

Community resilience in the literature from 1992 to 2024

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Received Date: February 07, 2024; Accepted Date: February 20, 2024; Published Date: March 01, 2024

Citation: Arturo S. Sánchez., Gilberto B. Ruiz., Rincón Ornelas RM, Julio E. Crespo., Cruz G. Lirios, et al, (2024), Community resilience in the literature from 1992 to 2024, *J, Surgical Case Reports and Images*, 7(2); DOI:10.31579/2690-1897/177

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Abstract

Background: The environmental complexity observed in a locality has been studied through an isomorphic model in which the emergence of two identities is anticipated: one entropic and the other negentropic. In situations of risk, scarcity and unhealthy conditions, communities organize to reduce the effects of natural disasters on community health.

Aim: Specify a model for the study of stress and community resilience in the face of environmental risk events and natural disasters.

Method: A non-experimental, cross-sectional and exploratory study was carried out with a non-probabilistic selection of 600 people affected by the flooding of a river in central Mexico.

Results: Significant differences were found between men and women with respect to their levels of risk, stress and resilience that served to specify the model of dependency relationships between the variables that explain isomorphic environmental complexity.

Discussion: In relation to other model specifications, it is recommended to include the variables to demonstrate the logical trajectories of proposed dependency relationships.

Keywords: natural disasters; stress; isomorphism; negentropy; entropy; resilience

Introduction

Starting from a psychological approach to environmental complexity, the objective of this work is to specify a model for the study of community resilience. In this sense, the discussion is focused on isomorphism as an object of study and negentropy and entropy as the units of analysis. Isomorphism refers to a scenario in which it is possible to observe the influence of public policies on behavior against or in favor of the conservation of the environment and natural resources, affecting the opportunities and capabilities of individuals, antecedent to the emergence of resilience (García et al 2015). If environmental complexity refers to the interrelationship between organized systems, then isomorphism refers to

the imbalance and balance of organized systems that can tend towards chaos or order. In the case of an imbalance with a tendency to chaos, resilience emerges as an organized response of communities (García 2008). In the face of natural disasters and environmental catastrophes, communities develop a negentropic isomorphism in order to reduce the effects of climate change on local public health (García 2007).

Negentropy not only refers to the resources and capabilities of communities, but also to their cognition, emotionality, cooperation, solidarity and identity. Even at a more organized level, negentropy

involves governance that would consist of an agreement between actors regarding sustainability. Conflicts between economic, political and social actors anticipate the suffering and/or resilience of communities. In contrast, entropy refers to hopelessness, indolence and indifference to environmental problems (García et al 2015). Environmental complexity can be observed in a model which would include entropic and negentropic variables. In this sense, a non-experimental, cross-sectional and exploratory study was carried out with a non-probabilistic selection of 600 residents of communities surrounding the Balsas River. Based on the findings, the model specification was carried out.

Environmental isomorphism: governance with gender resilience

Resilience includes the ability to resist critical events that put people's stability at risk, as well as the ability of survivors to recover from such traumatic events. In the past floods in the states of Morelos and Guerrero, three scales were applied: stress, resilience and risk; in order to find a correlation between stress and resilience under the assumption that less stress would lead to greater resilience. The instrument was applied to 600 people in order to reach a reliability level of 95% with a margin of error of 3.8% according to the formula $n = \frac{(p*q)*z^2}{e^2}$ for finite samples. The *T Test* as well as the *Pearson correlation* show important gender traits regarding the survival and reconstruction strategies that men and women undertake, the level of stress being differentiated by gender, but also the levels of resilience differentiated significantly. Humanity has faced conditions of vulnerability since the remote past; it is not something new or foreign to human societies to face environmental crises derived from catastrophic events associated with floods, earthquakes, hurricanes, cyclones, volcanic eruptions, tsunamis, among other catastrophes. Since then, survivors have implemented coping strategies in order to overcome crises by returning to levels of comfort or well-being prior to the catastrophe. In a group or personal manner, facing the crisis allows people to return to security conditions acceptable to them. The risk of experiencing an environmental catastrophe is a constant in the history of humanity, since environmental conditions vary on a dynamic planet such as planet Earth.

In the study of catastrophes, as well as risk, vulnerability is recognized as the determining factor that increases the insecurity with which people live in a given environment, since even within the same space there is a difference in the risk that face by varying the vulnerability in which they find themselves. The socioeconomic vulnerability in which people live increases the risk to which they are exposed, even before the catastrophe, thus the ways of facing and overcoming it vary according to the vulnerability in which they find themselves. Even vulnerability influences the way in which people, as well as communities, perceive risk, since those who live in greater exposure to it due to the vulnerability in which they find themselves, tend to make it invisible, to not see the risk in the that are found. In this sense, it is important to differentiate the vulnerability in which men and women find themselves, since even within the same households, conditions of inequitable access to family resources persist, differentiated mainly by gender. Conditions of poverty, vulnerability and gender subordination prevail in the Latin American region and worsen as poverty takes root in the region. Today the average global income of women is 35% lower than that of men, while 75% of economically active Mexican women who work in the countryside do not report income (Government of the United Mexican States 2001), widening the gap between the rural and urban population. The perception of environmental risk depends largely on the conditions of vulnerability in which the populations find themselves, thus vulnerability is a variable that influences the perception of risk, and the way strategies are generated to overcome the catastrophe. Since there is a difference in the vulnerability that men and women have, there is the possibility of a differentiated appreciation of risk and stress, as well as resilience by gender. Currently, faced with global risk (Beck 2007), most people live in conditions of environmental vulnerability, since Global Climate

Change (GCC) increases exposure to the risk of an environmental catastrophe associated with radical climate variations such as such as torrential rains, droughts, floods, rising sea levels in coastal areas, among others. In order to support the arguments of this research report, a qualitative study was carried out using a semi-structured questionnaire, in addition to a quantitative analysis in which a risk scale, stress scale and resilience scale were applied to more than 600 people who suffered the overflow effects of the Balsas River, as a result of the floods generated by cyclones *Ingrid* and *Manuel*. The methodology included a comparative analysis between communities that live in similar conditions as they are in the middle part of the basin, that is, between the headwaters and the mouth. The respondents, in a simple random manner, are individuals over 17 years of age who survived the flood, being a representative sample with a reliability level of 95% with a sampling error of 5% in accordance with the formula $n = \frac{(p*q)*z^2}{e^2}$ calculation of representative samples.

The results of the *T test* show that there is an important correlation between the level of stress and the ability to modify behavior at the individual and community level. They also show that the greater the stress, the greater the resilient abilities; Thus, it is concluded that people who experience an environmental crisis develop resilience capacities even when risk and environmental vulnerability are high.

Environmental entropy: Climate change and public health

The risk of facing an environmental catastrophe increases to the extent that vulnerability occurs. By recognizing that, in the last four decades, that is, since the 1970s, the average temperature in the first lower 8 km of the atmosphere has varied, it can be stated that there is an important variation in the global climate system, along which is called global climate change CCM, regardless of whether said change has an anthropogenic or natural origin. However, given the evidence, mainly the correlation between the increase in CO₂ emissions and the increase in temperature on the surface of the oceans, it is recognized that these climatic variations have a largely anthropogenic origin. Apart from the discussion about the origin of climate change, it is a fact that this phenomenon occurs on the surface of the planet, particularly in the first 8 km of the atmosphere. It is also a reality that since the industrial revolution the increase in CO₂ has been a constant, in addition the increase in CO₂ maintains a parallel with the increase in the average temperature of the planet. The vulnerability that human beings face is aggravated in the context of the MCC in which the global climate system undergoes transformations induced by human actions. Even without considering the implications of the MCC, disaster risk increases as more and more people, and their assets are exposed to risk due to the vulnerability in which they find themselves. Thus, extreme climate events have a greater social impact since the number of people living in conditions of social vulnerability increases, regardless of CCM. The environmental effects associated with the increase in temperatures lead to complex environmental risk scenarios by modifying the dynamics of wind gusts, as well as ocean currents, in addition to variations in humidity in the atmosphere, waves in the seas and oceans at sea level. planetarium (UNEP 2002). Climate variations influence the dynamics of the atmosphere, where climate variation has been recorded at least during the last four decades (UNEP, 2002). These atmospheric variations are important since they have generated a change in the climate system, mainly in tropical areas, where their adverse effects are also experienced with greater frequency and intensity. Measurements made of the atmosphere in the first 8 km started in the 1970s, first with weather balloons and from 1979 with satellites, show that the global temperature has changed between $+0.05 \pm 0.10$ degrees Celsius (°C) for each decade (UNEP 2002). This increase in temperature is linked to a greater presence of greenhouse gases, mainly CO₂, which have increased in the last 20 years, since in 2002 CO₂ emissions were 3% higher than those estimated in 1990 (Giecc 2001). The most dramatic thing is that the general global temperature of the planet's surface has increased $+0.15 \pm 0.05$ °C per decade, these

variations are generated mainly in the equatorial and subtropical regions (UNEP 2002) that are not the regions of significant generation of emissions of greenhouse gases, but their economies do not contribute significant quantities of CO₂, or any other related gas. It is dramatic because the tropical region over which large-scale climatic phenomena occur, mainly through hydrometeorological phenomena such as cyclones and hurricanes, are not directly responsible for the CO₂ emissions that alter the dynamics of the climate system of planet Earth. If it is recognized that there is a correlation between climate variation and greenhouse gases, particularly CO₂, whose presence is linked to emissions from industrial combustion processes, it is a fact that countries with less economic development contribute few of these emissions. Over the past 140 years, the best estimate is that the global average surface temperature has increased by $0.6 \pm 0.2^\circ\text{C}$. It is admitted that carbon dioxide levels have varied by just under 10% during the 10 thousand years that preceded the industrial era (Semarnat 2006). Since the 19th century (1800) CO₂ levels have risen by more than 30%, even with the absorption by oceans and forests on a global scale, the increase in atmospheric CO₂ levels continues to increase by more of 10% every 20 years (Semarnat 2006). Thus, scientists from the *Intergovernmental Panel on Climate Change* (IPCC) have projected an increase in ocean temperature of more than 1.5°C towards the end of the 20th century, in relation to the average of measurements recorded between 1850 and 1900. Based on these measurements, IPCC scientists carried out various models and built possible future scenarios. Based on the RCP4.5, RCP6.0 and RCP8.5 scenarios; At a high confidence level (UNEP 2002), significant increases in ocean water temperature of $\pm 1.5^\circ\text{C}$ are projected. Thus, torrential rains are increasingly frequent and devastating in Mexico and Central America, from Hurricane *Mitch* in the 90s as well as *Paulina* on the coasts of Acapulco, *Wilma* and *Stan* in 2005, to *Ingrid* and *Manuel* in 2013. It can be seen how these meteorological phenomena violate the safety of people in the isthmus of Central America, as well as in the Caribbean. The amount of water that can fall in a few hours has sometimes exceeded annual rainfall, which brings with it severe flooding and social catastrophes. In the specific case of Mexico, there is a record of increased rainfall that coincides with the presence of extreme hydrometeorological phenomena; followed by long periods of drought. Both phenomena, both torrential rains and droughts, occur with different intensity in the various regions of the country. The scenario was fulfilled in the first months of 2013 since the rains occurred sporadically even below the historical average, but when summer arrived the panorama changed drastically when greater rainfall occurred, making 2013 one of the most recorded wet conditions. In the months of July and August, high sea surface temperatures occurred within the average in most of the equatorial Pacific with anomalies close to -0.30°C in the El Niño 3.4 region (Conagua 2014). The El Niño 3.4 index had its lowest value in January (-0.61°C) approaching conditions of a weak La Niña event, however, these values were increasingly closer to the average from February to June (-0.21°C) (Conagua 2014). In 2013, warm SST temperatures were observed, with positive anomalous values in the Indo-Pacific oceans, the eastern Indian Ocean, the southeastern and southwestern Pacific Ocean; as well as in the North Atlantic Ocean. These anomalies were also present in the coastal region of the Pacific Ocean, generating an increase in ocean surface temperature in the central region of the North Pacific, which showed cooling on the coast of Alaska; however, anomalies were observed in the equatorial region. negative temperatures of the surface of the Pacific Ocean showing neutral conditions of the *El Niño phenomenon* (Conagua 2014). That is, 2013 in both the Pacific and the Atlantic in the tropical region of these oceans recorded the fourteenth and thirteenth warmest years since 1982, respectively (Conagua 2014). Thus, although almost the entire year of 2013 had little rainfall, so it was thought that it would be a dry year close to *La Niña*, in the month of August the humidity conditions increased mainly in the month of September, caused by the arrival to the country's coasts of four tropical systems (*Ingrid* and *Manuel* simultaneously) that caused the rainiest September in the last seventy

years (Conagua 2014). October rains were normal, while November rains once again exceeded any previous record for that month and the year ended with the fourth wettest December on record. Despite the moderate scenarios that existed at the beginning of the year, and that the behavior of rainfall in the first six months was below the national average, towards the second half of the year one of the years with the highest rainfall occurred. of the last 10 years (Conagua 2014). The vulnerability of populations living on the margins of flood zones shows the need to face the global risk that has been socially constructed.

Environmental Negentropy: Gender Roles and Social Agency

Gender is a sociocultural construction of the biological sex of people, through which the body of human beings is symbolized in a differentiated way based on their phenotype (genitals); From this cultural construction, people are socialized in an asymmetrical way, thus assuming a differentiated way of being and being in the world that enables power relations between the sexes. It is precisely from this sexual definition of their bodies that people think about themselves, as well as the social and cultural world they inhabit, finding meaning in their individual acts in a sociocultural context that gives them reason and meaning. Gender stands as the starting point from which people create and recreate a perspective of their own lives in relation to their social, historical and cultural context. The biological and anatomical differences of people are interpreted in patriarchal societies as an essential difference that marks the destiny of people, which justifies a differentiated morality that enables the oppression of one gender over the other; Thus biological differences become the basis of a political problem. By constituting themselves as the reference point of being in the world, people regulate their actions around the gender condition in which they were placed, which is why in the sex-gender system of patriarchy, women are oppressed by men. Women are participants in this subordination by thinking how the dominant culture imposes on them, women see themselves through the gaze of patriarchy, which is why they themselves reproduce the ideology and roles of male domination typical of patriarchy. This female oppression is not a male monopoly, since it has permeated the sociocultural sphere, women reproduce this androcentric vision of patriarchal power. In Latin American societies you can find thousands of examples in which women teach girls to obey men and reproduce gender roles, women share the sociocultural construction of the sex-gender system of patriarchy in which men dominate. to women through cultural mandates that they assume as their own. This system of oppression is reproduced on a daily basis so it is imperceptible to people's sight; Everyday life is where human diversity is expressed in which people relate, live and coexist; In everyday life, all vital situations occur, concrete as well as the subjective ones in which people exist. In everyday life, acts become routines through which people coexist with each other in an unreflective way, this is what Bourdieu called *habitus* (Bourdieu 1987). Life in society demands social structures that limit the actions of individuals, giving them meaning as well as a social meaning to the multiple individual acts that occur within society. Sex-gender structures allow men and women to live practically in a complex society, finding meaning in their unique actions within the sociocultural context in which they are immersed. Thus, the sex-gender system of patriarchy also explains how each individual action is linked to the group, giving people meaning to the action they perform as well as a sense of belonging to the group. However, in the context of patriarchal societies, the relationship between genders is carried out in a form of exclusion and domination; in this gender structure, women live in conditions of greater socioeconomic vulnerability. The conditions of gender oppression are expressed through indicators of exclusion in which women live on a global scale; For example, regarding economic exclusion, it is known that the majority of the 1.5 billion people who live on one dollar or less a day are women; that the average global income of women is 35% lower than that of men. In current Latin American societies, particularly Mexico, there is a sex-gender condition of subordination of women to men in the context of patriarchy. Even the

World Bank recognizes that despite the incorporation of women into salaried work, in addition to the growth of women's contribution to poverty reduction in Latin America, there are *challenges* that affect women differently, which puts at risk the possibility to reduce poverty in the region (Ferreira et al, 2013). In the same way, patriarchy shapes the imaginaries of men and women in Mexican society, with which it is possible to represent themselves, as well as others. Like any patriarchal society, the Mexican society is a generically hierarchical society, in which women live in conditions of submission to men based on the denial of their being a woman. Gender violence is expressed in the daily life of Mexican society in multiple acts of oppression towards them such as street harassment, domestic violence, workplace harassment, psychological violence, media violence, among others. Women in Mexico therefore share conditions of socioeconomic vulnerability but also risk like the rest of the women in Latin America. These conditions of exclusion partly explain why women face higher levels of poverty in addition to living in conditions of greater risk in the face of an environmental catastrophe, since typically in a patriarchal society women do not have property or sufficient socioeconomic resources to support them. which improve your quality of life. Gender discrimination reinforces the conditions of economic and social exclusion that women experience in the country, as well as in the rest of Latin America. These conditions of subordination and domination in which women find themselves increase the social vulnerability in which they find themselves, thus women on average present conditions of greater vulnerability compared to men. Even before facing any type of risk, the vulnerability in which women find themselves is greater compared to men, even when they share the same home, age, or other sociodemographic characteristics. Women, by the simple fact of being women, have fewer material resources (such as property, savings, income, among others) in addition to immaterial resources (academic training, social relationships, labor capital, among others); Therefore, they live in conditions of greater vulnerability, and therefore greater risk. Considering that one of the gender mandates in Mexican culture is that of the mother (Lagarde 2005), thus a primary role among women is that of caring for family members, especially if it is an adult woman with children, since that your main concern will be taking care of your children and to a lesser extent your spouse or other family members such as the elderly. This sex-gender condition puts women at greater risk, because in conditions of vulnerability they accumulate deficiencies, for example, when one of the family members has a physical disability, the *mother* will have to take care of that person, thereby which women face greater risk in the midst of an environmental catastrophe. The results of the National Council for the Evaluation of Social Development Policy (CONEVAL) in Mexico, in its *Gender and Poverty Report in Mexico 2008-2012*, found that there is a greater number of households headed by men, while the percentage of households with female heads and lack of access to food was relatively higher in relation to those headed by men (Coneval 2013). The gap is expressed among households headed by women. In 2012, there was a lag of 4.3% in percentage points, with respect to the lack of access to food in the total number of households, reducing the gap to 2.7% in non-poor households, but increasing to 6.6% in poor households. Women face greater conditions of vulnerability; the households they head are the most affected by poverty; Thus, by living in conditions of greater poverty, they face conditions of greater vulnerability and therefore greater risk of environmental catastrophe. Gender differences have repercussions on the conditions of existence of people, since there is an unequal distribution in terms of access and possession of resources (both material and intangible) that puts women in greater socioeconomic vulnerability. These differences in access and availability of resources almost always generate inequalities that increase the deficiencies of women, increasing their poverty in relation to men, even when they belong to the same family unit. In the different *Gender Poverty indicators* developed by Coneval (2010), it can be observed how women face conditions of greater poverty; for example, in terms of educational lag, a disadvantage of -2.4% is shown

(minus two point four percent.) presented by women compared to men in 2010 (Coneval 2010); Thus, women, having a greater educational gap, have greater poverty and also have less social capital. Also, when the time that men and women dedicate to work at home is measured, in the poorest households the gap between female and male work in hours reached -13.9 in 2008, while in 2010 it reached to -17.3, finally in 2012 the difference was -15.9. That is, the gap between domestic work between men and women oscillated at -15.7 hours on average throughout the four years reported in the Coneval report (2013), thus women dedicate more time to caring for the home measured in hours of work and implicitly to the care and well-being of other family members. In the face of catastrophes caused by torrential rains, women are more critically exposed to the risks involved in a crisis of these dimensions, due to the vulnerability in which they find themselves in advance of the presence of the incident. When studying the behavior of people in the face of environmental catastrophes, behavior differentiated by gender would be expected, since the conditions in which people find themselves are different for reasons of gender. The conditions in which people live lead them to have differentiated attitudes towards the events of daily life; strategies for coping with environmental crises will surely be affected by people's gender. There are gender conditions that determine the behavior of people even in the midst of an environmental catastrophe, observing that women make an effort to care for others as a gender mandate. Valera, Carbelo & Vecina (2006) define resilience as the ability of a person or a group to continue projecting themselves into the future despite destabilizing events, difficult living conditions and serious traumas. For the purposes of this work, it is worth highlighting the group action of continuing *to project itself into the future*, by allowing us to understand that the processes are both group and personal. Like any other concept brought from the natural sciences to the field of social sciences, its definition is not free of theoretical and ideological contradictions, since it is not a neutral concept but one constructed from outside social thought in order to avoid, in part, a theoretical assessment. From his critical view of the use of this concept in the study of disasters and risk, Calderón (2011) points out that it was in the magazine *Digitalis* number 23, where from physics, the term was introduced to psychology, by the child psychiatrist Michael Rutter (1970) and the French neurologist, psychiatrist and ethologist Boris Cyrulnik. Psychologists strove to find a concept that would allow them to observe people's ability to overcome tragedies or highly traumatic events (Calderón 2011). The idea of flexibility, resistance, elasticity; The one evoked by the physical concept of resilience seems to be echoed in parallel human behaviors, in which people who are more *flexible, resistant, and/or elastic*, have greater possibilities of overcoming a potentially traumatic catastrophic event. In this sense, it is considered, like Valera, Carbelo & Vecina (2006), that the concept of resilience is the result of a dynamic interaction between people and their environment. Resilience is not considered as the resulting process in individual terms, since doing so from this perspective when viewing resilience in individual terms constitutes a conceptual error. Resilience is a continuous process, it is not a state of the person; but rather it is a process rather than individual qualities; It is the central process of people's life history. "Resilience is never absolute, total, achieved forever, it is a capacity that results from a dynamic process" (Varela, Carbelo & Vecina 2006). Thus, the conditions of security or insecurity from which we start before facing a critical condition are directly associated with economic relations in addition to the political conditions through which resources are allocated or distributed in society. *Natural catastrophes* in this sense are not *natural*, since what these catastrophes reflect is the social inequality in the generation and distribution of resources, that is, what they show is the differentiated way through which resources are accessed and distributed. estate. Thus, these pre-existing conditions of the catastrophe crisis determine the capacity for recovery in addition to the possibilities of resilience; That is, the conditions that prevail before catastrophic episodes affect the return to *normal contexts*, but they also influence the practices

through which *balance can be maintained* during the disaster process itself (Coneval, 2013).

The possibilities of facing and overcoming an environmental catastrophe are determined not by the crisis itself, but by social structures that precede and determine it; When asking about social factors that favor resilience, we do not seek to individualize the problem of disaster situations “placing it only in a person's ability to recover from strong adversity” (Calderón 2011). With all these elements in mind, the resilience scale was constructed, which includes twenty-six items, including six false positives to avoid mechanical responses. The sum of the scale reaches 130, subtracting the false positives it includes. The scale was applied to the same 573 respondents from the sample as the risk perception and resilience scales. The results in the analysis of the responses on the resilience scale show high scores, since the average of the scale was 71.64 points out of 130 on the scale, the sample demonstrates that people who have faced an environmental catastrophe generate resilience, so their ability to act in favor of themselves and the people they are close to increases. In the case of the resilience scale, a greater dispersion was observed in the sample than was seen in the stress scale, since in this case the dispersion reached $\pm 2 \delta$ (two sigmas); Otherwise, the stress scale was more grouped since the population was contained within $\pm 1 \delta$ (one sigma). However, the dispersion can be considered that the population is within normality as the majority are grouped within $\pm 2 \delta$ even though there are some individuals outside below and above the parameter. This greater dispersion allows us to assume that social conditions are not mechanically related to the resources that each actor accumulates and with which they can face the crisis. The score that obtained the greatest repetition was 72.0 with a 4.9% relative frequency, while the first percentile added 59 points and the last percentile reached 88 points on the resilience scale. The analysis allows us to affirm that the people who experienced the catastrophic episodes had the capacity to recover from the floods and traumatic events resulting from the overflowing of the sub-basins of the Balsas River in the states. On the other hand, the results of the *T test* show that there is an important correlation between the level of stress and the ability to modify behavior at the individual and community level. They also show that the greater the stress, the greater the resilient abilities; Thus, it is concluded that people who experience an environmental crisis develop resilience capacities even when risk and environmental vulnerability are high.

The *Pearson correlation* demonstrated that there is an important reciprocity between the stress experienced by a person and their resilient attitude, that is, the greater the stress, the people developed greater resilience since the test found a significant correspondence of 0.176 at the 0.01 level. bilateral in the entire sample population without differentiating it by gender. Facing an environmental catastrophe, in this case flooding due to torrential rains, in conditions of social vulnerability exposes people to moderate levels of stress that allow them to apply actions through which they face the event and eventually transcend it. However, when differentiating the sample population by gender, important inequalities were observed between stress and resilience by gender. Men averaged a lower value on the stress scale than women, but also a lower bilateral significance in the *Pearson correlation* between stress and resilience, reaching a value of 0.128 of bilateral significance at the 0.05 level. On the other hand, women reached a higher score on the stress scale, but a greater bilateral significant correlation was also found in the relationship between stress and resilience, since women reached a value of 0.278 at the 0.01 level of bilateral significance. That is, women developed a greater attitude with which to face the environmental crisis. When opening the reflection to the study of environmental disasters associated with the CCA through the hydrometeorological effects associated with global warming in Latin America and the Caribbean, they are people who many times do not generate greenhouse gases significantly since their contribution is minimal; in addition to not having the real possibility of intervening in the political decisions that define the emissions of these gases by the main

world economies. In environmental geopolitics, peripheral countries do not have the capacity to interfere in the generation of greenhouse gases, as well as in resource extraction strategies or the transformation of their own territories. The conditions of vulnerability in which people live are determined by socioeconomic and gender processes historically embedded in a territory; The processes of use, conceptualization, exploitation and possession of nature do not depend on their subjective will. People who live in conditions of vulnerability, regardless of their subjective perception, are historically conditioned by social structures that precede them. It must be recognized that in the very definition of vulnerability there is a temporal dimension, since it is an impact on the means that establish the lifestyle in addition to the property that is in danger.

This is why even before the disaster, the most vulnerable groups will have greater difficulties in rebuilding their subsistence resources after the crisis, since the material and intangible means they have been precarious, thus their coping strategies will be less efficient. try to overcome the environmental crisis. They are, therefore, more vulnerable as they have fewer resources even before the disaster, so they will face greater obstacles to overcome it. In this study it was found, in relation to other studies on vulnerability, that the people most affected by the environmental disaster are those who even before the event live in conditions of social vulnerability (Calderón 2011), which is corroborated. The people who suffered the greatest emotional impact, as well as a feeling of greater stress after the 2013 floods in the study area, are people who live in places with less urban infrastructure and equipment, who are also women, as expected. People who live in vulnerable conditions experience greater stress, and even when they develop coping strategies, they are not always effective. However, the results found will have to be used in the design and implementation of intervention strategies in the face of environmental disasters, with a less clientelist vision. Intervention strategies for disasters caused by floods in the context of the CCM must include the agency capacity of those affected themselves, without victimizing them by reducing their ability to respond to the crisis. It is not considered that the State should not have intervention strategies or not support coping with the crisis; on the contrary, the participation of the State is required, added to the capacity for participation of the victims themselves. The design of intervention strategies must consider the resilience capacity of the actors who survive an environmental crisis. The analysis showed that 85% of those interviewed feel that despite the situation they face, they stated that they had the feeling of *maintaining control* in the face of the environmental crisis that meant a flood of more than a week, in addition to the isolation due to losing land contact and the delay of humanitarian aid in order to overcome the serious situation they were experiencing. People reacted to the environmental crisis in a resilient manner by generating strategies through which to face the catastrophe with the resources they have. The ability to withstand an environmental catastrophe (flood) demonstrated that a subject was strengthened by overcoming this process; Thus, the study of people who face these problems allows us to identify how populations create strategies that help them overcome the crisis, while they undertake risk reduction and management strategies. The coping strategies in the face of the catastrophic event will be defined by the person, their perception of risk and the development of resilient strategies. However, although on an emotional level the structuring causes of the vulnerability in which they live were strengthened, they did not decrease, but in most cases they worsened. Having the experience of surviving in addition to the information that allows them to generate strategies with which to face the crisis results in a more non-material cognitive enrichment. It is necessary to continue investigating the ways in which people face environmental catastrophes, since the most moderate scenarios show that environmental crises will increase. At the same time, a study of the stress of survivors of an environmental catastrophe is required to have elements of intervention on these traumatic episodes that will increase in the context of CCM. As

has been said, there will be an increasing number of people in vulnerable conditions exposed to environmental risk, so it is necessary to study the stress they experience to create mitigation mechanisms, reducing the possibility of emotional disorder in people. On the other hand, it is important to continue studies of adaptation to CCM derived from resilient actions of flood victims, since it could shed light on social adaptation strategies to CCM that allow broad social groups to overcome the environmental catastrophe more successfully. The social sciences must strive to generate a systematic study of human catastrophes derived from the environmental impacts associated with climate change; greater research must be generated on these contemporary problems. The study of these strategies against water stress within the CCM is pending in the socio-environmental sciences, thus this research will be extended by comparing the Balsas basin in Mexico with the Cauca basin in Colombia.

Environmental Resilience Model Specification

From the differences found between men and women with respect to the natural disasters caused by the flooding of the Balsas River, it is possible to observe that the trajectories of dependency relationships between the entropic variables – stress and risk – and the negentropic variables – resilience – it is possible to specify a model of the determinants of stress and/or resilience. The model includes two hypotheses related to the prediction of stress and/or resilience. These are two explanatory routes of the effects of the propaganda of helplessness that would generate hyperopia – perceptions of remoteness from environmental problems and in the case of closeness, they are reduced to their minimum expression –, in turn this would determine the formation of an identity entropic – hopelessness, indolence and indifference. In contrast, the resilience hypothesis warns that the propaganda of conservation of natural resources encourages cooperation, and this influences the formation of a negentropic identity indicated by the saving, reuse and recycling of waste. Both hypotheses, stress and resilience, explain the isomorphism observed in floods, as well as the differences between men and women with respect to the anticipation of a scenario of low availability of resources and shortage of public services.

Discussion

The contribution of this work to the state of knowledge lies in the specification of a model for the study of stress and/or community resilience. However, compared to other specified models, it does not include sociopolitical variables such as the intention to vote in favor of green proposals (Carreón et al. 2015), social entrepreneurship (Carreón et al. 2013) or social postmaterialism (Carreón et al. 2014). Although the specified model focuses its interest on communities, its relationship with the State would allow the levels of sustainable local development to be observed (García 2007), although it is the media that determines social representations by establishing issues on the public agenda. of citizens with respect to their authorities (García 2008). The specified model also does not include the dependency relationships between cognitive variables such as beliefs, attitudes and intentions that determine pro-environmental behavior (García 2012) even though these trajectories explain the tariff policies of municipal services (García and Bustos 2013). The inclusion of sociopolitical, cognitive and community variables would explain the isomorphism related to governance as an object of study of environmental complexity. Unlike stress or resilience that represent reactions of communities to environmental risk events, governance is indicative of a process in which negentropic resources and discourses counteract the effects of entropic identity (García, Carreón and Quintero 2015). This is because human capital appears to be linked to the production of innovations that reduce farsightedness and enhance cooperation. García et al. (2015) warns that, in the face of natural disasters, risk communication would be another variable to include in the model for the study of stress and resilience, since an increase in risk events means greater stress. Consequently, the formation of human capital would

be a function of the anticipation of risks and not after natural disasters and catastrophes (García, Carreón and Hernández 2014).

Even, instead of anticipating risks, an indifference known as farsightedness develops, which minimizes the scope of natural disasters in localities and when catastrophes are perceived as close, then their effects are maximized, holding the State responsible for environmental safety. (García 2016). Therefore, an explanatory and anticipatory model of governance would not only include sociopolitical and psychological variables but would also anticipate the emergence of an agenda that legitimizes the stewardship of the State in matters of environmental security and reduces citizen participation to its minimum expression. regarding its negentropic identity (García et al. 2015). To the extent that environmental risks, disasters, and stress intensify, they lead to the emergence of entropic and negentropic identities that will determine the resilience of communities in the face of shortages of natural resources and municipal services.

Conclusion

The objective of this work was to characterize resilience in relation to environmental complexity. Dimensions related to entropy and negentropy are noted. Furthermore, the relationships between the dimensions and subdimensions indicate a reflecting rather than determining model. Therefore, the area of opportunity of the present work lies in the exploration and description of the determinants of resilience which were reported in the literature as danger, threat, risk and disaster.

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DOI: [10.31579/2690-1897/176](https://doi.org/10.31579/2690-1897/176)

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