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Elements of socio-environmental conflict: The Constellation Brands brewery and Mexicali's water

Elements of Socio-Environmental Conflict: The Constellation Brands Brewery and Mexicali Water

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ABSTRACT:

The present study analyzes information about the Constellation Brands brewery project in Mexicali, Baja California, to determine the extent to which the project considers the area's semi-arid conditions, the threat of water scarcity, and the overexploitation of water sources. Official documents and technical studies on the project were examined through a document review. The analysis shows a lack of adherence to the concepts of water security (WS), sustainability, and democratic environmental governance, which seek to guarantee equitable and fair access to water, minimize environmental risks, and promote the broad and effective participation of social actors in the decision-making process associated with the project. There were inconsistencies in the information and technical data on consumption and a predominance of processes that lacked transparency in promoting the project, which resulted in a conflict between the project promoters and different sectors of the local society.

Keywords: 1. water security and sustainability, 2. environmental governance and social conflict, 3. Constellation Brands, 4. Mexicali, 5. Mexico.

RESUMEN

Se analiza información sobre el proyecto de la planta cervecera Constellation Brands, ubicada en el municipio de Mexicali, Baja California, a efecto de determinar en qué medida este proyecto está considerando las condiciones de semiaridez, la amenaza de escasez y la sobreexplotación de fuentes de agua. A través de una revisión documental, se indaga en documentos oficiales y estudios técnicos del proyecto. El análisis arroja una falta de apego a los conceptos de Seguridad del Agua, sostenibilidad y gobernanza ambiental democrática, mismos que buscan garantizar un acceso equitativo y justo al agua, minimizar los riesgos ambientales y promover la participación amplia y efectiva de actores sociales en la toma de decisiones vinculadas al proyecto. Se observan inconsistencias en la información y los datos técnicos de consumo, así como un predominio de procesos poco transparentes en la promoción del proyecto, lo que derivó en un conflicto entre los promotores y diversos sectores de la sociedad local.

Palabras clave: 1. seguridad del agua y sostenibilidad, 2. gobernanza ambiental y conflicto social, 3. Constellation Brands, 4. Mexicali, 5. México.

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INTRODUCTION

Broad participation of local social actors in water use decision-making processes represents a fundamental factor in achieving harmonious regional development. It allows the adequate integration of the concepts of water security (WS), sustainability, and democratic environmental governance. These are the premises of the present study of the Constellation Brands brewing plant project (hereinafter, brewery) in Mexicali. Constellation Brands is a New York-based American transnational company that produces and markets beer, wine, and spirits. It operates in the United States, Canada, Italy, New Zealand, and Mexico, with around 40 industrial facilities and approximately 9,000 employees (Martínez, 2018). This study aims to determine the extent to which such notions are incorporated into a region threatened by scarcity and overexploitation of water sources. The main technical and social aspects are analyzed to explain the social and hydrological problems resulting from the establishment of the brewery.

Since the announcement of the intention to build the brewery in Mexicali in April 2015, a series of social protests were unleashed in the municipality against the project itself and the lack of transparency implemented by the state governments' promoters when explaining the use of public resources to construct an aqueduct for the brewery's sole use. Given the scarcity of natural water in the region, local social groups considered this an inconsistency. The social pressure against the construction of the aqueduct caused it to be canceled. However, construction of the brewing plant in Mexicali began in 2016, intending to expand its export capacity to the United States (Martínez, 2018).

The present article is organized into five sections. The conceptual framework that should regulate the development of the brewery project is explained from the perspectives of social conflict, WS, sustainability, and environmental governance. Subsequently, methodological aspects of the study are mentioned based on a detailed document analysis. The third section presents the natural, hydrological, and social environment surrounding the brewery project. The regional hydrological situation and the social conflict resulting from the announcement of the brewery project are described. The fourth section emphasizes the water's sources, availability, demand, and projected consumption by the brewing plant and examines technical aspects and other topics associated with the project. Lastly, remarks and general recommendations are made to underscore the characteristics of the documents reviewed and the need to implement transparent processes with broad citizen participation.

CONCEPTUAL FRAMEWORK: CONFLICT, WATER SECURITY, SUSTAINABILITY, AND ENVIRONMENTAL GOVERNANCE

Conflict

Kloster (2017), who addresses issues of social struggles over water, explains that these are manifestations of the conflict; the author also stresses that there is no struggle without

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mediating a conflict between individuals with different positions concerning this resource: How it should be distributed? Who should pay? Who governs it? Who makes the decisions? (Kloster, 2017). These are some of the issues that divide people, groups, societies, regions, and even countries.

There is ample evidence that conflicts over water have increased as the pressure on the resource has increased (Becerra, Sáinz, & Muñoz, 2006). These conflicts are associated with the use and exploitation of water for industrial activities, mega-mining projects, the redirecting of waterways to supply large cities, and construction of works that compromise water resources in territories with water scarcity and high-water stress (Orellana, 1999; Tetreault, Ochoa García, & Hernández Gonzáles, 2012).

Additionally, other authors highlight environmental problems in local Mexican contexts, categorized as non-conflict, latent conflict, and low-intensity conflict. Socio-environmental conflicts entail an awareness of environmental problems and threats and awareness of a grievance derived from the lack of recognition of cultural values, distributive ecological issues, and undemocratic decision-making processes (Tetreault, McCulligh, & Lucio, 2019).

Toledo, Garrido, and Barrera-Basols (2013) found that initiatives triggering conflicts are typically driven by companies or corporations, both national and international, or by a policy or strategy to encourage the private sector to make use or extract water resources at a given site. They also state that different systems of participation, opposition, mobilization, and civil resistance are present within the conflict and different expressions of power on the part of the social and governmental actors involved.

Water security and sustainability

The United Nations (UN) considers WS as:

> The capacity of a population to safeguard sustainable access to adequate quantities of and acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against water-borne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability (UN-Water, 2013, p. 12).

Other studies mention that WS considers the close link between *interconnected social-ecological-hydroclimatic systems.* A link that needs to be implemented through flexible governance and water management systems, promoting trust between users and government agencies, timely and comprehensive exchange of information, transparency and responsible engagement with users, and effective representation among decision-makers, the scientific community, and public policy networks (Gray and Sadoff, 2006; Pahl-Wostl, 2007).

WS is closely associated with the concept of environmental sustainability described by Dobson (1998) as a moral principle, which includes elements of respect and equality in terms of the fair distribution and exploitation of the planet's natural resources so that human and

societal needs can be met while respecting and safeguarding the needs of other living beings now and in the future. Dobson's ideas highlight that the ethical principles for an equitable and fair distribution of resources are considered human rights.

Water sustainability and environmental governance

The local environment is ideal for effective water governance, although the interrelationships extend to regional, national, and international contexts. Therefore, a broad spectrum of organizations are associated with the management, administration, and operation of a common pool water resource in one location (Cortez & Castro, 2019). Kooiman (1993) states that water governance entails interconnected aspects such as a) new information and communication technologies, b) multiple actors, c) multiple approaches, d) multiple levels, such as supranational, national, regional, transboundary, federal, state, and municipal; e) polycentric power; and f) complex contexts.

These aspects presuppose the possibility of social conflict around the distribution and use of water due to scarcity and high competition among users. Effective governance schemes seek to address it intelligently. Castro (2017) suggests the implementation of an interdisciplinary approach to the conflict over water, in such a way that it is possible to observe the processes that create and reproduce socio-economic and political structure inequalities which exclude a large sector of the population from participation in democratic water policy and management.

Water governance implies the prevalence of democratic premises, prioritizing environmental sustainability and the fair distribution of natural resources; this is achieved by the predominance of institutional arrangements of authority and power with a more horizontal, interactive, and associative structure. Thus, good environmental governance envisages establishing institutional arrangements that contribute to the care of the natural system, and those where the quality of democracy allows for a configuration of broad social representation, as well as inclusive and objective decision-making processes of equity and social justice (Caldera & Tagle, 2017).

Based on the preceding, it is pertinent to distinguish whether such elements of WS, sustainability and democratic environmental governance prevailed in the decision-making processes related to the construction and operation of the brewery in Mexicali in a way as to avoid or lessen the risks of a social conflict.

METHODOLOGICAL ASPECTS

The present article is derived from the study requested by and prepared for the Mexican National Council for Science and Technology (CONACYT). A comprehensive document analysis was carried out based on official reports and technical, academic, and statistical reference studies, mainly from:

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a) the Environmental Impact Statement (EIS) document prepared for the construction project and operation of the brewery in Mexicali, Baja California (Sustaita & Olmos, 2016);
b) a study by the Mexican Institute of Water Technology (IMTA) on the projections of future water availability for the city of Mexicali (Salgado, Güitrón de los Reyes, & López, 2018);
c) *dictamen No. 306* [Opinion No. 306] of the XXIst Legislature of the State of Baja California, concerning the divestiture and authorization of alienation of properties owned by the State Executive in favor of the brewing company (Congreso del Estado de Baja California-XXI Legislatura, 2016);
d) the Water Program of the State of Baja California (PHEBC); Vision 2035 with current and future supply and demand data (Comisión Estatal del Agua de Baja California, 2018);
e) the survey on Constellation Brands Brewery Brand Image and CSR (Parametría Investigación Estratégica Análisis de Opinión y Mercado, 2018); and
f) official statements by the owners of Constellation Brands in New York (Sands, 2016).

The central themes and sub-themes were developed and argued based on the analysis of the mentioned documents. The analysis emphasizes the critical aspects of water sources, demand, consumption,[2] and supply for the brewing plant and the processes that caused the socio-environmental conflict.

NATURAL FRAMEWORK: TRANSBOUNDARY REGION OF THE LOWER COLORADO RIVER AND THE MEXICALI VALLEY

Three states in the United States (Arizona, California, and Nevada) and two in Mexico (Baja California and Sonora) represent highly demanding water resources users.[3] This condition requires an institutional effort to make water decisions, both in the binational and local contexts. The high climatic variability of the region has resulted in a decrease in moisture levels at the basin level, higher evaporation rates, prolonged drought periods, and an increase in salinity levels in the Colorado River, a situation that is accentuated downstream.

Abatement of the regional aquifer and salinity in Mexicali

A deficit of 456.04 million cubic meters per year (Mm^3/year) was reported in 2015, with a mean annual recharge rate of 520.5 Mm^3/year, an extraction volume of 602 Mm^3/year, 2.5 Mm^3/year of

[2] Volumetric equivalences: 1 liter of beer requires 3.7 to 4 liters of water, depending on the technology; 1 hectoliter (hl) = 100 liters (l); 1 million hectoliters (Mhl) = 0.1 million cubic meters (Mm^3); 1,000 liters= 1 m^3; 1,000,000 m^3 (Mm^3)= 1 Hm^3.
[3] Under normal hydrological flow conditions, the annual allocations for each user state of the lower Colorado River basin are California 5 427 Mm^3 (26.7%), Arizona 3 515 Mm^3 (17.3%), Nevada 370 Mm^3 (1.82%), and Mexico 1 850.2 Mm^3 (9.1%).

natural discharge, and 974.04 Mm^3/year of concessioned volume (Comisión Nacional del Agua, 2015)**.** Additionally, abatement rates of static levels ranging from 0.25 to 0.5 m/year are observed. The PHEBC indicates that this problem will deepen by 2035, with a deficit to its current use which will reach -523.8 Mm^3/year, or -47.6 percent in the Mexicali and Mesa Arenosa in San Luis Río Colorado aquifers (Comisión Estatal del Agua de Baja California, 2018, p. 39).

The following stand out: a) a significant degree of overexploitation of the aquifer, b) information inconsistency due to the lack of systematic studies, and c) the negative impact on local recharge caused by the decrease of north-south transboundary flow. All this explains the high degree of uncertainty surrounding the collection and recording of groundwater data in the Mexicali Valley and the difficulty of adequately planning production activities using groundwater. In 2018, Mexicali's municipality registered 1,065,882 inhabitants, of whom 250,000 lived in the rural area of the Mexicali Valley (COPLADE, 2018); the Mexicali Valley covers 186,000 ha, and agricultural activity consumes 1.677 Mm^3/year (Comisión Nacional del Agua, 2019).

High climatic variability and water management in the Mexicali Valley

Climate change forecasts for the Colorado River basin suggest changes in runoff volumes and seasonality, with reductions of 30 percent by 2050 (Bates, Kundzewicz, Wu, & Palutikof, 2008; Udall & Overpeck, 2017). Projections of increased demand and the consequent reduction of water availability indicate that the agricultural sector will be affected in the short and medium-term, given that the *Ley de Aguas Nacionales* [National Waters Act], in force since 1992, gives priority to domestic and public-urban uses, followed by livestock and agriculture; industrial activities following this last use.

Data from the National Water Commission (CONAGUA) from the past 30 years in Irrigation District 014, Colorado River, indicate a trend toward warmer winters and hotter and longer summers with high humidity episodes (CONAGUA, 2012). Additionally, the hydrometeorological and climatic multimodel analysis shows an increase from 100 to 120 days per year with temperatures above 38°C in the Mexicali-Imperial-San Luis Río Colorado-Yuma transboundary region; this will increase demand on the water and energy sectors (Wilder *et al.*, 2013).

Another foreseeable impact is the decrease in surface water delivery volumes to Mexico. For example, in scarcity, *The 1944 US-Mexico Water Treaty* (*Tratado de Aguas de 1944*) provides for proportional reductions for the eight user states. In this regard, Minutes 319 and 323 of this Treaty establishes reductions in case water levels in the Hoover Dam are at or below the critical line of 1,075 ft MSL (Comisión Internacional de Límites y Aguas entre México y los Estados Unidos, 2012, 2017).

Interpretation differences, or what Kloster (2017) considers confrontations by individuals from different positions concerning a resource, are identified as one of the main elements of socio-environmental conflict among local social actors who speak out against the brewery

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and its promoters. It highlights how each party visualizes the problem, related to a real natural context (the impacts expected from climate change, the implications in salinity, and the overexploitation and depletion of the aquifer). Tetreault, McCulligh, and Lucio (2019) mention that local actors show their knowledge of the context and, consequently, express a collective awareness of environmental problems and threats and their grievance of those who arrive in the region. Typically, those arriving in the region are transnational corporations and industrial megaproject promoters, who do not democratically and appropriately include local social actors in the decision-making.

CENTRAL ELEMENTS OF ANALYSIS ABOUT THE MEXICALI BREWERY PROJECT

Process timeline

On April 22, 2015, the Constellation Brands brewing plant construction and operation project began in Mexicali. The CBRE Economic Incentives Group, also known as *Compañía Cervecera de Baja California* (CCBC), presented the formal proposal to the state government regarding the intention to invest in the production, distribution, and sale of export products in the food industry (Congreso del Estado de Baja California-XXI Legislatura, 2016).

In June 2015, the initiative was made public through statements by the governor explaining the project's characteristics as a decree initiative; the project consisted of the installation of a production plant with an investment of around 2 billion dollars for the first phase and expected to generate 4,000 indirect jobs during the construction phase and 1,000 direct jobs once in operation (Congreso del Estado de Baja California-XXI Legislatura, 2016). The decree initiative itself stated that the proponents asked the state government to comply with the basic requirements and the assistance to acquire approximately 300 ha of land and other site conditions, such as at least 20 Mm^3/year of water for the next 50 years (Congreso del Estado de Baja California-XXI Legislatura, 2016).

This last aspect was established in an agreement signed on October 2015 between the state executive, the Public Services Commission of Mexicali (CESPM), and the company, highlighting that the agreement included a confidentiality clause between the parties. This aspect of secrecy surrounding water was perceived by local social actors as an element of conflict, considering that the concepts of WS and sustainability were not incorporated as suggested by Gray and Sadoff (2006). These authors highlight that the social-ecological-hydroclimatic system's close link should be fully considered under a water governance framework that promotes trust among users, ample and timely information exchange, and transparency.

In January 2016, company executives confirmed the brewing plant's installation; they mentioned that an initial investment of 1.5 billion dollars was planned for the construction and operation of the brewery in Mexicali. An additional 500 million dollars were considered

for investments in the purchase of land, water rights, infrastructure, and other site requirements. It was planned to start production with 5 million hectoliters per year (Mhl/year) in 2019 and increase to 10 Mhl/year in the short-term, to reach a medium-term maturity period of 20 Mhl/year (Sands, 2016).

On April 7, 2016, *Dictamen 306 de la Comisión de Hacienda de la XXI Legislatura del Congreso del Estado de Baja California* [opinion 306 of the Finance Committee of the XXI Legislature of the State Congress of Baja California] approved the divestiture of part of the land requested by the brewery, which was under the authority of the State of Baja California's Executive Power (Congreso del Estado de Baja California-XXI Legislatura, 2016). This process was completed in the next legislature in December 2016.

Social demonstrations of rejection

A series of mass social demonstrations in January 2017 gradually increased in attendance until reaching, in a single event, approximately 60,000 people. These demonstrations expressed discontent with the State Executive's initiatives concerning water, which had been fast-tracked by the XXII Legislature and published on December 30, 2016. They referred to the *Ley de Agua del Estado de Baja California* [Water Law of the State of Baja California], which the protesters identified with notable privatization overtones. Finally, given the social pressure, the law was abrogated on January 17, 2017 (Espinoza Valle, 2019).

Amid the social mobilization in which different groups protested against the brewery's installation in the Mexicali Valley, the so-called "*Mexicali Resiste*," "*Baja California Resiste*," "*Mexicali Consciente*," "*Célula 686*" and "*Colectivo Estatal Plebiscito por el Agua de Baja California*" stood out. These groups considered that the brewing plant would not generate significant social and economic benefits, but it would adversely affect the region's environment and water availability.

The previous gave rise to blockades to halt the Ejido Villahermosa-Ejido El Choropo aqueduct's construction, which was to transport 475 liters per second (lps) of water from the deep wells zone (northeast of the Mexicali Valley) to the brewery site located south of the city of Mexicali (Figure 1). The project was to be financed by the state government with a cost of 549 million pesos (Heras, 2017; Secretaría de Protección al Ambiente del Gobierno del Estado de Baja California, 2016).

Subsequently, on January 16, 2018, other social pressure actions were taken to halt construction work at the brewery site, which resulted in clashes between police forces and demonstrators, resulting in dozens of injuries and imprisonment (Arellano, 2018). This event represented one of the most critical episodes of the social struggle since it confronted the radically opposed positions of local individuals versus corporate initiatives. This social struggle substantiates, according to Kloster (2017), a manifestation of socio-environmental conflict.

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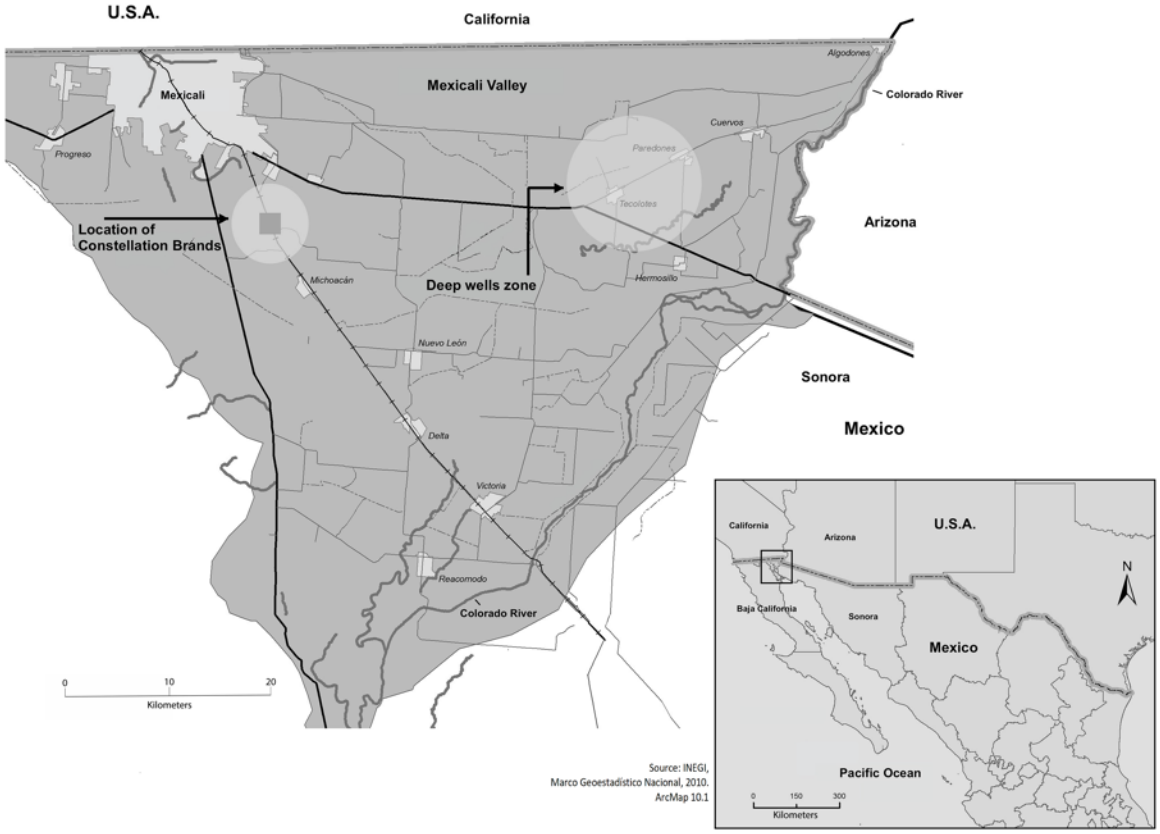
Figure 1. Mexicali City and Valley and the location of the Constellation Brands brewery



Source: INEGI, Marco Geoestadístico Nacional (2010). ArcMap 10.1

In October 2018, the "*Colectivo Estatal Plebiscito por el Agua en Baja California*" promoted a plebiscite petition on the brewery project (Muñoz, 2018) before the Citizen Participation and Civic Education Commission from the State Electoral Institute of Baja California (IEEBC).

This process revealed different critical episodes: on March 3, 2019, the IEEBC's Commission ruled the plebiscite irrelevant and inadmissible; the promoters of the plebiscite contested such ruling, and on April 17 of the same year, the Superior Tribunal of Electoral Justice of Baja California reinstated the process by revoking the previous ruling and gave indications for a transcendental study incorporating technical-environmental aspects. In response, on May 16, 2019, the Electoral Tribunal of the Judicial Power of the Federation ruled against the plebiscite, validating the previous opinion of inadmissibility and irrelevance issued by the IEEBC.

Parallel to this pressure from the community, Mexican President Andrés Manuel López Obrador (2018-2024) announced creating a special commission to analyze and decide on the

brewery case during a rally on March 26, 2019, in San Luis Río Colorado, Sonora. The commission was made up of government bodies such as CONAGUA, the Ministry of Economy, the Ministry of Environment and Natural Resources (SEMARNAT), the Mexican Institute of Water Technology (IMTA), and CONACYT.

On April 26, 2019, in a letter addressed to the head of the Ministry of Economy, the president of Constellation Brands Mexico mentioned that due to the high-level talks with the special commission, the executives of Constellation Brands were fully open to define a water volume cap suitable for everyone (Baima, 2019, unnumbered). They also stated that they fully agree with the National Water Commission's recommendation to secure their water titles (Baima, 2019, unnumbered).

Nevertheless, the rejection of the brewing company's establishment by an important part of the Mexicali community, which demanded conducting a plebiscite, prevailed. The plebiscite sought to update and contrast the results of a perception survey of the brewery, which was conducted in December 2018 in Mexicali's rural and urban areas. The survey results indicated that 59 percent of respondents in urban areas reported having bad and very bad opinions about the company, whereas, in rural areas, 41 percent said the same. Additionally, when asked about their installation in the Mexicali Valley, 62 percent of interviewees in the city expressed disagreement, whereas the proportion was 59 percent in rural areas. These findings are in line with another question in the same survey: whether or not people agreed to the plebiscite; in the city, 84 percent agreed, whereas 82 percent of participants in the rural area agreed (Parametría Investigación Estratégica Análisis de Opinión y Mercado, 2018).

Brewery water consumption and supply

Water consumption for the production of one liter of beer ranges from 3.8 to 4.0 liters of water (Fernández & Romero, 2010; García, 2018). For the present analysis, the proportion of 4 to 1, 4 liters of water per liter of beer produced will be used. Thus, average water consumption in the order of 2 Mm^3/year is estimated for the initial production phase of 5 Mhl/year; for the next production phase of 10 Mhl/year, a volume of 4 Mm^3/year; and for the medium-term, with the production of 20 Mhl/year in its stabilization phase will require 8 Mm^3/year of water (Cortez, 2019). However, as shown in subsequent sections, official documents report different and higher requirements.

Data: inaccuracies, discrepancies, and inconsistencies

The official documents reviewed in this study confusedly establish different data on water requirements, needs, and consumption (Table 1):

Table 1. Water requirements reported by the EIS and other technical studies for the construction and operation of the brewery (Mm^3/year)*

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Instance or source document	Total consumption	Total demand	Availability in agricultural wells	Availability in agricultural canals	Availability in the CESPM
EIS	2.56				
EIS			15.00		
EIS			11.86		
EIS				5.00	
EIS					10.00
EIS	30.00				
IMTA		6.30			
SPA-BC	11.67				
SPA-BC			14.98		
CESPM	≥ 20.00				
Opinion 306	≥ 20.00				
C. Brands	≥ 20.00				

* Note: The data is considered (and estimated) for the maximum production stage indicated by the brewery´s EIS.

Source: Adapted from information from the brewery´s EIS (2016), the IMTA study on projections of future availability in the city of Mexicali (2018), Opinion No. 306 of the XXIst Legislature of Baja California, the SPA -BC (2016), the CESPM (2015), and Constellation Brands (2016).

From there, we see the inconsistent (and confusing) way in which the data are reported in the different sections of the EIS (only one prepared by the company) for the construction and operation of the brewery and other official technical documents:

a. total consumption of 2.56 Mm^3/year (81.3 lps) for the two stages, and where maximum production would be reached (20 Mhl/year). It should be noted that the estimated volume will be only for raw materials, and processes of cleaning, steaming, and other uses are not included (Sustaita & Olmos, 2016, p. 15, 59);
b. programed total water demand for the first stage of production (10 Mhl/year) is 3.15 Mm^3/year (100 lps), which will be covered by the surplus reported by the CESPM (Salgado *et al*., 2018, pp. 12-14);
c. the current installed capacity and volumes are 15 Mm^3/year (475 lps) of water from the deep wells in the Mexicali Valley for beer production (Sustaita & Olmos, 2016, p.76);
d. is assured to acquire wells in the northeast of the Mexicali Valley to obtain 11.86 Mm^3/year (376 lps) (Sustaita & Olmos, 2016, p.91);
e. the drilling of wells for water extraction and the transport of 14.98 Mm^3/year (475 lps) is assured via aqueduct Ejido Villahermosa-Ejido El Choropo (Secretaría de Protección al Ambiente del Gobierno del Estado de Baja California, 2016, p. 6);
f. a guaranteed surface water volume of 5 Mm^3/year (158 lps) from irrigation canals adjacent to the brewery site (Sustaita & Olmos, 2016, p.94);
g. the CESPM has the installed capacity to supply the brewery with 10 Mm^3/year (317.1 lps) (Sustaita & Olmos, 2016, p.97);

h. total consumption of 5.83 Mm^3/year (185 lps) for the first stage of production (10 Mhl/year) (Secretaría de Protección al Ambiente del Gobierno del Estado de Baja California, 2016, p.8); of this, 19 lps would come from irrigation canals, 148 lps from the CESPM wells, and 19 lps from the CESPM's municipal network (Sustaita & Olmos, 2016, p. 118);
i. total water consumption of at least 20 Mm^3/year (Comisión Estatal de Servicios Públicos de Mexicali, 2015; Congreso del Estado de Baja California-XXI Legislatura, 2016; Constellation Brands, 2016);
j. total consumption for the maximum production stage (20 Mhl/year) of 30 Mm^3/year, of which 15 Mm^3/year refers to the primary source of supply of the deep wells in the Mexicali Valley, 10 Mm^3/year to the CESPM backup source and 5 Mm^3/year to the backup source for the irrigation canals (Sustaita & Olmos, 2016, pp. 116-117).

Three consumption scenarios are established based on the data presented in the different official documents on the brewery, as well as on the subsequent analysis carried out, the homologation of water volume units, and the organization of information:

1) Conservative criterion: total water consumption for the maximum production stage would be approximately 8 Mm^3/year, obtained from the consumption of 4.0 liters of water per liter of beer produced (Cortez, 2019);

2) Medium criterion: total water consumption for the stabilized maximum production stage would be 11.67 Mm^3/year, obtained from the 185 lps required for the first stage (Sustaita & Olmos, 2016, p. 118);

3) High criterion: total water consumption would be 20 Mm^3/year, obtained from the information outlined in response to the *Resolutivo Quinto* [Fifth Resolution] subparagraph b that the company offers the SPA-BC regarding the sources and final volumes of water that will be used by the brewery in its production processes (Constellation Brands, 2016).

Estimates of abatement of the Mexicali Valley aquifer and supply to the brewery

Official reports indicate overexploitation and gradual abatement of static levels between 0.25 and 0.50 m/year (Comisión Nacional del Agua, 2015). The brewery's EIS included a geohydrological simulation analysis of the aquifer´s behavior in the area of interest. The simulation analysis resulted in higher aquifer abatement levels than those previously reported by CONAGUA (Comisión Nacional del Agua, 2015). The analysis considered three scenarios: a) normal recharge and discharge conditions; b) discharge modification condition, consisting of an additional extraction of 15 Mm^3/year for the brewery; and c) cumulative modification of recharge reduction due to the reduction in deliveries of water from the Colorado River to Mexico in a proportion of 20 percent, as a consequence of the prolonged drought in the basin, plus the change in discharge conditions due to an increase in extractions of 15 Mm^3/year for the brewery. All of the above for horizons at 2025, 2035, and 2045 (Sustaita & Olmos, 2016, pp. 108-116).

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The first simulation carried out in the EIS´s analysis under normal conditions (a) indicates abatement rates ranging from 0.5 to 0.7 meters per year (m/year), which means that by 2025, the aquifer's static level in the northeastern part of the Mexicali Valley will be reduced by 6 m, 11m by 2035, and 16 m by 2045. The second simulation (b) shows a decrease in the order of 0.7 to 0.8 m/year, which means that the static level will drop 8 m to 2025 and 14 m to 2035. The third simulation (c) shows a drop-off rate of up to 1.05 m/year, which indicates that the static level decreases by 10.5 m in 2025, 16.5 m in 2035, and 23 m in 2045.

The geohydrological simulation exercises reflect the regional aquifer rates of abatement of the static levels problem, which causes an increase in saline concentration in the aquifer; given the highly probable condition of reduced surface water deliveries (20%) due to prolonged drought in the Colorado River basin (Wilder *et al.*, 2013). This scenario is congruent with recent forecasts, which indicate a reduction in water flows that could reach up to 30 percent by 2050 (Udall & Overpeck, 2017).

The previous scenarios are also consistent with the PHEBC's reference of the groundwater deficit (-47.6%) in 2035, which is why the same state program considers the future goal of decreasing extractions from the current level of 602 Mm^3/year to 456 Mm^3/year (Comisión Estatal del Agua de Baja California, 2018, p. 39).

Supply estimates for the brewery with water from the city of Mexicali

The assertion by the CESPM of having surplus volumes of 22.68 Mm^3/year is striking, which are currently shipped to Tijuana via the Río Colorado-Tijuana Aqueduct (Salgado *et al.*, 2018). This statement is inconsistent with the PHEBC, which projects a deficit of 26.8 Mm^3/year by 2035 for domestic use in Mexicali and 2.6 Mm^3/year for rural areas (Comisión Estatal del Agua de Baja California, 2018).

The IMTA study carried out in 2018 found that the surplus volume would provide the CESPM with water to supply the brewery since such volume would not need to be transported to Tijuana due to Playas de Rosarito's commissioning of the desalination plant. However, the desalination plant project is currently uncertain due to the manifested social rejection of its implementation and the risks of brine disposal contamination in soils and coasts, and high operating costs, especially in energy consumption (Hood, 2019). Note that there is already a 37-year contract with an annual amount to be paid of 2´078,423,290.56 pesos, based on the estimation of the cost of public works by the state government through public-private partnerships (Congreso del Estado de Baja California-XXI Legislatura, 2016; Congreso del Estado de Baja California-XXII Legislatura, 2016; Congreso del Estado de Baja California-XXII Legislatura, 2017).

Even in a scenario of uncertainties with the operation of the desalination plant, the CESPM offers the brewery a volume of 5.27 Mm^3/year or 167 lps (Sustaita & Olmos, 2016, p. 118), equivalent to 23.2 percent of the city's reserves, or what they call surplus. Despite the

strategic importance of that volume in planning Mexicali's development, the CESPM also claims that the volume of 10 Mm^3/year will be available for the brewery (Sustaita & Olmos, 2016, p. 97), which represents 44.1 percent of the city's current reserves.

The section on *Balance en condiciones futuras* [Equilibrium in future conditions] also states that the current availability of water from surface sources in Mexicali meets the demand for the population until 2034; however, if brewery consumption is included at 100 lps, or its equivalent of 3.15 Mm^3/year (the first production stage) that horizon is reduced to 2032 (Salgado *et al*., 2018, pp. 14-15). This estimated horizon is imprecise considering the prolonged drought trends at the river basin and the potential reductions in deliveries to Mexico stipulated in Minutes 319 and 323 of the 1944 US-Mexico Water Treaty.

On the other hand, the IMTA study carried out in 2018 mentions that the brewery is required to reimburse the CESPM for the volume of water rights obtained with agricultural land purchasing.[4] At the time of the study (May 2018), the brewery had water rights associated with only 195 ha with the suggestion to rush the acquisition of around 200 ha for the rest of the water rights (Salgado *et al*., 2018, p. 14) to reimburse volumes before 2033. The total volume corresponding to water rights of 391.6 ha in agricultural areas of gravity irrigation, as is the case of the brewery site, is 3.96 Mm^3/year. However, another section of the study mentions that the brewery is committed to reimbursing the CESPM for 323 ha of water rights (Salgado *et al.*, 2018); corresponding to a smaller volume of water (3.26 Mm^3/year), considering the official endowments of 10 108 m^3/ha and not the 10 800 m^3/ha used erroneously in the official studies.

Based on the preceding, the present study highlights two additional inconsistencies in the water volume that the CESPM declared to have available for the brewery, which it stated would come from the surplus. Concerning volume restitution from the brewery to the CESPM, firstly, the CESPM guaranteed a 5.27 Mm^3/year (167 lps) supply for the first production phase (10 Mhl/year). A negative or missing differential of restitution to the CESPM of the order of 2.01 Mm^3/year is observed here, which comes from the difference of 5.27-3.26 Mm^3/year. Secondly, the CESPM will guarantee supply with an installed capacity of 10 Mm^3/year (317.1 lps). Another negative or missing difference of restitution to the CESPM is observed here in the order of 6.74 Mm^3/year, which comes from 10-3.26 Mm^3/year.

Recalculating the future availability of water for Mexicali, based on data from the IMTA and the CESPM, it can be deduced that, if 3.15 Mm^3/year are guaranteed to the brewery, the water demand horizon for Mexicali's population is 12 years (2032). Due to the estimated

[4] Different data are mentioned in the EIS: 391.6 ha, whereas other parts of the study reported 396.4 ha and 388.5 ha. The IMTA study carried out in 2018 mentions an extension of 400 ha for the brewery.

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restitution differences of 2.01 and 6.74 Mm^3/year, respectively, that horizon would be significantly reduced.

In contrast, the CESPM asserts that the future availability of water will increase by 1 Mm^3/year over the next 30 years, as a result of possible transfers of water rights from the agricultural sector to the city (Salgado *et al*., 2018, p. 15). It should be mentioned that this volume is equivalent to shutting down 100 ha of irrigation annually. The 2018 PHEBC also refers to the intention of transferring surface water volumes from the irrigation district to the city of Mexicali by resizing the present gravity irrigation zone of 136,600 ha to 113,428 ha by the year 2035, that is, by reducing the agricultural area of gravity irrigation by 22,572 ha and its respective water usage, equivalent to 228.2 Mm^3/year (Comisión Estatal del Agua de Baja California, 2018, pp. 41-42).

An adequate analysis should be based on a consensual public policy focused on developing the national and regional agricultural and livestock sectors and local industrial and urban development. Therefore, it is inappropriate to secure volumes based on reducing agricultural irrigation surface in the Mexicali Valley.

ADDITIONAL OBSERVATIONS ON SCENARIOS OF AVAILABILITY AND DEMAND OF URBAN WATER FOR MEXICALI

It is claimed that the CESPM will increase its availability by 1.0 Mm^3/year continuously and stably over a 30-year horizon (Salgado *et al.*, 2018); this presupposes a high degree of uncertainty, considering that water volumes would come from agricultural irrigation rights. For that reason, estimating the future availability of surface water to meet the demand of the city of Mexicali (with or without a brewery) is questionable. In any case, a 50 percent probability of obtaining such volume (similar probabilities of occurring and not occurring) could be established conservatively, which would place the annual increase in availability at 0.5 Mm^3/year, and consequently shortening the horizon in the same proportion.

An average annual rate of 1.11 percent was used for the projected increase in demand (Salgado *et al.*, 2018, pp. 15-20). However, official reports state that the increase in Mexicali would be two or three times higher than estimated: 3.5 percent between 2016-2020, 2.35 percent between 2020-2025, 2.36 percent between 2025-2030, and 2.36 percent between 2030-2035 (Comisión Estatal del Agua de Baja California, 2018, p. 69).

Regardless of the discrepancy in the data on rates of increase in water demand used by the IMTA and the CEA-BC, estimates are added to the demand line in addition to the estimated standard line, which includes consumption by brewery considered at 3.15 Mm^3/year for the first stage of production (Salgado *et al*., 2018, p. 15). However, such net volume would reach 6.74 Mm^3/year, based on the negative differential calculated in the previous section, which translates into decreased availability based on the brewery's return volumes to the CESPM (3.26 Mm^3/year from 323 ha).

The previous has direct implications for estimated horizons to meet the future demand of Mexicali's population, thus increasing demand lines by more than double and thus approaching the availability line so that they intersect at a closer horizon, that is, in 2035, and not 2050, as stated.

The inconsistencies, discrepancies, and inaccuracies among official data analyzing aquifer abatement, water supply, and water availability and demand scenarios for the brewery represent additional significant elements of the project's socio-environmental conflict. These all indicate a lack of adherence to the concepts of WS and sustainability used in this study, which, according to UN-Water (2013), should promote access to adequate quantities and acceptable quality for sustainable socio-economic development and well-being, in such a way as to promote a climate of peace and political stability, conditions exacerbated by the brewing project in Mexicali.

The inconsistencies and main resolutions of the SPA-BC on the EIS

The inconsistencies observed both in the EIS and in the IMTA study are stated in the *Resolutivo Segundo del Dictamen* [Second Resolution of the Opinion] of SPA-BC's Administrative Resolution document concerning the EIS, which states that conditional authorization is granted in the matter of environmental impact to the company *BC Tenedora Inmobiliaria*, *S. de R. L. de C. V*. (Secretaría de Protección al Ambiente del Gobierno del Estado de Baja California, 2016, pp. 11-12). Additionally, *Resolutivo Quinto* [Fifth Resolution] "requires the compliance no later than 30 business days after the notification of the resolution [...], warning that failure to do so will render the present resolution ineffective" (Ibid).

The EIS presentation draws attention to the lack of information on the change of land-use license and the inconsistent information on sources and final volumes of water to be used by the brewery. Relatedly, the *Resolutivo Quinto* [Fifth Resolution] of the Administrative Resolution states that the company entered into a contract with the CESPM in October 2015 to receive a volume of 20 Mm^3/year for the construction and operation of the brewery, of which 15 Mm^3/year would come from the Mexicali Valley aquifer and the remaining 5 Mm^3/year from surface water sources (Constellation Brands, 2016).

The previous suggests the need to verify the congruency of the decisions made, considering the overexploitation status of the Mexicali Valley aquifer and the water demand for irrigation, which results from an annual programmed crop license, which is dominated by strategic crops. In the area where water is to be extracted from wells, the surface occupied for such crops (cotton, wheat, and alfalfa) represents 57 percent of the license. In contrast, from the south of Mexicali, where water is obtained through gravity irrigation, such crops represent 74 percent of the license (Comisión Nacional del Agua, 2019).

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Equivalence and comparison with water requirements reported by the EIS

The following section presents a comparison illustrating aspects of the brewery's water consumption:

Table 2. Equivalences for three estimated water consumption criteria for the brewery

Consumption criteria	Percentage of total urban consumption in Mexicali	Percentage of surplus volume from the CESPM	Percentage of total industrial consumption in Mexicali	Irrigation surface with rights (ha)
Conservative (8.00 Mm^3/year)	7.9	35.3	168	792
Medium (11.67 Mm^3/year)	11.15	48.5	244	1 155
High (20.00 Mm^3/year)	19.6	88.2	419	1 979

Source: Adapted from Sustaita & Olmos (2016) and Salgado, Güitrón de los Reyes, & López (2018).

Therefore, equivalences are derived considering total water consumption under the conservative 8.0 Mm^3/year criterion for the maximum production stage reported in the EIS and based on 4: 1 water-beer ratio[5] (Cortez, 2019):

a. 7.9 percent of total urban annual consumption in the city of Mexicali, which is of the order in 101.8 Mm^3/year (Comisión Estatal del Agua de Baja California, 2018; Salgado *et al.*, 2018, p. 13);

b. or 35.3 percent of the surplus from Mexicali reported by the CESPM, which is in the order of 22.68 Mm^3/year, of a total of assigned rights to the city in the order of 124.53 Mm^3/year (Salgado *et al.*, 2018, p. 13);

c. or 168 percent of the total invoiced industrial consumption reported for the year 2017 (4.77 Mm^3/year) (Comisión Estatal de Servicios Públicos de Mexicali, 2018);

d. or 792 ha of irrigated land, considering allocated rights of 10 108 m^3/ ha (Comisión Nacional del Agua, 2019).

It is necessary to estimate equivalences for other water consumptions reported in the EIS (Sustaita & Olmos, 2016) and the IMTA studies (Salgado *et al*., 2018), which mention different requirements for the brewery project. The inadequate handling of information of the official studies analyzed shows elements that generate socio-environmental conflict and, consequently, the demand of local social actors to promptly broaden the exchange of information and clear up critical decision-making processes involving the use of a highly competitive resource threatened with scarcity. This calls for the internalization of effective water governance, which, as Caldera and Tagle (2017) suggest, should incorporate

[5] The equivalences are estimated under the conservative consumption criterion to illustrate the proportion of water consumed to other user sectors.

democratic premises associated with environmental sustainability, broad social representation, and inclusive decision-making.

FINAL THOUGHTS

The present analysis identified inconsistencies, inaccuracies, and discrepancies concerning volumes of water consumption and future availability projections in the Mexicali Valley aquifer and the Mexicali urban area. This article reviewed official information on the most important critical aspects of water sources, availability, and demand. These inconsistencies, inaccuracies, and discrepancies were the main reasons for the social rejection that created conflict between the project promoters and the different local actors who opposed it.

Some particular aspects of the brewery project are noteworthy:

1) There was a high level of secrecy in handling critical information and a lack of effective communication of the project from the beginning of the process.

2) The "fast track" method used in the analysis and, subsequently, approval of Opinion 306 of the XXIst Legislature of Baja California, in which lands belonging to the executive branch of the State of Baja California were divested in favor of the company at a low cost.

3) The irregular and secretive manner in which the aqueduct was intended to be financed and built to transport water from the area of the wells in the northeast of the Mexicali Valley to the brewery site located south of Mexicali was an aspect that caused much discontent, social rejection, and blockades.

4) The SPA-BC's administrative resolution, which determined a conditional authorization from the brewery's EIS, despite a large number of aspects that had not been fulfilled at the time of its presentation. It lacked a definition of land tenure security, had inconsistencies in data management on sources and water supply volumes, wastewater discharges, and minimal or no socialization to avoid project rejection.

5) Lack of technical and normative rigor in reviewing and analyzing the EIS by the SPA-BC. The state government failed to observe the groundwater issue analyzed through three geohydrological simulation exercises reported by the EIS, which has an evident impact on the abatement of the regional aquifer with a resulting saline concentration in the area intended for water extraction for the brewery. Despite that, the project was ruled as environmentally viable, which is incongruous based on the EIS's calculations of aquifer behavior and the results of the present analysis on the impact on water sources and the city's reserves.

6) The endorsement given by the IMTA (2018) to the brewery project, although the technical-scientific body found significant deficiencies in the baseline information provided by the CESPM for project analysis. Furthermore, based on inadequate technical criteria, inaccurate calculations, and inconsistent data, the IMTA determined that there would be no impact on Mexicali's future water supply.

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7) The significant and permanent social rejection, manifested as a result of collective uncertainty from the beginning of the process due to the secrecy with which the project's promotion processes were carried out; the perceived risk as a consequence of the intensive use of water, and the minimal impact on direct job creation.

A general recommendation derived from the present analysis is that if the principles of WS, sustainability, and democratic environmental governance are to be considered the foundations of intelligent regional development, then these principles should be implemented. To that end, it is necessary to submit the technical, economic, environmental, social, and moral viability of establishing the brewery to the local society.

The previous entails consulting the involved actors through formal citizen participation processes that allow for a transparent and democratic determination of the final decision, thus considering the different local social actors who would benefit from or be affected by the project. The democratic process was carried out at the end of the conflict over the brewery, thanks to the citizen consultation on March 21 and 22, 2020, which ultimately resulted in the cancellation of the brewery project in Mexicali.

Translation: Miguel Ángel Ríos

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