

Perception and attitude on water governance: design of indicators for Irrigation Districts in Mexico

Cuéllar-Lugo, Martha B.¹; Asiain-Hoyos, Alberto^{1*}; Díaz-Rivera, Pablo¹; Suárez-Sánchez, Juan²; Hernández-Pérez, Juan M.¹; Alvarez-Avila, María del C.¹; Partida-Sedas, Salvador¹; Gallardo-López, Felipe¹

¹ Colegio de Postgraduados Campus Veracruz. km 88.5 Carretera Federal Xalapa-Veracruz, vía Paso de Ovejas, entre Puente Jula y Paso San Juan, Tepetates, Manlio F. Altamirano, Veracruz. C.P. 91669.

² Universidad Autónoma de Tlaxcala. Av. Universidad No. 1, La Loma Xico-tencatl. Tlaxcala, Tlaxcala. C.P. 90070.

* Correspondence: aasiain@colpos.mx

ABSTRACT

Objective: to define the selection criteria for the design and validation of a methodological tool that operationalizes the water governance concept across the perception and attitude of stakeholders for efficient water management in Irrigation Districts.

Design/methodology/approach: a questionnaire was designed and validated to assess perception and attitude variables in water governance, structuring the methodology in four phases. Initially, a contextualized conceptual framework was constructed to define a system of indicators with theoretical rigour. Subsequently, the psychometric operationalization of the variables into measurable items was carried out. A priori validation was performed using the Delphi technique, with a multidisciplinary panel of experts. Finally, a posteriori validation will empirically contrast the results to consolidate a robust diagnostic tool for longitudinal application.

Limitations/implications: the subjective nature of the constructs measured (perception and attitude), whose validity may be compromised in relation to observable behaviors. Nevertheless, the instrument is a reliable methodological tool for the empirical diagnosis and longitudinal monitoring of water governance.

Findings/conclusions: a methodological tool was developed that operationalizes intangible constructs of perception and attitude into quantifiable indicators for water governance. Validated using the Delphi method, it allows critical indicators such as institutional trust and perceived equity to be measured. This tool is a strategic resource for longitudinal diagnoses and the design of interventions towards more transparent and efficient water management.

Keywords: water management, methodological framework, irrigation water, community participation, socio-ecological systems.

Citation: Cuéllar-Lugo, M. B., Asiain-Hoyos, A., Díaz-Rivera, P., Suárez-Sánchez, J., Hernández-Pérez, J. M., Álvarez-Ávila, M. del C., Partida-Sedas, S., & Gallardo-López, F. (2026). Perception and attitude on water governance: design of indicators for Irrigation Districts in Mexico. *Agro Productividad*. <https://doi.org/10.32854/fwswhe62>

Academic Editor: Jorge Cadena Iñiguez

Associate Editor: Dra. Lucero del Mar Ruiz Posadas

Guest Editor: Juan Francisco Aguirre Medina

Received: November 14, 2025.

Accepted: January 18, 2026.

Published on-line: April XX, 2026.

Agro Productividad, 19(2). February. 2026. pp: 3-13.

This work is licensed under a Creative Commons Attribution-Non-Commercial 4.0 International license.



INTRODUCTION

Water governance (WG) is considered an integral and complex approach, which is made up of political, economic, social and environmental systems (Linh *et al.*, 2025;



Rosso, 2025). Within this framework, government actors, civil society, and the private sector interact (Bocarejo *et al.*, 2018; Victoria, 2018), whose work encompasses the development, management, and efficient handling of water resources (Garate *et al.*, 2023). Its effectiveness depends on the co-production that arises from the combination of participatory and inclusive processes, which incorporate local knowledge, accompanied by specialized technical knowledge (Klingaman *et al.*, 2024; Ngonyani *et al.*, 2024). This synergy is fundamental to strengthening resilience and adaptation to water scarcity (Aroy *et al.*, 2025; Datta *et al.*, 2025; Sahani *et al.*, 2025).

This is how GA has become a central paradigm that promotes: active and inclusive participation, adaptation to changing contexts, the incorporation of principles of distributive, procedural and recognition justice, as well as the search for solutions that respond to local realities (Lukas *et al.*, 2024; Linh *et al.*, 2025).

Irrigation Districts (IDs) represent a specific context for the application of this paradigm. According to Suárez and Obregón (2024), these constitute a complex socio-ecological system, embedded in a territory equipped with hydraulic infrastructure, which facilitates the distribution and management of water to support socioeconomic and agricultural growth. To improve their performance, effective participation of farmers, communities, authorities, and other key stakeholders is required for shared decision-making and joint conflict resolution (Altamirano *et al.*, 2019; Castañeda, 2021; Jariego, 2024; Lukas *et al.*, 2024). However, the effectiveness of these participatory processes is determined by subjective dimensions of the actors, where perception and attitude are fundamental factors.

Perception, understood as the cognitive process by which the brain organizes, interprets, and gives meaning to environmental stimulus (Fréré Arauz *et al.*, 2022), is influenced by prior experiences, emotions, and cultural context. This process significantly conditions the acceptance of policies and the adoption of sustainable practices (López-Porras *et al.*, 2018; Rosas-Baños *et al.*, 2023). Similarly, attitude, defined as a psychological tendency composed of cognitive, affective, and behavioral components that influences the evaluation of specific entities, exerts a direct influence on water management (Fishman *et al.*, 2021). Thus, while attitudinal differences can hinder distribution and generate inequalities (Velasco-Muñoz *et al.*, 2023), there are also favorable positions towards conservation.

Taken together, the perception of equity, transparency, and institutional trust, along with attitudes toward cooperation, are crucial for the self-organization and sustainability of irrigation systems (Howell *et al.*, 2023; Whitley, 2024).

In this context, the operationalization of perception and attitude constitutes a fundamental methodological tool. Capturing these subjective dimensions of water governance allows for the identification of patterns associated with greater technical efficiency, environmental sustainability, conflict reduction, and improved self-organization in irrigation systems. Therefore, this research aimed to define the selection criteria for the design and validation of a methodological tool that operationalizes the concept of water governance through the variables of users' perception and attitude for efficient water management in the IDs.

MATERIALS AND METHODS

This research employed a four-phase methodological design for the development and validation of an instrument (Figure 1) used to assess perception and attitude variables in water governance. This process adhered to rigorous conceptual standards, analyzing scientific sources to ensure the tool’s validity, reliability, and practical utility (Sinharoy *et al.*, 2022).

Phase 1. Conceptual design. A reference framework was constructed, integrated into the context of the IDs, based on methodologies such as: the Organization for Economic Cooperation and Development (OECD, 2018), the United Nations Development Programme (UNDP, 2015) and the Mexican Institute of Water Technology (IMTA, 2023); to define the dimensions of the indicator system (Pires *et al.*, 2017; Benson *et al.*,

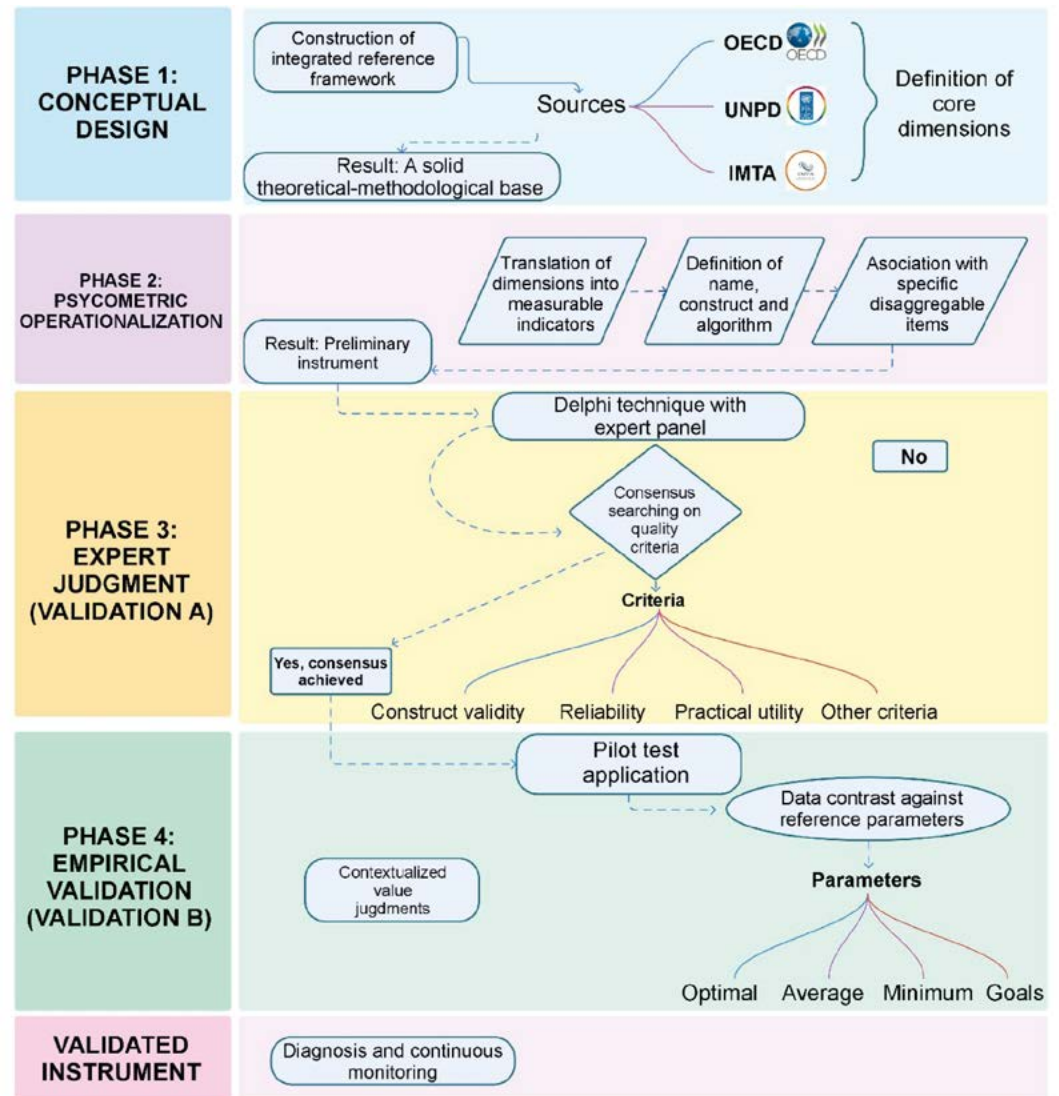


Figure 1. Methodological design for the evaluation of the perception and attitude of water governance in Irrigation Districts (IDs) in Mexico. Source: Own elaboration.

2019; Costa & Neto, 2023). This theoretical and methodological basis prevents the mere grouping of indicators without a logical and systemic structure (Schneider *et al.*, 2015; Linh *et al.*, 2025).

Phase 2. Psychometric Operationalization. The operationalization of each conceptual dimension allowed the construction of measurable indicators associated with the perception and attitude variables, using specific items adapted to different key stakeholders (Kang, 2022; Nelson *et al.*, 2024), such as producers, technicians, and authorities. In this phase, the names of the indicators, their theoretical meaning, and the calculation method were defined (Azevêdo *et al.*, 2022).

Phase 3. Expert Judgment Validation (*a priori*). For this phase, it was proposed to use the Delphi technique to form a multidisciplinary panel of experts and key users, thus ensuring diversity and experience in the instrument's domain (Mariano *et al.*, 2022; Alaze *et al.*, 2025). Subsequently, it undergoes constant rounds of anonymous evaluation, where experts assess each item according to the defined criteria and suggest improvements (Dragostinov *et al.*, 2022; Lim & Park, 2025) for application in a pilot test.

Phase 4. Empirical validation and comparison (*a posteriori*). The instrument was validated by comparing the results with reference parameters to evaluate the actors' performance (Dima, 2018). The results obtained served as a guide for making contextualized judgments, adapting the assessment to specific realities and goals (Renaud *et al.*, 2020), on the complex constructs of water governance in irrigation districts in Mexico. This process establishes that the tool is consolidated as a reliable system for the diagnosis and longitudinal monitoring of water management, allowing for adjustments and continuous improvements based on the results obtained (Gibbons *et al.*, 2021).

RESULTS AND DISCUSSION

Contextual analysis of the methodological framework

Currently, in the Mexican context, there is an increase in institutional distrust, in participation in decision-making, and in the adoption of efficient practices in the use and management of water due to centralized bureaucratic management and the perception of a deficient institutional system that harms agricultural producers (Hunecke *et al.*, 2017; Navarro-Frómeta *et al.*, 2019). Thus, overcoming these challenges requires interventions that prioritize and restore social trust through concrete positive experiences and the genuine strengthening of user associations and the effective decentralization of decision-making (Aquino-López and Aguilar-Sánchez, 2019), which can create a change towards effective governance.

Governance, particularly water governance, is recognized as a fundamental, multidimensional construct for sustainable water management (Duc *et al.*, 2024; Mishra *et al.*, 2021), primarily in scenarios where guaranteeing the human right to water faces substantial social and institutional challenges. Bilalova *et al.* (2024) mentioned that this approach encompasses political, social, economic, environmental, ethical and legal dimensions, and is essential to address the complexity and conflicts inherent in the management of this resource (Jiménez *et al.*, 2020).

Methodologies such as the one designed by the Organisation for Economic Co-operation and Development (OECD, 2018) provide a conceptual framework based on rules, practices, and multi-level processes. These methodologies analyze water governance through the following dimensions: effectiveness, which refers to the capacity of governance to define clear and sustainable water policy goals and objectives at different levels of government, implement these objectives, and achieve the expected results; efficiency, which relates to the contribution of governance to maximizing the benefits of sustainable water management and social welfare at the lowest possible cost; and trust and participation, which relates to the capacity of governance to build trust among the population and ensure the inclusion of stakeholders through democratic legitimacy and equity for society in general (Villa-Landa & Perero Van Hove, 2022).

Similarly, the methodology developed by the United Nations Development Programme (UNDP, 2015) is based on the following dimensions: social, which seeks the equitable use of water resources; environmental, fostering the sustainable use of the resource and the conservation of ecosystems; and political, aimed at social empowerment, so that stakeholders and citizens have equal opportunities to influence and monitor political processes and water management (Abbas *et al.*, 2023). This achieves equity, efficiency, sustainability, and the effective participation of all actors, especially vulnerable groups, in decision-making and oversight of water management, thus making the human right to water a reality.

Finally, in the Mexican context, the Mexican Institute of Water Technology (IMTA, 2023) has a methodology that has resulted in the design of indicators aligned with state obligations, organized into analytical categories such as normative reception of the right, budgetary commitment, institutional capacities, substantive equality, access to information, and justice mechanisms. Regarding these proposed methodological frameworks, Norberto-Cárdenas *et al.* (2024) stated that the indicators reflect a broader effort to strengthen institutional transparency and legal frameworks in water management, suggesting a comprehensive and structured approach to water rights and governance.

The integration of these three frameworks demonstrates that, beyond the differences in their methodological structures, they share a common concept: effective governance. This requires institutional strength, inclusive and genuine citizen participation, and well-defined accountability mechanisms. Furthermore, applying these methodological frameworks to the reality of irrigation districts in Mexico reveals challenges that transcend the technical and are deeply rooted in the social subconscious. Therefore, Bautista-Capetillo *et al.* (2025) stated that a comprehensive approach is needed that combines technical improvements with public policies, financial support, and strengthened collaborative networks to achieve the effective and sustainable adoption of technologies in irrigation districts.

Operationalization of variables

Conceptual analysis of perception and attitude to design indicators on water governance

The psychometric operationalization of variables constitutes a fundamental methodological advance for understanding and translating subjective dimensions into

quantitative data, which strengthen the management and evaluation of governance (Müller & Lecoeuvre, 2014; Mubiri *et al.*, 2024). Based on this analysis, and through the triangulation of methodological frameworks such as those proposed by the OECD, UNDP, and IMTA, the concepts of perception and attitude were operationalized into variables, enabling the development of a series of indicators, ranging from institutional trust to willingness to adopt innovations. The aim was to focus on the behavior, willingness, and stance of users to adopt technological proposals for efficient management in irrigation districts (Abila *et al.*, 2024; Adla *et al.*, 2024). This dual construction, perception-attitude, is a methodological contribution that allows us to interpret reality and behavioral predispositions (Castillo *et al.*, 2021), to offer a more holistic understanding of the factors that influence the effectiveness of water governance at the local level (Table 1).

Validation through the expert panel

Based on the operationalization, the indicators to be validated were selected using the Delphi technique, which aims to form a judgment based on the opinions of a group of experts (Niederberger & Spranger, 2020). For the application of this method, anonymous participation must be considered in an iterative process of at least two rounds, where the experts are given feedback on the results obtained (Drumm *et al.*, 2022). In addition, this technique requires the selection of experts, through criteria such as qualitative aspects, such as the k coefficient of expert competence (Cabero-Almenara *et al.*, 2020; Fernández-Gómez *et al.*, 2020).

In this research, the dimensions of the first version of the questionnaire were defined: 1) the respondent's experience in the efficient use and management of water; 2) knowledge of the administrative and technical operation of irrigation districts; and 3) analysis of the perception and behavioral attitudes of small-scale producer groups. Based on these characteristics, 10 experts were invited to evaluate the relevance, clarity, wording, and consistency of the response options for the items, using a dichotomous scale of “yes” and “no” (Curteanu *et al.*, 2025).

Aiken's V will be calculated to measure the content validity of a measurement instrument and identify the relevance of the items with respect to the specific domain of the group of experts (Barbosa & Cansino, 2022; Sierra-Barón *et al.*, 2025).

The calibration and validation carried out through this rigorous methodological process has resulted in a scientifically sound, culturally adapted questionnaire capable of generating reliable data to diagnose and improve water management in the Irrigation Districts of Mexico.

CONCLUSIONS

The development and validation of the questionnaire presented in this research constitutes a substantial methodological contribution to the field of water governance. Its main innovation lies in the systematic operationalization of intangible constructs—that is, the perceptions and attitudes of IDs users—through a system of quantifiable indicators, supported by conceptual frameworks from international organizations and validated using

Table 1. Construction of indicators on the perception and attitude on water governance in Irrigation Districts in Mexico.

| CONSTRUCT 1: USERS' PERCEPTION OF WATER GOVERNANCE IN THE IDs | |
|---|---|
| Dimension Conceptual | Perception Indicator |
| Legal Framework | Level of knowledge of the internal regulations of the IDs |
| | Perception of the clarity of the requirements for accessing water |
| Equity | Perception of the frequency of preferential treatment in water allocation |
| | Perception of impartiality in conflict resolution |
| Coordination | Perception of the quality of the relationship between users and their representatives |
| | Perception of the fulfillment of duties by the IDs |
| Stake | Perception of opportunities to participate in IDs decisions |
| | Perception of the attention given to needs by the IDs |
| Administration : Personnel | Perception of the quality of care provided by IDs staff |
| | Perception of staff training in water management |
| Administration : Finance | Perception of transparency in the use of resources |
| | Perception of fairness in the calculation of quotas |
| Sustainability | Perception of the volume of water available for irrigation |
| | Perception of the degree of water waste in the system |
| | Perception of the adoption of water efficiency technologies |
| CONSTRUCT 2: USERS' ATTITUDE TOWARDS WATER GOVERNANCE IN THE IDs | |
| Dimension Conceptual | Attitude Indicator |
| Legal Framework | Assessment of the need to update the internal regulations |
| | Level of agreement with the rigor in the application of the regulations |
| Equity | Level of confidence in the impartiality of IDs staff |
| | Assessment of mechanisms to prevent discrimination |
| Coordination | Willingness to collaborate in IDs improvement activities |
| | Assessment of communication with the IDs |
| Stake | Appreciation of the importance of participating in decisions |
| | Willingness to attend regular assemblies |
| Administration : Personnel | Assessment of the need to train staff |
| | Level of satisfaction with the service received |
| Administration : Finance | Level of agreement with increased fees for better service |
| | Assessment of the need for external audits |
| Sustainability | Willingness to implement sustainable practices |
| | Concern about the effects of climate change |
| | Assessing the importance of infrastructure maintenance |

Source: Own elaboration.

the Delphi method. This methodological rigor moves beyond purely descriptive approaches, facilitating the measurement of critical indicators such as institutional trust, perceived equity in water distribution, and the predisposition to adopt technologies. The tool thus provides a reliable empirical basis for conducting longitudinal assessments, identifying critical points in management, and designing specific interventions. Consequently, it stands as a strategic resource for transitioning toward adaptive governance in the IDs, promoting more transparent, inclusive, and technically informed management.

ACKNOWLEDGMENTS

The lead author thanks SECIHTI for the funding of her doctoral studies, which enabled her to develop her research project at the Colegio de Postgraduados, Campus Veracruz. She also extends her gratitude to the Scientific Committee of the 37th Scientific-Technological, Forestry and Agricultural Meeting Veracruz 2025 for selecting this work for publication.

REFERENCES

- Abbas, F., Al-Naemi, S., Farooque, A. A., & Phillips, M. (2023). A Review on the Water Dimensions, Security, and Governance for Two Distinct Regions. *Water*, *15*(1), 208. <https://doi.org/10.3390/w15010208>
- Abila, D., D., Asokhan, M., Balasubramaniam, P., & Kumaresan, P. (2024). Perception and adoption of drip irrigation technology among beneficiaries of the Tamil Nadu Irrigated Agriculture Modernization Project: A Structural Equation Modelling approach. *Plant Science Today*, *11*(sp4), 1-9. <https://doi.org/10.14719/pst.5795>
- Adla, S., Šaponjić, A., Tyagi, A., Nagi, A., Pastore, P., & Pande, S. (2024). Steering agricultural interventions towards sustained irrigation adoption by farmers: socio-psychological analysis of irrigation practices in Maharashtra, India. *Hydrological Sciences Journal*, *69*(12), 1586-1603. <https://doi.org/10.1080/02626667.2024.2376709>
- Alaze, A., Finne, E., Razum, O., & Miani, C. (2025). A questionnaire for a conceptual framework and interdisciplinary public health research using the Delphi technique-development and validation. *Frontiers in Public Health*, *13*, 1436569. <https://doi.org/10.3389/fpubh.2025.1436569>
- Altamirano, A., A., Valdez, T., J. B., Valdez, L., C., León, B., J. I., Betancourt, L., M., & Osuna, E., T. (2019). Evaluación del desempeño de los distritos de riego en México mediante análisis de eficiencia técnica / Performance assessment of irrigation districts in Mexico through technical efficiency analysis. *Tecnología y Ciencias del Agua*, *10*(1), 85-121. <https://doi.org/10.24850/j-tyca-2019-01-04>
- Aquino-López, V. D., & Aguilar-Sánchez, G. (2019). Environmental governability in the water use of irrigation district 023-San Juan del Río, Querétaro. *Agricultura, Sociedad y Desarrollo*, *16*(3), 331-349. <https://doi.org/10.22231/asyd.v16i3.1233>
- Aroy, P., C., Torrentira, Jr., M. C., & Joel, U., L. (2025). Developing Sustainable Water Supply Strategies among Indigenous Peoples in the Davao Region: A Systematic Review. *International Journal of Social Science and Education Research Studies*, *5*(1), 01-07. <https://doi.org/10.55677/ijssers/v05i01y2025-01>
- Azevêdo, E. L., Alves, R. R. N., Dias, T. L. P., Álvaro, É. L. F., Barbosa, J. E. L., & Molozzi, J. (2022). Perception of the local community: What is their relationship with environmental quality indicators of reservoirs? *PLOS ONE*, *17*(1), e0261945. <https://doi.org/10.1371/journal.pone.0261945>
- Barbosa, M., & Cansino, J. (2022). A Water Footprint Management Construct in Agri-Food Supply Chains: A Content Validity Analysis. *Sustainability*, *14*(9), 4928. <https://doi.org/10.3390/su14094928>
- Bautista-Capetillo, C., Pineda-Martínez, H., Flores-Chaires, L., & Pineda-Martínez, L. (2025). Agriculture Resilient at Three Irrigation Modules of Zacatecas, Mexico: Water Scarcity and Climate Variability. *Agronomy*, *15*(4), 800. <https://doi.org/10.3390/agronomy15040800>
- Benson, D., Gain, A., & Giupponi, C. (2019). Moving beyond water centrality? Conceptualizing integrated water resources management for implementing sustainable development goals. *Sustainability Science*, *15*, 671-681. <https://doi.org/10.1007/s11625-019-00733-5>
- Bilalova, S., Newig, J., & Villamayor-Tomas, S. (2025). Toward Sustainable Water Governance? Taking Stock of Paradigms, Practices, and Sustainability Outcomes. *WIREs Water*, *12*(1), e1762. <https://doi.org/10.1002/wat2.1762>

- Bocarejo, S., D. (2018). Gobernanza del agua: pensar desde las fluctuaciones, los enmarañamientos y políticas del día a día. *Revista de Estudios Sociales*, 1(63), 111-118. <https://doi.org/10.7440/res63.2018.09>
- Cabero-Almenara, J., Romero-Tena, R., & Palacios-Rodríguez, A. (2020). Evaluation of teacher digital competence frameworks through expert judgement: The use of the expert competence coefficient. *Journal of New Approaches in Educational Research (NAER Journal)*, 9(2), 275-293. <https://www.learntechlib.org/P/217617/>
- Castañeda, V., A. A. (2021). Evolución de la gestión del agua en municipios de México: Estudio de un Organismo Público Descentralizado en Los Altos de Jalisco (2013-2018). *Agua y Territorio, Water and Landscape*, 17, 33-54. <https://doi.org/10.17561/at.17.5518>
- Costa, M. M., & Neto, S. (2023). Exploratory analysis of the water governance frameworks regarding the OECD principles in two river basins in Brazil and Portugal. *Utilities Policy*, 82. <https://doi.org/10.1016/j.jup.2023.101556>
- Curteanu, M., Marinescu, V., Ferdohleb, A., Bahnarel, I., Pinzaru, I., & Ciobanu, E. (2025). Testing and validation of the questionnaire for evaluating the chemical composition of bottled water in relation to public health. *Moldovan Journal of Health Sciences*, 1(12), 41-47. <https://doi.org/10.52645/mjhs.2025.1.07>
- Datta, R., Chapola, J., & Lewis, K. (2025). Rethinking Indigenous Community-Led Water Sustainability: Decolonial and Relational Approaches in Western Canada. *Water*, 17(3), 334. <https://doi.org/10.3390/w17030334>
- Dima, A. (2018). Scale validation in applied health research: tutorial for a 6-step R-based psychometrics protocol. *Health Psychology and Behavioral Medicine*, 6(1), 136-161. <https://doi.org/10.1080/21642850.2018.1472602>
- Dragostinov, Y., Harðardóttir, D., McKenna, P., Robb, D., Nessel, B., Ahmad, M., Romeo, M., Lim, M., Yu, C., Jang, Y., Diab, M., Cangelosi, A., Demiris, Y., Hastie, H., & Rajendran, G. (2022). Preliminary psychometric scale development using the mixed methods Delphi technique. *Methods in Psychology*, 7, 100103. <https://doi.org/10.1016/j.metip.2022.100103>
- Drumm, S., Bradley, C., & Moriarty, F. (2022). 'More of an art than a science'? The development, design and mechanics of the Delphi Technique. *Research in Social and Administrative Pharmacy*, 18(1), 2230-2236. <https://doi.org/10.1016/j.sapharm.2021.06.027>
- Duc, N. H., Kumar, P., Long, P. T., Meraj, G., Lan, P., Almazroui, M., & Avtar, R. (2024). A Systematic Review of Water Governance in Asian Countries: Challenges, Frameworks, and Pathways Toward Sustainable Development Goals. *Earth Systems and Environment*, 8, 181-205. <https://doi.org/10.1007/s41748-024-00385-1>
- Fernández-Gómez, E., Martín-Salvador, A., Luque-Vara, T., Sánchez-Ojeda, M. A., Navarro-Prado, S., & Enrique-Mirón, C. (2020). Content validation through expert judgement of an instrument on the nutritional knowledge, beliefs, and habits of pregnant women. *Nutrients*, 12(4), 1136. <https://doi.org/10.3390/nu12041136>
- Fishman, J., Yang, C., & Mandell, D. (2021). Attitude theory and measurement in implementation science: a secondary review of empirical studies and opportunities for advancement. *Implementation Science: IS*, 16. <https://doi.org/10.1186/s13012-021-01153-9>
- Gárate, R., J., Pashanasi, A., B., Palomino, A., G. del P., & Pereyra, G., T. V. (2023). Gobernanza del agua: un análisis sistemático de desafíos, temáticas y propuestas para una gestión hídrica sostenible. *Producción + Limpia*, 18(2), 116-138. <https://doi.org/10.22507/pml.v18n2a7>
- Gibbons, C., Porter, I., Gonçalves-Bradley, D., Stoilov, S., Ricci-Cabello, I., Tsangaris, E., Gangannagaripalli, J., Davey, A., Gibbons, E., Kotzeva, A., Evans, J., Van Der Wees, P., Kontopantelis, E., Greenhalgh, J., Bower, P., Alonso, J., & Valderas, J. (2021). Routine provision of feedback from patient-reported outcome measurements to healthcare providers and patients in clinical practice. *The Cochrane database of systematic reviews*, 10, CD011589. <https://doi.org/10.1002/14651858.cd011589.pub2>
- Howell, C. L., Cortado, A. P., & Ünver, O. (2023). Stakeholder Engagement and Perceptions on Water Governance and Water Management in Azerbaijan. *Water*, 15(12), 2201. <https://doi.org/10.3390/w15122201>
- Hunecke, C., Engler, A., Jara Rojas, R., & Poortvliet, P. (2017). Understanding the role of social capital in adoption decisions: An application to irrigation technology. *Agricultural Systems*, 153, 221-231. <https://doi.org/10.1016/j.agsy.2017.02.002>
- IMTA [Instituto Mexicano de Tecnología del Agua]. (2023). Indicadores de Derechos Humanos al Agua y al Saneamiento en México 2023. Escobar, N. C y Zavala, V. L. C. (Eds). IMTA. Jiutepec. Morelos. 200p. <https://www.imta.gob.mx/gobmx/DOI/libros/2023/Libro-indicadores-derechos-humanos-agua-saneamiento.pdf>

- Jiménez, A., Saikia, P., Giné, R., Avello, P., Leten, J., Liss Lymer, B., Schneider, K., & Ward, R. (2020). Unpacking Water Governance: A Framework for Practitioners. *Water*, 12(3), 827. <https://doi.org/10.3390/w12030827>
- Kang, T. (2022). Construction and Empirical Analysis of Citizens' Water Literacy Evaluation Index System: A Structural Equation Model. *Water Resour Manage*, 36, 1393-1411. <https://doi.org/10.1007/s11269-022-03089-1>
- Klingaman, E., Baghirzade, B., Rowles, L., Toledo-Flores, L., Pérez-Flores, M., López-Cruz, J., & Saleh, N. (2024). Strengths of Zapotec Indigenous Knowledge in Water Management. *ACS ES&T Water*, 4(6), 2382-2389. <https://doi.org/10.1021/acsestwater.3c00731>
- Lanza, C., G. M., Engler, A., & Wollni, M. (2021). Planned behavior and social capital: Understanding farmers' behavior toward pressurized irrigation technologies. *Agricultural Water Management*, 243, 106524. <https://doi.org/10.1016/j.agwat.2020.106524>
- Lim, S., & Park, J. H. (2025). Development of a questionnaire for problematic social networking sites use: Ensuring content validity through Delphi methodology. *PLOS ONE*, 20(3), e0315442. <https://doi.org/10.1371/journal.pone.0315442>
- Linh, H., Truc, D., Binh, N., & Tri, V. (2025). Assessing Water Governance Trends and Challenges at a Local Level - An Application of the OECD Water Governance Framework in Soc Trang Province, Vietnam. *Water*, 17(3), 320. <https://doi.org/10.3390/w17030320>
- Lukas, M. A., Pandic, D. B., Djani, W., & Arjana, I. G. B. (2024). Analysis of water governance in irrigation management institutions in the Bena irrigation area, South Amanuban district, South Central Timor regency. *Journal of Law and Sustainable Development*, 12(3), e2867. <https://doi.org/10.55908/sdgs.v12i3.2867>
- Mariano, R., A. S., Motter, F. R., & Cruz, L., L. (2022). Design and validity of an instrument to assess healthcare professionals' perceptions, behaviour, self-efficacy and attitudes towards evidence-based health practice: I-SABE. *BMJ Open*, 12, e052767. <https://doi.org/10.1136/bmjopen-2021-052767>
- Martínez, R., F. (2010). Los indicadores como herramientas para la evaluación de la calidad de los sistemas educativos. *Sinéctica*, 35, 1-17. <https://sinectica.iteso.mx/index.php/SINECTICA/es/article/view/128/121>
- Maya, J., I. (2024). Using stakeholder network analysis to enhance the impact of participation in water governance. *Humanities and Social Sciences Communications*, 11, 1-6. <https://doi.org/10.1057/s41599-024-02958-x>
- Mubiri, P., Ssengooba, F., O'byrne, T., Aryajja-Keremani, A., Namakula, J., Chikaphupha, K., Aikins, M., Martineau, T., & Vallières, F. (2024). A new scale to assess health-facility level management: the development and validation of the facility management scale in Ghana, Uganda, and Malawi. *BMC Health Services Research*, 24, 371. <https://doi.org/10.1186/s12913-024-10781-y>
- Müller, R., & Lecoivre, L. (2014). Operationalizing governance categories of projects. *International Journal of Project Management*, 32(8), 1346-1357. <https://doi.org/10.1016/j.ijproman.2014.04.005>
- Navarro-Frómata, A. E., Herrera-López, H., Castro-Bravo, C. (2020). Irrigation Water Challenges: A Study Case in the State of Puebla, Mexico. In: Otazo-Sánchez, E., Navarro-Frómata, A., Singh, V. (eds.) "Water Availability and Management in Mexico". Water Science and Technology Library, Vol. 88. Springer. https://doi.org/10.1007/978-3-030-24962-5_12
- Nelson, T., Poleacovschi, C., Weems, C., Ikuma, K., García, I., & Rehmann, C. (2024). Navigating end-user perceptions: development and initial psychometric properties of a water quality perception scale. *Frontiers in Water*, 6, 1357921. <https://doi.org/10.3389/frwa.2024.1357921>
- Nkonyani, H., Gambo, B., Mourad, K., Rilwanu, T., & Berndtsson, R. (2024). Indigenous Knowledge in Watershed Management: The Case of the Mara River Basin, Tanzania. *Water*, 17(1), 63. <https://doi.org/10.3390/w17010063>
- Niederberger, M., & Spranger, J. (2020). Delphi technique in health sciences: a map. *Frontiers in Public Health*, 8, 457. <https://doi.org/10.3389/fpubh.2020.00457>
- Norberto-Cárdenas, N., Robles-Cuevas, H. O., Olvera-Robles, D., Ruiz-Canizales, R., & Nettel-Barrera, A. del C. (2024). Perspectiva jurídica del derecho al agua, la gestión hídrica y las concesiones en México. *DIXI*, 27(1), 1-30. <https://doi.org/10.16925/2357-5891.2025.01.06>
- OECD [Organisation for Economic Cooperation and Development]. (2018). Implementing the OECD Principles on Water Governance: Indicator Framework and Evolving Practices. OECD Publishing. París, Francia. 34p. <http://dx.doi.org/10.1787/9789264292659-en>
- Pires, A., Morató, J., Peixoto, H., Botero, V., Zuluaga, L., & Figueroa, A. (2017). Sustainability Assessment of indicators for integrated water resources management. *The Science of the total environment*, 578, 139-147. <https://doi.org/10.1016/j.scitotenv.2016.10.217>

- PNUD [Programa de las Naciones Unidas para el Desarrollo]. (2015). Guía para los organismos que vigilan la gestión del agua en El Salvador. Como crecen en transparencia y rendición de cuentas. Programa de las Naciones Unidas para el Desarrollo. Antiguo Cuscatlán, El Salvador. 122p. <https://siwi.org/wp-content/uploads/2016/01/social-audit-manual.pdf>
- Renaud, J., Lacasse, M., Côté, L., Théorêt, J., Rheault, C., & Simard, C. (2020). Psychometric validation of the Laval developmental benchmarks scale for family medicine. *BMC Medical Education*, 21, 357. <https://doi.org/10.1186/s12909-021-02797-3>
- Rosso, R. (2025). On Seven Principles of Water Governance. *Water*, 17(6), 896. <https://doi.org/10.3390/w17060896>
- Sahani, A. K., Gupta, G., Anand, S., Sharma, V. R., Singh, R., Kamil, A., Kumar, H., Gagan, A., Mayala, V. K., Mishra, A. P., Jaiswal, S., & Anand, J. (2025). Indigenous Knowledge and Water Conservation Practices in South Africa: A Systematic Literature Review. *Journal of Environmental & Earth Sciences*, 7(2), 248-261. <https://doi.org/10.30564/jees.v7i2.7988>
- Schneider, F., Bonriposi, M., Graefe, O., Herweg, K., Homewood, C., Huss, M., Kauzlaric, M., Liniger, H., Rey, E., Reynard, E., Rist, S., Schädler, B., & Weingartner, R. (2015). Assessing the sustainability of water governance systems: the sustainability wheel. *Journal of Environmental Planning and Management*, 58(9), 1577-1600. <https://doi.org/10.1080/09640568.2014.938804>
- Sierra-Barón, W., Gómez-Acosta, A., & Quintero, A. (2025). Evidencia de validez y fiabilidad de un instrumento de ahorro de agua en población colombiana. *ÁNFORA*. <https://doi.org/10.30854/anf.v32.n59.2025.1153>
- Sinharoy, S., S., Amelie, C., M. P., Patrick, McManus, S., & Caruso, B. (2021). Development and validation protocol for an instrument to measure women's empowerment in urban sanitation across countries: The Agency, Resources, and Institutional Structures for Sanitation-related Empowerment (ARISE) Scales. *BMJ Open*, 12(2), e053104. <https://doi.org/10.1101/2021.05.04.21256595>
- Suárez, P., K. V. & Obregón, N., N. (2024). Distritos de riego y territorios socioecológicos. *Bitácora Urbano Territorial*, 34(1), 129-139. <https://doi.org/10.15446/bitacora.v34n1.111748>
- Victoria, M. A. (2018). Gobernabilidad y gobernanza del agua como bien común de la naturaleza. *Journal of Law and Sustainable Development*, 6(1), 1-20. <https://doi.org/10.37497/sdgs.v6i1.87>
- Whitley, H. (2024). Exogenous, Endogenous, and Peripheral Actors: A Situational Analysis of Stakeholder Inclusion within Transboundary Water Governance. *Sustainability*, 16(9), 3647. <https://doi.org/10.3390/su16093647>