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*Ensayos*

## **Sistemas socioecológicos, resiliencia comunitaria y protección civil: una revisión**

***Socioecological Systems, Community Resilience and Civil Protection: A Review***

***Sistemas socioecológicos, resiliência comunitária e proteção civil: uma revisão***

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### **Resumen**

Este artículo presenta los resultados de una investigación documental sobre los conceptos de *sistema socioecológico*, *resiliencia*, *resiliencia comunitaria* y *protección civil*. Para estos dos últimos temas se examinaron las discusiones académicas relacionadas con las áreas de oportunidad que existen para la generación del conocimiento. Se encontró que los vacíos en el conocimiento indican el estado real de los colectivos de personas en cuanto a la capacidad de resiliencia comunitaria frente a fenómenos perturbadores, así como a la limitada participación de las personas en la toma de decisiones para afrontar dichas situaciones. En este contexto, se requiere del diseño y operación de indicadores que permitan recabar evidencia sobre la resiliencia comunitaria e indagar sobre la gestión de riesgo para reducir la vulnerabilidad en una población. Además, se debe profundizar en la capacidad de respuesta

gubernamental frente a los desastres y en el modo de incorporar el enfoque de la sustentabilidad como eje de la política pública de protección civil. Considerando los resultados, se concluye que hay una relación entre los sistemas socioecológicos, la resiliencia comunitaria y la protección civil, a partir de la cual se pueden integrar marcos de análisis multidisciplinarios, sistémicos y holísticos que permitan abordar los problemas derivados de la interacción de la sociedad y el medio ambiente en casos de fenómenos extremos como los desastres.

**Palabras clave:** protección civil, resiliencia, resiliencia comunitaria, sistemas socioecológicos.

### **Abstract**

This article presents the results of a documentary research on the concepts of *socio-ecological system*, *resilience*, *community resilience* and *civil protection*. For these last two topics, the academic discussions related to the areas of opportunity that exist for the generation of knowledge were examined. It was found that the gaps in knowledge indicate the status of the people in terms of community resilience against disturbing phenomena, as well as the limited participation of decision makers to face such situations. In this context, the design and operation of indicators is required to collect evidence on community resilience and investigate risk management to reduce vulnerability in a population. In addition, the government's capacity to respond to disasters, and the way to incorporate the sustainability approach as the axis of public civil protection policy must be deepened. Considering the results, it is concluded that there is a relationship between socioecological systems, community resilience and civil protection, from which multidisciplinary, systemic and holistic analysis frameworks can be integrated that allow addressing the problems derived from the interaction of the society and the environment in cases of extreme phenomena such as disasters.

**Keywords:** civil protection, resilience, community resilience, socioecological system.

## Resumo

Este artigo apresenta os resultados de uma pesquisa documental sobre os conceitos de sistema socioecológico, resiliência, resiliência comunitária e proteção civil. Para esses dois últimos tópicos, foram examinadas as discussões acadêmicas relacionadas às áreas de oportunidade que existem para a geração de conhecimento. Constatou-se que as lacunas de conhecimento indicam o real estado dos grupos de pessoas em termos de resiliência da comunidade frente a fenômenos perturbadores, bem como a limitada participação das pessoas nas tomadas de decisão para enfrentar tais situações. Nesse contexto, o desenho e a operação de indicadores são necessários para coletar evidências sobre a resiliência da comunidade e investigar a gestão de risco para reduzir a vulnerabilidade de uma população. Além disso, deve-se aprofundar a capacidade de resposta do governo a desastres e a forma de incorporar a abordagem da sustentabilidade como eixo da política pública de proteção civil. Considerando os resultados, conclui-se que existe uma relação entre sistemas socioecológicos, resiliência comunitária e proteção civil, a partir da qual podem ser integrados quadros de análise multidisciplinares, sistêmicos e holísticos que permitam abordar os problemas derivados da interação da sociedade e do ambiente. ambiente em casos de fenômenos extremos, como desastres.

**Palavras-chave:** proteção civil, resiliência, resiliência comunitária, sistemas socioecológicos.

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## Introduction

This dissertation was the product of a documentary review on the concepts of socio-ecological system, resilience and its community aspect and civil protection. Regarding these last two issues, he scrutinized himself regarding the main areas of opportunity for the generation of knowledge. In general, socioecological systems are made up of social and natural subsystems that maintain close relationships and interactions at different spatial scales over time. They are considered complex systems due to the diversity of components and internal and external interactions that they present. Also, they are adaptive, they self-organize, they feed back, they are not linear and they show dynamic attributes that allow them to reach equilibrium points in the face of radical transformations caused by extreme phenomena such as disasters.

An important characteristic that socio-ecological systems have is resilience, which appeals to the system's ability to face adverse situations, recover from them and continue with its development. On the other hand, community resilience refers to the willingness capacity that favors social and institutional systems to face difficulties, problems and social and natural situations that ultimately contribute to strengthening the functions, structures and identities of people and their collectives.

Regarding civil protection, this can be assumed as a human right. From the point of view of the General Law of Civil Protection, it refers to the solidarity and participatory action that provides for the coordination and agreement of the public, private and social sectors in order to create a set of strategies and concrete actions aimed at safeguarding not only the life, integrity and health of the population, but also the assets, the infrastructure, the productive plant and the environment in the face of natural or anthropic phenomena.

Socio-ecological systems and resilience have been constituted as analytical frameworks inscribed in the systemic paradigm, which allows explaining social and environmental phenomena in the context of climate change due to the fact that it proposes a transdisciplinary and holistic approach that takes up the complexity of the relationship between the people and ecosystems. In this sense, disasters (considered as adversities, crises or problems faced by a system) are assumed to be a complex phenomenon, since they can unfold important transformations in favor of the continuity and development of a socio-ecological system.

As a result of the documentary review, it is pointed out the areas of opportunity that exist for the development of research that addresses community resilience and civil protection. Broadly speaking, they urge to investigate the real conditions and the resilience capacity of communities or groups of people in the face of disturbing phenomena. They also highlight the importance of taking into account the limited participation in decision-making and actions in the face of disasters. It is also argued in favor of the design and implementation of local or community indices that estimate the resilience capacity, vulnerability and sustainability of socio-ecological systems.

Regarding the issue of civil protection, areas of knowledge generation are proposed in terms of risk management from the perspective of reducing the exposure and vulnerability of the population, prioritizing anticipation, prevention and resilient processes. Research that investigates the response capacity of the institutional and governmental sphere to sudden changes in the dynamics of socio-ecological systems is also timely. In this sense, emphasis

is placed on delving into the ways of incorporating the perspective of sustainability as the axis of public civil protection policy.

Finally, an association is established between socio-ecological systems, community resilience and civil protection. It is highlighted that both socioecological systems and community resilience make up multidisciplinary and holistic analytical frameworks that allow the production of knowledge about the relationship between society and the environment and what happens in the face of extreme phenomena such as disasters.

### **Socio-ecological systems**

The emergence of socio-ecological systems at the scientific level poses a paradigm that starts from the establishment of a complex interrelation between the social and ecological spheres, by integrating and harmonizing each of its elements, which interact in different space-time circumstances (Balvanera , Astier, Gurri and Zermeño, 2017). Likewise, the conjunction of natural and social systems poses a multidisciplinary collaboration and articulation that allows solving the problems that emanate from the paradigm.

In this sense, one of the precedents of socioecological systems is the general theory of systems, which addresses the problems of the derivation and formulation of those principles that are valid for systems in general, regardless of whether they come from physics, biology, sociology or other sciences. This distinction, added to the definition of system, allows us to find the models, principles and applicable laws that are specific to it.

The general theory of systems represents a backbone to generate relevant and transferable models to various disciplinary fields (Bertalanffy, 2019). "It is assumed as a general science of the whole" (Bertalanffy, 2019, p. 37). Likewise, the vein of adaptive socio-ecological systems comes from a systemic, holistic and integrative epistemology, circumscribed in the paradigm of complexity (Farhad, 2012).

A system represents a conjunction of articulated elements in constant interaction with the purpose of achieving certain objectives. Also, it can be considered as a group of correlated objects or parts that make up a whole or are subject to factors with some defined relationship (Johansen, 1993). From the philosophical perspective, a system represents an aggregate of objects with relationships and connections among themselves, and that make up a certain integrity or unit (De la Peña and Velázquez, 2018).

In this sense, the parts, objects or components that fit within a system that maintains interrelationships and that works structurally, with its own characteristics, is called a

subsystem. That is, "subsystems are smaller systems within larger systems" (Johansen, 1993, p. 56). For its part, systemic thinking supposes two objectives, according to Sarabia (1995): the first concerns the conformation of a robust and generalist theory that starts from a unitary perspective of the world; the second, said theory allows explaining natural or artificial objects whose structure can be simple or complex.

De la Peña and Velázquez (2018) argue that the emergence of new disciplines in the digital age has made it possible to deepen the understanding of systems as an instrument for building knowledge, which, consequently, has allowed the explanation of processes and phenomena that they obtain a greater proximity to reality as a representation of it. Likewise, it supposes high levels of complexity due to the fact that they incorporate new objects, components and relations in the operation of a determined system. The authors also argue that every system has fundamental characteristics such as:

- 1) Composition and structure: defined by the components and subsystems that make up the system and that obey a hierarchical arrangement.
- 2) Internal organization: a consequence of the very structure and operation of the objects or elements, which provides a consistent and stable relationship, but which allows changeability without the system losing integrity.
- 3) Specificity in its correlation with the environment and its nature: defined by its external relationships that establish components and subsystems of this or another nature, existing in the environment.
- 4) Integration: granted by the relationships and interactions that are established between its objects, components and subsystems (De la Peña y Velázquez, 2018).

On the other hand, the three characteristics of the tools that will make it possible to analyze the objects or elements of a system are: 1) the functional aspect, which concerns the investigation of the activity that it develops; 2) the organic, which investigates static and dynamic structures, and finally, 3) the genetic aspect, which reveals the evolution and future of objects (Sarabia, 1995). These are "simply the parts or components of a system and these parts may have a limited variety" (Johansen, 1993, p. 55).

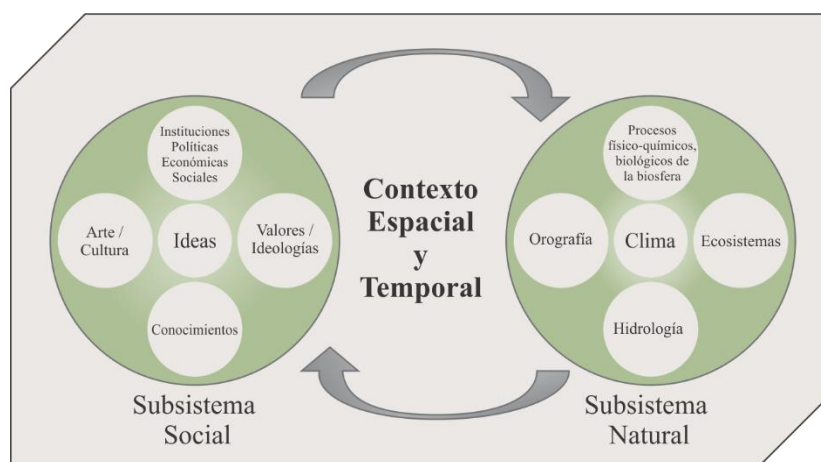
In another order of ideas, the classical scientific approaches hardly manage to solve the problems posed by climatic imbalances. Faced with this context, the joint approaches of the social and natural sciences, transdisciplinary, that configure analytical frameworks and the production of knowledge from an integrating perspective, a premise in solidarity with the concept of socio-ecological systems (Cerón, Fernández, Figueroa and Restrepo, 2020). This



makes it possible to explain a totally intertwined system between human groups and the natural environment. De la Peña and Velázquez (2018) argue that what is related in general and in particular to systems is part of the systemic paradigm; socioecological systems are placed under this perspective.

Socioecological systems are composed of interdependent natural and social subsystems, with interactions at multiple temporal and spatial levels (de los Ríos, Filippi and Vélez, 2015). Globally, they are integrated into networks of systems on a regional scale, and these in turn in local ones, so they form nested structures of subsystems, with vertical and horizontal interrelationships (Castillo and Velázquez, 2015). They are considered complex adaptive systems because their interactions are concerted and self-organized endlessly over time, which also gives rise to phenomena characterized by non-linearity, in defined and indefinite thresholds. (Delgado, Tironi y Marín, 2019).

**Figure 1.** Socio-ecological system



Source: self made

Within the social subsystem, behaviors and ideas are integrated that include political, economic and social institutions. These also include values, knowledge, ideology, spirituality, arts and culture, among other elements. The natural subsystem includes ecosystems, orography, hydrology, climate and physical, chemical and biological processes of the biosphere (Farhad, 2012). All the elements are located in a certain period and space (figure 1). This proposes a transdisciplinary and multiscalar approach that allows the description, analysis and synthesis of its complexities (Delgado et al., 2019).

Complex adaptive systems seek patterns that interact with the context, learn from experience to adapt; they are not linear, they feed each other at different levels, which allows

them to self-organize and change unpredictably to increase their resilience and adaptability (Cardona, 2001). These attributes refer to a coupling of human activities to the characteristics and dynamics of ecosystems, limiting significant transformations in it (Anderies, Janssen and Ostrom, 2004). Likewise, they are structured hierarchically because the processes that operate on a macro scale circumscribe those that operate on a micro scale. (Delgado *et al.*, 2019).

### **Resilience and community resilience**

A fundamental attribute of socioecological systems is the inescapable relationship between resilience and adaptability, which is revealed in the interactions of social and natural systems (Cerón *et al.*, 2020). In this nuance of discussion, De La Torre and Moreno (2019) argue that the resilience of these systems concerns tolerance or regeneration in the face of different disturbances and crises, which allows them to face them, overcome them and benefit from them through self-structuring mechanisms. , facing transformations without collapsing and generating the development of various balance points; that is to say, that resilience is a premise for the sustainability of the system.

The concept of resilience refers to “the empirical study of the systems that surround people; from the observation, explanation, analysis and synthesis of phenomena that operate at multiple spatial and temporal scales” (Balvanera *et al.*, 2017, p. 142). Likewise, it is conceived as a scientific perspective increasingly used to examine intertwined social and ecological systems. Resilience not only represents a framework for research, it is also more frequently applied in practice (Moberg and Hauge, 2016). From another position, it refers to:

The ability of a system, be it an individual, a forest, a city or an economy, to cope with change and continue to develop. It is about how humans and nature can take advantage of shocks and disturbances, such as a financial crisis or climate change, to stimulate renewal and innovative thinking. (Stockholm Resilience Centre, 19 de febrero de 2015, párr. 2).

For its part, the United Nations Office for Disaster Risk Reduction [UNDRR] (2020) defines resilience as:

The ability of a system, community or society exposed to a hazard to resist, absorb, adapt, transform and recover from its effects in a timely and efficient manner, including through the preservation and restoration of its basic structures and functions, through risk management (p. 15).

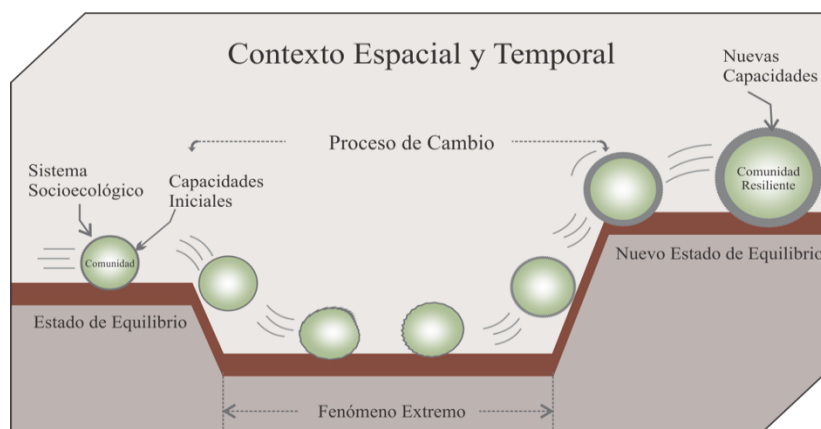


Resilience is based on the assumption that people and nature maintain a strong symbiosis, to the extent that they make up a socio-ecological system; that is, that within every ecosystem people are integrated and there are no people who do without ecosystems (Stockholm Resilience Center, 2015). The genesis of the word comes from the Latin *resilire* which means 'go back' or 'jump back', 'bounce', 'be repelled', 'arise'; the prefix refers to repetition, continuation, recovery, going to the front after suffering a blow or experiencing a traumatic situation; defines integrity in crises (Rojas, 2018).

Resilience has been related to positive adaptation under challenging situations; It refers to processes of harmonic conciliation and development after experiencing adverse situations. It is a theoretical construction that explains development situations under risk factors (Menanteux, 2016). From the perspective of socio-ecological systems, disasters (referring to crisis, stress, calamity, difficulty, among others) are assumed to be complex phenomena that unfold transformations in the dynamics of the system (González, 2008).

Faced with the diversity of conceptualizations of resilience, two backbone characteristics stand out in socio-ecological systems: the first, the ability to face adverse phenomena and become stronger from them, and the second, which appeals to a complex and multidimensional nature, that is, it alludes to adaptation to change. In this order of ideas, the notion of the limit of the system becomes important, which is influenced by a certain dynamic and changing regime that allows it to be maintained over time (figure 2). Currently, studies focus their interest on the resilience of socio-ecological systems, assuming that social and ecological systems are integrated, interdependent and evolve in a complementary way. (Sánchez, Gallardo y Ceña, 2016).

**Figure 2.** Resilience and community resilience



Source: self made

The community vein of resilience arises in the context of climate change and social, political, cultural and economic transformations that promote the increase of survival and conservation mechanisms, under the premise of strengthening social groups to face adverse and complex situations such as are the disasters. Therefore, community resilience is assumed as the organization and management capacity that sustains social and institutional systems and helps them to face crises, difficulties and socio-environmental situations, while contributing to the strengthening of functions, structures and identities. of people and their groups (Moreno, 2021).

Under this vision, community resilience is essential to promote strategies and training actions aimed at reducing the vulnerability of the population and promoting civil protection against extreme events. Therefore, it raises a notion of positive freedom; that is, the opportunity for people and their communities to make decisions and actions aimed at strengthening their self-protection, their development and, in general, improving their quality of life (Maldonado and González, 2013).

Of Latin American origin, the concept of community resilience has made it possible to examine the various resources, means and skills that collectives, families or cultural groups use to face and recover from socio-ecological threats (figure 2). It is assumed that collective resilience is achieved through associations and interactions of community properties that combine shared and organized actions of reconstruction, mainly addressing the social entity itself (Menanteux, 2016). Community characteristics refer to exchanges for the welfare of the group of people through social cohesion and solidarity actions. Likewise, they involve human relations with different levels of adhesion and conflict influenced by components of social construction. (López y Limón, 2017).

Regarding the term community, it refers to three fundamental axes: 1) a common territory, 2) characteristics shared by the members and 3) cooperative relations in the face of shared problems or needs. The community involves attributes to be highlighted in the face of vulnerability: 1) social changes are particularly difficult to capture through vulnerability indices; 2) to overcome vulnerabilities, the least possible actors or agents external to the community are used, and 3) the exercise of internal capacities is prioritized (Menanteux 2016).

The contributions of Sánchez et al. (2016) on community resilience focus their attention on the collective capacity of citizens to respond to change. The academic discussion is headed under two perspectives: analyzing how a system returns to a state of equilibrium

after facing a stress or crisis and basing itself on complex adaptive systems, which account for how the elements of the system interact with dynamic feedback, providing flexibility and adapting to any type of change.

This perspective fundamentally proposes the way in which a crisis or extreme event (such as a natural disaster) can lead the system to exceed its equilibrium state. The concept of resilience is a dynamic property, subject to a continuous process of adjustment. Such a vision is typical of the theory of complex adaptive systems, which concerns self-organization, the co-evolutionary interaction between subsystems and the ability to adapt that allows it to respond or reorganize in the face of a crisis or extreme event. (Sánchez *et al.* 2016).

It should be noted that the community vein of resilience comes from an approach based on social epistemology, with research associated with the analysis of social structures and community processes as systems. It is the product of social solidarity and arises in the face of extreme adverse events that lead the community to act under certain circumstances and values. Two important premises of this vision are networks and bonds of social support; In addition, a crucial element of community resilience is that it can make it possible to design intervention policies aimed at moving from a vulnerable environment to a resilient one, based on positions of sustainable development. In this sense, the dimensions of citizen participation, knowledge, initiatives and forms of local organization in the recovery and reconstruction process become important (Rojas, 2018).

From the position of the academic debates, Balvanera *et al.* (2017) propose the main areas of opportunity for the production of knowledge on resilience, vulnerability and sustainability of socio-ecological systems in Mexico. The first concerns “the stability of systems, scientific certainty and the existence —a priori— of expert decision makers” (p. 147). The second corresponds to the serious limitations of the institutional and governmental sector to respond to sudden changes in socio-ecological systems and deal with their uncertainty. It is argued in favor of the implementation of indices at the municipal level to face problems related to resilience, vulnerability and sustainability; however, little has been investigated at the community level. Finally, it is shown that although the concepts of resilience, vulnerability and sustainability have been integrated in the monitoring of the dynamics of socio-ecological systems, their scope is limited, in addition to the significant contradictions of existing government policies and programs in this matter.

For his part, Rojas (2018) reveals the gaps in knowledge about community resilience. In the first instance, if this is an intrinsic, contextual or imposing feature, or the combination

of them. In the second instance, he reveals that, from the point of view of public management, there are various areas of opportunity in research due to the wide conceptual theoretical gaps in risk management; consequently, it is presented as a space of opportunity to be incorporated as a guiding axis in public policies from the environmental, social, economic and cultural perspective. Finally, it is proposed to generate contributions and discussions on community components: identity, solidarity, humor and social self-esteem.

### **Civil protection**

Regarding the public policy of civil protection, it is necessary to point out the historical path of its formulation. In 1966, derived from the overflow of the Pánuco River that caused damage in the states of Veracruz and Tamaulipas, as well as the flood that the city of Irapuato suffered in 1972, the federal government instructed the Secretary of National Defense to take charge of rescue operations and assistance to the population. Thus, a strategic military planning was established that led to the elaboration of the Disaster Assistance Plan for the Civilian Population (Plan DN-III-E) in force today (Garza, 1998).

The Organization for Economic Cooperation and Development [OECD] (2013) indicates that, as a result of the earthquakes of September 19 and 20, 1985, the Federal Executive decreed the creation of the National Civil Protection System (Sinaproc), whose announcement was published in the Official Gazette of the Federation (DOF) on May 6, 1986. However, as Garza (1998) points out, it is not until May 11, 1990 when the creation of the National Civil Protection Council is published in the DOF as an advisory body for the coordination of actions and social participation in the planning of civil protection.

On June 6, 1995, a social participation mechanism was established in our country through the creation of the Scientific Advisory Committees of the National Civil Protection System (Garza, 1998). In 1996, the federal government established the Natural Disaster Fund (Fonden) (OECD, 2013). The promulgation of the Civil Protection Law was carried out on May 12, 2000, later a new ordinance was issued on June 6, 2012, currently in force, whose regulations were issued on May 13, 2014.

Civil protection is conceptualized as solidarity and participatory action in consideration of the risks of natural or anthropic origins and their adverse repercussions. Provides for the coordination and consultation of the public, private and social sectors within the framework of a national system, in order to create a set of provisions, plans, programs, strategies, mechanisms and resources so that, in a co-responsible manner and prioritizing

management of risks and the continuity of operations, the measures and actions that are necessary to protect the life, integrity and health of the population, as well as their assets, infrastructure, the productive plant and the environment are applied (Presidency of the Republic , June 6, 2012).

Izu (2009) conceptualizes civil protection as "the set of rules, procedures, bodies and human and material resources arranged for protection against catastrophic damage of any origin" (p. 312). On the other hand, civil protection, according to the Human Rights Commission of the State of Mexico (2016), can be understood as "the right of every human being to have his safety guaranteed in the presence of disturbing phenomena" (p. 300). It raises the protection of the lives of people, their families, their properties and means of subsistence, as well as appealing in favor of well-being and integral development against natural or anthropic phenomena. In this plane of ideas, it can be argued that "climate change can undermine the exercise of human rights and this can have repercussions on greater effects on the natural system" (Arce, 2018, p. 67).

Under this framework, academic discussions of public policy on civil protection are important. Alcantara et al. (2019) highlight the scarce consideration of scientific and traditional knowledge focused on land management, which is transferred to the construction of risk and the occurrence of disasters. Also, a report from the Superior Audit of the Federation [ASF] (2014) poses challenges in terms of coordination, and reforms in institutional, administrative, regulatory and financial matters.

Alcantara et al. (2019) propose transdisciplinary research aimed at assessing the real conditions of the population (experiences, resources, assets, capacities, potential and requirements in terms of social welfare) as unavoidable elements for the prevention and management of risks in the face of disasters. All of this can be integrated transversally with the public policy related to the management of the territories from the local level; it is in this context where disasters originate and where they must be dealt with.

Estrada's (2014) discussion shows that the civil protection policy has been inefficient in effectively preventing the occurrence of disasters. He points out that there are instruments that affect the phases of a disaster, but emergency care has been favored, relegating anticipation and prevention to the background. In this order of ideas, the research by Morán (2017) shows how the civil protection policy in Mexico fundamentally transfers the risk to private parties and ensures only public infrastructure, neglecting the reduction of exposure,



vulnerability of the population and its recovery. , in addition to limiting citizen participation in the matter.

## Conclusions

In summary, throughout this dissertation various conceptualizations on socio-ecological system, resilience, community resilience and civil protection were discussed. It should be clarified that a system is defined as the set of objects or components that interact with each other with a defined purpose. The first concept, socioecological system, refers to the relationships that exist in the social subsystem: composed of political, economic and cultural elements; values, knowledge, ideology, spirituality, arts and culture of people and their groups, as well as the subsystems made up of ecosystems, orography, hydrology, climate and physical, chemical and biological processes of the biosphere that interact at different spatial and temporal scales .

Socioecological systems receive the attribute of complex and adaptive due to the network of relationships and interactions that exist at multiple levels of its components and hierarchical structure with the purpose of self-organizing, providing feedback and generating balance mechanisms in the face of adverse scenarios. That is, to engage in the processes of change and thereby sustain and continue its development over time. This type of system represents an analytical framework, inscribed in the systemic paradigm, which in the context of climate change is ad hoc to address the problems of the relationship between society and environment from a holistic and transdisciplinary point of view.

The second concept, resilience, is an unavoidable attribute of socio-ecological systems. It represents an approach to the empirical study of the systems that surround and coexist with people, attending to those phenomena that occur at different spatial and temporal levels. It is, therefore, a theoretical construct that explains the development of a system under crisis factors.

At the conceptual level, the resilience of a system is its aptitude to face the processes of change; that is, face and recover from crises and adverse situations. In this vein, the community aspect of resilience arises in the context of climate change and concerns the ability of the group of people or community to positively resolve difficulties or crises of an environmental or social nature. This will ultimately strengthen the functions, structures and identity of the communities themselves.



This community aspect of resilience involves three fundamental factors: territory, shared characteristics, and cooperative relationships. Also, it allows proposing the strengthening of strategies that reduce the vulnerability of people and that promote a culture of civil protection. This can be considered as a human right that every person must possess to guarantee their safety against the occurrence of disturbing phenomena. On the other hand, it is conceived as solidarity and participatory actions that provide for the coordination and concertation of the public, private and social sectors in order to create a set of strategies and concrete actions aimed at safeguarding the life, integrity and health of the population. , as well as its assets, infrastructure, production plant and the environment against natural or man-made phenomena.

### **Future lines of research**

As a result of the documentary review of the academic discussions on the knowledge gaps in community resilience and civil protection, the following points can be synthesized, as areas of research opportunity:

- The real conditions of the populations or communities regarding their resilience capacity in the face of complex disturbing phenomena and the limited citizen participation in the problem.
- The design and implementation of community indexes that allow gathering information on problems related to the resilience, vulnerability and sustainability of socio-ecological systems.
- Disaster risk management from the point of view of reducing the exposure and vulnerability of the population, as well as anticipation, prevention and recovery.
- The institutional and governmental capacity to respond to sudden changes in the dynamics of socio-ecological systems and the uncertainty that characterizes them.
- Ways to incorporate the perspective of sustainability as the guiding axis of public policy in terms of civil protection.

To close, a very close relationship can be established between socio-ecological systems, community resilience and civil protection. The first concept posits an intrinsic association between society and ecosystem; Resilience is an inherent attribute that allows it to resolve crises in a positive way for the benefit of its development and that, from a community perspective, allows formulating actions and strategies that strengthen the

reduction of vulnerabilities and civil protection against complex phenomena such as disasters. natural.

On the other hand, it is noteworthy that socio-ecological systems, resilience and its community perspective make up multidisciplinary, systemic and holistic analytical frameworks that allow addressing problems on the relationship between society and the environment in the face of extreme phenomena such as disasters.

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