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Social Construction of Disaster Triggered by the 19S Earthquake in the Municipalities of Tláhuac y Xochimilco, Mexico City

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ARTICLE SECTION

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Abstract: The 19S earthquake triggered a disaster in the CDMX; thousands of homes in the Tláhuac and Xochimilco municipalities were damaged. The objective of this text is to understand the anthropogenic causes of the disaster through the analysis of academic studies, official reports, spatial variables and field observation. The research provided a glimpse of the incidence of social causes in the disaster: the urban expansion of the city on ecological conservation land, changes in land use from agricultural and forestry to urban, the growth of irregular settlements and precarious housing, non-compliance with building regulations and overexploitation of groundwater in the southeast of the Mexico basin. All this derived from housing, water, and land management policies. The importance of the study lies in the fact that it highlights the need to promote a disaster mitigation and prevention policy linked to the development model.

Key words: risk, vulnerability, hazard, development, housing.

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IDEAS CLAVE / HIGHLIGHTS / IDEES CLAU

1. Los daños derivados del sismo 19S evidencian el desastre como consecuencia del "desarrollo" no sustentables.
2. Los desastres resultan de riesgos no gestionados, generados de la dinámica entre amenazas y vulnerabilidades.
3. La falta de vivienda formal para población de bajos recursos económicos ha contribuido al establecimiento de asentamientos vulnerables a sismos.
4. La extracción de agua subterránea ha generado hundimientos y fracturas del suelo que debilitan las edificaciones.
5. Las políticas hídricas, habitacionales, de uso de suelo y prevención de desastres deben vincularse a la planeación del desarrollo.

1. The damage resulting from the 19S earthquake is evidence of disaster as a consequence of unsustainable "development".
2. Disasters result from unmanaged risks, generated by the dynamics between hazards and vulnerabilities.
3. The lack of formal housing for the low-income population has contributed to the establishment of settlements vulnerable to earthquakes.
4. Groundwater extraction has generated subsidence and soil fractures that weaken buildings.
5. Water, housing, land use and disaster prevention policies must be linked to development planning.

1. Els danys derivats del sisme 19S evidencien el desastre a conseqüència del "desenvolupament" no sustentables.
2. Els desastres resulten de riscos no gestionats, generats de la dinàmica entre amenaces i vulnerabilitats.
3. La falta d'habitatge formal per a població de baixos recursos econòmics ha contribuït a l'establiment d'assentaments vulnerables a sismes.
4. L'extracció d'aigua subterrània ha generat enfonsaments i fractures del sòl que afebleixen les edificacions.
5. Les polítiques hídriques, residencials, d'ús de sòl i prevenció de desastres han de vincular-se al planejament del desenvolupament.

EXTENDED ABSTRACT[1]

On September 19 2017, an earthquake of magnitude 7.1 struck Mexico City. As opposed to the 1957 and 1985 earthquakes, during which the central part of the city registered the most damage, this time other areas were also severely affected. Over 3 thousand dwellings were damaged or lost in the southeastern municipalities of Tlahuac and Xochimilco.

The aim of this project was to explore the social dimension of the disaster triggered by the 2017 earthquake in the two-abovementioned municipalities through the identification and analysis of the intervening social practices. From a qualitative perspective, we maintain that disasters have a forceful spatial manifestation when they materialize in specific territories. The causes that lead to natural phenomena becoming threats and making the population vulnerable may have distant origins both in space and time. This is why we proposed to study the case of Tlahuac and Xochimilco in relation to the Valley of Mexico and the metropolitan area of which they are part. A multi-scale cartographic analysis of the variables that intervened in the disaster revealed the local reality in a regional context. Cartographic analysis allowed for the establishment of relationships, points of convergence, and assembly of territorial variables.

Empirical data was obtained from the analysis of official and academic documents and observations in the field. Variables were managed and thematic maps were produced using the ArcGis program. Our theoretical-methodological framework takes on from the work of the Latin American Network for Social Studies on Disaster Prevention (LA RED), which conceives of disasters not as natural phenomena but as social constructions originating in risk-prone development models that affect vulnerable populations. Among the causes of disaster, we identified the following: human transformations of the environment such as urban expansion, land-use changes from agricultural and forest to urban, growth of irregular settlements and inadequate housing, non-compliance with building regulations, and the overexploitation of the water table in the southeastern part of the Valley of Mexico. The intensification of these processes in the last four decades has drastically transformed the environment of the municipalities under study, making it more dangerous and rendering the population more vulnerable.

The study area belongs to the Valley of Mexico, a basin with deep anthropic transformations that contains the Mexico City Metropolitan Area, one of the largest population centers in the world. Through its geological history, the Basin saw a system of lakes bordered by mountain ranges of volcanic origin develop, resulting in three different types of soil: soft (of lacustrine origin), transitional (combining materials of lake and volcanic origin), and hard (of volcanic origin). Today, lakes are virtually extinct and completely covered by buildings, and the urban sprawl also extends through the mountain slopes.

Water for human consumption is extracted from the Basin's subsoil in quantities larger than can be replaced, which has led to sinking and soil fracturing, with consequent damage to buildings and infrastructure. The ever-growing extraction of water through wells, especially in the southeastern portion of the city, has exacerbated the problem, particularly in the areas of soft and transition soils. The city, for its part, classifies soils into two types: urban and conservation, the latter having important environmental functions, but which are subjected to considerable pressure by urban expansion.

[1] Traducción exclusiva de los autores / Authors' exclusive translation.

From the mid-twentieth century, when urban growth accelerated, major earthquakes have mostly affected settlements on lacustrine and transition soils.

In the last two decades, the Tlahuac and Xochimilco municipalities have experienced an important demographic growth and urban expansion at the expense of conservation soil areas. These municipalities, which until the 1980s still sustained rural lifestyles, have become recipients of low-income population expelled from central municipalities by rising housing costs, leading to the creation of irregular and precarious new settlements, mostly of self-made dwellings. These facts have contributed to the environmental degradation caused by a rapidly growing local population, as well as to the vulnerability of people who live in unregulated, precarious buildings.

Tlahuac and Xochimilco play an important ecological role in the Basin, offering essential environmental services. Apart from concentrating a sizeable portion of the existing conservation soil, they provide as much as 40% of the total water available to city residents. At the same time, these municipalities show the highest poverty rates in the city, which manifest themselves in the precarious condition of irregular dwellings, a degraded environment resulting from sinking and fracturing of the terrain, and the expansion of the urban area. All this constitutes an ideal scenario for disasters.

When the earthquakes of 1957 and 1985 rocked Mexico City, urban expansion was still not so evident in Tlahuac and Xochimilco. Many of the existing buildings in 1985 were recent, not older than 15 years, and they were mostly one or two-story houses. The very few buildings that existed rarely exceeded five stories, and building density was lower than it is today. To a certain extent, this protected people during the 1985 earthquake. By 2017, however, 75% of buildings were self-construction houses with low technical standards. The majority of the family homes that were damaged during the 2017 earthquake are located in lacustrine deposits and transition soils close to water wells and fractures.

Our research has allowed us to identify the social causes of the disaster, namely urban expansion over ecological reserves, changes in land use from agricultural and forest to urban, the growth of irregular settlements and precarious housing, the lack of enforcement of construction regulations, and the overexploitation of the water table in the southeastern portion of the Valley of Mexico; all of these derived from the existing housing, water management, and soil management policies.

In seismic-prone areas like Tlahuac and Xochimilco, sound land-use policies and the design of risk-proof buildings suitable to the existing conditions can stop making threats of natural phenomena and reduce the vulnerability of the local population. The extraction of water from underground deposits and the formation of fractures favored the damage suffered by a large number of buildings during the 2017 earthquake. Unsuitable territorial organization, water management, and construction policies paved the way for a number of unsustainable practices that turned the earthquake into a real threat and contributed to the formation of a disaster.

The land-use, water management, and housing policies implemented in Mexico City have the potential to exacerbate the effects of earthquakes. Therefore, it can be stated that, in this case, the disaster originated in social, economic, and political decisions, and that the contradictions inherent in the existing development model were just as decisive as the geophysical force of the earthquake.

While it is impossible to prevent earthquakes from occurring in Mexico City, it is possible to mitigate their risk. For this, it is necessary to implement a development model that

brings together water, housing, land-use, risk mitigation, and disaster prevention policies so as to build more sustainable environments. The study highlights the need to promote a disaster mitigation and prevention policy linked to a development model that instead of turning natural phenomena into disasters leads to the construction of safe environments.