

Trajectory of public private associations. Case: wastewater treatment plant "Agua Prieta" - Jalisco

Trayectoria de las asociaciones público privadas. Caso: planta de tratamiento de aguas residuales "Agua Prieta" – Jalisco

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Abstract

Objectives: Public-private associations (PPPs), for the government sector, an opportunity to take advantage of the experience and efficiency of the private sector to improve the representation of services and develop the necessary infrastructures for economic and social development. PPPs generally involve large-scale projects, but unfortunately some sectors, such as water management, exclude the opinion of experts, giving rise to monopolies that greatly benefit the private sector, even excluding them from responsibilities by not fully resolving the problem for which they were created. contracted, the costs being absorbed by the public sector. Methodology: Confirming the success of PPP participation in works still in operation is premature, but an analysis of the current results is made, taking as a case study, the "Agua Prieta" Wastewater Treatment Plant (PTAR). Contribution: The results show that the collaboration of community groups in carrying out a participatory diagnosis and having follow-up and evaluation mechanisms to monitor the performance of the private partner, are actions that further improve the chances of success of the project; On the other hand, competition and the adequate selection of private partners represent the biggest failure factor in the implementation of PPPs.

Administration of Public Resources, Institutional and regulatory framework, wastewater treatment

Resumen

Objetivos: Las asociaciones público-privadas (APP) representan, para el sector gubernamental, una oportunidad para aprovechar la experiencia y la eficiencia del sector privado para mejorar la prestación de servicios y desarrollar las infraestructuras necesarias para el desarrollo económico y social. Las APP generalmente involucran proyectos de gran envergadura, pero desafortunadamente algunos sectores como la gestión del agua, excluyen la opinión de expertos, gestándose monopolios que benefician ampliamente al sector privado, incluso excluyéndolos de responsabilidades al no resolver en su totalidad la problemática por la que fueron contratados, siendo absorbidos los costos por el sector público. Metodología: Confirmar el éxito de la participación de las APP en obras aun en operación es prematuro, pero se hace un análisis de los resultados actuales, tomando como caso de estudio, la Planta de Tratamiento de Aguas Residuales (PTAR) de "Agua Prieta". Contribución: Los resultados evidencian que la colaboración de los grupos comunitarios en la realización de un diagnóstico participativo y contar con mecanismos de seguimiento y evaluación para monitorear el desempeño del socio privado, son acciones que mejoran en mayor medida las probabilidades de éxito del proyecto; por otra parte, la competencia y la selección adecuada de los socios privados representa el mayor factor de fracaso en la implementación de APP.

Administración de Recursos Públicos, Marco institucional y regulatorio, saneamiento de aguas residuales

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Introduction

The drive for infrastructure development in a country is aimed at activating the domestic economy and projecting new investment expectations from foreign capital. The financial crisis of governments has led to budget cuts, which has motivated the implementation of new approaches to public services with the participation of the private sector. This has led to infrastructure projects in the transport sector; however, other areas of the economy, due to increased demand, such as healthcare, have pushed for the introduction of private sector participation to manage the delivery of these services (Acerete, Gasca, Stafford, & Stapleton, 2015).

The Programme for the Promotion of PPPs in Mexican States (PIAPPEM) clarifies that PPPs do not necessarily focus on the construction and financing of new infrastructure but can include in the same contract the operation/provision of a public service. In this sense, the use of this type of scheme, according to the same PIAPPEM, is used in Mexico for the development of projects in sectors such as roads, health, education, infrastructure, water sanitation, among others (Rebollo Fuente, 2009).

With regard to risk sharing, this is another characteristic of this contractual relationship, where both sectors take part in the event of a claim. Regarding risk-taking, Sresakoolchai and Kaewunruen (2020) consider that one of the most positive aspects of adopting PPPs is the appropriate allocation of risks in order to optimise the benefits for PPPs.

Acerete Gil (2003), for his part, comments that PPPs "bring together a series of structures and concepts that involve collaboration between the public and private sectors in the design and implementation of infrastructure projects and public facilities, for the sharing of risks and responsibilities", since according to De la Fuente (2008), the objectives of PPPs are to address investments in infrastructure and generate profitable businesses, where the interests of the parties combine to achieve their objectives, as well as to supply and guarantee public goods and services.

In this way, it can be seen that the changes and the international vision registered in the 1990s for PPPs, is handled as an innovative strategy, where this interaction between the public private sector is not new and that until 1970 there was no presence of PPPs among international organisations and relations were few between donors and national governments directly (Almeida, 2017). By 1969, the term was coined in the Pearson Commission Report "Partners in Development: Report of the Commission on International Development".

The momentum of PPPs was boosted by the economic crisis of the mid-1970s; to alleviate it, international organisations such as the World Bank (WB) and the International Monetary Fund (IMF) promoted changes in economic structures and public policies. In addition, the increase in poverty and social inequalities in the world strengthened PPPs in the late 1980s and early 1990s, finding a relationship with international development aid and cooperation.

Although there are those who are against this financing scheme due to the results, political management and interests, among other questions, Moore (2006) finds that there is an increase in trust towards the private sector to improve living conditions, economic and technological development within a society, thus assuming a social responsibility.

From this government-private contractual relationship, it should be noted that PPPs serve as a legal tool that regulates the financing of investments from the private sector, and are intended to promote infrastructure to provide public services. Both sectors have different objectives: the public sector guarantees social welfare, public services through infrastructure works, among others, while the private sector generates income for the capital invested, guaranteeing the results agreed in contracts of this alliance. A specific time is stipulated, generally in the long term, to carry out its objectives with the fulfilment of a task, work, improvement, activity, acceptance of specific risks, surveillance, etc., all aspects regulated by the law that each country applies in the matter.

Currently in Mexico there is a lack of information and open access on issues related to impact monitoring and evaluation, application of penalties in response to untimely response and objectives not achieved by the investor, in works under this financing scheme. In countries such as Mexico, this issue is relatively new and is regulated by their respective Public-Private Partnerships Law, both in force since January 2012; in practice, there are different implementation models, from the construction, modernisation, maintenance, conservation and operation of infrastructure works, aspects linked to the development and growth of these Latin American countries.

The objective of this article is to describe the trajectory that PPPs have had internationally and their development in Mexico, through the analysis of governance in water sanitation in the Metropolitan Area of Guadalajara (AMG) with a case study of the Wastewater Treatment Plant (WWTP) of "Agua Prieta", in order to assess the performance obtained so far with respect to the expected results in the social and environmental sphere, through a review of specialised literature, information from public entities with open access and interviews with key actors.

Concepts of Public-Private Partnerships

The figure of PPPs has crossed borders, as they are currently enjoying acceptance and growth in different countries. The interest of governments, organisations, corporations, transnationals, among other actors, in attending to the welfare of humanity has become relevant in the decisions and regulations on the public function of each country.

Korab-Karpowicz (2020) mentions that for several years, PPPs have been handled internally as a government instrument to operate, but nowadays the intervention of actors as a nation-state takes different actions in the face of the generation of new international relations. The strength of PPPs as a partnership for international relations helps to solve governance problems beyond nation-state actors, leading to the acceptance of more democratic and accountable global governance.

The evolution of the model also generates new concepts that define the relationship. The fact that a new actor or third sector intervenes within a state structure to meet the same need gives rise to the term "Third Way". Patiño (2016) comments that the presence of a new institutional structure, including private parties with the intention of fulfilling the same objectives and activities as the public sector, generates a characteristic feature of this new alliance. The different schemes between the public and private sectors seek first and foremost to achieve an "optimal contract", where the private sector guarantees and ensures maximum efficiency through its experience and knowledge to guarantee social welfare (Barreto Nieto, 2011).

The World Bank Reference Guide (2014) details that the functions that are the responsibility of private parties may vary, and will depend on the type of good and service involved. Among others, contract types include functions such as design, concerning the development of the project from its original concept and requirements to the design specifications of the completed construction. PPPs relating to construction or rehabilitation are developed to create infrastructure that requires private parties to build and equip it. On the other hand, where PPPs involve existing assets, the private party would be responsible for rehabilitating or extending the asset. As for maintenance, PPPs assign maintenance responsibilities to the private party for the duration of the contract. In terms of financing, a PPP that includes the construction or rehabilitation of the asset requires private initiative to partially or fully finance the capital needed for the works. And with respect to the operation, the private party's responsibility may vary depending on the nature of the asset or service in question, whether it is providing technical support and providing a service to the government. In addition to the technical operation of the asset, the private party may provide services directly to the user, as in the case of public lighting and the water distribution system in several entities of the country.

Table 1 is presented below to illustrate different concepts addressed by different authors when referring to PPPs.

Concept	Source
"PPP is a mechanism by which the public sector (government or other state organisations) uses the capacities of private sectors (including cooperatives, private, charitable, non-governmental organisations (NGOs, etc.) such as knowledge, expertise and financial sources to provide infrastructure services (water and wastewater system, transport system, health system, education system, etc.). The private sector, on behalf of the government, plays the service delivery role."	Azami-Aghdash, Sadeghi-Bazargani, Saadati, Mohseni & Gharaee (2020)
"The concept of a PPP refers to a long-term agreement between public and private entities that allows the private sector to provide public services".	(Engel et al., 2014) citado por Liu y Xiongzhi (2019)
"Public-private partnerships can be defined as "the formation of cooperative relationships between government, for-profit businesses and private non-profit organisations to fulfil a policy function".	(Linder y Vaillancourt Rosenau, 2000, p.5) citado por Korab-Karpowicz (2020)
"They are voluntary arrangements between state and non-state actors, are based on a set of norms and rules, and involve the formulation of policy and the delivery of public goods, which distinguishes them from occasional public-private interactions or lobbying.	(Streck, 2002) Citado por Bjärsting (2017).
"Through PPPs, the state can take advantage of the private sector's capacities (financial, technological, administrative) to generate goods and services. Thus, in recent years there has been a trend that reflects a greater interaction between public and private actors to carry out tasks and activities in science and technology".	(Cimoli, 2000) citado por Navarro Arredondo (2013).
"A PPP is an agency relationship in which the government serves as the principal, and the private investor is commissioned to design, execute and manage a long-term investment project, transferring responsibility for the delivery of public goods or services, linking the return and utility of the investment to the sustained, high quality performance of the project".	Polack, Martínez Silva & Ramírez Chaparro (2019).
"The PPP is a form of public service provision that operates by agreement between the public sector and the private sector, whether it is a private or state initiative. Through this modality, part of the services, the implementation and management of which are originally the responsibility of the public sector, are handed over to a private entity for their provision".	Gallo Aponte, Fácio, Rodelo, Brito Jaime & Abcaris Racines (2018).

Table 1 Concepts Public-Private Partnerships

Source: Own elaboration, based on the above-mentioned authors

Background

As investment models, PPPs originated in 1992 in the United Kingdom; their purpose was to promote the participation of private capital in public sector projects, to develop infrastructure works for sanitation and health services that could not be financed by the sector (Vasallo Magro and Izquierda de Bartolomé, 2010).

For its part, Spain had already developed the figure of concession, today known as PPP, before the United Kingdom implemented it. In this sense, the concession as a legal figure is "the most common contractual manifestation of PPPs in Spain and in other countries with an administrative tradition" (Rebollo, 2009). In addition, in their evolution, PPPs went through "a process developed worldwide as a result of the crisis of the State since the seventies of the last century" (Sada Correa and Sada Correa, 2014), registering a boom at the beginning of the millennium in countries such as Germany, Portugal, Korea and Australia, among others.

The history of PPPs can even be traced back to European countries, where private investment in public infrastructure was already being generated in the 18th century. As a reference, one can mention the concession contract for the supply of drinking water in Paris, the Suez Canal and the Trans-Siberian Railway, already in the 19th century.

Tang, Shen and Cheng (2010) relate three generations as antecedents in the evolution of the model: presence of errors due to lack of experience for both sectors; large companies develop specialised projects in the urban sector, generally hiring PPP project managers who worked for public entities; and finally, in this third generation, social development emerges.

However, for other authors such as Warshawsky (2016), PPPs have been present in one form or another for many centuries, and have gained momentum in the 1990s and 2000s as an alternative or third way of partnership with the aim of changing welfare: private sector participation is sought in the development of projects, mainly in public service.

Internationally, the UK, as mentioned above, has extensive experience in PPPs. Acerete, Shaoul, Stafford and Stapleton (2010) highlight this nation as a global player in the field, where it has implemented the management of different financing schemes involving the private sector, including the construction of crossings and roads, and subsequently the expansion and maintenance of roads (Design, Build, Finance and Operate - DBFO).

In Spain, Acerete, Stafford and Stapleton (2011) record as a precedent the financing of a hospital with a PPP structure in operation for more than 10 years, carried out solely under this model, where the initial contract was never financially viable (it was very costly for the government) and a second contract improved its viability due to the financial benefits. In the financial sector, on the other hand, the authors highlight that regional non-profit savings banks are socially obliged to invest in the region for their communities.

Background in Mexico

As mentioned above, PPPs are an alternative financial strategy to boost Mexico's economic development through infrastructure development, mainly in the road construction sector.

However, failed results, deficiencies, lack of involvement of society, corruption and the search for profitability, regardless of quality and social benefit on the part of the private sector, have generated a strong controversy for this investment scheme between the public and private sectors (Lozano Montero, Godínez López and Albor Guzmán, 2017). The little regulation of PPPs in Mexico, according to Érick Díaz, generated great benefits "only for the private sector". He adds that there is little literature in Mexico because it is a relatively new topic, but other countries in the 1950s and 1990s developed the concessions that have been part of PPPs since the 19th century, and have been adapting to legal changes.

Prior to the legal recognition of PPPs in Mexico, three participation models or mechanisms can be distinguished as antecedents to PPPs: Productive Investment Projects with Deferred Registration in Public Expenditure (PIDIREGAS), Projects for the Provision of Services (SPSS) and Concession Schemes (Rojas de Paz and Delgadillo Díaz, 2017).

The creation of the Public-Private Partnerships Law came to regulate the implementation of this model in the country; its main objective is to regulate contractual relations between the public and private sector to achieve a social purpose. Thus, Article 2 of this legislation considers that "public-private partnership projects must be fully justified, specify the social benefit sought and demonstrate their financial advantage over other forms of financing".

This law clarifies that long-term contracts must not exceed 40 years of concession, including term extensions, and in the case of contracts that exceed this period, they must be approved by law (articles 87 and 98).

In addition, articles 14, 21, 25, 38 and 59 of this legislation set out the institutional framework, contracting mechanisms, required studies, approval procedures, PPP registration, fiscal management and other issues that make up the country's public-private partnership policy.

This legislation and its regulations set out the institutional responsibilities for conducting a PPP tendering process, and describe the process for evaluating the bids received and selecting the winning bidder.

The Centro de Estudios de las Finanzas Públicas (CEFP) (2016), as a technical collaborating body in legislative matters of Public Finance and Economy, integrates extensive information on the subject, from the background of PPPs, their trajectory, projects, legal framework, modalities, cases, among others.

The description of the background and the most relevant aspects registered in Mexico on the subject are included in Table 2.

Project	Background	Contract	Conditions
Productive Infrastructure Investment Projects - PIDIREGAS	Deferred Registration for Public Expenditure. Born in 1995 as a reform in response to the economic crisis of December 1994, scarce public resources and the development of infrastructure projects for PEMEX and CFE.	Procurement through international competitive bidding.	Commitment to build the projects with own resources or markets. With the start of income generation once the projects were completed, the obligation would be paid.
Concessions	Emerging after PIDIREGAS in the early 1990s. Aimed at road works projects and service provision. Given the economic crisis of 1994, terms of less than 10 years, increasing tariffs and decreasing demand, it was concluded that the projects were not profitable.	Road concession programme (52 concessions) to develop new roads - 5 thousand kilometres	50% bank loans 20% public subsidies 30% concessionary company
New Concession Scheme	The SCT and Banobras reorganise the previous scheme. Participation of state, federal and private resources. Maximum term of 30 years to keep the concession.	Public tender	Toll collection, rates regulated by the SCT. Concessionaires are responsible for cost overruns.

Table 2. Background on the legal framework and first PPP projects in Mexico.

Source: Own elaboration with data from CEFPE, (2016)

López Toache, Amado and Martínez de Ita (2018) mention that PPPs in Mexico have been favoured by the economic reforms of the 1980s to the present day, taking on greater momentum and momentum to materialise as new privatisation structures in the 21st century that undermine the public sector.

In this sense, Espejel Espinoza and Díaz Sandoval (2015) argue that the reform on PPPs in criminal matters is worrying, because private parties go from being simple contractors to administrators for twenty to thirty years - subject to renewal - responsible for the construction, maintenance and/or management of prisons. With this, they point out, the government commits itself to pay year by year for the use of the facilities and services, but if the private sector does not fulfil its obligations and commitments, the loss will be absorbed by the nation and the private companies involved will not be called to account.

Background of PPPs in Wastewater Treatment Plants in Mexico

Public-Private Partnerships (PPPs) in Mexico have emerged as a strategic tool to encourage investment and the development of infrastructure projects. These partnerships are based on the collaboration between the public and private sectors to carry out projects of public interest, seeking to combine the resources and capacities of both parties to achieve more efficient results. In the PPP approach, a private company is responsible for the financing, construction, operation and maintenance of the facilities, according to agreed quality, service or other standards (Engel, Fischer and Galetovic, 2014).

The development of PPPs in Mexico has had ups and downs over the years. At the federal level, PPP projects in Mexico had their beginnings in the context of major reforms of liberalisation and privatisation of Mexican markets. They can be considered to have started in the late 1990s and early 2000s, as it was during this period that Mexico began to implement the PPP model as a tool to promote private investment in public infrastructure projects. However, it was not until 2012 when the Public-Private Partnerships Law was enacted, which established the legal framework and guidelines for the implementation of PPPs in the country. (Sada Correa and Sada Correa, 2014).

During the first years of implementation, several projects were carried out in sectors such as roads, airports, ports, telecommunications and energy. The federal and state governments started to use PPPs as a tool to boost the modernisation and development of infrastructure in the country. (López Toache and Chavez Maza, 2020).

Some examples of projects developed under the PPP scheme can be seen in Table 3.

Project	*Year	Description
Cancun International Airport	1989	During this period, a PPP was carried out for the construction and operation of Cancun International Airport, one of Mexico's main tourist destinations.
Mexico-Toluca Highway	1994	A PPP was established for the construction and operation of the Mexico-Toluca highway, an important communication route between Mexico City and the city of Toluca.
Container Terminal of the Port of Manzanillo	1994	A PPP was implemented for the construction and operation of the Container Terminal at the Port of Manzanillo, one of Mexico's most important ports for international trade.
Mexico-Puebla highway	1995	This PPP was in charge of the construction and operation of the Mexico-Puebla highway, one of the country's main highways connecting Mexico City to the city of Puebla.
* Year of implementation		

Table 3 Main pioneering projects developed with the Public-Private Partnership model.

Source: Own adaptation. Ministry of Communications and Transport (SCT) (1996) (1997). Airport and Auxiliary Services (2016)

On the issue of water sanitation in Mexico, PPPs have played an important role. These partnerships have allowed the implementation of infrastructure projects and services to improve water management, wastewater treatment and drinking water supply in different regions of the country.

One of the flagship projects in the field of water sanitation is the PTAR Atotonilco. This PPP was established for the construction and operation of a wastewater treatment plant located in the state of Hidalgo. The plant, inaugurated in 2015, is considered one of the largest in Latin America and has the capacity to treat wastewater from various sources to reduce pollution and improve water quality in the region (Rodríguez, Molina, del Cuvillo Martínez-Ridruejo and Bozzano, 2014).

In the state of Guanajuato, a PPP was carried out for the construction of the Salamanca WWTP. This initiative aimed to improve water management and reduce pollution in the city. The treatment plant, inaugurated in 2017, allows for the proper treatment of wastewater before it is released into the environment (Pantoja-Espinoza, Proal-Nájera, García-Roig, Cháirez-Hernández and Osorio-Revilla, 2015).

In terms of drinking water supply, the city of Puerto Vallarta in the state of Jalisco has experienced significant improvements thanks to a PPP that was established to improve the drinking water supply and sanitation system in the city. Through the expansion and improvement of existing infrastructure, it has been able to provide a more reliable supply of drinking water to the community (Sistema de Agua Potable y Alcantarillado de Puerto Vallarta, 2020).

In recent years, Mexico has experienced a significant increase in the use of PPPs as a mechanism to drive the development of key infrastructure. According to a World Bank report (2019), Mexico is among the Latin American countries with the largest number of PPP projects underway, covering various sectors such as transport, energy, water and sanitation, health, among others.

One of the main benefits of PPPs lies in the ability to attract private investment for projects that otherwise might not have the necessary resources for their implementation. The participation of the private sector makes it possible to diversify the sources of financing and transfer part of the risk to the investor, which reduces the fiscal burden on the government and allows resources to be allocated to other priority sectors.

In addition to investment, PPPs can also generate efficiencies in project management and operation. The experience and expertise of the private sector can improve the quality of services and the timely delivery of projects. In addition, competition among private participants can foster innovation and cost reduction, generating benefits for both government and end-users.

However, it is important to mention that PPPs also pose challenges and risks. These include appropriate project selection, equitable allocation of risks and benefits between parties, transparency in tendering and contracting processes, and protection of public interests. Clear regulatory frameworks and effective oversight mechanisms are essential to ensure the long-term success and sustainability of PPPs. In Mexico, there are institutions in charge of promoting and regulating PPPs, such as the Ministry of Finance and Public Credit (SHCP) and the Investment Unit of the Ministry of Economy (UISE). These entities are in charge of establishing guidelines and criteria for the implementation of PPPs, as well as evaluating and monitoring ongoing projects.

Despite the potential benefits of PPPs, there are also challenges and criticisms associated with their implementation in Mexico. Some authors (Bracey and Moldovan, 2006; Sanger and Crawley, 2014; Sandoval Ballesteros, 2016) argue that PPPs can lead to further privatisation of public services and generate imbalances in the distribution of benefits. The need for greater transparency and accountability in the process of private partner selection and project management has also been pointed out.

To address these concerns, the Mexican government has implemented measures to strengthen the regulatory framework for PPPs and ensure greater transparency. For example, clear rules have been established for the tendering of projects and mechanisms for monitoring and evaluation of partnerships have been improved.

Involvement of PPPs in Infrastructure Works for WWTPs in the AMG

In Jalisco, the authorities in charge of water issues and hydraulic works are at the federal level the National Water Commission (CONAGUA), at the state level the Jalisco State Water Commission (CEA) and at the municipal level in the AMG the Intermunicipal System of Drinking Water and Sewerage Services (SIAPA) (Flores Elizondo, 2016) (Flores Elizondo, 2016).

According to the 2010 CONAGUA report, Jalisco treats only 3,493.5 litres per second out of a total of 14,144 litres per second, registering a critical situation, as only 24.7% is treated (Villanueva and López, 2014). The wastewater treatment plants for the sanitation of wastewater out of operation in this regard Anda Sánchez (2017) comments that in 2013 in the state of Jalisco there were 273 WWTPs in different municipalities, where 50% were not operating (22 abandoned and 63 about to be decommissioned), due to the high costs of maintenance, operation and electricity according to the report of the State Water Commission of Jalisco (CEA) and an interview with officials of the state water system.

Given the inequality and use of water in Mexico and as an alternative for the sanitation of wastewater or domestic water in an area of Zapopan, Jalisco, Caro, Vizcaíno, Hernández, Reyes and Díaz (2019), comment that there are studies that propose the construction of Treatment Plants with natural, ecological and sustainable processes based on plants, physical, chemical and biological sediments that carry out a purification process. In 2016 in the town of Las Cañadas de San Isidro in the municipality of Zapopan, it promoted the Natural and Sustainable Ecological Systems to contribute to the discharge of sewage or wastewater, helping 60 families to improve water sanitation in the area, training and awareness to improve the environment. Unfortunately in Mexico there is an imbalance in the consumption and availability of water, as most of it is used by industry, which contributes a high percentage of the Gross Domestic Product (GDP), but there are other alternatives that can be promoted by governments and communities to contribute to this problem of sanitation for domestic wastewater.

Case study

The different health, environmental and social problems that have been triggered by the contamination of the Santiago River by industrial discharges and the scarce legislation to control these discharges, hinder the operation of the WWTP designed to treat sewage or domestic wastewater from the AMG (McCulligh, 2013). Another problem that exacerbates the pollution of the Santiago River is due to irregular settlements and the lack of planning for an orderly growth of the AMG, giving rise to marginalisation and poverty in certain areas due to lack of infrastructure such as schools, hospitals, roads, among others, but mainly the lack of works such as drainage and sewerage, increasing the risk indices for the population with health, safety, social and environmental problems. Torres-Rodríguez (2018), comments that the metropolisation of this area has transformed soils suitable for agricultural activity into industrial and urban areas, demanding greater natural resources, including water, mainly for industrial and housing processes, causing an imbalance with the environment and social development.

According to data provided by the State Government of Jalisco (2012) in a report issued by the State Water Commission (CEA), the Rio Blanco WWTP served only 3% of sanitation for a population of approximately 3.3 million people in the AMG in 2012. The AMG's wastewater sanitation system is being expanded with the integration of two WWTPs. The first one is El Ahogado, starting operations in 2012 to serve 20% of the wastewater treatment and Agua Prieta to serve 80%, starting operations in 2014. The treated water is used for electricity generation using the biogas produced at the "Valentín Gomez Farias" hydroelectric plant of the Federal Electricity Commission (CFE), registering its final discharge in the Santiago River.

Both WWTPs are located within urbanised areas or regular low-income housing developments and irregular housing units, as well as large industries in the south of the AMG.

The "Agua Prieta" WWTP is the second largest in the country and the third largest in Latin America, and its construction is being promoted due to the contamination of the Santiago River by discharges generated by the AMG. This initiative is made possible by the support of the three levels of government, federal, state and municipal, through the financing of private capital in the PPP scheme with a period of 20 years, under the Build, Operate and Transfer (BOTT) model, which addresses the design, construction, financing, operation and maintenance. The financial distribution and characteristics of the project are illustrated in Table 4.

AGUA PRIETA" WASTEWATER TREATMENT PLANT		
INVESTMENT SOURCES (Figures in millions, excluding V.A.T.)	El Ahogado and Agua Prieta Sewerage and Collectors WWTPs	Treatment Plants D.B.O.T. Scheme Agua Prieta 8,50 m3/s
Federal Expenditure Budget (PEF)	\$1.842,5	
State of Jalisco	1842,5	
Trust Fund. National Infrastructure Fund (FONADIN)		\$948,0
Private Investment		\$1.657,3
Subtotal	\$3.691,0	\$2.605,3
Winning consortia:	Tender No. 43111001-090-08 Trust No. 1004	Controladora de Operaciones de Infraestructura S.A. de C.V. (CONOISA) 50%; Atltec S.A. de C.V. 34%; Servicios de Agua Trident S.A. de C.V. 16%

Construction start dates	2007 - 2011	Site 36 months Operation 207 months Operation in 2013
*Includes Financial Expenses Note: The private sector is contracted under the DBOT (design, build, operate and transfer) scheme, with a concession period of 20 years. Typology: Hydraulic Infrastructure.		

Table 4 Project characteristics

Source: CNA (2012) *National Infrastructure Programme 2007-2012*. De la Peña, Ducci & Zamora - IDB (2013). *Own adaptation*

This work was financed with federal non-refundable support from FONADIN with 49% and private investment (51%) recoverable through a service provision contract, convened by the Ministry of the Interior (2008) in public tender No. 43111001-090-08, for the Agua Prieta WWTP project: "provision of wastewater treatment services at the Agua Prieta WWTP with a capacity of 8,500 lps. which includes the executive project, construction, electromechanical equipment, operation tests, capacity tests, operation, conservation, maintenance, as well as the removal and final disposal of biosolids and solids generated in the monofill, under the lump sum modality with mixed, private, partial and recoverable investment, within 27 months from the date of signing the supervision contract".

Among its objectives is the sanitation of 100% of the wastewater of the AMG, promoting environmental benefits such as improving water quality and reducing diseases, odours, employment generation (1,500 direct and 4,500 indirect), generation of electricity, sludge treatment in compliance with NOM-004-SEMARNAT-2002, which guarantees improvements in soils for agriculture, among others.

The Government of the State of Jalisco, with the support of the State Water and Sanitation Commission (CEAS), the CNA, promotes sustainable alternatives for the environment, environmental protection and economic engine for projects. For this project, the intervention of the private sector in the participation of the corresponding percentage of the State Government through the municipalities of the AMG in the course of the work, allows a financing alternative to the lack of economic resources of any of the parties, to conclude works of relevance for social benefit (National Institute of Sanitary Management (INGESA) (2008).

The results after years of initiating these projects have both positive and discouraging comments, given this investment of millions of dollars by the Mexican government, where investors must guarantee optimum results in response to the government's initiative to include the private sector in the financial model of the Public-Private Partnership in public works that resolve social problems.

Relevant information in interview

As fieldwork, an interview was conducted with a former government official from the state of Jalisco, who is knowledgeable and expert in this wastewater treatment project for the AMG, under the PPP financing scheme. A description of the background and general details of this project were obtained in order to understand the problems and the final objective of this infrastructure. Given that there are few studies in specialised databases on this specific WWTP, we were guided by the public and private entities involved in this project to search for information.

Among the data to be highlighted are:

- This project is awarded through a tender.
- It will benefit more than 3.5 million inhabitants.
- This project is the third largest in Latin America and the largest plant in Mexico.
- The cost per cubic metre for water treatment is 98 cents, the lowest in the country.
- Capacity of 8,500 litres per second.
- It will cover 80 percent of the wastewater produced by the AMG.
- As an important part of the AMG's wastewater sanitation system, the San Gaspar-Agua Prieta collector has not yet been built, which would go to the edge of the Huentitán ravine in the Atemajac Basin, which would take the sewage from the east of Guadalajara, the San Gaspar, Osorio and San Andrés basins, to the Agua Prieta WWTP, where it would finally be treated and discharged into the Santiago River. It is known that there have been settlements in the area of the Barranca, without any interceptor tunnel, throwing the sewage directly into the river through the ravine.
- This collector would be in charge of CONAGUA and the State Government, as the State Government did not budget for it in the total project.
- The biogas will be used to generate electricity.
- The PTAR Agua Prieta was planned to treat 8,500 litres per second, but in the absence of this collector, it only treats 6,000 litres per second from the San Juan de Dios River, the remaining 2,000 litres of sewage fall directly into the Santiago River without any process. It can be said that this magnificent project is useless.
- The project does not contemplate the treatment or sanitation of industrial or agro-industrial water, only domestic or waste water. This limitation has not allowed the objective of 100% wastewater treatment in the AMG to be achieved. On the other hand, the permissibility of the authorities and the strictness of the law to oversee and monitor the waste produced by all the companies located in the AMG. It is known that there are permanent and constant discharges of industrial waste, prohibited by national and even international law.
- There were no agreements to buy land for the construction of the WWTP, because it is close to the Federal Electricity Commission (CFE), the "Agua Prieta" WWTP.
- Concrete actions were carried out for the construction of the Agua Prieta and El Ahogado WWTP, by the State Government through the Comisión Estatal del Agua y Saneamiento (CEAS) and in coordination with the Sistema Intermunicipal de Agua Potable y Alcantarillado, (SIAPA) and the Comisión Nacional del Agua, (CNA).
- The resources will come from the following distribution, it is clarified that the difference between the cost of the project and the total amount of investment will be financed by the company with risk capital and / or credit.
 - a) The risk capital, equivalent to 25% of the cost of the project.
 - b) The resources from the credit, equivalent to 28.5% of the cost of the project.

- c) The support of the fund, equivalent to 49% of the cost of the project with the support of the fund.

The distribution of percentages among the municipalities participating in this AMG project is listed below. See Table 5.

MUNICIPALITY: AGUA PRIETA	
El Salto	-
Tlajomulco de Zuñiba	-
SIAPA	100.0%
Guadalajara	50%
Tlaquepaque	8%
Tonala	11%
Zapopan	31%
TOTAL	100%

Table 5 Percentage distribution

Source: own adaptation based on interview data.

- The reality is that today the results are far from the commitments, objectives and promises that were made before this millionaire investment. The government and the investors did not diagnose in depth the problem of pollution of the Santiago River, leaving aside the pollution that companies and industries in the AMG produce every day, as the damage is mainly generated by industrial and chemical waste rather than by wastewater and domestic water. Academics, society, experts, local farmers, key actors, among others, were not involved. Finally, the laws are permissive and protect the investor, as the responsibility and risks fall on the public sector.
- The state of Jalisco has several WWTPs that are not functioning, not operating, so it should carry out a technical study with experts and, based on the experience of other WWTPs in Mexico and the world, include local and regional communities and different social and economic sectors to study the possibility of reactivating, adapting and modernising these infrastructures, considering that their presence can avoid further environmental damage and destruction of land and natural resources in the face of new proposals that are millions in the millions since their construction, which in many cases only put the state and the federation in debt.

- Finally, there is a problem that exacerbates the wastewater sanitation situation in the AMG, which is the indiscriminate and unplanned growth of low-cost housing developments allowed by the authorities to real estate companies or developers in the vicinity of the AMG river or basins that do not have adequate infrastructure for the provision of services, including aqueducts and sewage. Likewise, irregular settlements without control by the municipalities and authorities, where they improvise channels or outlets for wastewater into natural basins, giving rise to an area with high levels of pollution, which in turn strengthens the urban stain of marginalisation, insecurity and poverty, generally of immigrants or families with very low incomes.

Analysis of results

Promoting public works that guarantee the development of a country's economy through programmes and projects is an issue that every government handles in different ways, although its applicability defines its level of development. The contractual alliance as a financial strategy between the public and private sector through Public Private Partnerships (PPP) is an alternative to strengthen the different sectors of the economy, where governments adopt, regulate and govern PPPs to promote works that provide public services for social welfare, when the finances of the state do not allow to provide 100% of the capital. In Mexico it is relatively new and its implementation in some cases has been more of an experiment than a project analysed to solve the real problem.

Unfortunately, in some sectors, such as water management in metropolitan areas, monopolies have been created that largely benefit the private sector, even excluding them from responsibilities by not fully resolving the problem for which they were contracted, with the costs being absorbed by the public sector. The proposals presented by the investor were not always the most suitable for solving the problem of water sanitation.

In Mexico, the impact of PPPs represents a real challenge, given that monitoring initiatives are practically new and there is a lack of official information from the institutions involved.

Unfortunately, in water management in metropolitan areas, monopolies have been created that largely benefit the private sector, even excluding them from responsibilities by not fully resolving the problem for which they were contracted, with the costs being absorbed by the public sector. Furthermore, the proposals put forward by the investor were not always the most suitable for solving the problem of water sanitation.

Infrastructure management activities, traditionally carried out by the public sector, include construction, financing, operation, maintenance, regulation and control. However, the private sector may also be involved in whole or in part under policies established by law.

The changes in the international market economy, globalisation and the different designs and political schemes developed for these associations have allowed the dynamisation of a network of their own aspects and characteristics that today strengthen their legitimacy at a global level. As structured institutions with more grounded objectives, the literature shows diverse antecedents for PPPs with supported data and formalised records.

One of the justifications used to promote the implementation of PPPs in countries such as Mexico is the lack of adequate infrastructure to meet the demand for citizen services, which leads to a reduction in basic rights.

For this financing scheme, in Mexico, the Public-Private Partnerships Law (LAPP) legally ratified the legality and promotion of this contractual relationship between the public and private sectors, with the signature of Felipe Calderón, then President of the Republic, on 16 January 2012 (Diario Oficial de la Federación. DOF, 2018). Since then, these regulations have generated conflicting opinions, including the generation of corruption, the granting of privileges, public indebtedness, the handing over of control of public sector administration to private entities, among others.

The aim of this legislation is to improve the efficiency and effectiveness of these projects, as previous legal provisions had loopholes that - as in the Mexican case - fostered vices carried over from previous concession models, such as cost overruns, lack of transparency and poor coordination between government entities and private parties.

A review of the Mexican context of PPPs shows that they have made use of concessions that opened the door to private capital to jointly address major infrastructure deficiencies, such as the creation and maintenance of highways and road projects.

It was noted that in the last decade of the last century, in the absence of specific legislation on the subject, Mexico faced difficulties in the application of PPPs such as cost overruns, lack of compliance in delivery, lack of planning and coordination, unforeseen environmental impacts, corruption, and so on.

However, the experience allowed learning from the deficiencies and generating robust regulations that, a little more than a decade after coming into force, have given way to a variety of concession projects in areas as diverse as road infrastructure, health, drinking water supply and sanitation, as well as other public works that have been built thanks to the participation of private capital.

With all of the above, scholars from other disciplines could deepen their analysis of current or completed projects under this scheme with a sharper vision and a focus that measures social welfare, environmental impact and the legality of the contracts signed, as well as their compliance, since it is the taxpayers or users who pay for these million-dollar works that generate debt for the nation.

These results could strengthen or refute opinions in favour or against this form of financing that governments adopt as an alternative to solve social problems through public works.

Conclusions

The concept of Public-Private Partnerships (PPP) arises from the participation of the public and private sector in the construction of works for the development of infrastructure in a country. The intervention of this model in different countries around the world can be justified by the lack of economic capacity of governments to promote infrastructure development that guarantees an improvement in the quality of life of their citizens.

PPPs are alliances or contractual relationships whose intention is to achieve particular objectives for both the state and the investor with its private capital. Arguably, their origins date back several centuries and have evolved to the present day.

Developing countries may find in PPPs a financial strategy to promote economic development and social welfare, especially given their legal regime, regulations, financial models, contractual relationships, geography and the experience of other countries.

As a financing alternative, PPPs are currently being implemented by governments in Latin America, where Mexico is no exception, as they have become a strategy to boost economic development through public works infrastructure in both countries since 2012.

The literature reviewed shows the opinions of experts, scholars, academics and international organisations in favour and against, based on the results, the costs of public works, the political management that has been given to the projects, the fulfilment of objectives safeguarded in promises and hopes to benefit the majority of citizens.

On the other hand, it should be remembered that there are several models that involve the private sector in projects of this nature; as there is a wide range of schemes, the criteria for selecting a particular one should take into account aspects such as the ability to mitigate demand risk and payment risk, as well as the ability to make the projects attractive to all parties, i.e., users/citizens, investors and the public sector.

In Mexico, the impact of PPPs represents a real challenge, given that monitoring initiatives are practically new and there is a lack of official information from the institutions involved.

Finally, it is important to highlight that currently the federal government's major public works are carried out with mostly public funds managed by the Ministry of National Defence (SEDENA) and Banobras, leaving aside the participation of private capital in projects such as the Felipe Ángeles International Airport, the Mayan Train or the Dos Bocas refinery, despite the technical and financial benefits of PPPs described in this document.

Public-private partnerships in Mexico have been an important tool to promote the development of infrastructure and services in the country. While they have faced criticisms and challenges, the government continues to work on improving its regulatory framework to promote greater transparency and accountability in these partnerships. The effective use of PPPs can contribute significantly to economic growth and social welfare in Mexico through their potential to attract private investment and thus foster collaboration and improve the quality of life of citizens, which makes them an option to consider in the Mexican context.

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