

## Water Sustainability in the COVID-19 Era

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Submitted: 17 Jun 2022; Accepted: 24 Jun 2022; Published: 01 Jul 2022

**Citation:** Cruz García Lirios., Jose Marcos Bustos Aguayo., Francisco Ruben Sandoval Vazquez. (2022). Water Sustainability in the COVID-19 Era. *Int J Clin Med Edu Res.* 1(1), 35-42.

### Abstract

The governance of water sustainability supposes an instance of local development in which political and social, public and private actors establish co-responsibility agreements around a natural resource considered as a common good. In this sense, water resources and public services have been assumed as a public good, generating a latent and manifest conflict around its quality and payment, promoting an evident citizen environmental awareness on the eve of local elections that the This study aimed to explore cross-sectionally in a sample of 100 students from a public university in central Mexico. From a structural model prior to establishing the reliability and validity of the instrument, the theoretical relationships between the factors were adjusted to the data obtained, but it is discussed whether the type of study, sample selection and analysis limit the results to the context, as well as the possibility of including other variables in the contrast of the proposed model.

**Keywords:** Governance, Sustainability, Water Resources, Public Services, Common Goods

### Introduction

Until February 2022, the pandemic has led to the death of seven million, although underreporting prevails and the figure would reach 25 million deaths directly and indirectly related to COVID-19. Mitigation and containment policies are guided by an epidemiological traffic light that recommends the isolation and confinement of people, increasing the use of water for personal, family and residential sanitation. It is estimated that in Mexico City water availability per capita has decreased in the last 30 years at a rate of 200 liters per day with an increase in its cost that forces residents of marginalized areas to allocate up to 20% of their income. Therefore, the study of the residential use of water consumption is relevant for anti-COVID-19 policies. As the strategies are evaluated, the dialogue between the governors and the governed would reach co-responsibility.

This article is part of the Social Work discipline, an area of institutional studies of water sustainability, but incorporates concepts from the psychology of sustainability, such as beliefs, perceptions, attitudes and intentions, as well as sociology, ecological as is the case of anthropocentrism and ecocentrism, as well as environmental economics such as the integrated management of water resources and services.

Therefore, the objective of this work is to establish the reliability and validity of an instrument that measures the cognitive

dimensions of civil participation around the governance of local water sustainability in order to specify a model for the study. of civil participation in institutional management. In this way, the governance of water sustainability, from the point of view of the psychology of sustainability, refers to an information system related to the availability of water and decision-making such as behaviors against or in favor of that management [1].

However, from the psychological point of view, governance is only an informative and representative exchange of intentions and actions between political and social, public and civil actors [2]. Therefore, from ecological sociology it will be necessary to focus this system on a problem known as anthropocentrism that refers to this information system as legitimizing the water needs of current generations regardless of the expectations of future generations of species.

Although the phenomenon of anthropocentrism has been widely studied and discussed, its link with the environmental footprint in general and the water footprint in particular has been dismissed by psychology and sociology. This is how, from the economic approach, it will be possible to notice that the problem is due to a lack of comprehensive management and administration of water resources and services that, when assumed as public or private goods, imply a segmented responsibility [3].

In this way, Social Work integrates the three psychological, sociological and economic visions to warn that: 1) water resources and services are common goods; 2) the management and subsequent administration will be focused from the shared responsibility between civil and political actors [4].

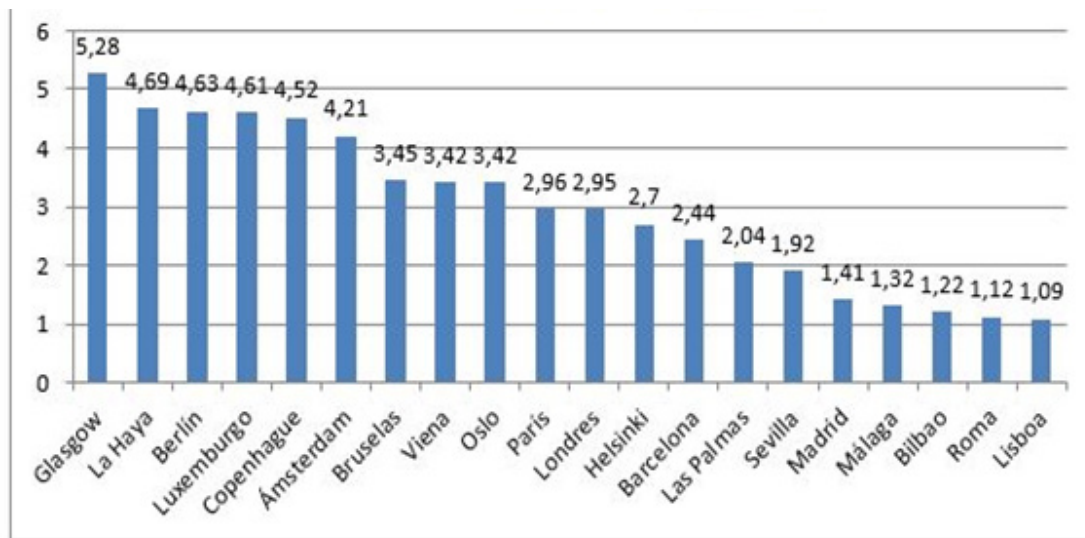
Therefore, the governance of water sustainability supposes the inclusion of civil actors in the state institutions that manage water resources and services, as well as state participation in civil organizations that self-manage water [5].

Individuals, faced with government regimes and forms of State, have developed sociopolitical discourses around which it is possible to infer their identity, beliefs and representations regarding their authorities, their government strategies, public

services and assistance benefits [6]. Socio-political representations understood as general ideas about management and administration of water resources and services. From the state of knowledge, a model of relationships reflecting sociopolitical representations is specified for the analysis of discourses. Such an exercise will make it possible to understand the differences between the governors and the governed at the local level of the municipal drinking water service, establish the public agenda and anticipate conflicts between authorities and users; collective actions and social mobilizations.

### Water Sustainability Theory

The governance of water resources and services has its origin in the summits related to climate change that have been held since the Biosphere Conference in Paris 1968 to the Rio 2012 summit.



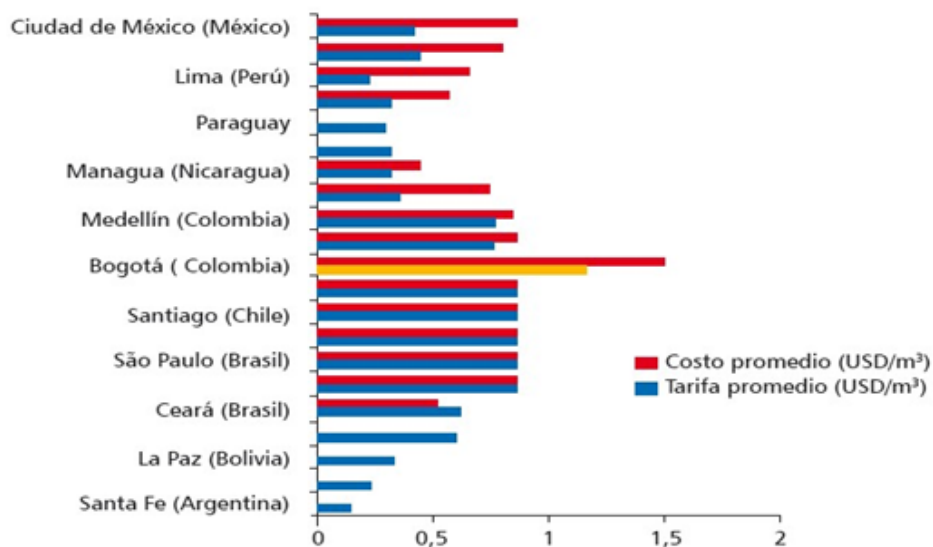
Source: UN (2015)

Figure 1: Collection system in European cities (€/m³)

Although the Biosphere Conference laid the foundations for the conservation of natural resources, it was not until the Rio Summit in 2012 that local action was proposed to influence the global. In this event, binding agreements were made in the economic, political and social aspects with respect to the environment based on governance models in which citizen participation would be essential for Sustainable Local Development. However, the management and administration of water resources was carried out based on the establishment of a global agenda centered on a system of unit costs or free of subsidies and forgiveness for volumes of

water and based on its availability and demand ( see Figure 1).

In the case of Latin America, the collection system was influenced by the relationship between the rulers and the ruled, as is the case of the subsidy and the cancellation of the payment of the public supply service. This is the case of Mexico in which these water supply strategies and programs based on electoral preferences, voting intentions and effective votes in favor of the government in turn encourage civil organization in the face of local and federal elections (see Figure 2).



Source: UN (2015)

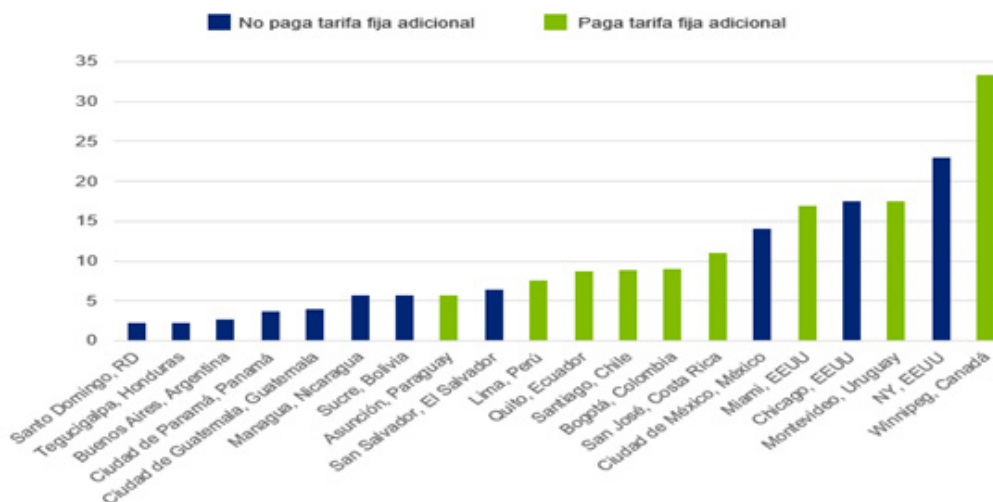
Figure 2 : Collection system in Latin America (USD/m³)

The cities of Latin America have been governed from this system of subsidies and forgiveness to the extent that these capitals intensify their civil mobilization for regular supply, health and tariff reduction, considered indicators of quality of public service ( see Figure 3).

In the case of Mexico City, the problem that goes from the scarcity to the remission of tariffs in a context of local or federal elections consists of an average supply per capita, although consumption is

restricted, the supply policy prevails on the internal demand, as well as the distribution of the resource in the demarcation.

Based on this context, cities organized from a solidarity and cooperative economy logic have built management and administration systems focused on the opportunities and capabilities of individuals or groups rather than on the logic of cost and benefit, profit and utility when considering the water service as a private good.



Source: UN (2015)

Figure 3: Collection system in American cities (USD/m³)

The standard theory of change, in this sense, proposes a governance of water resources based not only on the availability of water per capita, but also contemplates the inclusion of supportive supply systems in seasons of scarcity due to temperature increase, before natural disasters such as frost, drought, hurricanes, landslides or floods.

The governance of water resources and services, for the purposes of this work, consists of four periods related to 1) formulation adjusted to the objectives of public policies, 2) structuring of the design of information systems (operation), 3) execution of processes and monitoring of results (implementation), 4) provision of the service in accordance with the established reference standards.

Political actors, economic agents and residential users participate in each phase, but in the operational stage an audit defines the subsequent implementation. Before restarting the governance cycle, a supervisor defines the transition from the execution stage to the start of a new service scheme. The governance model is carried out in different instances such as administration, internal management, quality control and auditing processes, but unlike the governance model focused on subsidies and remissions to adhering colonies and supporters of the government in turn, the participation of specialists, managers, administrators, technicians and users is active. However, the governance of water resources and services is not only limited to public goods, but is also related to private goods, common resources and toll goods.

Water governance supposes the combination of an infeasible exclusion in a scheme where personal consumption does not affect the water availability of others, as is the case of common resources and public goods.

However, private goods and toll goods have been proposed as alternatives to regulate waste and promote saving and care for water resources through rates for supply services. However, the distinction between goods, the complexity of governance is accentuated by including variables related to public policies and their direct and indirect effects on human well-being.

The governance of private, public or common goods would be determined by political, normative, regulatory and instrumental factors that the authorities can exercise to establish security, good

living, health or good social relations. Each of the governments of public, private and common goods would be organized by levels that go from the global to the local according to the roles of the actors in the management of knowledge, financing and technologies aimed at solving problems derived from utilitarian policies, deficient, inefficient and their indirect effects. At each of the global, cross-border, national or local levels, the agencies of the United Nations Organization (UN), regional governments, national or local authorities interact with civil organizations to properly monitor and manage resources in accordance with international regulatory frameworks, bilateral, sectoral and municipal.

In summary, the governance of water resources is a concerted and permanent management and administration around the formulation, structuring, implementation and evaluation of goods, resources and public, common and private services oriented to Sustainable Local Development. From this definition, the objective of this work will be to expose the water problems that show the imbalance between availability and consumption, international agreements on the right to water, the Theory of Sociopolitical Representations to explain the relationship between rulers and ruled with Regarding water resources and services, the state of knowledge to contrast the concepts with findings and the specification of a model for the study of Local Water Governance.

### Water sustainability studies

The psychological studies of sustainability can be analyzed from a logic of centrality and periphery (see Table 1).

**Table 1: Water governance studies**

	Author	factors
1980	Berk et al.,	immediate self-interest
1983	hamilton	idealistic motives
1987	Corral et al.,	Refrigerator
1992	Corral and Obregon	Competences and reasons
1994	Aiken et al.,	Cognitive dissonance
1999	Oliver's	water restriction
2000	Corraliza and Martin	attitudes
2001	Van Vugt	Identity
2001	Corral	shortage
2002	Busts et al.,	Reasons
2003	Corral et al.,	beliefs
	Author	Determinant of water cooperation
2004	Busts et al.,	instrumentation skills
2004	Corral and Pinheiro	Austerity, anticipation, altruism, effectiveness, deliberation, saving
2004	Corral et al.,	propensity for the future
2004	Frajio et al.,	Competencies
2004	Hernandez and Reimel	Cooperation and solidarity networks
2004	Medina et al.,	relationship climate
2005	Fraj and Martinez	Feeling of Community

2008	Bolzan	Trust and Commitment
2010	Bizer	Credibility
2010	Brenner	governance
2010	Gissi and Soto	Tequio and Guatza
2011	Garcia	Socialization
2012	Carreon	neo-institutionalism
2013	Carreon	Participation
2014	Carreon et al.,	Entrepreneurship
2016	Carreon	governance
<i>Source: self-made</i>		

From this nomenclature, it is possible to notice that Sustainable Development is a central issue or node that involves climate change, global warming, the greenhouse effect and carbon emissions as environmental factors that have a direct impact on the quality of the environment. air and respiratory health in economically developed cities and economies, but in addition to air pollution, water and municipal waste problems are central issues in the economic and urban periphery because the natural resources of the southern hemisphere they are transformed into satisfiers for the northern hemisphere, as is the case of crude oil and its derivatives [6].

In this system of centrality and periphery, the psychology of sustainability seems to be divided into two aspects in which the psychology of the South tries to understand and explore the knowledge and rationalities, spaces and risks that derive from the impact of the exploitation and transformation of the nature on the lifestyles of the communities [7].

For its part, the psychology of sustainability in the northern hemisphere is more concerned with describing and explaining the effects of climate change on management, innovation and entrepreneurship networks that are developed in developed economies than in emerging economies. In the northern hemisphere, the psychology of sustainability began the description of the quality of the environment and environmental awareness to arrive at the study of trajectories and structures of variables in equation models in order to predict unfavorable behaviors or those linked to sustainability, equity and happiness [8].

### Water sustainability model

The models of structural equations, trajectories, structures and disturbances had their antecedents in correlation and regression studies from which the associations that allowed the modeling of dependency relations between variables were established [9]. Although structural equation models are based on covariances, correlations and regressions allowed the specification of models [10]. For this reason, in a sustainable development scenario, the agents around the central node of knowledge interact to shape a balanced system where centrality depends on the periphery, north from south, east from west.

However, the state of knowledge tends to configure a descriptive network of environmental problems, although the studies are also

oriented towards the explanation of trajectories and structures in which the themes are integrated into models in order to be able to anticipate the effects of the problems. in the psyche and behavior. Thus, a review of psychological studies on sustainability from 2010 to 2014 shows that values, perceptions and beliefs are the determining variables of consumption. In this sense, the three variables are considered exogenous to attitudes, intentions, skills and use [11]. The values imply relationships of interdependence between nature and communities (biosphereism), rooted relationships between groups based on ecosystemic diversity (communitarianism), competitive relationships between human beings (individualism) based on the scarcity of resources and balanced relationships between generations (sustainability) based on the austerity of current humanity, future technologies and the availability of resources [12].

Perceptions denote involuntary exposure to risk, the absence of control of the situation (uncertainty) and skepticism towards the information generated by civil protection institutions [13]. In this sense, the perception towards normal and strange risk situations is explicitly represented from experiences and non-experienced information [14]. Therefore, it implies indication of danger, prevention, contingency, management and protection; expectation that determines an action, and quick solution reaction [15]. They can be defined as an immediate and simplified response to the dangers and uncertainties that determine judgments, decisions and behaviors [16].

Beliefs are presented as disorienting (dominant social paradigm, paradigm of the human exception, anthropocentrism, materialism, progressivism and utilitarianism) and as guiding (new environmental paradigm, conservatism, ecocentrism, naturalism and austerity) of human behavior towards the protection of the environment. environment [17]. The beliefs that prevent sustainable development denote that human behavior and economic growth are exempt from the laws of nature and therefore such growth is only determined by technological progress [18]. In contrast, the beliefs that favor sustainable development imply the rethinking of anthropocentric visions, the establishment of limits to economic growth, the importance of ecological balance, the necessary sustainable development [19]. The beliefs about the supremacy of human needs over the processes of nature, the consequent conception of the balance or imbalance of human needs with the processes of nature and the consequent unlimited

or limited economic growth, are presented with a different degree inter culturally, economically and generationally.

Therefore:

**Formulation:** Will the dependency relationships between the factors put forward in the state of knowledge adjust to the empirical observations in a context of local and federal elections?

**Null hypothesis:** Given that the reported findings suggest that water governance underlies the political inclusion of civil society, its sociopolitical participation and organizational capacity, then the relationships between values, dispositions, perceptions, skills, knowledge, intentions and actions will adjust to the phenomenon observed in the study demarcation.

**Alternate hypothesis:** Despite the fact that the study locality reflects the prevalence of dependency relationships between the factors put forward in the state of the question, the specificity of the programs and strategies of the political and social, public and private actors supposes the emergence of new forms of discussion, consensus and shared responsibility that inhibit the adjustment of the theory to the local empirical reality.

### Method

A non-experimental, cross-sectional and exploratory study was carried out. A non-probabilistic and intentional selection of 322 students from a public university in the State of Morelos was carried out, considering their participation in management,

production and information transfer programs related to water resources and services in their community or school. The Carreón Water Governance Scale (2016) was used, which includes 20 items that weight values, perceptions, beliefs, attitudes and intentions related to service quality, social participation and inclusive or neo-institutional public administration. Each response option includes five response options: 0 = not at all likely, 1 = very unlikely, 2 = unlikely, 3 = somewhat likely, 4 = very likely

The students were surveyed in the lobby of their university, after a written guarantee of confidentiality and anonymity of their answers, as well as a warning that the results of the study would not affect their economic, political, social or academic status, negatively or positively. The information was processed in the Statistical Package for Social Sciences (SPSS for its acronym in English, version 17.0) and Analysis of Structural Moments (AMOS for its acronym in English version 7.0). Analyzes were performed to establish reliability with Cronbach's alpha parameter, validity with the exploratory factorial analysis technique of principal axes with promax rotation, as well as adequacy and sphericity with the Bartlett and KMO tests. The fit of the model was weighted with the coefficient of goodness of fit and mean residual index.

### Results

Table 2 shows the descriptive values of the instrument, which together with the subscales reached a sufficient level of reliability and validity (alpha of 0.788 for the general scale and alphas of 0.779 to 0.817 in relation to a sufficient minimum of 0.700).

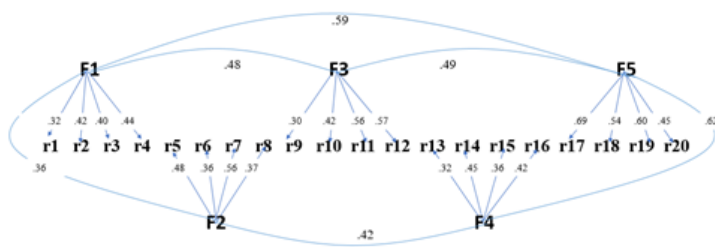
**Table 2: Instrument Descriptives**

R	Item	M	FROM	TO	F1	F2	F3	F4	F5
r1	Post-Election Waivers	3.21	1.02	0.781					0.415
r2	Subsidies before the elections	3.24	1.24	0.732					0.403
r3	Shortage before the elections	3.54	1.45	0.742					0.320
r4	Scarcity prior to the elections	3.67	1.54	0.783					0.403
r5	Shortages prior to the elections	3.91	1.82	0.741				0.311	
r6	Post-election insanitary conditions	3.04	1.94	0.731				0.502	
r7	Post-election confrontations	3.05	1.05	0.742				0.312	
r8	Kidnappings of pipes prior to the elections	3.26	1.26	0.743				0.403	
r9	Pre-election droughts	3.41	1.54	0.704			0.481		
r10	Post-election floods	3.84	1.36	0.741			0.495		
r11	Post-election fires	3.92	1.93	0.736			0.456		
r12	Post-election dehydration	3.26	1.36	0.784			0.403		
r13	Neighborhood distrust prior to the elections	3.56	1.05	0.794		0.413			
r14	Civil unrest before the elections	3.78	1.36	0.781		0.394			
r15	Citizen outrage prior to the elections	3.94	1.06	0.794		0.314			
r16	Social anger after the elections	3.05	1.93	0.794		0.382			
r17	I would protest before the elections	3.16	1.46	0.725	0.405				
r18	I would denounce leaks after the elections	3.52	1.20	0.743	0.431				
r19	I would pay an increase before the elections	3.48	1.31	0.754	0.483				
r20	I would block streets before the elections	3.59	1.35	0.705	0.492				

Source: self-made; Extraction method: principal axes, promax rotation . Adequacy and sphericity [ $X^2 = 324.12$  (35df)  $p = 0.000$ ;  $KMO = 0.671$ ]. M = Mean, SD = Standard deviation, A = Alpha fifth of the value of the item, F1 = Values (alpha of 0.817 and 23% of the total variance explained), F2 = Perceptions (alpha of 0.790 and 21% of the total variance explained), F3 = Beliefs (alpha of 0.785 and 18% of the total variance explained), F4 = Attitudes (alpha of 0.801 and 16% of the total variance explained), F5 = Intentions (alpha of 0.779 and 13% of the total variance explained). Each item is answered with one of five options: 0 = not at all likely, 1 = very unlikely, 2 = unlikely, 3 = somewhat likely, 4 = very likely.

In order to establish the structure of relations between the factors, the relations between the factors were estimated. The prevalence of dependency relationships between exogenous factors with respect to endogenous ones is noted. It then means that the intentions are anticipated based on the beliefs, perceptions and values related to water sustainability (see Table 3).

Figure 3 shows the dependency relationships between the five factors established in the validity of the instrument. The perceptual factor as a direct determinant of intentions (0.610) suggests that other possible factors would be influencing the probabilities of carrying out a co-responsible negotiation between users and the authorities in charge of the management and administration of public resources and services.



**Figure 3:** Structural model of governance of water resources

Source: Prepared with the data; F1 = Values, F2 = Perceptions, F3 = Beliefs, F4 = Attitudes, F5 = Intentions  
 Finally, the fit and residual parameters [ $X^2 = 432.13$  (35df)  $p = 0.021$ ;  $GFI = 0.995$ ;  $CFI = 0.990$ ;  $RMSEA = 0.007$ ] suggest the acceptance of the null hypothesis relative to the adjustment of the theoretical relationships between the factors with respect to the empirical observations made in the study locality.

### Discussion

The contribution of this work to the state of the question lies in the establishment of the reliability and validity of an instrument that measures water governance based on five factors established in a locality in Mexico City, but the type of exploratory study, the type of intentional sample selection and the type of factor analysis limit the results to the research context and the study sample.

It is necessary to extend and diversify the study in order to test the reliability and validity of the instrument in different contexts

and samples, as well as the estimation of a confirmatory factorial analysis of principal components with varimax rotation in order to establish a more robust model in regarding the adjustment of their dependency relationships.

Regarding the state of knowledge, the theoretical relationships established show the possibility of expanding the range of variables related to co-responsibility in the sustainability of the quality of the drinking water service, as well as in its indicators of negotiation, conciliation and prevention agreements. unhealthy scenarios, conflicts over rates, reduction of subsidies and forgiveness that guide the values, perceptions, beliefs, attitudes and intentions of the actors towards a sustainable collection system, as well as protection and care of the resource and public service.

Regarding the construction of a water sustainability governance system, it is necessary to consider everything from the conception of resources as a common good to the establishment of a charging system according to water availability by documented species in the locality, demarcation or region. The governance of water sustainability, indicated by a charging system based on the availability and quality of the public service, as well as the values, perceptions, beliefs, attitudes and intentions derived from public management and administration, implies inclusion and participation. around the negotiation, agreements and shared responsibilities between the governors and citizens in a demarcation like Mexico City.

### Conclusion

The objective of this work has been to establish the reliability and validity of an instrument that measures the cognitive dimensions around civil participation for the governance of the sustainability of water resources and services, assumed as common and in relation to Social responsibility. In this sense, the research question dealt with the dependency relationships between these cognitive factors associated with civil participation in the framework of governance of water sustainability. The null hypothesis warned that such relationships put forward in the revised theoretical and empirical frameworks would be adjusted to the context and the study sample since, being a global phenomenon with repercussions on local development, it would reliably explain comprehensive water management.

However, the alternative hypothesis warned that the specificity of the context, as is the case of conflicts and agreements between political and civil actors regarding water supply, would suppose a limited explanation of the theories and findings reviewed in the literature.

In this way, the specification of the proposed model was based on the empirical test of the model in other contexts and samples different from the one of the present study in order to be able to corroborate the explanatory trajectories and in any case the consistency and validity of the instrument, which by the way are limited by the type of exploratory study, the type of intentional sample selection and the type of factor analysis [20-21].

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