DOI: 10.24850/j-tyca-2025-01-10

Notes

Service quality models in the public drinking water supply in Mexico

Modelos de calidad de servicio en el suministro público de agua potable en México

Jorge Silva[1], ORCID: https://orcid.org/0000-0002-0961-4696

[1]Instituto de Investigaciones Dr. José María Luis Mora, Mexico City, Mexico, j.a.silva@outlook.com

Corresponding author: Jorge Silva, j.a.silva@outlook.com

Abstract

To analyze service quality models in the public drinking water supply in Mexico. The paper conducts a systematic review of various works of erudition on the subject, with the models being identified based on their application. A systematic literature review was conducted using the Preferred Reporting Item for Systematic Reviews (PRISMA) and the 3-stage approach by Arksey and O'Malley. The study design was chosen because it helps in the identification of articles through predefined criteria. Electronic searches were conducted via Web of Science and Scopus, with articles published between 1980 and 2022 being identified. The articles

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

were then screened for relevance, applicability, validity, and reliability. The review identified at least five GAPS under the GAP model, which include knowledge, policy, delivery, communication, and consumer. Subsequently, the SERVQUAL model shows that the public drinking water supply systems fall below the set expectations of reliability, assurance, empathy, tangibles, and responsiveness. Contrarily, the government has set up programs like PROME and the Citizens' Initiatives for General Water Law aimed at improving citizen participation and comprehension of key GAPS in the water supply system. The research is novel as it prods the subject of service quality models in Mexico. This topic is an unexplored area, especially with regard to the GAP and SERVQUAL models. The insight derived from this paper will bridge the existent dearth of knowledge while improving policy formulation and implementation.

Keywords: Consumer expectations, drinking water, satisfaction, service quality

Resumen

Analizar modelos de calidad de servicio en el suministro público de agua potable en México. El trabajo realiza una revisión sistemática de varios trabajos de erudición sobre el tema, identificando los modelos a partir de su aplicación. Se realizó una revisión sistemática de la literatura utilizando el elemento de informe preferido para revisiones sistemáticas (PRISMA) y el enfoque de tres etapas de Arksey y O'Malley. El diseño del estudio fue elegido porque ayuda en la identificación de artículos a través de criterios predefinidos. Se realizaron búsquedas electrónicas a través de Web of Science y Scopus, identificándose artículos publicados entre 1980 y 2022. Luego, los artículos fueron seleccionados por relevancia,

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

aplicabilidad, validez y confiabilidad. La revisión identificó al menos cinco brechas en el modelo GAP, que incluyen conocimiento, política, entrega, comunicación y consumidor. Posteriormente, el modelo SERVQUAL muestra que los sistemas públicos de abastecimiento de agua potable se encuentran por debajo de las expectativas establecidas de confiabilidad, seguridad, empatía, tangibilidad y capacidad de respuesta. Por el contrario, el gobierno ha puesto en marcha programas como el PROME y las iniciativas ciudadanas para la Ley General de Aguas destinados a mejorar la participación ciudadana y la comprensión de las brechas clave en el sistema de suministro de agua. La investigación es novedosa, pues indaga en el tema de los modelos de calidad de servicio en México. Este tema es un área inexplorada, especialmente con respecto a los modelos GAP y SERVQUAL. La información derivada de este documento salvará la escasez de conocimiento existente, y mejorará la formulación e implementación de políticas.

Palabras clave: expectativas del consumidor, agua potable, satisfacción, calidad del servicio

Received: 18/01/2023

Accepted: 22/08/2023

Published Online: 24/08/2023

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y Ciencias del Agua
OPEN ACCESS
Check for updates

Introduction

A common assertion among public administration scholars and practitioners alike is that a safe/ efficient drinking water supply is a key variable that influences the life quality of denizens. As per the World Health Organization (WHO, 2022), safe and readily available water is important for public health, with unsafe levels of contaminants contributing to chronic diseases, nervous system/reproductive effects as well as gastrointestinal illnesses. The Sustainable Development Goal target 6.1, coined by the WHO, presents target measures whereby safe drinking water is determined by the water source, availability, and whether it is free from priority chemical/fecal contamination (WHO, 2022; WHO, 2012).

Studying water supply from water suppliers' perspective is essential for ensuring sustainable and reliable water resources, addressing water scarcity, maintaining water quality, promoting water efficiency, and fostering collaboration among stakeholders (United States Environmental Protection Agency, 2023; Svalbarði Polar Iceberg Water, 2023; Chapagain, Wagner, Joshi, & Eck, 2020; Danley, 2019; Hunter, MacDonald, & Carter, 2010). The study from water suppliers' perspective is of paramount importance for several reasons: Ensuring Sustainable Water Supply, adapting to Changing Conditions, Addressing Water Scarcity, Ensuring Water Quality and Safety, Enhancing Water Efficiency, Collaboration and Awareness (United States Environmental Protection Agency, 2023; Svalbarði Polar Iceberg Water, 2023; Chapagain *et al*., 2020; Danley, 2019; Hunter *et al*., 2010).

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

In relation to service quality, it is termed as a measure of how well an entity or organization delivers services based on customer expectations. Kansara (2020) denotes that a solid public drinking water supply system can solely be termed as quality if it provides service that is both effective and efficient. The customers or denizens oft hold different kinds of expectations for the service performance, with the desired service being highlighted as the highest expectation of return (Kansara, 2020). The provision of adequate service returns is viewed as the lowest expectation as it does not entirely meet the hopes and wishes of the customers (Khader & Madhavi, 2017).

It is imperative to note that different customers possess different tolerance levels when it comes to service quality. The perceived service quality influences customer satisfaction with the primal emphasis being drawn on the service process, outcome, and physical environment (Expert Program Management, 2018). There are various dimensions that contribute to service quality systems, with the topmost being reliability. Kansara (2020) alludes that reliability focuses on how the drinking water supply services are delivered in tandem with the management of challenges or problems. Furthermore, the services are solely termed as reliable if the pricing methodologies are fair.

The second dimension is responsiveness, whereby customers expect the inherent structures and governmental agencies to provide prompt service which meets their inchoate needs or desires. The dimension is complemented by assurance whereby the government is tasked with inculcating trust into consumers that the service is efficient and effective (Gleason & Casiano-Flores, 2021; Hazin, 2000; Haldevang, 2022). The fourth variable is empathy which explores whether the

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

services are able to provide individual attention to each of the customers. The final dimension is tangibility which focuses on the appearance of physical facilities used in the provision of drinking water services to the customers.

The service dimensions should be geared towards maximizing customer satisfaction, devoid of any operational failures or challenges. In most nations, the service quality of the public drinking water supply systems is compounded by population growth, especially in urban areas. The growth is correlated with an influx in activities which then increases the need/demand for clean water (Mazari-Hiriart, Tapia-Palacios, Zarco-Arista, & Espinosa-García, 2019; Jiménez, Ramos, & Quezada, 1999; Karnib, 2015). The result is a decline in the quality of clean drinking water itself because the water resource capacity is limited. The occurrence of gaps in the service quality inadvertently contributes to a decline in satisfaction levels for the customers while increasing healthcare issues and complications (Carranza-Álvarez, Medellín-Castillo, Maldonado-Miranda, & Alfaro-de-la-Torre, 2020; Arreguin-Cortes *et al*., 2020).

Specifically, Mexico's drinking water supply systems have faced criticism in recent years due to their lack of efficiency and effectiveness in addressing consumer needs. Mazari-Hiriart *et al*. (2019) highlight that Mexico has a population of nine million inhabitants, with the city metropolitan area encompassing up to 22 million people. Previously, the metropolitan area had a solid water supply system that was self-sufficient, although population demands have forced the government to extract at least 70 % of its water from the regional aquifers, with 30 % being imported (Border, 2020).

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

The water supply system is heavily reliant on groundwater, although there have been concerns about its quality due to an influx of wastes from commercial, industrial, and domestic activities. The lack of wastewater treatment has further exacerbated the issue of clean water being contaminated, especially during periods of heavy rain (Espinosa-García *et al*., 2015). Espinosa-García *et al*. (2015) denote that the heavy rain causes the exfiltration of wastewater into the surrounding subsoil, thus creating quality issues in many locations within the lacustrine zone. Furthermore, underground water contamination is exacerbated by the risk of unlined canals, especially in transition zones where the soil is highly permeable.

The overreliance on groundwater, contamination as well as increased population growth has contributed to below-par customer satisfaction (CNA, 2017). A background analysis reveals that the conventional service quality models in Mexico fall short of the five dimensions mentioned prior. Specifically, the assurance and reliability prongs are non-existent in the models. Hurtado, Gardea-Torresdey and Tiemann (2000) allude that most Mexican people are wary about tap drinking water even though it is treated. This has, in turn, caused a shift towards bottled water since the tap water is contaminated with fluoride. Furthermore, the water systems in Mexico are not entirely reliable, with mishaps and operational failure due to heat extremes based on climate change (Hurtado *et al*., 2000; Haldevang, 2022; United Nations International Children's Emergency Fund, 2021; Zeraebruka, Mayabib, Gathenyac, & Tsige, 2014). At least 70 % of Mexico is affected by drought, with rainfall levels decreasing by 20 % (Haldevang, 2022). Since the nation is over-reliant on groundwater sources, the availability of safe

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

drinking water has waned off substantially, thus causing a decline in customer satisfaction (Water Integrity Network, 2020). It is of great importance system redundancy and robustness for avoiding service interruptions and ensuring the continual water supply for improving customer's satisfaction (Taylor, Slocum, & Whittle, 2019).

The overarching aim of this paper is to review service quality models in the public drinking water supply in Mexico. A systematic review of literature will be conducted on the topic, with the primal emphasis being drawn on what the government has done to improve service quality models. The systematic review is substantial in describing the characteristics, disadvantages, and advantages of the models identified. Furthermore, a comparative analysis of the models will be conducted using insight from the divergent works of erudition with the main models being identified. The paper is divided into five sections which include the introduction, method, results, discussion, and conclusions.

Methodology

To determine service quality models in public drinking water supply in Mexico, the researcher conducted a systematic literature review using the Preferred Reporting Item for Systematic Reviews (PRISMA). The study design was chosen because it helps in the identification and analysis of articles through predefined criteria of inclusion and exclusion (Lawati, Dennis, Short, & Abdulhadi, 2018; Mokssit, De Gouvello, Chazerain, Figuères, & Tassin, 2018). The review was also based on the 4-stage approach coined by Arksey and O'Malley, as shown in the subsequent sections (O'Connor *et al*., 2022).

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

Stage 1. Research Question

The first stage in the approach is the identification of the research question, which is "what service quality models are used in Mexico for drinking water supply?". The research question was seminal in defining the scope of the systematic review and the type of data sources to be used.

Stage 2. Identification of relevant studies

In this stage, the researcher conducted electronic searches through two databases, namely Web of Science and Scopus, between June 6th and 19th, 2022. The search strategy involved keying in free-text words such as "service quality models," "Mexico," "drinking water supply," "public water systems," and "water quality". A snowball sampling method was applied, whereby some of the papers did not directly answer the research question (Kohli, 2020; Genter, Willetts, & Foster, 2021; Soumaila *et al*., 2019). The method was substantial in identifying additional papers that contained vital information about service quality levels in Mexico.

Stage 3. Study selection

The researcher then identified the titles and abstracts of the specific articles, after which they were screened for relevance, applicability, validity, and reliability. The inclusion criteria focused on articles that provided sufficient detail about service quality models and whether they were published between 2000 and 2022. Furthermore, the researcher

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

evaluated whether the articles could be categorized as journal articles, online articles, books, government documents, or technical reports (PRISMA, 2022). The exclusion criteria, on the other hand, revolved around articles which were not relevant for this research.

Stage 4. Charting the data

A preliminary data charting table was developed, as shown below. The Table 1 was piloted by the researcher with data being extracted on the article title, type of document, authors, and main findings.

Table 1. Literature selected.

Title	Type of document	Authors	Comments on Main Findings
The contradictions of urban water management in Mexico	Journal article	Barkin (2005)	The author denotes that service quality has dwindled in Mexico due to inherent bureaucracy and adhocracy in the water supply systems
Water and sewage service quality: Proposal of a new multi-questionnaire monitoring tool	Research article	Franceschini, Galetto, and Turina (2008)	The authors recommend the use of SERVQUAL as a tool that can measure consumer satisfaction with regard to the efficient and effective management of water resources
Output-based disbursements in Mexico: transforming the water Sector in Guanajuato	Technical report	Saltiel and Mandri-Perrott (2008)	The technical report shows that there are policy gaps that undermine the reliability and responsiveness of water authorities to the needs of Mexican citizens

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

Title	Type of document	Authors	Comments on Main Findings
A conceptual model for critical incident analysis	Journal article	Kirby (2010)	The paper explores the critical incident model used to measure service quality. The author shows that the model is seminal in understanding how events, political factors, and authorized interveners can influence service quality
Water governance in Mexico: Political and economic apertures and a shifting state citizen relationship	Journal article	Wilder (2010)	The author reports that Mexico's water system is yet to mature despite the adoption of a dramatic national water policy. This is because the system is riddled with bureaucracy that undermines service quality
Evolution of water management in Mexico	Journal article	Arreguín-Cortés and Mejía-Maravila (2011)	The article explores the various gaps and challenges prevalent in the water supply systems in Mexico
Making water reform happen in Mexico	Policy paper	Gurría (2012)	Using the GAP service quality model, the article denotes that the public drinking water supply system is compounded by quality service GAPS such as administrative, information, policy, capacity, objective, funding, and accountability
Drinking water quality in a Mexico City university community: Perception and preferences	Journal article	Espinosa-García *et al*. (2015)	The authors denote that customers have a negative perception about the service quality of public drinking water supply, with most of them citing organoleptic reasons and health reasons

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

Title	Type of document	Authors	Comments on Main Findings
Consumer perception and preference of drinking water sources	Journal article	Sajjadi, Alipour, Matlabi, and Biglari (2016)	The article shows that Mexican customers have specific preferences for drinking water based on their perception of the service quality
Climate threats, water supply vulnerability, and the risk of a water crisis in the Monterrey Metropolitan Area (Northeastern Mexico)	Journal article	Sisto, Ramírez, Aguilar-Barajas, and Magaña-Rueda (2016)	The journal article shows that the current service quality levels have increased due to maintenance work and emergency repairs
Progression of service quality concepts	Journal article	Khader and Madhavi (2017)	The paper explores the evolution of service quality models over the years
Household's perception of water quality and willingness to pay for clean water in Mexico City	Journal article	Rodríguez-Tapia, Revollo-Fernández, and Morales-Novelo (2017)	The authors conducted a survey that showed that Mexicans pay a lot of money for safe drinking water, which undermines their income levels and satisfaction rates
Public perception related to inadequate drinking water quality among Brazilian adults	Journal article	Garcia, Garcia, and Barardi (2018)	The article denotes that consumer perception about the image of the drinking water supply systems influences their preferences
Building a methodology for assessing service quality under intermittent domestic water supply	Journal article	Mokssit *et al*. (2018)	The article denotes that there is a need for water agencies in Mexico to assess their operational and management performance in order to dole out top-tier service levels to customers

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

Title	Type of document	Authors	Comments on Main Findings
Inequality in access to drinking water and subsidies between low and high-income households in Mexico City	Journal article	Morales-Novelo, Rodríguez-Tapia, and Revollo-Fernández (2018)	The authors highlight that there is a high level of inequality in access to safe drinking water in Mexico caused by economic and population growth. This then increases the gap between water demand and supply while undermining the service quality operations of the Water System of Mexico City (SACMEX)
Measuring user compliance and cost effectiveness of safe drinking water programs: A cluster-randomized study of household ultraviolet disinfection in rural Mexico	Journal article	Reygadas, Gruber, Dreizler, Nelson, and Ray (2018)	The authors denote that customers have a negative perception of the service quality of public drinking water supply
Organizational effectiveness evaluation in Mexico City's drinking water system	Journal Article	Silva-Rodríguez-de-San-Miguel (2018)	The author used the reliability and responsiveness of the SERVQUAL model, which showed that the service quality of public drinking water supply in Mexico is below-par
SWM technology for efficient water management in universities: The case of PUMAGUA, UNAM, Mexico City	Policy paper	González-Villarreal, Lartigue, Hidalgo, Hernández, and Espinosa (2018)	The article recommends the use of smart water management, which can build trust and improve the image of service quality models in the eyes of consumers

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

Title	Type of document	Authors	Comments on Main Findings
Integral drinking water management model in Iztapalapa, Mexico City	Journal article	Silva-Rodríguez-de-San-Miguel, Lambarry-Vilchis, and Trujillo-Flores (2019)	The article applies the SERVQUAL model, which shows that the service quality experienced by customers is quite low in Mexico
Operational efficiency of Mexican water utilities: Results of a double-bootstrap data envelopment analysis	Journal article	Ablanedo-Rosas, Guerrero Campanur, Olivares-Benitez, Sánchez-García, and Nuñez-Ríos (2020)	The paper explores the functional quality of Mexican Water utilities. The data derived indicates that the utilities provide low service quality levels due to the lack of support from the government
What are households willing to pay for better tap water quality? A cross-country valuation study	Article	Beaumais, Briand, Millock, and Nauges (2020)	The paper shows that most customers are willing to pay higher prices because they are unsatisfied with the water quality
Covid exposes Mexico City's water access gap between rich and poor	Article	Madry (2020)	The author highlights that the coronavirus pandemic exacerbated capacity gaps which in turn undermined service quality in Mexico
Lack of safe drinking water for lake Chapala Basin communities in Mexico inhibits progress toward sustainable development goals 3 and 6	Journal Article	Smith, Jackson, Peters, and Herrera-Lima (2020)	The article shows that funding, policy, and accountability gaps have contributed to a decline in access to safe and conducive public drinking water in Mexico
Covid-19 and Mexico's water crisis	Article	Carey (2021)	The author shows that the COVID-19 pandemic increased water shortage issues, thus minimizing service quality

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

Title	Type of document	Authors	Comments on Main Findings
A cross-sectional study to measure household water insecurity and its health outcomes in urban Mexico	Journal article	Jepson *et al*. (2021)	The article shows that inefficient service quality levels in Mexico contribute to drinking water insecurity which also increases negative health outcomes in the population
Structural factors of expectations regarding the public drinking water service in a town in Central Mexico	Journal article	Juarez-Najera, Bustos-Aguayo, and Garcia-Lirios (2021)	The article shows that the advent and subsequent spread of the coronavirus pandemic exacerbated concerns about the service quality of public drinking water supply systems in Mexico
Unfolding water quality status during COVID-19 lockdown for the highly polluted Santiago River in Jalisco, Mexico	Journal article	Kutralam-Muniasamy, Pérez-Guevara, Martinez, and Chari (2021)	The article indicates that anthropogenic activities have contributed to low service quality levels in Mexico, with the water sources being contaminated
The efficiency of post-reform water utilities in Mexico	Journal article	Salazar-Adams (2021)	The article shows that the Mexican water industry is saturated by public agencies which impose strict limitations on privately managed utilities. The implementation of decentralized autonomous water utilities has further undermined service quality, with increased costs being reported
Optimizing household water decisions for managing intermittent water supply in Mexico City	Journal article	Wunderlich, Freeman, Galindo, Brown, and Kumpel (2021)	The authors denote that customers are compliant with safe drinking water programs due to the positive image they hold of the service quality level

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

Apart from the previous steps, three validity criteria were chosen for the selection of the documents: Study Risk of Bias Assessment, Synthesis Methods, and Certainty Assessment.

1. Study risk of bias assessment

The identified articles were rated for quality using a Likert scale ranging from 0 to 10. The quality control criteria were substantial in determining whether there was any bias in the findings presented by each author. The studies with a lower quality score were excluded, with the researcher identifying study designs and categorizing them as per the inclusion criteria. Furthermore, a meta-regression was conducted that combined the study design type and quality criteria in a bid to reduce the risk of bias.

2. Synthesis methods

The researcher determined the studies that were eligible for synthesis based on the insight they provided on service quality models in public drinking water supply in Mexico. Any missing data or information from the specific studies was handled through the snowball sampling method, with the researcher filling in gaps through comprehensive literature reviews and deductive methodologies. A sensitivity analysis was also conducted, which allowed the researcher to comprehend and report the robustness of the articles included.

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

3. Certainty assessment

A certainty assessment was conducted to determine whether the evidence presented in the articles/works of erudition effectively answered the research question. The assessment checked key domains such as publication bias, imprecision, indirectness, inconsistency, and risk of bias.

Results

The utilization of the PRISMA technique and the three-stage approach introduced by Aksey and O'Malley allowed the researcher to identify a total of 40 articles. At least two of the articles were found to be inconclusive regarding service quality models in the public drinking water supply. Another nine were excluded from the article analysis because they did not show any signs or content of the key service quality models explored, which include GAP and SERVQUAL frameworks. The remaining 29 articles were reviewed, with insight derived being included in the discussion section of the study. The articles were gauged on their quality and impact factors. Furthermore, the researcher ensured that there was no form or indication of bias in the results, which could undermine the quality of the study.

Discussion

The topic of service quality models in the public drinking water supply is undoubtedly an unexplored area. The systematic review showed that most of the conventional works of erudition are singularly focused on customer perceptions regarding service quality. As a matter of fact, a

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

good chunk explores the use of SERVQUAL measures when determining customer perceptions which creates an apparent dearth of knowledge on other service quality models. To bridge this gap, the researcher deemed it fit to conglomerate results from the 29 documents identified and classify them into key themes that revolve around the four service quality models. The characteristics of the models were identified in tandem with their advantages and disadvantages.

Service quality

Prior to highlighting the key models used in assessing the public drinking water supply in Mexico, it is imperative for the reader to gain an insight into the concept of quality. In his seminal work, Kansara (2020) opines that the concept of quality is a vital tool in the attainment of ultimate performance and efficiency. The concept is not influenced by the nature of the product or service, although it emphasizes performances, processes, and actions. The water services are oft distinguished into inputs and resources. The inputs act as primary contributions to the functionality of the supply systems, with resources helping improve their efficiency (Kansara, 2020). The success of a public drinking water supply system is gauged by its ability to interact with customers who actively participate in the service delivery process. Barkin (2005) builds upon this assertion by noting that the services are oft created and consumed in a simultaneous manner. In light of this, customer participation and service intangibility should be combined in order to improve satisfaction from one customer to the other. Based on this perspective, Wilder (2010) noted that the public drinking water supply system in Mexico is characterized by five features which include implicit/explicit service, information,

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

facilitating goods, and supporting facilities. The key features all directly influence the service quality models in public drinking water supply systems, thus morphing the structures into a mass service (Barkin, 2005; Wilder, 2010; Wilder, Martínez-Austria, Hernández-Romero, & Cruz Ayala, 2020; Arreguín-Cortés & Mejía-Maravila, 2011).

In mass service systems, the degree of interaction between the customers and the system is quite low, while the degree of labor intensity is high. Furthermore, customization is not inclusive, which means that low and high-income customers receive divergent levels of service, thus influencing their willingness to pay (WTP) (Beaumais *et al*., 2020). The assertions made by Wilder (2010) clearly show that the public drinking water supply system in Mexico is more of a mass service rather than an open system that views the customer as a co-producer. Therefore, most customers in the Mexican environment are not allowed to participate in the service process, which minimizes their level of satisfaction while creating negative perceptions about the drinking water supply (Mokssit *et al*., 2018; Mukokoma & Van Dijk, 2011).

GAP Model

The GAP Model of Service Quality was created by Parasuraman, Zeithaml, and Berry (1985) with the aim of understanding and evaluating customer satisfaction. The model denotes that customer perception is a function of perception. This means that satisfaction is attained when and only if the customer views the service as a key variable that meets their expectation (Parasuraman *et al*., 1985). In the event that the service model does not satisfy them, then at least five customer service GAPS are created:

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

knowledge-based, policy GAPS, delivery GAP, communication GAP, and customer GAP.

The first GAP is knowledge-based, whereby there is a difference between the company's provision of the drinking water supply services and customer expectations. This GAP is oft brought about by the lack of awareness on the management's side about what customers expect. Gurría (2012) highlights that knowledge GAPS are prevalent in the Mexican public drinking water supply systems due to information asymmetry among the stakeholders. The federal government is not cognizant of the needs and challenges faced by the customers; thus, it rolls out water services that have limited standardization (Gurría, 2012; Murrar, Batra, & Rodger, 2021). Furthermore, the incomplete REDPA and metering systems have made it hard for the customers to comprehend the amount of money required for them to effectively receive safe and sufficient drinking water.

Policy GAPS come in second; wherein there is a dissimilarity between the federal government's understanding of denizen needs and subsequent translation of the understanding into policies/ standards that accentuate service delivery. Gurría (2012) shows that water reforms in Mexico are undermined due to the lack of comprehension on the government's side. For instance, change implementation is slow even though structures have been put in place to diagnose the need for improved service in public drinking water supply systems (Gurría, 2012; Octavia & Chotib, 2019). The Conagua publication of 1989 is a primal example of a reform that stalled due to challenges in the alignment of incentives among the municipalities and providers. Furthermore, the government has been unable to roll out a clear implementation plan for

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

the 2030 Water Agenda. Gurría (2012) highlights that there is a need for the necessary strategic financial plans to be put in place, which address critical implementation bottlenecks.

The delivery GAP in the public drinking water supply systems in Mexico is caused by a difference between the planned delivery policies/ standards and the actual service delivery. Gurría (2012) denotes that the delivery GAPS are commonplace because the policies are not specific to what services should be doled out. Furthermore, there is a general lack of enforcement and compliance structures with scattered planning tasks/capacity exacerbating customer dissatisfaction. The delivery GAPS have also increased due to capacity issues, with the Mexican government reporting a high turnover among water professionals due to the lack of commitment. There is a general lack of training programs for the technical, management, and administrative staff, which thus limits their knowledge, skills, and general attitudes.

The communication GAP occurs when the promised services are not delivered as expected, thus causing customer dissatisfaction. Garcia *et al*. (2018) expatiate that this GAP is caused by the mismatch between the functional and administrative units, namely the states, regions, metropolitan areas, municipalities, and water bodies in Mexico. The lack of hydrological boundaries and imperatives has created communication issues between the administrative bodies. The communication GAP is also exacerbated by a lack of continuity of public policies at the local levels (Kirby, 2010; Garcia *et al*., 2018; Espinosa-García *et al*., 2015). This is because the government has a 3-year term for mayors, which limits their political mandates when it comes to service delivery.

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

The customer GAP is defined as the dissimilarity between customer expectations and perceptions. This GAP is common in the public drinking water supply because the customers are not cognizant of what the services have done for them (Sajjadi *et al*., 2016; Sisto *et al*., 2016; Silva-Rodríguez-de-San-Miguel, 2018). Furthermore, a good chunk of them misinterprets the quality of service due to previous mishaps. Sajjadi *et al*. (2016) allude that the limited stakeholder engagement for users/consumers and farmers/ indigenous communities have expanded the customer GAP. Furthermore, there is no official mechanism in place which collects and communicates customer expectations.

The aforementioned GAPS are directly caused by economic and population growth in Mexico, which has thus far increased the demand for water. The influxes are set against naturally limited endowment that contributes to challenges in the public drinking water supply demand and supply levels. Morales-Novelo *et al*. (2018) argue that households are facing pressure to maintain their participation, thus confirming that the system is based on mass service ideologies. There is a general lack of facilitating goods and supporting facilities which contribute to inequality (Rodríguez-Tapia *et al*., 2017; Silva-Rodríguez-de-San-Miguel *et al*., 2019). By using the Lorenz curve and Gini Coefficient, Morales-Novelo *et al*. (2018) found that a decline in participation contributes to the customer, communication, and delivery GAPS. Furthermore, the current policies in Mexico have created subsidies that present a regressive distribution wherein high-income customers benefit more compared the low-income customers.

The policy and delivery GAPS are at the core of the research by Smith *et al*. (2020), who denote that the lack of funding and support has

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

led to a dip in access to safe/conducive public drinking water in Mexico. The article results showed that there I a high level of arsenic compounds and total coliform bacteria in drinking water which violates SDG 6, which calls for sustainable clean water and sanitation. As a matter of fact, areas like San Pedro and Mezcala are duly affected by delivery GAPS since the garrafones from local vendors are affected by total coliform bacteria (Smith *et al*., 2020; Carey, 2021; Jepson *et al*., 2021; Pacheco-Vega, 2019)**.** An in-depth review of the bacterial contamination reveals that it occurs during initial refilling with the government not paying attention to the quality lapses among the local vendors. The lack of clear hydrological boundaries has thus far increased the ability of local vendors to operate without any scrutiny (Juarez-Najera *et al.*, 2021; Kutralam-Muniasamy *et al.*, 2021).

Based on the preceding literature, the main advantage of the GAP model is that it identifies and distinguishes the key GAPS in knowledge, policy, delivery, communication, and customer GAPS (Morales-Novelo *et al*., 2018). A clear delineation and explanation are provided for the causal factors behind every GAP. In light of this, the government or entities can be able to address each GAP and improve satisfaction. Contrarily, the model is marred by assumptions, with the term expectation being viewed as polysemic. This is because the customers analyze the quality of services using various standards rather than expectations. Therefore, relying on customer expectations to understand the service quality of public drinking water supply systems is a fallible angle that creates more questions than answers.

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

SERVQUAL Model

Franceschini *et al*. (2008) introduce the SERVQUAL model as a measure of service quality which splits the overall service into five key components: reliability, assurance, tangibles, empathy, and responsiveness. The first component is reliability which explores the ability of a firm to accurately and dependably perform its promise to the customers (Bhasin, 2021; Khader & Madhavi, 2017; Polyakova & Mirza, 2015; Prevos, 2016). Franceschini *et al*. (2008) denote that the Mexican public drinking water supply systems are marred by challenges that undermine their reliability. Most of the challenges are financial-based with limited own-source revenues at the sub-national level (Franceschini *et al*., 2008). Furthermore, the continued reliance on federal programs and CONAGUA resources has exacerbated funding gaps, thus making it hard for the systems to effectively deliver services to the customers.

The second component is assurance which explores the courtesy, knowledge, and ability of the employees to inspire confidence in the firm's operations/services. Silva-Rodríguez-de-San-Miguel *et al*. (2019) presented a journal article that explored the integrated drinking water management model in Mexico City. Congruent denotations from the paper show that the level of confidence in the system is quite low due to the lack of inspiration from the employees. In lieu of this, the perceived quality and service satisfaction rates are undermined on the customer side (Silva-Rodríguez-de-San-Miguel *et al*., 2019; González-Villarreal *et al*., 2018).

Silva-Rodríguez-de-San-Miguel (2018) explored the third component of the SERVQUAL model, which is tangibles that analyze the

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

equipment and facilities used by a firm to attain its objectives. Using data gleaned from the Development of the Federal District (Mexico City today), the researcher argued that the current facilities in the drinking water supply system fall short of the requirement. This inadvertently causes insufficient water supply as well as below-par quality (Silva-Rodríguez-de-San-Miguel, 2018). The lack of equipment and facilities has contributed to waterway exploitation and a deficit of 23 % in recharge. In lieu of this, there is a surge in land subsidence which ultimately affects urban infrastructure.

Saltiel and Mandri-Perrott (2008) back the findings highlighted by Silva-Rodríguez-de-San-Miguel (2008) by showing that the share of municipal wastewater receiving treatment in Mexico is 30 % more than in other countries in Latin America. Contrarily, the treatment facilities fall below the specified levels of OECD countries. The failures are attributed to the lack of tangibles, with most Mexican treatment plans not complying with effluent discharge regulations. Moreover, at least 55 % of households are affected by drinking water interruptions due to inefficient tangibles (Saltiel & Mandri-Perrott, 2008).

Silva-Rodríguez-de-San-Miguel (2018) goes further to introduce the fourth component, empathy, whereby a firm has to provide customers with individualized services or attention. The author opines that the water supply is not homogenous in Mexico City, with some residents receiving 200 liters while others more than 350 liters on a daily basis. The lack of individualized services and facilities has led to a discontinuous drinking water supply and additional losses of up to 35 % due to leaks in the system network. Furthermore, the water supply is filled with chlorine and other compounds that negatively affect the health of the denizens.

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

The lack of individualized services has also contributed to a decline in the customer willingness to pay (WTP) levels. Rodríguez-Tapia *et al*. (2017) highlight that the general or recommended WTP per family should be set at 4.7 % of the drinking water bill. Au contraire, Mexican customers are less likely to pay for drinking water services due to the below-par service quality levels. This has, in turn, created a market dynamic whereby there is a high demand for bottled water compared to city tap water. Rodríguez-Tapia *et al*. (2017) cite that bottled water in Mexico is 235 times more expensive at $120 compared to city tap water at $0.51 per cubic meter. The lack of trust in the water supply agency has adversely affected the willingness of customers to pay while undermining supply policies coined by the government. The low WTP is also commingled with a lack of responsiveness by the government since it is unable to obtain resources from the customers (Rodríguez-Tapia *et al*., 2017; Reygadas *et al*., 2018).

The final component is responsiveness which expatiates the willingness of an entity to aid its customers while providing prompt services. As per Saltiel and Mandri-Perrott (2008), the Mexican public drinking water supply is less responsive to the needs of the people. This is because there are no clear national policies on how to handle wastewater and pollution concerns. Furthermore, the responsiveness has gone down a tad due to a shift in the national government's focus from infrastructure development and quality improvement to revenue generation (Ablanedo-Rosas *et al*., 2020; Madry, 2020). There is a general lack of concern on extending services to the poor with the federal government with customers seeking solutions in the private sector. As mentioned by Rodríguez-Tapia *et al*. (2017), the low WTP means that the

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

government is not able to generate revenues, thus creating a viable environment for private entities to dominate the water supply systems. This has serious negative implications for low-income families as they cannot afford the water supply prices put in place by private entities.

The five components of the SERVQUAL model are advantageous to the government as they aid in the measurement and management of service quality in the public drinking water supply systems. Similar to the GAP model, the framework identifies key causes behind low customer perceptions and confidence in service quality. Furthermore, the model is beneficial as it permits the government and water agencies to assess service quality performance on the basis of individual and company-related challenges (Denantes & Donoso, 2021; Klobucista & Robinson, 2021). The assessment process comes in handy in determining the respective customer segments and how they are affected by low service quality levels. Contrarily, the SERVQUAL model faces intense criticism since it focuses solely on service delivery rather than outcomes (Seth, Deshmukh, & Vrat, 2005). Moreover, there is a high correlation between 5 SERVQUAL dimensions, thus meaning that the obtained scores are not entirely exact.

Government improvements

Using both the GAP and SERVQUAL models, the Mexican government has been able to identify key gaps and challenges compounding the public drinking water supply system. The government recently initiated the Programa de Mejoramiento de Eficiencia de Organismos Operadores (PROME) framework, which reduced water subsidies and improved the

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

quality of services doled out to the customers (The World Bank, 2017; Worldlife, 2018). The program is supported by the national/federal policy goal of accentuating system efficiency to 44 % from the previous 36 % reported for commercial, physical, and energy facilities that serve the public drinking water supply facets (The World Bank, 2017). Furthermore, the program targeted water utilities by providing investments and action plans. This was substantial in improving monitoring processes for any changes that occur in the water supply systems.

Consequently, the government has facilitated consumer/citizen participation in the water supply systems via the Citizens' Initiatives for General Water Law (IC-LGA). This has allowed citizens to work in tandem with professionals and academics so as to improve the efficiency of the public drinking water supply systems (Silva, 2019). The citizens share insight on urban water issues, water justice, and drinking water availability which then allows the government to coin water policies. The cross-pollination of deeply rooted practical knowledge of the masses with scientific knowledge has improved the capabilities of the federal and private stakeholders to dole out quality services to the people (Tangaja, Arceo, Centino, & Camello, 2021).

Moreover, the government has rolled out policies aimed at managing the level of drinking water availability in both urban and rural areas. The policies are based on data that highlights coverage, service quality, and compliance levels (Salazar-Adams, 2021; Wunderlich *et al*., 2021; Yarimoglu, 2015). In lieu of this, the denizens from divergent locations are allocated coverage based on the demand levels, thus improving satisfaction. There are, however, issues of disconnections and

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

lack of availability in urban areas due to population growth which have thus far been handled through equal rationing.

Conclusions

The preceding systematic review explores service quality models in the public drinking water supply in Mexico. To undertake this task, the researcher implemented the Preferred Reporting Item for Systematic Reviews and the three stage approach developed by Arksey and O'Malley. The tools helped in the identification of 40 articles which were reviewed based on validity and content. A total of 29 articles were gleaned from the process.

Notably, two models are identified, namely the GAP and SERVQUAL models, both of which show that the service quality is below-par and requires changes. The GAP model showed that the service quality system is marred by key GAPS that are knowledge-based, policy, delivery, communication and customer GAP. The SERVQUAL model, on the other hand, showed that there is a need for the government to improve the responsiveness, empathy, tangibles, assurance and reliability levels of the service quality system in order to improve consumer confidence. The review expatiates that most customers are faced with issues of pricing, contamination, availability, and inequality, which undermines their confidence in the public drinking water supply systems.

The paper has a positive implication for Mexican society as it distinguishes the key gaps and challenges riddled in the public drinking water supply system. The insight derived can help the government to specifically target the problem areas and improve service quality for all

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Tecnología y ciencias del agua, ISSN 2007-2422, 16(1), 488-529. DOI: 10.24850/j-tyca-2025-01-10

and sundry. The analytical lens applied combines various elements of service quality from different works of erudition which inform policy formulation and implementation. By using the findings in this paper, the government will be able to improve confidence in its structures while minimizing customer dissatisfaction. Further research is, however, required into whether critical incidents such as anthropogenic activities or pandemics are correlated with a decline in service quality.

Acknowledgments

The National Council of Humanities, Sciences and Technologies (Conahcyt) is thanked for the financial support provided within the framework of the Call for Postdoctoral Stays in Mexico 2022, Type B. Continuity Postdoctoral Stays and Modality 1. Academic Postdoctoral Stay, with the academic project entitled "Model to improve the quality of the public drinking water supply service for the inhabitants of the territorial demarcation of Iztapalapa in Mexico City". Likewise, thanks to the Dr. José María Luis Mora Research Institute for being the Institution where the aforementioned stay was carried out.

References

Ablanedo-Rosas, J. H., Guerrero-Campanur, A., Olivares-Benitez, E., Sánchez-García, J. Y., & Nuñez-Ríos, J. E. (2020). Operational efficiency of Mexican water utilities: Results of a double-bootstrap data envelopment analysis. *Water*, 12(2), 553. DOI: 10.3390/w12020553

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Arreguin-Cortes, F. I., Saavedra-Horita, J. R., Rodriguez-Varela, J. M., Tzatchkov, V. G., Cortez-Mejia, P. E., Llaguno-Guilberto, O. J., & Sainos-Candelario, A. (2020). State level water security indices in Mexico. *Sustainable Earth*, 3(9), 1-14. DOI: 10.1186/s42055-020-00031-4

Arreguín-Cortés, F. I., & Mejía-Maravila, E. (2011). Evolution of water management in Mexico. *International Journal of Water Resources Development*, 27(1), 245-261. DOI: 10.1080/07900627.2010.538640

Barkin, D. (2005). The contradictions of urban water management in Mexico. *VertigO-la revue électronique en sciences de l'environnement* (Hors-série 2). DOI: 10.4000/vertigo.1881

Beaumais, O., Briand, A., Millock, K., & Nauges, C. (2020). *What are households willing to pay for better tap water quality? A cross-country valuation study*. DOI: 10.2139/ssrn.2407873

Bhasin, H. (2021). *The Servqual model – Definition, dimensions, gaps and advantages service*. Recovered from https://www.marketing91.com/servqual/

Border. (2020). *Safe drinking water for US - Mexico border colonias*. Recovered from https://www.epa.gov/sites/default/files/2020-11/documents/utep_dryvonnesantiago.pdf

Chapagain, B. P., Wagner, K. L., Joshi, O., & Eck, C. J. (2020). Perceived importance of water issues and factors affecting learning opportunities in Oklahoma. *Water*, 12(2), 395. DOI: 10.3390/w12020395

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Carranza-Álvarez, C., Medellín-Castillo, N. A., Maldonado-Miranda, J. J., & Alfaro-de-la-Torre, M. C. (2020). Water quality management in San Luis Potosi, Mexico. In: Otazo-Sánchez, E., Navarro-Frómeta, A., & Singh, V. (eds.). *Water Availability and Management in Mexico* (pp. 465-484). Cham, Germany: Springer.

Carey, L. (2021). *COVID-19 and Mexico's water crisis*. Recovered from https://togetherband.org/blogs/news/covid-19-and-mexico-water-crisis

CNA. (2017). *The role of water stress in instability and conflict*. Recovered from https://www.cna.org/archive/CNA_Files/pdf/crm-2017-u-016532-final.pdf

Danley, S. (2019). *Study explores importance of water supply and quality to food companies*. Recovered from https://www.bakingbusiness.com/articles/49707-study-explores-importance-of-water-supply-and-quality-to-food-companies

Denantes, J., & Donoso, G. (2021). Factors influencing customer satisfaction with water service quality in Chile. *Utilities Policy*, 73, 101295. DOI: 10.1016/j.jup.2021.101295

Espinosa-García, A. C., Díaz-Ávalos, C., González-Villarreal, F. J., Val-Segura, R., Malvaez-Orozco, V., & Mazari-Hiriart, M. (2015). Drinking water quality in a Mexico City university community: Perception and preferences. *Ecohealth*, 12(1), 88-97. DOI: 10.1007/s10393-014-0978-z

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Expert Program Management. (2018). *Gap model of service quality*. Recovered from https://expertprogrammanagement.com/2018/03/gap-model-service-quality/

Franceschini, F., Galetto, M., & Turina, E. (2008). *Water and sewage service quality: Proposal of a new multi-questionnaire monitoring tool*. Recovered from https://staff.polito.it/fiorenzo.franceschini/Pubblicazioni/Water%20and%20sewage%20service%20Quality%20a%20proposal%20of%20a%20new%20multiquestionaire%20monitoring%20tool.pdf

Garcia, L. A. T., Garcia, L. M. T., & Barardi, C. R. M. (2018). Public perception related to inadequate drinking water quality among Brazilian adults. *Water Policy*, 20(5), 885-900. DOI: 10.2166/wp.2018.180

Genter, F., Willetts, J., & Foster, T. (2021). Faecal contamination of groundwater self-supply in low- and middle-income countries: Systematic review and meta-analysis. *Water Research*, 201, 1-10. DOI: 10.1016/j.watres.2021.117350

Gleason, J. A., & Casiano-Flores, C. (2021). Challenges of water sensitive cities in Mexico: The case of the Metropolitan Area of Guadalajara. *Water*, 13(5), 1-19. DOI: 10.3390/w13050601

González-Villarreal, F., Lartigue, C., Hidalgo, J., Hernández, B., & Espinosa, S. (2018). *SWM technology for efficient water management in universities: The case of PUMAGUA, UNAM, Mexico City*. Recovered from https://www.iwra.org/wp-content/uploads/2018/11/7-SWM-Mexico-final.pdf

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Gurría, A. (2012). *Making water reform happen in Mexico*. Recovered from https://www.oecd.org/cfe/regionaldevelopment/Making%20Water%20Reform%20Happen%20_%20Mexico_Jan18.pdf

Haldevang, M. D. (2022). *Machete-wielding men storm winery amid Mexico water shortages*. Recovered from https://www.bloomberg.com/news/articles/2022-05-27/armed-group-occupies-oldest-mexican-winery-over-water-shortage#:~:text=As%20of%20May%2015%2C%2057,crisis%20over%20access%20to%20water

Hazin, L. S. (2000). *Toward more efficient urban water management in Mexico*. Recovered from https://www.gdrc.org/uem/water/mexsaade.htm

Hunter, P. R., MacDonald, A. M., & Carter, R. C. (2010). Water supply and health. *PLoS Medicine*, 7(11), e1000361. DOI: 10.1371/journal.pmed.1000361

Hurtado, R., Gardea-Torresdey, J., & Tiemann, K. J. (2000). Fluoride Occurrence in Tap Water at "Los Altos de Jalisco". In: *The Central Mexico Region*. *Proceedings of the 2000 Conference on Hazardous Waste Research* (pp 211-219). Denver, Colorado, USA.

Jepson, W. E., Stoler, J., Baek, J., Morán-Martínez, J., Uribe-Salas, F. J., & Carrillo, G. (2021). Cross-sectional study to measure household water insecurity and its health outcomes in urban Mexico. *BMJ Open*, 11(3), 1-12. DOI: 10.1136/bmjopen-2020-040825

Jiménez, B., Ramos, J., & Quezada, L. (1999). Analysis of water quality criteria in Mexico. *Water Science and Technology*, 40(10), 169-175. DOI: 10.1016/S0273-1223(99)00683-6

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Juarez-Najera, M., Bustos-Aguayo, J. M., & Garcia-Lirios, C. (2021). Structural factors of expectations regarding the public drinking water service in a town in Central Mexico. *Public Security and Public Order*, (27), 51-59. DOI: 10.13165/PSPO-21-26-08

Kansara, S. (2020). Modelling the water supply service quality: a case study of the municipal corporation. *International Journal of Productivity and Quality Management*, 29(1), 94-107. DOI: 10.1504/IJPQM.2019.10018902

Karnib, A. (2015). Evaluation of the quality of service of the water supply delivery in Lebanon. *Journal of Water, Sanitation, and Hygiene for Development*, 5(1), 17-27. DOI: 10.2166/washdev.2014.057

Khader, A., & Madhavi, C. (2017). Progression of service quality concepts. *Global Journal of Management and Business Research: An Administration and Management*, 17(6), 17-27. Recovered from https://journalofbusiness.org/index.php/GJMBR/article/view/2288

Kirby, E. A. (2010). A conceptual model for critical incident analysis. *Journal of Critical Incident Analysis*, 1(1), 3-16. Recovered from http://jcia.aciajj.org/files/2010/10/Kirby-1.pdf

Klobucista, C., & Robinson, K. (2021). *Water stress: A global problem that's getting worse*. Recovered from https://www.cfr.org/backgrounder/water-stress-global-problem-thats-getting-worse

Kohli, A. (2020). "*Snowballing" in systematic literature review*. Recovered from https://www.linkedin.com/pulse/snowballing-systematic-literature-review-amanpreet-kohli/

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Kutralam-Muniasamy, G., Pérez-Guevara, F., Martinez, I. E., & Chari, S. V. (2021). Unfolding Water Quality Status during COVID-19 Lockdown for the Highly Polluted Santiago River in Jalisco, Mexico. *Research Square*, 1-15. DOI: 10.21203/rs.3.rs-581075/v1

Lawati, M. H., Dennis, S., Short, S. D., & Abdulhadi, N. N. (2018). Patient safety and safety culture in primary health care: A systematic review. *BMC Family Practice*, 19, 1-12. DOI: 10.1186/s12875-018-0793-7

Madry, K. (2020). *Covid exposes Mexico City's water access gap between rich and poor*. Recovered from https://climatechangenews.com/2020/10/01/covid-exposes-mexico-citys-water-access-gap-rich-poor/

Mazari-Hiriart, M., Tapia-Palacios, M. A., Zarco-Arista, A. E., & Espinosa-García, A. C. (2019). Challenges and opportunities on urban water quality in Mexico City. *Frontiers in Environmental Science*, 7, 1-12. DOI: 10.3389/fenvs.2019.00169

Mokssit, A., De Gouvello, B., Chazerain, A., Figuères, F., & Tassin, B. (2018). Building a methodology for assessing service quality under intermittent domestic water supply. *Water*, 10(9), 1-24. DOI: 10.3390/w10091164

Morales-Novelo, J. A., Rodríguez-Tapia, L., & Revollo-Fernández, D. A. (2018). Inequality in access to drinking water and subsidies between low and high-income households in Mexico City. *Water*, 10(8), 1-16. DOI: 10.3390/w10081023

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Mukokoma, M. M. N., & Van Dijk, M. P. (2011). An assessment of the urban water service delivery quality gap in Uganda and Tanzania: Taping the customer's voice in water service delivery. *Water Resources Management*, 145, 349-359. DOI: 10.2495/WRM110301

Murrar, A., Batra, M., & Rodger, J. (2021). Service quality and customer satisfaction as antecedents of financial sustainability of the water service providers. *The TQM Journal*, 33(8), 1867-1885. DOI: 10.2495/WRM110301

O'Connor, P., O'Malley, R., Kaud, Y., Pierre, E. S., Dunne, R., Byrne, D., & Lydon, S. (2022). A scoping review of patient safety research carried out in the Republic of Ireland. *Irish Journal of Medical Science*, 1-9. DOI: 10.1007/s11845-022-02930-1

Octavia, A., & Chotib (2019). Service quality gap analysis of water supply in urban areas: Water supply company, Bogor Regency. In: Emamian, S. S., Adekunle, T. O., Nangkula, U., & Awang, M. (eds.). *ICSDEMS 2019* (pp. 47-57). Singapore: Springer Singapore.

Pacheco-Vega, R. (2019). Human right to water and bottled water consumption: Governing at the intersection of water justice, rights and ethics. In: Sultana, F., & Loftus, A. (eds.). *Water politics* (pp. 113-128). London, UK: Taylor and Francis.

Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1985). A conceptual model of service quality and its implications for future research. *Journal of Marketing*, 49(4), 41-50. DOI: 10.2307/1251430

Polyakova, O., & Mirza, M. (2015). Perceived service quality models: Are they still relevant? *The Marketing Review*, 15(1), 59-82. Recovered from https://shura.shu.ac.uk/10175/3/Polyakova_Mirza_PSQM.pdf

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Prevos, P. (2016). Servaqua: Towards a model for service quality in potable reticulated water services. In: Campbell, C., & Ma, J. (eds.). *Looking forward, looking back: drawing on the past to shape the future of marketing* (pp. 366-375). Cham, Germany: Springer International Publishing.

PRISMA. (2022). *PRISMA 2020 checklist*. Recovered from https://prisma-statement.org//documents/PRISMA_2020_checklist.pdf

Reygadas, F., Gruber, J. S., Dreizler, L., Nelson, K. L., & Ray, I. (2018). Measuring user compliance and cost effectiveness of safe drinking water programs: A cluster-randomized study of household ultraviolet disinfection in rural Mexico. *The American Journal of Tropical Medicine and Hygiene*, 98(3), 824-834. DOI: 10.4269/ajtmh.17-0440

Rodríguez-Tapia, L., Revollo-Fernández, D. A., & Morales-Novelo, J. A. (2017). Household's perception of water quality and willingness to pay for clean water in Mexico City. *Economies*, 5(2), 1-14. DOI: 10.3390/economies5020012

Sajjadi, S. A., Alipour, V., Matlabi, M., & Biglari, H. (2016). Consumer perception and preference of drinking water sources. *Electron Physician*, 8(11), 3228-3233. DOI: 10.19082/3228

Salazar-Adams, A. (2021). The efficiency of post-reform water utilities in Mexico. *Utilities Policy*, 68, 101153. DOI: 10.1016/j.jup.2020.101153

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Saltiel, G., & Mandri-Perrott, C. (2008). *Output-based disbursements in Mexico: Transforming the water sector in Guanajuato*. Recovered from https://openknowledge.worldbank.org/bitstream/handle/10986/11015/463170BRI0Box31roaches201Mexico1OBD.pdf?sequence=1&isAllowed=y

Seth, N., Deshmukh, S. G., & Vrat, P. (2005). Service quality models: A review. *International Journal of Quality & Reliability Management*, 22(9), 913-949. DOI: 10.1108/02656710510625211

Silva, J. (2019). Mexico's efforts to improve its water management systems. *Revista Espacios*, 41(17), 2. Recovered from https://www.revistaespacios.com/a20v41n17/a20v41n17p02.pdf

Silva-Rodríguez-de-San-Miguel, J. A. (2018). Organizational effectiveness evaluation in Mexico City's drinking water system. *Revista Espacios*, 39(45), 1-16. Recovered from https://www.revistaespacios.com/a18v39n45/a18v39n45p02.pdf

Silva-Rodríguez-de-San-Miguel, J. A., Lambarry-Vilchis, F., & Trujillo-Flores, M. M. (2019). Integral drinking water management model in Iztapalapa, Mexico City. *Management of Environmental Quality*, 30(4), 768-782. DOI: 10.1108/MEQ-04-2018-0080

Sisto, N. P., Ramírez, A. I., Aguilar-Barajas, I., & Magaña-Rueda, V. (2016). Climate threats, water supply vulnerability and the risk of a water crisis in the Monterrey Metropolitan Area (Northeastern Mexico). *Physics and Chemistry of the Earth, Parts A/B/C*, 91, 2-9. DOI: 10.1016/j.pce.2015.08.015

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

Smith, C. D., Jackson, K., Peters, H., & Herrera-Lima, S. (2020). Lack of safe drinking water for lake Chapala basin communities in Mexico inhibits progress toward sustainable development goals 3 and 6. *International Journal of Environmental Research and Public Health*, 17(22), 1-12. DOI: 10.3390/ijerph17228328

Soumaila, K. I., Niandou, A. S., Naimi, M., Mohamed, C., Schimmel, K., Luster-Teasley, S., & Sheick, N. N. (2019). A systematic review and meta-analysis of water quality indices. *Journal of Agricultural Science and Technology B*, 9, 1-14. DOI: 10.17265/2161-6264/2019.01.001

Svalbarði Polar Iceberg Water. (2023). *Water quality: Information, importance and testing*. Recovered from https://svalbardi.com/blogs/water/quality

Tangaja, A., Arceo, A., Centino, A., & Camello, M. (2021). Level of user satisfaction and service quality of Mantalongon Water System Cooperative for improved services. *International Journal of Sciences: Basic and Applied Research*, 60(3), 81-92. Recovered from https://www.gssrr.org/index.php/JournalOfBasicAndApplied/article/view/13222

Taylor, D. D., Slocum, A. H., & Whittle, A. J. (2019). Demand satisfaction as a framework for understanding intermittent water supply systems. *Water Resources Research*, 55(7), 5217-5237. DOI: 10.1029/2018WR024124

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

The World Bank. (2017). *Delivering better water services to Mexicans*. Recovered from https://www.worldbank.org/en/results/2017/10/30/delivering-better-water-services-to-mexicans

United Nations International Children's Emergency Fund. (2021). *Urban water scarcity guidance note: Preventing day zero*. Recovered from https://www.unicef.org/media/95381/file/Urban%20Water%20Scarcity%20guidance%20note.pdf

United States Environmental Protection Agency. (2023). *Water efficiency for water suppliers*. Recovered from https://www.epa.gov/sustainable-water-infrastructure/water-efficiency-water-suppliers

Water Integrity Network. (2020). *Water-related commitments in Mexico's open government plan*. Recovered from https://www.waterintegritynetwork.net/2020/06/15/water-related-commitments-in-mexicos-open-government-plan/

Wilder, M. (2010). Water governance in Mexico: Political and economic apertures and a shifting state-citizen relationship. *Ecology and Society*, 15(2), 22. Recovered from http://www.jstor.org/stable/26268136

Wilder, M. O., Martínez-Austria, P. F., Hernández-Romero, P., & Cruz-Ayala, M. B. (2020). The human right to water in Mexico: Challenges and opportunities. *Water Alternatives*, 13(1), 28-48. Recovered from https://www.water-alternatives.org/index.php/alldoc/articles/volume-13/issue-1/562-a13-1-2/file

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)

WHO, World Health Organization. (2012). *Global costs and benefits of drinking-water supply and sanitation interventions to reach the MDG target and universal coverage*. Recovered from https://apps.who.int/iris/bitstream/handle/10665/75140/WHO_HSE_WSH_12.01_eng.pdf

WHO, World Health Organization. (2022). *Drinking water*. Recovered from https://www.who.int/news-room/fact-sheets/detail/drinking-water

Worldlife. (2018). *Mexico offers a long-term solution to water security*. Recovered from https://www.worldwildlife.org/magazine/issues/winter-2018/articles/mexico-offers-a-long-term-solution-to-water-security

Wunderlich, S., Freeman, S. S. G., Galindo, L., Brown, C., & Kumpel, E. (2021). Optimizing household water decisions for managing intermittent water supply in Mexico City. *Sustainable Systems*, 55(12), 8371-8381. DOI: 10.1021/acs.est.0c08390

Yarimoglu, E. K. (2015). A review of service and E-service quality measurements: Previous literature and extension. *Journal of Economic and Social Studies*, 5(1), 169-200. Recovered from https://core.ac.uk/download/pdf/153449384.pdf

Zeraebruka, K. N., Mayabib, A. O., Gathenyac, J. M., & Tsige, Z. (2014). Assessment of level and quality of water supply service delivery for development of decision support tools: Case study Asmara water supply. *International Journal of Sciences: Basic and Applied Research*, 14(1), 93-107. Recovered from https://gssrr.org/index.php/JournalOfBasicAndApplied/article/view/1341

2025, Instituto Mexicano de Tecnología del Agua. Open Access bajo la licencia CC BY-NC-SA 4.0 (https://creativecommons.org/licenses/by-nc-sa/4.0/)