



STRUCTURAL EQUATION MODELING OF A WATER MANAGEMENT IN THE COVID-19 ERA

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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 322 students from a public university in central Mexico. From a structural model after 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.

Key words: Governance, sustainability, water resources, public services, common goods

Introduction

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

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as behaviors against or in favor of that management (García et al., 2017). It is a tripartite process; reveals a conflict between the parties, followed by an agreement based on the scarcity of resources and a co-responsibility that guarantees the conservation of resources for future generations.

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 (Carreón et al., 2017). This is so because it is considered that the differences between the rulers and the ruled with respect to resource management will decrease as scarcity increases. When the supply of public services is reduced, it will generate more conflicts, but the climatic evidence will legitimize the increase in rates for those who hoard or consume more resources.

Therefore, from ecological sociology it will be necessary to focus on this anthropocentric system. This is information that legitimates the water needs of current generations, regardless of the expectations of future generations of species. It was a management system where supply exceeded demand, but the obvious risk events such as droughts, landslides, floods, fires or hurricanes have generated a despair that translates into the conservation of resources for future generations.

However, the fact that the link between the phenomenon of anthropocentrism and the environmental footprint in general has been widely studied and discussed, and that the water footprint has been dismissed by psychology and sociology; explains 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 (Sandoval et al., 2017).

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 (Carreón et al., 2017). The construction of an agenda of common resources supposes the care of the environment as part of the future of the coming generations. In other words, the well-being of the children of those who today conserve the resources is the main reason for such austerity.

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 (García et al., 2017). The merger of management in self-management and the configuration of co-management supposes the beginning of an agreement between the actors considering that the resources are common.

Individuals before 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 (García et al., 2017). In this stage of governance, trust between the actors is essential to build the public agenda and with it the public discussion about resources for future generations.

The socio-political representations understood as general ideas around management and administration of water resources and services have been specified by the state of knowledge as a model of relations reflecting the socio-political representations 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.

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

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 economic, political and social agreements were made 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.

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.

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

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.

From this context, cities organized from a solidarity and cooperative economy logic have built management and administration systems focused on the opportunities and capacities 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.

The standard theory of change 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 increases, in the face of natural disasters such as frosts, droughts, hurricanes, landslides or floods. This approximates the balance between the supply of the State with respect to social demand, but without considering the availability of current and future resources.

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. This is a phase prior to the conflict between the rulers and the ruled. Such asymmetry will spread between political and social actors, as well as between public and private sectors, creating a gap between state management and civil self-management.

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. This is so because the public administration dialogues with social actors and private sectors regarding the conservation of resources and through the establishment of rates according to the consumption of the parties involved.

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. In one of its phases, environmental awareness emerges as a foretaste of a fatalistic scenario in which resources are considered scarce, shortages prevail, public service rates and health contingencies are increased.

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. Its legitimacy is achieved when risk events such as droughts or floods are evident, which reflect scarcity and thus forced austerity.

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. This is the case of the subsidies that the public administration implements to balance supply and demand, but given the growing imbalance, the charging system is updated until it reaches a point where the consumption unit is valued for its scarcity.

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. Such situations would be conditioned by the availability of resources and their conservation from a co-responsibility model.

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. Subsidy policies would be ideal in a locality with high political participation, but undesirable in municipalities evaluated by international or national organizations.

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 this scheme, the evaluation of policies, strategies and programs for the conservation of public resources and services will be a universal criterion of co-management between the parties involved, generating sufficient debate for their restructuring or gradual substitution as radical and always based on the availability of resources, their optimization and innovation as co-responsibility processes between the interested parties.

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.

The psychological studies of sustainability can be analyzed from a logic of centrality and periphery.

From this nomenclature, it is possible to notice that Sustainable Development is a central issue or node that involves climate change, global warming, and 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 (Abramo, 2012).

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 (Acosta, 2010). It is a comprehensive governance where subsidies are implemented due to the scarcity of resources and civil participation. The increase in both generates an internal conflict in the public administration that can be seen in the decoupling of supply strategies and programs.

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 this scheme, institutionalism prevails over civil self-management, since the social actors are at the expense of the evaluating organisms to cast their vote against or in favor of the governing administration.

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 (Behancourth, 2010). It is a behavioral management system for sustainability. The extension of this behavior in the organization has been related to social responsibility. Both are indicated by actions of recycling, reuse and promotion of products and services with low levels of CO₂ emissions. The anticipation of this behavior has been carried out from cognitive variables such as perceptions, attitudes, motives and intentions to carry out the optimization of resources and the innovation of processes.

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 (Blunda, 2010). Based on this criterion, the behavior to achieve sustainability has been established from its relationship with the cognitive, evaluative and normative variables.

Although structural equation models are based on covariances, correlations and regressions allowed the specification of models (Carosio, 2010). For this reason, in a scenario of sustainable development, the agents around the central node of knowledge interact to shape a balanced system where the centrality depends on the periphery, the north on the south, and the east on the 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 to be able to anticipate the effects of the problems. in the psyche and behavior. This is the case of a shortage that will result in shortages and conflict between political and social actors, thus the emergence of agreements between actors and public or private sectors.

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 (Corral, 2010). It is a governance to achieve sustainability based on the dialogue of knowledge, convergence of norms and values, as well as the implementation of strategies based on the awareness of scarcity, shortages, unhealthiness and scarcity of resources and public services such as water and the energetic ones.

Values imply relationships of interdependence between nature and communities (biosphereism), rooted relationships between groups based on ecosystem diversity (communitarianism), competitive relationships between human beings (individualism), based on the scarcity of resources and balanced relationships between generations (sustainability), depending on the austerity of current humanity, future technologies and the availability of resources (Nozica, 2011). The governance that was built from these normative and evaluative criteria considers common resources more than public or private. If resources are assumed to be scarce, then their conservation will be indicated by expectations of limited consumption.

Perceptions denote involuntary exposure to risk, the absence of control of the situation (uncertainty) and skepticism towards the information generated by civil protection institutions (Quiroz, 2013). In this sense, the perception towards normal and strange risk situations is explicitly represented from experiences and non-experienced information (Sharples, 2010). Therefore, it implies indication of danger, prevention, contingency, management and protection; expectation that determines an action, and quick solution reaction (Barkin & Lemus, 2011). They can be defined as an immediate and simplified response to the dangers and uncertainties that determine judgments, decisions and behaviors (Bertoni & López, 2010).

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 (Corral & Domínguez, 2011). 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 (Duerden & Witt, 2010).

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 (Flores & Parra, 2011). 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:

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?

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. Even though 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 1 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 1. Instrument Descriptives

R	Item	M	SD	TO	F1	F2	F3	F4	F5
r1	Post-Election Waivers	3.2	1	0.78					0.42
r2	Subsidies before the elections	3.2	1.2	0.73					0.4
r3	Shortage before the elections	3.5	1.5	0.74					0.32
r4	Scarcity prior to the elections	3.7	1.5	0.78					0.4
r5	Shortages prior to the elections	3.9	1.8	0.74				0.31	
r6	Post-election insanitary conditions	3	1.9	0.73				0.5	
r7	Post-election confrontations	3.1	1.1	0.74				0.31	
r8	Kidnappings of pipes prior to the elections	3.3	1.3	0.74				0.4	
r9	Pre-election droughts	3.4	1.5	0.7			0.48		
r10	Post-election floods	3.8	1.4	0.74			0.5		
r11	Post-election fires	3.9	1.9	0.74			0.46		
r12	Post-election dehydration	3.3	1.4	0.78			0.4		
r13	Neighborhood distrust prior to the elections	3.6	1.1	0.79		0.41			
r14	Civil unrest before the elections	3.8	1.4	0.78		0.39			
r15	Citizen outrage prior to the elections	3.9	1.1	0.79		0.31			
r16	Social anger after the elections	3.1	1.9	0.79		0.38			
r17	I would protest before the elections	3.2	1.5	0.73	0.41				
r18	I would denounce leaks after the elections	3.5	1.2	0.74	0.43				
r19	I would pay an increase before the elections	3.5	1.3	0.75	0.48				
r20	I would block streets before the elections	3.6	1.4	0.71	0.49				

Note: Prepared with study data. 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.

Figure 1 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.

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.

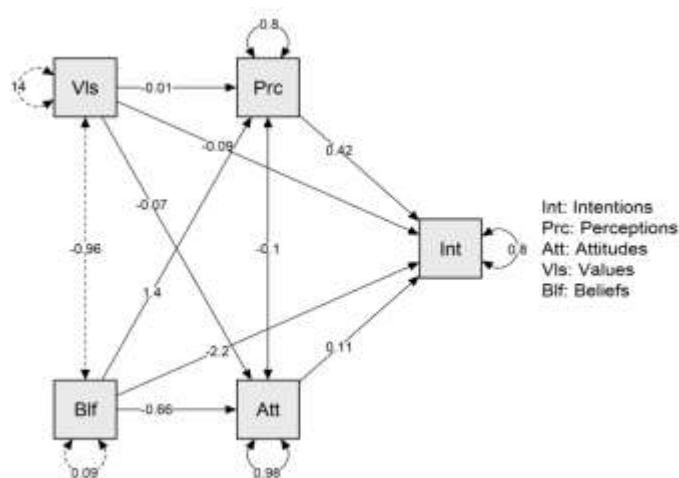


Figure 1. Structural model of governance of water resources
 Note: Prepared with study data

The factors established in Table 1 are included, as well as the indicators set out in the description of the instrument. It is a statistical technique that explains the paths of incidence of each factor to predict a behavior that can be a waste of resources, or else, savings depending on the surrounding information in the media and that is processed in evaluative, perceptual, belief, attitudinal and intentional symptoms. A decrease or increase in the values of these factors negatively or positively affects the behavior of saving water and reuse. It is possible to appreciate that risk perceptions

directly affect water consumption. If the people surveyed assume that there will be a shortage, then they will prepare for a shortage and increase in rates, reducing their needs for water use.

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 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 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 present work, when identifying that governance is at a level of perception of risks due to the scarcity of resources, warns that any intention of negotiation already agreed between the parties would be generated from the information disseminated in the traditional media, as well as from electronic social networks. The processing of data related to shortages will generate an anticipation of the fatalistic scenario and with it the expectation of an increase in rates.

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, and supposes the inclusion and civil participation around the negotiation, agreements and shared responsibilities between the rulers and citizens in a demarcation such as 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 responsibility. Social.

In this sense, the research question dealt with the dependency relationships between these cognitive factors associated with civil participation in the governance framework of water sustainability. It is a mobilization based on the perceptions associated with risk events such as droughts or floods, but also linked to government action such as the implementation of subsidies.

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. In other words, the literature has consistently compiled the effect of supply policies and charging systems that increase depending on the availability of resources.

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. This is so because the co-management of public resources and services supposes perceptions of the rulers that affect civil

participation in the polls, as well as trust in their authorities in the face of the management of an environmental crisis.

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 studies 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.

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