elements that incentivize and enhance individual capacities to improve organizational performance. Human resources training is considered an essential part of WU management since knowledge allows for the improvement of processes and provides a set of shared beliefs and expectations associated with strategic planning in an organization (Geels, 2004).

Label and Reed (2010) identify five dimensions of capacity: (i) the socio-political (macro-level), which facilitates the coordination of government agencies involved in water supply; (ii) the institutional, financial, and technical dimensions (meso-level), and (iii) the human resources dimension (micro-level), in terms of quantity and quality. At the macro-level, Loera and Salazar (2017) identify the political context and the relationships between the WUs and other governing bodies; at the meso-level, the management of legal, technological, and financial resources available to the WU, and at the micro-level, the hiring and training of human resources.

The capacity-centered approach has been used to analyze the situation of water management in different parts of the world. Mugisha (2009) describes a case in Uganda where the capacity of the national WU (National Water and Sewerage Corporation, NWSC) increased as a result of different actions: the government increased the utility's autonomy, and the utility reduced its staff, increased training activities and employee incentives, indexed rates for inflation, and improved customer service.

In 1998, the NWSC was operating at a deficit. It had a coverage of 48%, and 51% of the water was lost. After the reforms, coverage increased to 71%, water losses decreased to 23%, and a surplus was achieved in 2008. Schwartz, Nursyirwan, van Nes, and Lujendijk (2009) used the same approach to analyze problems in the Indonesian water sector, pointing out that improving the sector's capacity requires identifying the most pressing needs when designing sectoral policies, in addition to improving human resources management, which involves, among other actions, hiring the candidates with the best profiles, training specialized staff, and promoting higher education options related to hydraulic engineering and management.

Timmer, de Loë, and Kreutzwiser (2007) evaluated the capacity of local governments to protect water sources in six communities in the Annapolis Valley (Canada); they found that, despite the high-quality of the relevant human resources, communities faced important financial, technical, and institutional constraints. The method used in this Canadian study was adapted by Lebel and Reed (2010) to evaluate water supply conditions in the Montreal Lake indigenous community; they found that the main problems were the lack of communication between the government agencies responsible for water supply and the potential financial impact of water service shortages.

In Mexico, little attention has been paid to the area of drinking water management based on the institutional capacity approach. Tortajada (2001) states that several evaluations identified capacity building needs in the sector between 1992 and 2000, but this failed to translate into effective programs to address the shortfalls, which has adversely affected the efficient management of water resources. Domínguez (2010) reports that WUs in the state of Veracruz have a low planning capacity, inadequate human and financial resources, and insufficient recovery of operating costs. Loera and Salazar (2017) compared the Hermosillo and Mexicali WUs and found that Mexicali's utility performed better due to its increased management autonomy, more complete measurement coverage, diverse investment resources, and more capable staff.

## METHOD

The present study compares the institutional capacity of the Saltillo and Hermosillo's WUs, based on performance indicators; our hypothesis was that better performance is associated with higher institutional capacity. The method to evaluate institutional capacity was adapted from Lebel and Reed (2010) and Loera and Salazar (2017). The approach

used in these studies compares the degree of development in each institutional capacity dimension.<sup>6</sup> Sixteen indicators (based on the aforementioned studies) were evaluated; they are presented in Table 2, in the *Results and discussion* section. At the macro-level, we evaluated autonomy (indicators 1 and 2) and the political and institutional context of the WU (3 and 4); at the meso-level, production and consumption measurement (5 and 6), rates and collection (7 to 9), and financial administration (10 and 11); at the micro-level, manager recruitment (12 and 13), staff development (14 to 16), and relationships with the union (17). Each indicator was evaluated according to its degree of compliance: a value of 1 is assigned if the indicator is present in almost all cases, 0.5 if the indicator is only partially observed, and 0 if the indicator is deficient. Subsequently, the average score for all areas was calculated to obtain a numerical value to be used in comparing the degree of institutional capacity in each WU.

The institutional capacity levels of each WU were compared with the performance indicators of both organizations: service coverage, physical efficiency (percentage of water volume produced and billed), commercial efficiency (percentage of water volume billed and collected), and operating profit (the difference between revenues and operating costs). Users' evaluation of WU services and environmental performance were also compared. The information used in this analysis was based on a review of documents provided by both WUs; interviews with key informants; statistics from the National Water Commission (CONAGUA) and the National Institute of Statistics and Geography (INEGI), and the Indicator Program for Water Management Utilities (PIGOO) developed by the Mexican Institute of Water Technology (IMTA).

## RESULTS AND DISCUSSION

This section presents compliance for each indicator at the institutional capacity analysis levels.

Table 2. Assessment of Institutional Capacity of Saltillo and Hermosillo Water Utilities

|   | Saltillo | Hermosillo |
|---|----------|------------|
| <i>Macro</i>  |          |            |
| 1. Citizen members of governing bodies are independent of local politicians         | 1        | 0.5        |
| 2. The municipal president has no significant influence on administrative decisions | 1        | 0          |

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<sup>6</sup>There are other comparative methods, such as benchmarking, that contrast the efficiency of water utilities; however, they rely on large samples and do not allow for a detailed observation of the factors behind performance differences.

|   |      |      |
|---|------|------|
| 3. The existence of juxtaposed governments does not affect decision-making or project execution               | 0.5  | 0    |
| 4. There is a good relationship with CONAGUA and the State Water Commission                                   | 0.5  | 0.5  |
| <i>Meso</i>   |      |      |
| 5. All taps have a meter  | 1    | 0.5  |
| 6. All catchments have a meter  | 1    | 0.5  |
| 7. Rates are indexed  | 1    | 0    |
| 8. Non-payment penalties are effectively applied  | 1    | 0.5  |
| 9. Collection is not affected by political clientelism  | 1    | 0    |
| 10. Investment resources are generated in a self-sustainable manner   | 0.5  | 0    |
| 11. Capacity to meet financial obligations is present   | 1    | 0.5  |
| <i>Micro</i>  |      |      |
| 12. Hiring managers privileges experience in the sector and technical-administrative skills                   | 1    | 0.5  |
| 13. Managers remain in office for periods that allow for long-term planning                                   | 0.5  | 0    |
| 14. The number of employees is adequate   | 1    | 0.5  |
| 15. Staff receive adequate training   | 1    | 0.5  |
| 16. Salaries and benefits are competitive and encourage cooperation to achieve the company's collective goals | 1    | 0.5  |
| 17. There is a good relationship with the union   | 1    | 0    |
| <i>Average</i>  | 0.88 | 0.28 |

Source: Own elaboration.

The average rating indicates that Saltillo's WU has a higher degree of institutional capacity. We will now describe the analysis of each level, shown as the ratings in Table 2.

### *Macro-Level*

Aguas de Saltillo is governed by a shareholder's assembly; this group appoints the administrative council and the general manager. The administrative council includes the municipal president (who has the right to speak but not to vote), four municipal representatives (local businesspeople), and four representatives of the private partner Interagbar (Aguas de Saltillo, 2001). In an interview, an Aguas de Saltillo manager indicated that the municipal president's office is not involved in the utility's administrative decisions, but it needs to be provided with information and updates on the planned annual goals. Although a healthy distance from the local executive has been maintained, this does not mean that the municipal president is not involved in the definition of the company's policies. In 2012, municipal president Jericó Abramo Masso negotiated a waiver of fees associated with new connections for low-income users in exchange for an increase in rates to finance the connection subsidy.

Aguas de Saltillo is linked to the state government via the State Water and Sanitation Commission and the State Secretariat of Health, which issues water quality certificates. It also coordinates with Conagua to obtain investment resources from federal programs. Although Aguas de Saltillo's relationships with government agencies have usually been good, problems have occurred. According to an Aguas de Saltillo official, the existence of juxtaposed governments between 2014 and 2017<sup>7</sup> had a negative effect on the execution of some projects. It has also been difficult to charge certain government bodies for the service. However, these incidents have not affected the overall operation of the organism. Another flaw in the institutional context is the issue of drinking water rights, which are managed by Conagua and belong to the municipality: the rights to certain water catchments are claimed by *ejidal* users, but since such rights are undefined, the situation has led to confrontations between *ejidatarios* and Aguas de Saltillo staff (Ríos, 2017).

Agua de Hermosillo is administered by a governing assembly composed of the municipal president (who chairs the assembly), an infrastructure coordinator, a municipal treasurer, a representative of CONAGUA, a representative of the State Water Commission, the president of the advisory council, the ruling councilor of the Water Affairs Committee, a first-class councilor, and seven honorary citizens who were incorporated into the council's structure in 2011 (Hermosillo City Council, 2011).

The advisory council (whose only powers are expressing opinions and providing consultation) includes academic representatives, professional and corporate groups, and citizen associations (Hermosillo City Council, 2011). Although the regulatory framework

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<sup>7</sup>In this period, the municipality of Saltillo was governed by the Partido Acción Nacional (PAN). The state of Coahuila, on the other hand, has been uninterruptedly governed by the Partido Revolucionario Institucional (PRI) since 1929.

presents an image of plurality in the conformation of the governing bodies of Agua de Hermosillo, the influence of the municipal president is marked: five of the members are representatives of the municipal government, and although the president of the advisory council and the seven citizen spokespeople are not public employees, most of them have links with the municipal president who appointed them, and some have previously been members of the advisory council; therefore, the composition of this council has faced conflicts of interest because some of the spokespeople were also partners in the company created for the construction of the Independencia Aqueduct in 2011.<sup>8</sup>

Additionally, in practice, the municipal president has made important decisions concerning the WU. According to information provided by the TECSA representative, the central aspects of the contract were negotiated directly with the municipal president instead of the WU's director. Many positions in the WU administration are occupied by people close to the municipal president and other political actors in the municipality (Loera & Salazar, 2017); as a result, the payroll includes people who lack experience in the sector and whose efforts are oriented toward their individual political careers instead of organizational performance.

Since its conformation as a municipal organism, the relationship between the municipal and state governments has defined most of the municipality's water policy because the presence of different parties at both levels made it difficult to reach agreements concerning long-range projects. By contrast, in 2010, the municipal, state, and federal governments were headed by members of the same party (PAN), which resulted in the completion of the Independencia Aqueduct project, where the federal contribution was 50%. Currently, the relationship with the state government is mediated by the State Water Commission (CEA); this agency has operated the Independencia Aqueduct since its commissioning in 2013 and delivers drinking water to the WU.

#### *Meso-Level*

**Measurement.** Aguas de Saltillo achieved 100% micro-metering coverage in 2003, which has remained constant throughout the decade.<sup>9</sup> In addition to maintaining service coverage, the WU verifies that the meters work properly in a specialized laboratory (Armendáriz, Aguas de Saltillo, personal communication, June 28, 2019). In addition, it has access to resources to change damaged meters since the user is responsible for replacement costs in case of theft or damage to the device and the organization offers the user insurance to cover the cost of any such problem. By contrast, both micro- and macro-

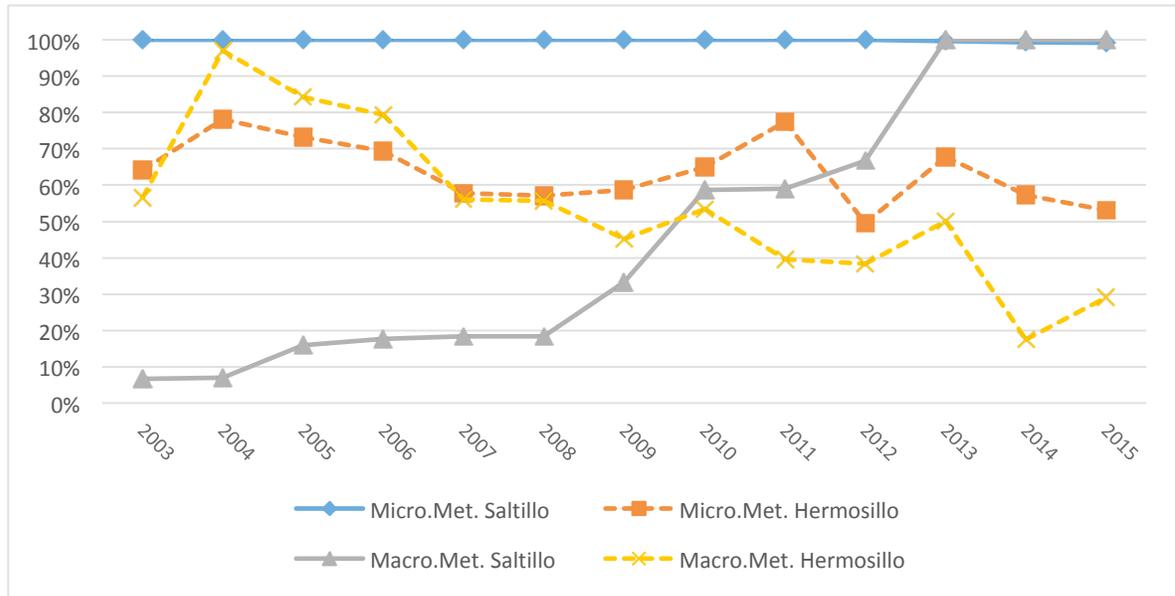
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<sup>8</sup>Marcos Gluyas and Jesús R. Sitten, shareholders in the Exploraciones Mineras del Desierto S.A. de C.V. construction company, chaired the council at different times, as well as Fernando Gutiérrez Cohen, who was a council member when the organism was under state administration.

<sup>9</sup>Information on this indicator is only available as of 2003.

metering in Agua de Hermosillo have shown a downward trend (see Figure 1), such that in 2015, only 52% of users' taps had a meter installed.

Figure 1. Micro-Metrics and Macro-Metrics 2003-2015



Source: Adapted from data disclosed by Aguas de Saltillo (2003 to 2016), CONAGUA (2009 to 2014 and 2015b), and PIGOO (n.d.).

Low micro-measurement has resulted from failures (and probably corruption) in meter installation programs. In April 2010, Agua de Hermosillo designed a plan to acquire and install 100,000 new meters throughout 2011 to cover the deficit. According to the municipal president at the time, Javier Gándara, 55,000 meters had been installed by August 2011, and an additional 20,000 were in the bidding process, which gave the impression that the company had solved the micro-metering problem by September 2012, at the end of Gándara's term in office. However, in October 2012, the new director of the organization presented a program to install 120,000 new meters at a cost of 80 million pesos. This new program implied that the meters acquired in the previous three-year period had not been installed; thus, the councilors in the opposition<sup>10</sup> expressed their doubts regarding the true use of the devices, and council member Óscar Serrato resigned from the body stating that the meters had been bought at twice their market price (Haro, Moreno, Salazar, & Loera, 2016).

**Rates.** In Saltillo, the rates must be approved by the municipal council. According to the association contract, the Saltillo water rate is indexed for monthly inflation and is updated automatically according to the National Consumer Price Index (INPC) (Congreso del Estado de Coahuila, 2009). This is the only type of increase stated by the contract, and

<sup>10</sup>PRI councilors in this case, since at that time, the mayor belonged to the PAN.

only in 2011 was a rate adjustment carried out to finance connections for low-income people (as mentioned above).

In the case of Hermosillo, the Water Law of the State of Sonora states that rates must be proposed by the WU and approved by the local congress. The WUs are not required to adjust the rates for inflation by law; they are only given a recommendation to calculate rates based on a formula factoring operating costs and the INPC (Congreso del Estado de Sonora, 2006). In 2013, the rate was increased by 47.4% due to substantial inconsistencies between the rate and the operating costs. Rates had remained at the same levels throughout 2011 and 2012, they were not adjusted for inflation, and the newly opened Independencia Aqueduct meant water supply payments to the CEA (Agua de Hermosillo, 2012).

Both agencies have preferential rates to support low-income people. In the case of Hermosillo, they are called “social rates,” whereas in Saltillo, they are known as “popular rates.” In Hermosillo, discretionary tariff management has allowed for the political use of rates. In January 2015, the head of water administration and finance in Hermosillo sought a position in local congress with the PAN. That month, she promoted the registration of users as beneficiaries of the social rate by handling flyers with her name; this action shows how managers use their positions to promote themselves politically, even if this affects the WU’s financial viability.

In Hermosillo, users of intakes without a meter were charged a flat fee based on estimated consumption; the amounts to be paid for this unregulated volume is left to the discretion of the utility. This creates problems because water savings are discouraged by allowing the user to consume any amount without having to cover the actual cost of the supply.

**Collection.** The legal frameworks of both WUs allow penalties to be applied to defaulting users. In Saltillo, the Water Law for the Municipalities of Coahuila establishes limited service in case of payment arrears for two months and complete suspension if the arrears are not paid by the third month. The only cases in which the service is never suspended are health service buildings or due to public health or safety reasons. Service suspension is applied even to the utility’s management staff, and despite that payment defaulting has decreased among public sector organizations, there are still some who fail to cover their payments on time.

The Hermosillo Water Law allows the utility to suspend the service in the event of non-payment: service can be suspended to users with more than two monthly payments due. However, the suspension of services is applied on a discretionary basis; members of the organization known as the “*Unión de Usuarios*” can avoid the suspension even if they are defaulters due to political pressure from the union.<sup>11</sup> Moreover, the Users Union is not the

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<sup>11</sup>The Users Union is a clientele-based organization that negotiates discounts and writing-offs with Agua de Hermosillo. To obtain these benefits, people who join the union can

only way to obtain discounts and writing-offs, they can also be arranged directly with the WU since one of the directors personally handled such requests. As opposed to the state of Coahuila, the Sonora Water Law does not provide for exemptions in the case of healthcare buildings or due to health-related arguments, although, in practice, no cuts are applied to these types of properties.

**Financial Administration.** In Aguas de Saltillo, infrastructure investments totaling 373 million pesos were carried out from 2009 to 2015, averaging 53.3 million per year. Of this total, 62% was taken from the WA's resources, and the rest was obtained from federal programs (Aguas de Saltillo, 2009-2015). Aguas de Saltillo has never resorted to indebtedness to finance investment because acquiring debt requires authorization from the municipal council, which according to WU executives, is extremely difficult to obtain. In Agua de Hermosillo, Infrastructure investments totaling 1 229 million pesos were made from 2009 to 2015, which represents an average of 161 million pesos per year. Of this amount, Agua de Hermosillo used its own resources only in 2011 (1.39 million), 2014 (54.8 million), and 2015 (59.69), for a total of 115.9 million, that is, around 10% of the investment during the period. The rest of the investment came from federal resources (48%), state resources (18%), and debt (24%) (CONAGUA, 2009, 2010, 2011, 2012, 2013, 2014, 2015b).

In 2015, Fitch Ratings granted a credit quality rating of BBB to Agua de Hermosillo because the financial corporation considered that the utility depended to a great extent on the support of the municipal government (rated A+) to stay afloat. Although Aguas de Saltillo is not rated by Fitch, the municipality of Saltillo has an AA rating, and the opinion indicates that the utility's self-sufficiency has a positive influence on the municipality's rating because the municipality does not need to provide the utility with financial support (Fitch Ratings, 2017).

#### *Micro-Level*

**Appointment of managers.** In Saltillo, the general manager is proposed by private shareholders, and the appointment is approved by the shareholders' assembly. The general managers of Aguas de Saltillo have a background working at other organizations part of the SUEZ Corporation<sup>12</sup> around the world. There were four managers in the period between 2001 and 2014; they averaged 3.25 years in the position. In Hermosillo, the director is appointed by the organization's governing assembly; however, given the influence of the position on the assembly, in practice, it is the municipal president who decides on the appointment. Therefore, the profile of those who have served as the WU's director has varied considerably depending on the municipal president in office. The

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choose to pay a fixed fee (considerably lower than the regular water bill) or actively participate in the organization's mobilizations.

<sup>12</sup>SUEZ acquired Aguas de Barcelona in 2018.

position has been covered by people boasting a long career in the sector as much as by people lacking any experience in water management but who have a political or personal relationship with the municipal president. Moreover, according to regulations, the governing assembly appoints area directors, which has allowed mayors to install their friends and relatives in these positions. Seven directors ran the organization from 2002 to 2015; that is, an average duration of only 1.85 years, or nearly half the average in Saltillo. This situation makes long-term planning virtually impossible.

**Staff development.** Human resources management requires a sufficient number of trained and well-motivated employees. The number of employees per thousand taps in both organizations has shown a decreasing trend from 2003 to 2012. In Hermosillo, it decreased from 4.4 in 2003 to 3.43 in 2012, while in Saltillo it decreased from 2.5 to 1.8 in the same period. In absolute terms, Agua de Hermosillo operated with nearly 829 employees in 2012, whereas Aguas de Saltillo employed only 377 people. Hermosillo uses almost twice as many employees to supply water to a city of almost the same size as Saltillo, which significantly affects operating costs and reveals staff management shortfalls.

One of the reasons why Saltillo has a more productive workforce is the increased training it provides to its staff. In Hermosillo, 9.77 hours of training per employee per year were delivered from 2013 to 2015. Of these, 4.38 hours dealt with administrative matters, 4.63 with personal development, and only 0.76 hours with technical issues. In Saltillo, the number of training hours per employee per year was 21.5 during the same period. Of these, 8.89 hours covered administrative matters, 5.69 personal development, and 7 hours were dedicated to technical issues. Thus, employees in the Saltillo utility are provided more than twice the number of training hours as in the Hermosillo utility, and training is much more focused on technical courses—more than nine times as much.

Concerning compensations, the Aguas de Saltillo general manager's salary was 126,427 pesos per month, whereas in Aguas de Hermosillo, the general director's salary was 75,617 pesos. That is, the salary of the Saltillo's WU manager is slightly less than twice that of Hermosillo's WU, which represents an incentive to attract highly qualified personnel to the position. With respect to the rest of the employees, personal services per employee are 230,000 pesos per year in Saltillo and 270,000 in Hermosillo; thus, incentives are more significant in Hermosillo. In both cases, these compensations are higher than the average annual remuneration in either municipality (INEGI, 2014). In addition, profit sharing is a benefit available to Saltillo employees, which creates an additional incentive to improve the collective performance of the organization.

**Relationship with the union.** Strikes have been a recurrent event in Hermosillo. Although strikes have never resulted in the interruption of operations (Jara, 2008), they have created a confrontational environment within the utility that has adverse effects on the development of its activities. TECSA's taking over of the commercial area in 2011

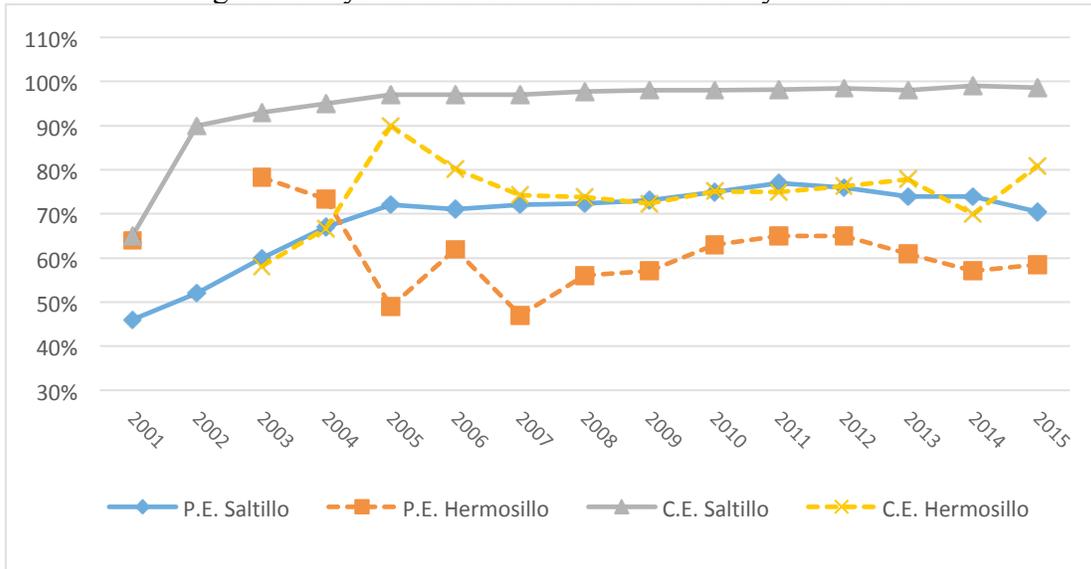
resulted in friction with the union, which demanded the cancellation of the contract with the company. The director of TECSA indicated that union workers refused to cooperate while the company operated in Agua de Hermosillo. They failed to carry out instructions given by the consulting firm’s staff; therefore, orders were relayed to them via utility staff.

No strikes have taken place during the Aguas de Saltillo period; a demonstration was organized in 2005 by around 80 workers who complained about overtime not being paid (Ramos, 2005). Beyond this event, the relationship with the union has been harmonious. A study found no differences between the opinions of unionized and non-unionized employees with respect to the organizational principles adopted by the company (Aguilar Benítez, Castro, & Martínez, 2009), which facilitates the implementation of activities and programs into the body. Additionally, Aguas de Saltillo evaluates work environment internally and has attained workplace-related certifications, for instance, OHSAS 18001: 2007 (Occupational Health and Safety Management Systems), Gender Equity Certificate, and Family-Responsible Company Certificate.

*Comparing Performance*

The coverage of drinking water services is high in both cities (98% in Hermosillo and 99% in Saltillo). In Hermosillo, the supply is available 24 hours a day, 7 days a week. Rationing (8-hour per day supply) has been applied a few times. In Saltillo, only 10% of users reported continuous service seven days a week in 2001, whereas in 2015, the indicator increased to 74% (Aguas de Saltillo, 2016).

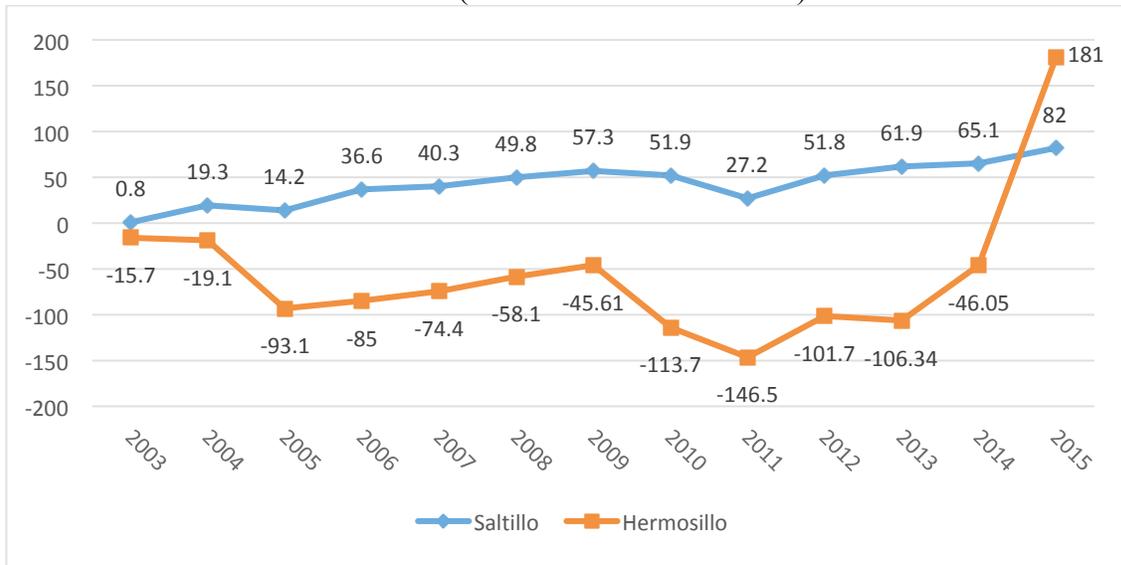
Figure 2. Physical and Commercial Efficiency 2003-2015



Source: Prepared by the author using data from PIGOO (n.d.), Aguas de Saltillo (2003 to 2016), and Conagua (2001-2002).

Aguas de Saltillo has operated at a surplus since 2003 and has increased its operating profit margins over the years. On the other hand, Agua de Hermosillo has had problems to cover its operating costs, which is why the municipal government has had to provide resources for its viability, and only after the 47% increase in rates in 2013 did it begin operating at a financial surplus.

Figure 3. Operating Profits of Water Utilities in Hermosillo and Saltillo (Millions of Current Pesos)



Source: Adapted from data disclosed by Conagua (2009 to 2014), Fitch Ratings (2009, 2011, 2016) (for Hermosillo), and Aguas de Saltillo (2003-2016).

The increased efficiency of the Saltillo utility has helped to mitigate the pressure on groundwater sources. The utility has also put in place a reforestation project in the Zapalinamé mountains financed by voluntary contributions from users, which is intended to conserve the water catchment located in the area (Aguas de Saltillo, 2015). In Hermosillo, the overexploitation of underground sources has resulted in decreased levels of groundwater recovery, which was used as a justification for the construction of the Independencia Aqueduct (CEA & SCALE, 2010). However, unlike the case of Saltillo, Hermosillo lacks a program for the conservation of catchment areas.

**User evaluation.** The National Survey on Government Quality and Government Impact (INEGI, 2015b) indicates that the percentage of users who are satisfied with their drinking water services is higher in Saltillo than in Hermosillo (55.9% vs. 38.7%). Similarly, in Saltillo, users gave their WU a score of 7.7, compared to a score of 6.8 in Hermosillo. According to the National Survey on Urban Safety (INEGI, 2016), water leaks and issues with the supply of drinking water were among the main problems for 69.8% of people over 18 years of age in Hermosillo in December 2016, and the figure increased to 81.5% in December 2018 (INEGI, 2018). For its part, in Saltillo, the figure was only 29.3% in 2016 (INEGI, 2016) and remained practically unchanged (30.1%) by December 2018

(INEGI, 2018). In general, the management of drinking water services in Saltillo has shown a positive evolution towards greater efficiency, economic and environmental sustainability, and a positive perception of these services among the citizenry—this evolution is consistent with the higher institutional capacity observed in the Saltillo utility.

## CONCLUSIONS

In the first years of the twenty-first century, drinking water services in the municipalities of Saltillo and Hermosillo were reorganized as two different types of entities: a private-public joint venture in Saltillo and a public municipal enterprise in Hermosillo. Despite the similarities between these two municipalities, the results obtained by their respective WUs have been very different. A comparison of their characteristics allows for the identification of the differences in institutional capacity behind the observed performance.

At the macro-level, Aguas de Saltillo's management is more autonomous than Agua de Hermosillo's. Although Saltillo's municipal president is involved in important decisions of political relevance, the organizational environment allows for the negotiation of solutions with the WU based on association and technical assistance contracts, which on the one hand, define the obligations of the private partner and, on the other hand, reduce political discretion in decision-making. By contrast, in Hermosillo, the mayor's involvement is conspicuous. This office appoints positions and determines WU's policies, and the institutional configuration leaves more room for the executive head to discretionally introduce criteria opposed to the correct administration of water in the organization's decision-making process.

At the meso-level, the differences in consumption measurement are also noteworthy. Whereas practically all consumption is measured in Saltillo, a measurement deficit prevails in Hermosillo, aggravated by alleged corrupt practices associated with the purchase of new meters. The discretionary management of the rates in Hermosillo contrasts with the diligent indexation carried out in Saltillo; this, in addition to the clientele practices that plague the collection of bills, have prevented Agua de Hermosillo from using its own resources to invest in infrastructure for a long time and rendered the utility dependent on federal programs and transfers from local governments in order to operate.

At the micro-level, the Hermosillo utility is characterized by having privileged proximity to the mayor over managerial skills in the appointment of company management, in contrast with Saltillo, where highly experienced staff with an international background have been hired and paid generous compensations. Fewer employees work in Saltillo, but they are provided much more training than their peers in Hermosillo; this is reflected by the former's higher productivity.

Overall, the characteristics observed in the three levels indicate that Aguas de Saltillo has achieved a higher institutional capacity development, which has resulted in higher

efficiency indicators than those obtained by Agua de Hermosillo. These features allow for higher sustainability, both economic and environmental. From an economic perspective, the Saltillo utility has achieved a surplus of operating profits that have resulted in investments and even the payment of dividends to the municipality.

By contrast, Agua de Hermosillo showed low levels of efficiency during the analyzed period, which affected its financial and environmental sustainability because it has required significant amounts of government resources and water transfers from an additional basin to sustain its operation. Agua de Hermosillo tried to correct some of its shortcomings by contracting a private company (TECSA) to manage its commercial area; however, this action resulted in friction with the union and, eventually, the early termination of the contract.

In general, the management scheme adopted by Aguas de Saltillo has allowed the utility to increase and maintain its institutional capacity, which in turn has resulted in increased operating efficiency and financial sustainability. The joint venture scheme allows for the implementation of private company management practices that improve efficiency but, at the same time, reflect the public interest, represented by the municipal government.

The comparative analysis suggests that Agua de Hermosillo needs to strengthen its institutional capacity at all three levels, especially in the areas of management autonomy, measurement and collection coverage, and employee training. It should be noted that the management practices implemented by the private partner in Saltillo have also been used by other utilities, even if they are not of a public-private nature, such as in the cases of León, Guanajuato (Herrera, 2017), or Mexicali, Baja California (Loera & Salazar, 2017).

The analysis of institutional capacities can help to identify areas of opportunity to improve the drinking water supply in the country; therefore, more studies on this topic should be carried out with the purpose of comparing different organizational schemes. The identification of the most important factors in the management of WUs would allow for the direction of sector policies toward the strengthening of these areas. Among the limitations of the approach used in the present study are that the multiple-level approach results in a certain loss of analysis depth and that the results of peer comparison studies cannot be generalized to the overall population. Therefore, future studies should be focused on a single level of analysis, and the approach should be applied to larger samples so that findings can be generalized.

Translator: Miguel Ángel Ríos Flores

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