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Water sustainability expectations in the face of COVD-19

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Abstract

The objective of this work lies in the modeling of the psychology of sustainability understood as a paradigm of knowledge, explanation and prediction of behavior in risk scenarios and contingent situations, but with a propensity for the future. A documentary work was carried out with a selection of sources indexed to international repositories, considering the keywords, as well as the publication period from 2019 to 2022. The specification of the model shows three axes of research developed from the inter and multidisciplinary, but with a clear hegemony of studies oriented from positive psychology; well-being, satisfaction and happiness, although other factors can be included considering other subdisciplines such as health, educational or social psychology.

Keywords: *growth, development, organizations, communities, calendar*

Introduction

As of this writing, the SARS-CoV-2 coronavirus pandemic and COVID-19 disease have infected 15 million, sickened 8 million, and killed 600,000. In Mexico, 350,000 have been infected, 200,000 are sick and 40,000 have died. In this context, the policies, strategies and programs to mitigate the pandemic have consisted of frequent handwashing, the use of masks and the confinement of people [26]. Regarding the use of water for washing hands, utensils and clothing, these policies suggest an intensive use in terms of volume, which exceeds the average per person of 120 liters per day in marginalized areas of Mexico City.

In the development of the welfare state that highlights economic, political and environmental rights as the third generation of individual guarantees, public services arise and with them municipal services [24]. This means that resource management is carried out from the local public administration. In the case of water services, management has a human rights imperative. It is a series of mandates for the municipal authority in charge of carrying out procedures, collections, fines and subsidies to be able to regulate the supply between communities without compromising their income, although the most vulnerable, marginalized and excluded allocate up to 20% of their income to payment of privatized water.

The psychology of sustainability will emerge in this scenario of environmental and water rights. It is a discipline that inherits its theories, methods, techniques, instruments and the most significant variables, such as attitudes, objectives, abilities, intentions and behaviors favorable to the conservation of nature for future generations, from social psychology and community psychology. Other revision proposals can be found in [7] where two types of theories are proposed: those of long and medium range, distinguishing general and specific explanation frameworks, although this taxonomy, the revision, is followed in the present work. It is carried out based on significant contributions of interdisciplinary criteria in which technological variables are related to psychological variables to explain the optimization of water resources.

The contribution of social psychology to the psychology of sustainability lies in the models of reasoned action, planned behavior and acceptance of technology, although the evaluative and spontaneous normative models were consolidated in their first stage of development from 1970 to 1990 [18]. In this scenario, cost-benefit models prevailed

that would forge the deliberation, planning and systematization of a type of behavior that was identified as ecological, pro-environmental and responsible.

Regarding community psychology, which contributes to symbolic processualism, successor to the sense of community, attachment to place and group identity, the psychology of sustainability acquired its temporal dimension, which consists of carrying out actions not only for the benefit of current generations but also for the future. inhabitants of the planet. It is a developed aspect, but little spread outside the community health centers.

In this way, the theory of water services is structured in the psychology of sustainability, although its foundations are found in social, community, risk and educational psychology. Even the influence of other subdisciplines such as health or political psychology is reflected in the variables of risk perception and skills [17]. The development of the psychology of sustainability has been vertiginous in the field of risk events, but its bases are found in the cost-benefit studies that were developed in microeconomic psychology with the theory of prospective decisions.

Risk perception was adopted by health psychology to establish thresholds of probability of prevention and adherence to treatment of illnesses or accidents in the occupational area, but it was political psychology that introduced this variable in studies of trust between rulers and ruled [16]. This is how the psychology of sustainability was built as a multidisciplinary area of knowledge.

However, the transition from the psychology of sustainability to the psychology of water services has been a long one. Since the first multidisciplinary study was conducted in 1980, architecture and design as a subdiscipline have been extensively informed and constructed using models that explain and predict multidimensional behavior; cognitive, temporal, situational, and behavioral [2]. Forty years later, the only consensus reached is that these works can be included in a distinguishable field of knowledge as behavior for sustainability. A long debate was generated for the variable to achieve this status, contrary to the establishment of its dimensions.

Thus, the transition from a 40-year-old psychology of sustainability to a psychology of water services could take the same number of years [27]. From now on, it is possible to outline some axes, trajectories and relationships between the variables that are subtracted from the social, community, political, health. economic, risk and education in order to explain the impact of residential water services. This purpose could be built from the corresponding studies and findings.

In the 1980s, within the framework of environmental policies focused on the scarcity of water resources, psychological conservation studies were developed to explain the impact of this situation on residential water consumption and the corresponding payment for the volume of water [21]. The charging system was an environmental policy strategy whose purpose was the comprehensive management of resources and their efficient conservation. Until 1992, the first Earth Summit established as a goal for the millennium the right of access to the resource and its conservation from the reduction of consumption, as well as co-management between authorities and users.

Consequently, investigations related to the prediction of efficient use, as well as the payment of services, were preferably inferred from their cognitive determinants and situations in residences. Some classic studies propose the intervention of educational psychology through competencies to distinguish dispositional, motivational and strategic traits in the face of scarcity, unhealthiness or scarcity of water resources [3]. The most developed studies were those that modeled the cognitive variables with the behavioral ones and whose origin dates back to the eighties to explain the waste or saving of water. In Mexico, based on the modeling of beliefs, attitudes, motives and behaviors, the first theoretical proposal was in 1986, and in that same year another study explored patterns of consumption behavior in cities, as well as strategies to reduce consumption [4].

A year before the editorial presentation of the first study of the reflective dimensions of sustainable behavior, a paper on risk perception was published that introduced the study of the variable in residential water problems [9,11]. The perception of risk had already been presented in 1987, but it took 16 years to import it into the psychology of sustainability [28,12]. Three dimensions, social, environmental and personal, were correlated with water savings, but the regression coefficient was low and inhibited future models with the modeling of the variable [10].

However, the rise of psychological studies of sustainability originated with the structural equation models introduced in the 1990s but was consolidated in the following decade when the discussion on ecological, pro-environmental and sustainable behavior was formalized in 2004. Yes, in the eighties, the theoretical modeling proposed, these were only possible with the development of software capable of estimating the structure of hybrid axes and

trajectories in constructs and indicators [6]. It was not until the first decade of the millennium that the dimensions of sustainable behavior were demonstrated, although the tests of the model were not carried out, which could have generated multi-trait and multi-method validity.

Until 2008, an observational model applied to sustainable behavior was contrasted. Its importance lies in segmenting ecological beliefs (scarcity, pollution) and utilitarian beliefs (access, ease and benefits) as its determinants [8]. The reflexive model included five dimensions of domestic water use, but the ecological dimension was negatively related [14]. On the contrary, the utilitarian dimension was positively and significantly associated. It was a significant advance for the consolidation of sustainable psychology by showing that utility predicted specific water care actions.

Although the relationship between utilitarianism and behavior was significant for the subdiscipline, it was the fragmentation in orientation and styles that marked a milestone in future research [25]. Affinity, outrage, appreciation, self-presentation, and deliberation were linked to altruism, pro - environmentalism, and austerity. In other words, the new dimensions found allowed a sectoral advance in knowledge by focusing on the socio-psychological dimensions.

However, it was not until 2015 that the public management variables with municipal services and their effects on the volume of consumption and payment per unit of water were outlined [22]. The urban sustainability model of water resources proposes everything from gray water collection to treatment mediated by a series of technical variables such as collection and classification. The virtue of this proposal is that it opened the debate on human consumption and its assisted technology.

In 2017, a study on emotions and water saving discovered three consequences derived from the sustainable use of residential water services: gratitude, anger and remorse [23]. In another work of the same year, future orientation and free water determined the consumption of water.

It was not until 2018 when technological variables were merged with psychological variables to establish an intelligent system for measuring and optimizing soapy water [19]. The model included a control interface for the deployment of water, as well as an infrared sensor for its regulation, capture for treatment in the sink, toilet and shower. The simple routine of interaction with the technology influenced the washing time, but it was the dissemination of the system among family and friends that significantly reduced the use of water and its reuse.

It is not until the year 2020 when direct, positive and significant relationships are observed between the sustainable behavior indicated by altruism, frugality and equity with respect to positive consequences such as happiness, well-being and satisfaction, although this relationship is mediated by costs. That is, the optimization of water services is regulated by negative effects, reducing the positive effect of sustainable behavior [13].

In short, since 1980, the year of the first study on the demand curves for water services and their effects on established behavior, comparing sustainable behavior with the tariff system, until the latest research published in 2020, in which mediation of Costs on happiness, altruism and well-being, the psychology of sustainability has prioritized interdisciplinary models, although dispositional, situational and technological factors prevail. In this 40-year construction process, psychological studies of water sustainability have modeled several variables and demonstrated factor structures to explain and predict resource optimization.

Precisely, in this 2020, psychological studies on the sustainability of water seem to have anticipated the pandemic caused by the SARS-CoV-2 coronavirus and the COVID-19 disease by explaining the use of water, one of the emblematic factors of prevention of infections, illnesses and deaths.

Therefore, the objective of this paper is to discuss water service policies in the face of COVID-19, considering the conditions in which the phenomenon is occurring, as well as its short-, medium-, and long-term effects on water consumption. as a prevention strategy. before the health and economic crisis.

Thus, the contribution of this work to the state of the question lies in: 1) review of the epistemic, theoretical, conceptual, empirical and instrumental frameworks of residential water services, 2) methodological approach to the frontier of the state of knowledge, 3) discussion of the viability of risk prevention policies.

This is how the first section addresses a theory of water services that emerged after the welfare state enshrined universal rights. Inherent in the first and second generations, like health guarantees, access to water as a human resource was the prelude to municipal water services [5]. Thus, in the second section, the representation of these water services as behavioral determinants for sustainability is

discussed. Finally, in the third section, the findings of the last frontier of the state of knowledge are exposed and discussed.

Method

Design. A documentary, retrospective and exploratory study was carried out with a selection of sources indexed to international repositories, considering the publication threshold from 1980 to 2022, as well as the search by keywords: "water resources", "public services" and "water sustainability"." (See Table 1).

Table 1: Descriptions of the reviewed sources.

	Author	*Category*
1980	Berk et al.,	CBP
1986	Bustos	CPA
1986	Corral et al.,	CPA
1987	Slovik	CER
2003	Corral et al.,	CER
2004	Corral & Queiroz	COS
2008	Corral et al.,	COS
2015	Ma et al.,	CBG
2017	Marques et al.,	COS
2018	Gonzalez et al.,	CBT
2020	Corral et al.,	COS

Source: Prepared with data from the study: CBP = Policy-Based Behavior, CPA = Pro-Environmental Behavior, CER = Risk Avoidance Behavior, COS = Sustainability-Oriented Behavior, CBG = Management-Based Behavior, CBT = Behavior Based in the technology,

Instrument. Inventory of Behavior for Sustainability (ICS) which records: 1) theoretical, conceptual and empirical discussion; 2) modeling of variables from trajectories and verifiable relationships; 3) samples greater than 100 for exploratory models and 250 for confirmatory models, 4) findings based on regression parameters whose values range between 0.30 and 0.70; 4) applications of the results to the discipline.

Procedure. Each item of ICS is qualified by expert judges in the subject, considering three rounds; a) a qualification where a negative value is assigned to the absence of any requirement and a positive value to the fulfillment of the requirement, b) comparative where the evaluations and the criteria of the judges are exchanged; c) reconsideration where the judges can choose to modify their initial rating or remain in their position, arguing their reasons. The data was processed in the software that estimates partial least squares (PLS for its acronym in English) version 3,3,2.

Results

Neural networks, as a technique for analyzing the relationships between edges and nodes, explain the learning of information and communication systems. In this sense, the structure of the neural network reveals learning that goes from risk perceptions to affinity with nature and by extension to the care of public services such as water and energy (see Figure 1).

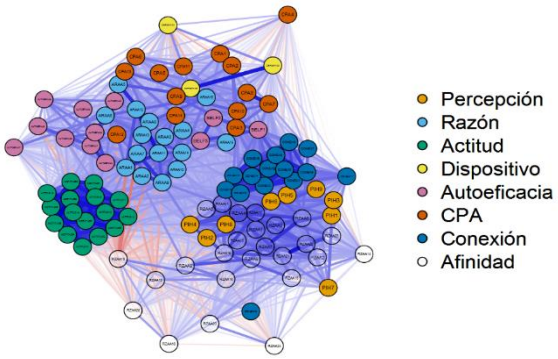

Fig 1: Network of findings on sustainability expectations in the literature from 2019 to 2022

Source: Elaborated with data study

The centrality of the networks, which explains the proximity of the edges to the nodes, suggests that the expectations of sustainability do not present dispersions or volatility that places them in a polarization scenario. (See Figure 2).

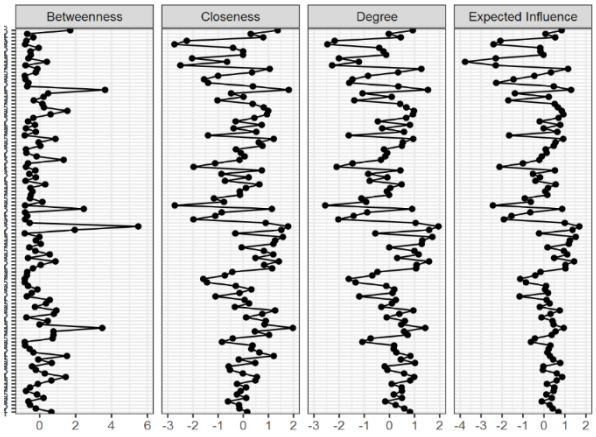

Fig 2: Centrality of findings on sustainability expectations in the literature from 2019 to 2022

Source: Elaborated with data study

The grouping of the neural networks, which indicates the prevalence and tendency of the edges to be related to the nodes, warns of a moderate dispersion and volatility that would explain the configuration of a structure of expectations oriented towards sustainability (see Figure 3).

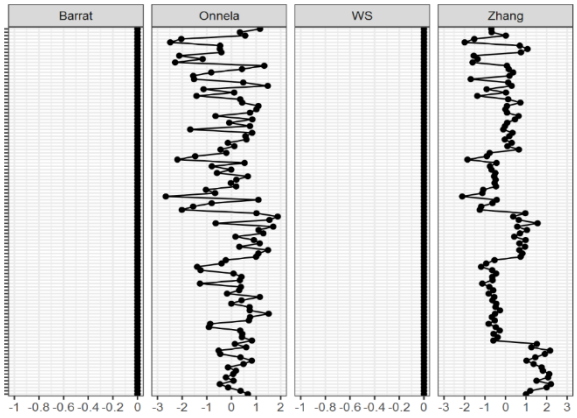

Fig 3: Clustering of findings on sustainability expectations in the literature from 2019 to 2022

Source: Elaborated with data study

In summary, the results suggest a structure of neural networks where learning moves from risk perceptions to affinity with natural resources and public services, as well as a tendency of these edges to move towards a centrality of relationships, but absent in their nodes. In addition, the configuration of these elements is narrow, but not towards a dominant node, rather absent.

Discussion

From the theoretical, conceptual and empirical frameworks exposed, it is possible to model the axes, trajectories and relationships between situational, technological and psychological variables as determinants of behavior for sustainability and its negative as positive effects.

The model includes three axes that explain the relationships between situational variables such as irregular supply, technological variables such as filtration, and economic variables such as rates on the positive consequences of sustainable behavior such as happiness, well-being, and satisfaction.

Axis 1. From fees to happiness for extrinsic reasons and altruism. The trajectory has not been fully established, only partially. Given that a policy of subsidies and forgiveness can be assumed to mean protection, the route has not been empirically demonstrated, but it is theoretically feasible [1]. If free supply programs are considered in contingent situations such as the pandemic, this could activate the extrinsic motivation of a subsidy or cancellation of the service, as well as an altruistic act of sharing water with other irregular users in its supply, generating states of experiences. positive with myself. This is the case of sectors of the lower middle class that support vulnerable, marginalized and excluded sectors through donations of money or volume of water, intensifying recognition and their permanent sense of happiness.

Axis 2. From filtering technology to subjective well-being through attitudes and equity. The path has not been shown by the psychology of water sustainability, although there is evidence of a positive and significant relationship between filtration technology and water savings through the acceptance and adoption of appliances [20]. In this process, equity would increase subjective well-being by considering technology as inclusive. In other words, affordability and ease of use represent a utility that would affect shared responsibility for residential water optimization. This is the case of medium-high category users who can invest in filtration technology and find its use intensive and shared, as well as a potential benefit for their quality of life.

Axis 3. From the dosage of the water supply to the satisfaction in the residential use of water. The path explains the impact of the technological variable through the perception of the risk of shortages, shortages, unhealthiness and scarcity, as well as the expected austerity or impoverishment of users [15]. Municipal services are assumed to be recipients of technological optimization, in the case of residences, neighborhoods or sustainable cities that adopt and adapt technologies to increase the experience of use, as well as water comfort with above-average availability.

In short, the proposal refers to the impact of municipal service fees, filtration technology and the tandem or irregular supply on happiness, well-being and satisfaction, through motives, altruism, attitudes, equity, perceptions and frugality. This is so because these are variables that reflect the progress of behavioral predictive studies aimed at sustainability. It is a deliberate, planned, systematic and identity process in which decision-making and actions favor scenarios that may be heritable or without a water footprint for future generations.

Conclusion

The contribution of this work to the state of the matter lies in the concretion of a model for the study of sustainable behavior, although the review was limited to the Mexican context, considering international indexing, suggesting the extension of the proposal to the inclusion of other variables. Determinants of a system of optimization and innovation of the municipal service.

In relation to the theoretical and conceptual frameworks that highlight the emergence of an explanatory subdiscipline of behavior favorable to the conservation of water resources, this work has

highlighted dimensions related to their determinants, reflexive and consequent in order to structure the trajectories. of the relationships between these variables. Such an exercise will allow integrating in the classroom the elements that have emerged in the research due to evidence of low empirical correlations.

Regarding the psychological studies of water sustainability that highlight dimensions related to municipal service rates, filtration technology and supply situation with respect to motives, altruism, happiness, attitudes, equity, well-being, perceptions, frugality and satisfaction, the present This work has structured the relationships between these variables in axes and trajectories in order to anticipate scarcity, shortage, unhealthy and scarcity scenarios, showing the emergence of positive variables that predict the psychology of water sustainability. Such expectation will allow pedagogical sequences to be developed in the classroom with the purpose of forming an intellectual capital oriented to local sustainability.

Regarding the modeling of the psychology of water sustainability, in which the proposed variables stand out, a paradigm can be noted that accounts for a deliberative, planned and systematic process, but which has not yet managed to adapt the systems of representation to reach a local sustainability in which at least the political and social actors establish a common agenda, considering water problems, as well as the positive psychological response to contingencies, risks and environmental threats, residential situations or community, educational environments and institutional.

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