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Formalization of correlational studies of water problems

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Abstract

The intra-individual, inter-individual, intra-group and inter-group explanatory levels developed from the social sciences around hydrological problems are exposed. Based on two norms: hydrological exclusion as a conformity mechanism that makes individuals dependent on their leaders, and hydrological inclusion as an innovation mechanism that makes individuals and groups supportive of water scarcity, the impact of water scarcity is explained. environmental situation in individual cognition, personal interrelationships, group roles and intergroup conflicts.

Studies on hydrological problems have been developed from bivariate models that are characterized by establishing a causal relationship between a variable X and a variable Y. Regression analyzes establish the causal relationship between two variables and have been considered as preliminary. for multi-causal analyzes of trajectories and structures. The "β" (Beta) statistic whose significance is less than .05 is considered as a parameter that explains the causality between a variable Y as a function of a variable X. These analyzes suggest the development of multi-

causal studies in which the system of savings or waste, reuse or waste, recycling or contamination of water extracted, filtered, potable or treated for residential, commercial, peripheral, or rural areas, current or future generations.

In this sense, socio-hydrological, economic-hydrological, political-hydrological or psychological-hydrological studies have revealed an exclusionary logic in which economic norms prevail over social, political, environmental, local, neighborhood or family norms. Therefore, conformity (hydrological exclusion) has determined the inequitable distribution of water between animal and plant species, between opulent areas and peripheral neighborhoods or rural communities, between current and future generations.

However, in peripheral neighborhoods and rural communities, innovation processes (hydrological inclusion) have been built in which conflicts over water are the beginning of the development of sustainable alternatives. In this sense, it is pertinent to expose the studies that corroborate the hydrological exclusion and with it, the citizen conformity observed in the waste, contamination or location against the hydrological inclusion and its corresponding solidary innovation observed in the dosage, saving, reuse and recycling.

For this, levels of analysis are used in chronological order in which the impact of the environmental situation on the individual and the groups to which he belongs or wishes to belong are observed.

Regarding the contexts and spaces in which the investigations were carried out, they have proliferated in America and Europe at a global level, in the United States, Mexico and Brazil at a regional level, in Sonora and Mexico City at a national level and in Iztapalapa and Netzahualcóyotl at the local level.

The impact of the environmental situation on cognition and individual behavior.[1]

In economically developed countries abundant hydrological availability is correlated with insatiable individual needs. In economically emerging countries, water scarcity has been the factor that most influences individual behavior. Said impact is mediated by values, perceptions, beliefs, attitudes and mainly through intrinsic motivation (future generations; children, nephews, grandchildren).[1-4]

Significant differences can be observed between the North American and South American contexts. In the United States of America and Mexico, attitudes and motives are the determinants of personal water saving, in Brazil values and beliefs have a mediating effect on individual behavior.

Significant differences are also observed in North America. In Mexico, beliefs and motives are the mediating determinants of pro-environmental behavior and in the US, attitudes and knowledge are the predictors of pro- ecological behavior .[5-7]

In Mexico there are differences between its regions. In the north, where scarcity is more evident than in the center of the country, it determines cognition and personal action. Meanwhile, in the capital of the

[1]Bustos and Flores (2000), with a sample of 301 residents of the ZMVM, demonstrated that health affectation beliefs are determined directly, positively and significantly by the quality of the environment ($\beta = .465$; $R^2 = .216$; $R^2_{adjusted} = .213$, $p < .000$).
Bustos, Flores and Andrade (2002) with a sample of 202 inhabitants of Nezahualcóyotl and Chimalhuacan in the State of Mexico and the Federal District, showed that motives predict personal cleanliness ($R^2 = .16$).
Meinhold & Malkus (2005) with a sample of 848 North Americans established the direct, positive and significant effect of environmental attitudes and environmental knowledge on pro-environmental behavior ($\beta = .44$ and $\beta = .26$ respectively and with a significance of . 01).

country, saving water is based on extrinsic reasons (expense savings or monetary compensation)

The studies presented demonstrate the indirect impact of the environmental situation on individual behavior through their beliefs, values, attitudes or motives. However, such research has avoided the influence of the groups in which the individual is inserted.

The impact of the environmental situation on the interrelationships between individuals.[2]

Studies that explain and even predict the indirect and significant effects of hydrological availability on individual solidarity or competitiveness have been developed from three foundations:[2-3]

Hydrological availability influences group cognition (values, beliefs or actions of responsibility) through individual cognitive factors (perceptions, attitudes, motives).[10-15]

In developed economies, knowledge regarding the environmental situation has determined group actions. In emerging economies, the inequitable distribution of water in rural communities and popular neighborhoods has led to disputes and solidarity over water. These are values that guide the care of water, attitudes that determine waste and reasons that influence saving. Cognitive factors function as mediators of the effect of contingencies or abundances. Hydrological availability is processed by individual cognition to impact group dynamics. The individual is the mediator of the hydrological situation and group processes. Individual responsibility is a filter for the hydrological exclusion experienced by peripheral areas of cities. The group leaders are intermediaries denouncing the scarcity of water and haranguing the people for their right to water. In the Metropolitan Zone of the Valley of Mexico, community, neighborhood or corporate leaders link the environmental situation with the electoral processes and the corresponding demands. Groups excluded from public drinking water services are used to confront the authorities and political representatives during electoral periods. The leaders of these movements influence their followers by posing a hydrological scarcity derived from political incompetence rather than from the environmental situation, they demand the service without considering hydrological availability and urge their sympathizers to confront the authorities by avoiding social assistance, self-organization or solidarity.[16-18]

A mathematical model that can provide us with a lot of information to allow the use of water is through the Hopf bifurcation. The Hopf bifurcation is a type of bifurcation that some systems present, in such a way that by varying the value of the bifurcation parameter of the system, this undergoes a change in the stability of the critical point under study, this is given some parameters we can see:[9]

[2]Corbet (2005) with a sample of 344 North American residents demonstrated through a multiple linear regression model ($R^2 = .52$; $p < .001$) the direct, positive and significant effect of personal control ($\beta = .19$; $p < .01$) and the desire for change (β .17; $p < .01$) on the behavior of environmental responsibility.
Corral (2003) with a sample of 200 Mexican residents established the direct, positive and significant effect of reuse motives and recycling motives on the reuse of glass ($R^2 = .19$) and steel ($R^2 = .20$) as well as the recycling of newspaper ($R^2 = .23$) and clothing ($R^2 = .19$). Glass reuse correlated ($r = .27$; $p < -01$) with steel reuse.
Corraliza and Martín (2000) with a sample of 420 residents in Madrid Spain, showed that attitudes determine ($R^2 = .09$; $p < .01$) the behavioral factor of waste.
Cottrell (2003) with a sample of 713 email surveys randomly chosen from the database provided by the Maryland Marine Trades Association (MMTA), showed that knowledge of environmental issues directly determines, positively and significantly ($\beta = .28$; $p < .05$) to the general responsibility for environmental behavior.

Where:

$$P = KP\left(1 - \frac{P}{N}\right)$$

P(t). It is the amount of water that exists in an area over time.

K. is the extraction constant of that water.

N. They are the conditions of the place where the water is found.

We add a value that represents the amount of water that is extracted represented by C, then:

$$P = KP\left(1 - \frac{P}{N}\right) - C$$

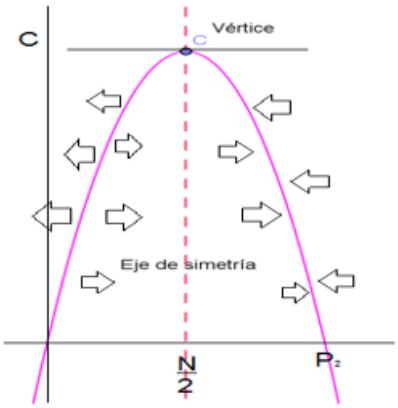
Now it is required to know how much water must be extracted to maintain the place:

$$P = KP - \frac{KP^2}{N} = 0$$

We solve the equation and from this we obtain;

$$x = \frac{-K \pm \sqrt{K^2 - 4KC}}{\frac{-2K}{N}}$$

Once our equation is solved, it is drawn and we observe:



This means that if we draw a little more water where our apex is, without letting it recharge, we run the risk of not having enough for the next season (Marsden 1976).[19-20]

Hydrological availability influences individual behavior from the presence, observation or action of another individual. [3]

[3]Corral, Frías and González (2003) with a sample of 200 Mexican residents demonstrated the direct and positive effects (β = .48, β = .16, β = .41) of a demographic variable (sex) on environmental, social and environmental risks. and personal explained 20 percent of its variability (R^2 = .20). The risk factors correlated directly, positively and significantly (r = .83, r = .83, r = .77 the three with p < .01) in each of them, both men and women perceive the same degree of risk in the three different magnitude levels. They showed that saving water is strongly related (R = 23; p < 0.05) with the recycling of products.significance of less than .05.

In both developed and emerging economies, the influence of the mere presence or mere comment of one person on the behavior of another has been duly demonstrated by the social sciences. The economic situation determines the hydrological situation and this, in turn, affects the relationships between consumers. In this sense, it is a level of interpersonal explanation in which the interrelation between individuals implies a scenario in which the environmental economic situation affects the adjustment of personal behavior to the expectations of other individuals. However, saving water is influenced by the group norm and waste is determined by the social norm. Groups with a high level of education and high income put more pressure on their members to adhere to the care or protection of the environment. However, anthropocentric cultures tolerate those who waste water without considering the problems of groups excluded from the service or the needs of future generations. In Mexico, pro-environmental behavior is the result of group pressure. People who waste water are identified as part of the problem and are discursively sanctioned. In the north of Mexico, studies have been developed that show the effect of saving water on waste and waste on hydrological care. In the ZMVM, housewives are considered to be the main people responsible for caring for water. The observation of the children influences the domestic consumption that housewives make. Even the indications of the infants around the care of the water influence their teachers. These are implicit influence processes in which the mere presence or the mere comment modifies the wasteful behavior. In the popular neighborhoods of Mexico City, the scarcity of water is associated with the norms of neighborhood coexistence. That is to say, the dwelling houses that have water wells tend to take care of and share the water based on the recognition of their neighbors. Consequently, the second foundation refers to two processes: rational and affective. In the first, groups deliberately influence the individual and in the second, groups impromptu influence people.[22]

Hydrological availability influences spending or individual savings through group influence.[4]

The influences of groups on individuals are inferred from the incidence of values in decisions and individual behavior. Hydrological problems frame the group influence on individual cognition. In developed economies as well as in emerging economies, hydrological needs are regulated by environmentalist, con-

[4]Amérigo and González (2001) with a sample of 184 students from Madrid, Segovia and Toledo, Spain, showed that selfish values predict (β = .2496; p < .05) the intention of pro-environmental behavior through the regression technique in successive steps.

Pato, Tróccoli and Tamayo (2002) with a sample of 281 Brazilian students, using two multiple linear regression models (first model: R = .43; R^2 = .34; $_{adjusted\ R}{}^2$ = .15 second model: R = . 39; R^2 = .20; $_{adjusted\ R}{}^2$ = .11), established the direct, positive and significant effects between the universal evaluative factors on the evaluative factor around cleanliness (b= .29; p < .01) and the security value factor over the economic value factor (b= .22; p < .01)

Comins and Chambers (2005) with a sample of 205 Australian students demonstrated the direct, positive and significant effect of biospheric values on public transport preferences (b= .24; p < .001). In contrast, they also demonstrated the direct, negative and significant effect between selfish values on public transport preferences (b= -.15; p < .05).

Joireman, Lasane, Bennett, Richards, and Salaimani (2001), with a sample of 191 North American students, demonstrated that perceived social consequences directly, positively, and significantly determine (β = .52; p < .01) pro-environmental intention.

Pato and Tamayo (2006) with a sample of 443 Brazilian students established the indirect (β = .266) and direct (β = .20), positive and significant effect of the universal dimension of social values on (β = .466) a dimension (activism) of pro-environmental behaviour. Likewise, the benevolent dimension of social values had both effects (β = .14 and β = .20) on (β = .34) this pro-environmental activist dimension. These effects were mediated (β = .19 and β = .20, respectively) by the ecocentric dimension of environmental beliefs and attitudes.

servationist or alternative world values. In central economies as in peripheral economies, hydrological consumption is determined by sustainable principles. However, there are significant cultural differences between established economies and potential economies. The former tend to build anthropocentric, individualistic and selfish values. The latter tend to build ethnocentric, collectivist and altruistic values. This substantial difference means that in the dominant economies the scarcity of water, caused by climate change, is an ideal scenario for environmental mobilization. In contrast, in dominated economies, a shortage of water, due to lack of public supply, is the ideal setting for community solidarity and political manipulation. The impact of the environmental situation on intra-group roles (conformist-dependent and conflictive-innovative)[5]. In reference to the leaders of the groups that regulate the hydrological situation in the behavior of its members, the social sciences have shown:

Group regulations around water scarcity. From the perceptions of risks and control, the behaviors of the leaders and sympathizers within a group have been determined. A situation of hydrological shortage is enough to maintain the roles within popular neighborhoods and residential areas. The groups involved conform to an internal norm that consists of demanding a regular supply of water from their representatives. When this process of governmental political dependence is exhausted, conflicts arise in which the roles of the group are removed, generating fragmentation and competition for the public drinking water service. That is, the perception of control that derives from dependence on the leader is replaced by the perception of risks that underlies the conflict with the leader. Consequently, the behavior of adherents ranges from conformity to innovation. A situation of hydrological shortage is enough to activate the creativity of consumers and demand in various ways the regular supply of water or to organize themselves to be self-sufficient while the contingency elapses.[8]

Intra-group conflict around hydrological distribution. At the moment that consumers face the dilemma of supporting leaders who do not supply them with water or confronting their authorities to be self-sufficient, a process of changing roles arises in which the leaders are replaced by others who are more creative and solve the irregular shortage in the demanding neighborhoods. These are new leaders who emerge from neighborhoods or residential areas with ideas of self-organization that guarantee sufficient water supply. In electoral times, these are candidates who take advantage of the hydrological situation to criticize the governments in power and launch their proposals for a solution to the problem. The problem of irregular water supply is transformed into a problem of political ungovernability.

However, conflict, creativity, innovation and even change of leaders does not guarantee the emergence,

[5]Acuña (2002) with a sample of 237 students from Mexico City, demonstrated, through a multiple linear regression analysis with the successive steps technique, the prediction (β = 0.399; p = 0.000) of social participation in favor of environment based on the personal capacity and influence factor included in the environmental locus of control variable.
Ibarra, Inda, Fernández and Báez (2000) with a sample of 261 Cuban inhabitants, showed that a member of a subsequent generation (son) determines directly, positively and significantly (β = 10.26; p = .000) the perception of risks of a family living in an unhealthy neighborhood
Oom, Rebelo, Reis & Menezes (2005) with a sample of 2,093 Portuguese showed the direct, positive and significant effects of personal values on general environmental values (β = .60), general environmental values on attitudes towards recycling (β = .41), the specific knowledge about the perception of control (β = .81), the perception of control over the recycling behavior (β = .77), the subjective norm about personal norms (β = .28) and personal norms about recycling behavior (β = .45), all with a significance of less than .05.

much less the permanence of a regular water supply system. Often, the conflicts move from the interior of the popular neighborhoods to other demarcations. Such are the cases of the colonies in the east of the ZMVM in which the conflicts with their authorities expanded into confrontations with other settlers and authorities from other demarcations.

The impact of the environmental situation on inter-group relations.[6]

Social sciences have explained the effects of water scarcity on conflicts between neighborhoods, neighborhoods or communities based on two foundations:

Closed groups (with selfish values, ethnocentric beliefs, utilitarian perceptions, reparative abilities, anti-environmental behaviors) resolve their hydrological conflicts by transferring them to other groups that compete with them for the extraction, storage, distribution and consumption of water. In developed economies, closed groups are xenophobic, blaming migrants directly for economic deterioration and indirectly for ecological deterioration. Racist groups maintain that the levels of unemployment are caused by the immigration policies of their governments that cheapen labor by allowing unregulated migration. This policy had an impact on the increase in population and with it on economic growth that had to be redistributed among the middle classes and migrants. This economic increase determined the environmental deterioration. In the emerging economies, the closed groups are those middle classes that, in their eagerness to achieve the economic status of their counterparts in the central economies, influenced economic policies to accelerate the over-exploitation of energy resources, mainly hydrological ones.[21]

Open groups (with biospheric values, ecocentric beliefs, risk perceptions, preventive skills, sustainable behaviors) resolve their hydrological conflicts by showing solidarity with groups excluded from the public water service. In developed economies, open groups are alter-globalists, environmentalists or preservationists who defend and even incorporate migrants into their environmentalist ideals. In dependent economies, open groups are communitarian rather than environmentalists, they defend their neighborhoods or communities, including their spaces and traditions, rather than nature itself. Precisely, the economic policies of underdeveloped countries favored the migration of communities to urban neighborhoods. Said move implied the transfer of traditions, habits and community customs to neighborhoods. Community networks were transformed into neighborhood networks in which people sought to care for water as a community element rather than as a natural element or non-renewable resource.

[6]Angosto and Martínez (2004) with a sample of 209 Spanish inhabitants established the direct, negative and significant effect of outgroup perception on two dimensions (public and private) of contact intention ($\beta = -.27$; $p < .001$; $\beta = -.16$, $p < .001$ respectively).

Aoyagi, Vinken and Kuribayashi (2003) with samples from Japan, the Netherlands, the United States, Thailand and Indonesia, showed that in Japan egoistic values directly, negatively and significantly predict ($\beta = -.18$; $p = .001$) environmental beliefs . In the Netherlands, traditional values directly, positively and significantly ($\beta = .25$; $p = .001$) affect progress beliefs. Finally, in the United States, altruistic values determine directly, positively and significantly ($\beta = .45$; $p = .001$) environmental beliefs.

Hernández and Reimel (2004) with a sample of 314 Venezuelan family heads established the direct, positive and significant causal relationship between four variables in which participation in a community organization influences quality of life (b= .10; p < . 05), the type of family home affects quality of life (b= .15; p < .05) and participation in a community organization is a determinant of quality of life (b= .18; p < .001).

Medina, Mundéate, Martínez, Dorado and Mañas (2004) with a sample of 169 Spanish workers, demonstrated the direct, positive and significant effects ($\beta = .20$; $p < .05$) of task conflict on the supportive climate. Likewise, they established the prediction ($\beta = .24$; $p < .05$) of the climate of goals from this conflict.

In the consolidated economies, while the closed groups favored anti-environmental norms, their open groups developed sustainable norms from the questioning of the anthropocentrism of the closed groups. In dependent economies, closed groups-built norms of economic growth and open groups, pro-environmental norms.

In this sense, the impact of the environmental situation on individuals, personal interrelationships, group roles and inter-group conflicts has been explained by the social sciences based on the revelation of dependent normative mechanisms and innovative conflict mechanisms. The hydrological exclusion, being the dominant norm in the closed groups, was questioned and overcome by the open groups that built an inclusive hydrological normativity in which the needs of current generations do not affect the capacities of future generations to preserve energy resources, mainly hydrological ones. However, the social sciences have not explained the intervention of technology and the media in this process that goes from hydrological exclusion to inclusion. Family consumption of water by concentrating on the washing of utensils and clothes infiltrated in some electrical appliance technology does not decrease from the supervision or surveillance of the proper functioning of the technology but from maintenance. In other words, a newly acquired technology or one with sufficient maintenance saves more energy and water than an obsolete technology. Finally, research on the impact of the distribution of water within a group has not developed statistical techniques to demonstrate the recursive effect that goes from the actions of the group towards environmental hydrological redistribution.

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