Life Above, Rubble Below: A Case of Historically Produced Risk & Perception in Mexico City

María Moreno Carranco (1), Beki McElvain (2)

Abstract

Mexico City's periphery is home to marginalized communities, and mainly constituted of autoconstructed houses built along the dried lakebed of Lake Texcoco. These settlements are subjected to amplified earthquake risk because of below-ground soil conditions in the lakebed beneath them, which makes them an ideal place to study the social production of risk. In Colonia del Mar, Tláhuac, people believe their community is built atop rubble dumped there after the 1985 earthquake. It is said the government illegally dumped debris from collapsed structures into the lakebed swamp that would be urbanized as Colonia del Mar. In 2017, another major earthquake caused structural collapses and damage along the lakebed edge, and especially in Colonia del Mar. This paper explores the factual possibility for these below-ground conditions and argues that approaches for relocation and rebuilding in Mexico City's periphery are profoundly informed by historical processes that socially produce risk in marginalized areas.

Affiliation
(1) Universidad Autonoma Metropolitana, Departamento de Ciencias Sociales
(2) UC Berkeley, Department of City and Regional Planning

Contacts:
mmoreno [at] correo [dot] cua [dot] uam [dot] mx (1)
bmcelvain [at] berkeley [dot] edu (2)

Received:
24 August 2019

Accepted:
20 May 2020

DOI:
10.17454/ARDETH06.12

ARDETH#06

Risk is not equally distributed.

Introduction

Mexico City is a high-inequity place with disaster risk divided spatially and along geologic and class lines. Most of the Mexico City metropolitan zone is exposed to multiple environmental hazards, including relatively frequent and widespread earthquakes and flooding. Risk is high in many areas of Mexico City, but particularly so in the areas where *Lago de Texcoco* (Lake Texcoco) used to be. Some of these places correspond to the center of the city while others are part of the urban periphery, which is home to more marginalized communities. The peripheral settlements at the southeast edge of the city are mainly constituted of *autoconstruido* (autoconstructed or "self-built") houses at the edge of the mostly dried lake bed that constituted the Texcoco lake system, which has been continuously drained in favor of urbanization since the Spaniards colonized the region in the 16th century. *Autoconstrucción* (autoconstruction) is common in these peripheral areas, and there are socioeconomic vulnerabilities and lakebed soil conditions that amplify risk and complicate recovery from earthquake disasters and flooding. In addition to flooding hazards, the soft, spongy lakebed soil conditions, present at both the center and in the periphery of the city, amplify ground motion during earthquakes, and increase disaster risk for the people living in this built environment (Nikolaou et al., 2019). However, risk is not equally distributed. In an earthquake disaster the peripheral areas are potentially worst hit, take much longer to recover, and are often neglected by the authorities responsible for reconstruction and civil service.

Located on the border of Tláhuac adjacent to the watery alcaldía of Xochimilco, Colonia del Mar is a neighborhood that was particularly affected by the M7.1 earthquake in 2017, where citizens have adapted to collapsing structures and the massive *grietas* where ground failure has ruptured neighborhood thoroughfares with informal solutions that have persisted well into 2019. In this marginalized place, there is a popular narrative: In 1985, before Tláhuac and the surrounding area was built out and urbanized, a massive M8.1 earthquake devastated Mexico City. Over ten thousand buildings were destroyed along with miles of infrastructure throughout the city. Local people say that part of the structural rubble

and debris from these collapsed structures was used to fill the swampy area like a landfill in what would become Colonia del Mar. The colonia's name literally means "from the sea", and makes reference to the sandbanks surrounded by shallow waters which were filled in and then urbanized in the late 1980s. Since the colonia was built atop this debris-filled landfill, earthquake risk is extremely high due to the unstable below-ground conditions. Since the time the del Mar was founded, residents have suffered from subsidence and surface cracks in the land. While there is no official documentation for this story, it is generally believed to be true and is potentially supported by spatial data showing concentrated damage in the area from the 2017 earthquake. If this narrative is factual, it would have implications for how we understand the risk assumed by this community in Tláhuac. If we are thinking about the historically produced disaster risk in Mexico City in general, how do conditions like these inform the perception of risk? If the risk assumed by residents of Tláhuac is produced and made worse by government-led illegal processes that increase potential harm to people living in the city's periphery, what should be the approach to reconstruct or relocate – and which is the better option for communities largely forgotten by city leadership?

If the risk assumed by residents is produced and made worse by government-led illegal processes, what should be the approach to reconstruct or relocate?

History and the Social Production of Risk

Historical processes heavily influence the production of risk. In the case of Mexico City, the Mexica, a powerful Aztec faction, made the crucial decision in 1325 to found Mexico-Tenochtitlán on an islet in the middle of Lake Texcoco. From her to the Spanish conquest to the *Porfiriato*, this decision would determine the history and evolution of Mexico City more than any other factor. The earthquake disasters of 1985 and 2017 have since confirmed the traumatic certainty of this prediction.

Early settlers in what is now Mexico City have been manipulating the lacustrine environment that makes up the great basin since long before the Spanish conquest. Mexico-Tenochtitlán was protected by earthen dams, and the Mexica grew crops on the water using floating *chinampas* flanked my man-made canals and raised walkways for travel around the city (Vitz, 2018). The Mexica did not necessarily live in total har-

mony with their environment, but unlike the Spanish, the indigines were fully aware of the "levee effect" that came with these infrastructures, and managed that risk through incorporated farming techniques and designated land uses (Candiani, 2014: 34). The difference then was a matter of both scale and modes of production. It wasn't until the Spanish brought new urban settlement patterns, new land-based agrarian modes, and new profit-driven industry to urbanize Mexico-Tenochtitlán that floods became real disasters (Candiani, 2014; Crouch et al., 1982).

Most of the history of the urbanization process of the city has been characterized by being accelerated, profit driven, disorderly, and with serious negative environmental effects.

After the fall of Mexico-Tenochtitlán in 1521, Hernán Cortés built the capital of New Spain on top of the old city for political and symbolic reasons, despite any perceived challenges posed by the city's location on the lake (García Acosta et al., 2003). However, the *chinampas* and most of the transport canals had no place in the new colonial city, and the Spaniards embarked on deliberate efforts to remove the water as they built out the new city. This effort began with the progressive desiccation of Lake Texcoco. This process is well documented by historians, and these various drainage efforts would have implications for disaster risk in the modern city. As the Spaniards were gradually polishing and beautifying their new city, they were constantly fighting the lake, which did not mesh with the urban ideal that guided them, and resulted in significant flood disasters throughout the colonial period (Candiani, 2014; Crouch et al., 1982; García, 2004).

When early efforts to resist these floods proved futile, the apparent solution was to drain the basin. In 1608, the massive *Desagüe de Huehuetoca* (drainage system) public works project was completed, but the lake system was far too complex and the problem of flooding was only partially solved (Candiani, 2014). In 1629, flood disaster drowned the city for five years, making evident the need to take more extreme measures (Crouch et al., 1982). The option to relocate the capital was considered. However, the symbolic value of the place and potential economic losses were evaluated and it was decided that the city would remain in the basin (García, 2004). At this time, the dangerous subsoil conditions started to become evident. Due to the soft lacustrine soils, the city was beginning to sink in a process called *subsidence*, causing the stone-walled colonial buildings to recede into the ground, further

exacerbating flood and drainage problems (Candiani, 2014; Martínez, 1980). The issue of subsidence would persist through the modern period and has indeed remained an issue that affects both flood and earthquake risk today (Vitz, 2018).

Mexico City entered modernity under the regime of Porfirio Díaz (1876-1911). Díaz's goal to modernize the country, coupled with his admiration for French architecture and urbanism, has had profound consequences for Mexico City in general and for the city's disaster risk in particular. By 1910, the population of the city grew from 200,000 inhabitants to 470,000 under the Porfiriato. During that time, the city's urbanized area grew from 8.5 to 40 square km (Morales, 1978). This rapid urban expansion was made possible by increased desiccation of swampy areas, which expanded the buildable area in and around Mexico City and resulted in the emergence of an extensive real estate market on high risk areas (Gruzinski, 2004: 484) and produced further peripheral settlements. In addition to new neighborhoods, there were also significant advances in urban infrastructure that sought to make the city more functional. Particularly noteworthy was the construction of the *Gran Canal del Desagüe* (the Great Drainage Canal), which was completed in 1900. The objective of this canal was to drain all remaining water from Lake Texcoco, which still covered a large part of the capital's territory and was not yet developed. The canal was imagined as a permanent solution to both flood and sanitation issues by expelling Mexico City's lake water and wastewater out of the basin (Agostoni, 2003). Despite these major infrastructural endeavors, it was still possible to navigate the canals from Chalco and Xochimilco at the Southern edge of the city and reach the city center at the end of the nineteenth century. The fight against nature persisted, and the flood risk remained, growing worse in the lakebed areas as the city expanded.

These groundwater extraction projects were known to contribute to subsidence as early as the mid 1920s (Carrillo, 1969 cited in Tellman et al., 2018). The problem was ignored by officials, and groundwater pumping increased in frequency and intensity until the 1940s (Marsal and Mazari 1962; Marsal 1992 cited in Tellman et al., 2018). Subsidence rates reached an incredible 18 centimeters per year from 1930-1960

Natural disasters are not natural at all, but are rather the result of environmental hazards interacting with the built environment and vulnerable populations.

(Tellman et al., 2018). By 2018 some areas of the capital, including Tláhuac, were sinking up to 40 cm per year. Most of the history of the urbanization process of the city has been characterized by being accelerated, profit driven, disorderly, and with serious negative environmental effects. Currently, more than half of the city's inhabitants live in areas that began as irregular settlements in the periphery, outside the formal housing market and with little or no planning (Padilla and Rebeco, 2009) and in many cases on unstable lakebed subsoil. The relationship between water management, rapid urbanization, peripheral neglect and devastating earthquake effects was evident in both the 1985 and 2017 disasters. This history is relevant since it sheds light on the ways in which risk has been produced in Mexico City. Every decision made since the founding of Mexico-Tenochtitlan and the Spanish conquest has shaped the city's risk in a particular way. Issues of subsidence, development on soft soils, the provision of infrastructure, and socioeconomic disparities in settlement patterns poses serious vulnerability to earthquakes and flooding that have been, to a profound extent, produced.

Natural disasters are not *natura*l at all, but are rather the result of environmental hazards interacting with the built environment and vulnerable populations (Comfort et al., 1999). Scholars who study risk agree that risk to society from environmental hazards is generated, or at least influenced, by human decision-making and behavior (Beck, 1992; Tierney, 2014). Human settlement patterns show an attraction to "environmental amenities" that lead to settlements in areas exposed to hazards (Tierney, 2014). People have settled along coastlines, in river basins, in fire-prone forests, and so on. The Mexica and later, the Spaniards, were no different when they chose to settle in the lacustrine basin of Lake Texcoco. Tierney unpacks this concept of place further, citing that disasters that result from this exposure are brought about through societal factors that create conditions for them.

From *The Social Roots of Risk*: "disasters themselves are largely the consequence of - socioeconomic and political conditions that exist in affected societies and communities; global processes that contribute to so-called underdevelopment; legacies of colonialism, which include exploitation of natural resources and

the environment; and processes that marginalize societies and groups within societies." (Susman et al., 1983, as cited in Tierney, 2014: 39) Thus, the effects of disasters are inherently the product of these patterns of human settlement that foster exposure to hazards, coupled with forms of social differentiation and power that create conditions for vulnerability (Tierney, 2014; Blaikie et al., 1994).

Studies on the social production of risk call into question the existing socioeconomic conditions of societies and the interventions of political, elite, and informal actors, particularly through the implementation of infrastructure projects, political regime shifts, and top-down planning processes intended to modernize places and control hazards (Blaikie et al., 1994; Harvey, 1996; Tierney, 2014). In these ways, risk is produced through infrastructure, often in response to previous disasters, or as a preventative measure where there are known hazards. Tierney points to social constructionism or "socially constructed ideas" as concepts that promote risk, for example, through political- and elite-driven safety measures that prioritize profit-making development (Tierney, 2014: 58). Using levees as an example, Tierney explains that infrastructure creates risk and conditions for disaster by promoting an illusion of protection and encouraging development in high hazard areas. Continued development, for example, along rivers creates environmental changes and destroys natural protective barriers that can also amplify risk (Tierney, 2014: 59). Put another way, actors with power and authority shape vulnerability and determine "robustness" to new and existing threats over time through their decisive actions. These urban decisionmakers' responses to emergent threats can increase vulnerability in their communities and in fact make their cities less resilient as a direct result of risk mitigation projects (Tellman et al., 2018).

Development patterns evident in Mexico City over time show that the social production of risk is intrinsically tied to the city's history. The city's legacy of major infrastructure projects designed to shape the natural environment and control it for optimized capitalist production schemes and political power that began with the conquest and grand scale colonial drainage projects (Candiani, 2014). Over several regimes, Lake Texcoco has been drained and shaped to

Risk is produced through infrastructure, or as a preventative measure where there are known hazards.

The city's legacy of major infrastructure projects designed to shape the natural environment and control it for optimized capitalist production schemes and political power.

Fig. 1 – Cracked street 18 months after the earthquake (photo Luis Razzo).

support the proliferation and urbanization of Mexico City, and since then the region's water sector has been expanded and privatized, consequently exacerbating both environmental hazards and and the exclusion of communities from access to water services (Castro, 2004; Tellman et al., 2018). In effect, there have indeed been and continue to be socioeconomic and political factors that affect vulnerability differently in various parts of the city and at different scales. Large scale disasters, like earthquakes, affect entire regions, but conditions at the local scale show disparate levels of resilience and ability to recover. In Mexico City, *below-ground conditions* and *water provision* are two important factors in recovery at the local level. Spatially and politically, water infrastructure creates a disparity of interests as it serves to both provide a resource and assist with adaptation to flooding, but simultaneously generates risk in vulnerable areas that receive fewer services and less attention when an earthquake disaster affects underground infrastructure.

This is exemplified in Tláhuac and other alcaldías in Mexico City's periphery, where a large scale earthquake disaster in 2017 rocked the city differently in the edge of the former lake than it did in other areas. Much of the outer regions are still recovering, and are doing so without consistent access to water since below-ground infrastructure was damaged and never repaired. If the story about the debris dumped in marshy ground below Colonia del Mar in Tláhuac is true, the decisions made during a past earthquake recovery period has increased the risk for an already socioeconomically vulnerable community. Similarly, how the government of Mexico City decides to approach recovery in del Mar and colonias like it will determine communities' risk for inevitable future disasters.

Situating Colonia del Mar, Tláhuac

Tláhuac is an *alcaldía* of Mexico City that is regularly socioeconomically, politically, and infrastructurally disconnected from sanitation and water resources. Located in the southeast of the city at the edge of the former Texcoco lakebed, Tláhuac is home to agricultural towns and low-income communities inhabited by around 360,000 people (SEDESOL, 2018). Many of the area's structures are two or three story houses built out of cement block and concrete slabs, which are less resistant to earthquake shaking than other more flexible materials. Worse, these structures are autoconstructed without professional supervision, and in most cases are built in stages, with floors added as families grow and require more space. Further, since jobs are largely informal (according to INEGI in 2019 job informality in the city is almost 60%) it is difficult to predict income and plan for construction. Depending on family needs and available resources, the *autoconstrucción* process can last for years.

The alcaldía of Tláhuac is made up of marshy wetlands and soft clay soils left over from the drained lakebed of Lake Texcoco. Many of the settlements in Tlahuac are *pueblos originarios* (prehispanic towns) devoted to agriculture, while others originated as squatter settlements that were later formalized, and some others are semi-planned *colonias populares* (working class neighborhoods). In the 1970s, during one of many periods of intense peripheral growth in

Fig. 2 – Damaged house supported by wood formwork a year after the earthquake (Photo Luis Razzo).

Mexico City, Tláhuac was subjected to a rapid urbanization period despite its unstable soil conditions. What was once farmland was subdivided into 3200 200 sq meter plots of land intended for development, and poor migrants from Michoacán, Oaxaca, Guerrero, and Jalisco began to populate the area, where they found work, raised families, and built community. Colonia del Mar is a small neighborhood established in an especially marshy part of Tláhuac. According to informal accounts, the colonia was briefly considered as a potential site for an amusement park by a japanese organization. However, the soil conditions were declared so unstable that the project was canceled. If this story is accurate, it would appear subsoil studies were disregarded as the Mexican government set about urbanizing the site. Along with the pastoral migrants who moved into the developing area, squatters who formerly populated the neighboring hills were relocated to Colonia del Mar when the hills

Fig. 3 – Colonia del Mar, Tláhuac situated on the dry lakebed of historic Texcoco. (Data Source: Source: Datos Abiertos Ciudad de Mexico at https://datos.cdmx.gob.mx; Map: B. McElvain, 2019).

It is unclear how much the government has allowed development versus the possibility of community generated growth.

were rezoned as conservation land. The government implemented clientelist practices, an exploitative system of patronage, that was a normal part of the city's informal and formal growth at the time. The original plots of land were promised to those who settled there at 250 square meters, with the agreement that more numerous families would get access to additional plots through *despliegue*, or "land grabbing" that contributed to the rapid urbanization of the area. Because much of the area is autoconstructed, it is unclear how much the government has allowed development versus the possibility of community generated growth. Colonia del Mar and other communities in Tláhuac experience and adapt to shocks like earthquake disasters differently than the region's more connected, affluent areas. Over a year after the 2017 earthquake disaster, people in del Mar still have limited access to water and other resources, and have adapted to living with deep *grietas*, or cracks from ground failure, that

Fig. 4 – "I am not a victim of the September 19th earthquake, but rather of a years long collapsed swage system. I dare the government to prove me wrong" (Photo Luis Razzo).

inhibit street and walkway mobility in and around the neighborhood and further isolate the already marginalized community. According to official figures, in the 2017 earthquake over 5,000 houses were damaged in the 2017 earthquake in Colonia del Mar alone. Of these damaged homes, 1,200 have been declared inhabitable. In addition to the structural damage, 38 grietas were counted in the streets of the neighborhood (Ahedo, 2017). Crime has also increased in proportion to the damage, and people are living in dangerously compromised structures and rebuilding with dangerous or seismically vulnerable materials. Colonia del Mar, like much of Tláhuac, has not yet started a meaningful recovery process despite extensive damage to homes and infrastructure in the alcaldía. The immediate response by officials was poor all over the city, but was especially lacking in these peripheral communities.

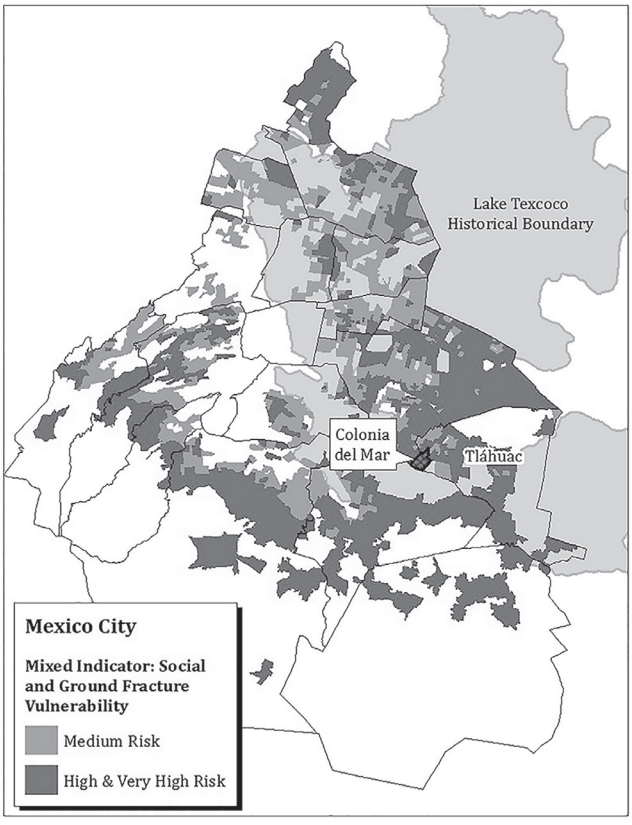

Fig. 5 – Colonia del Mar, Tláhuac social and ground fracture vulnerability. (Data Source: Datos Abiertos Ciudad de Mexico at https://datos.cdmx.gob.mx; Map: B. McElvain, 2019).

The vulnerable conditions in which people in Colonia del Mar live are directly related to human decision-making via the historic processes of desiccation and underground water extraction.

Community Perception of Risk

There is no evidence of the rubble story being true on any *gobierno* website or in any official public documents. Yet, if you ask anyone in Tláhuac about the disaster landfill beneath Colonia del Mar, you will hear the same story about the earthquake in 1985, and the dumping of *escombros para rellenar* (underground rubble) that makes the neighborhood unsafe. In fact, informal conversation with virtually anyone in Mexico City familiar with Tláhuac or public risk policy will unofficially support the story, too. Residents feel so strongly about this, many have expressed a desire to be relocated, their slogan being *"reubicación no reconstrucción!"* (relocation no reconstruction). As mentioned, problems with grietas and subsidence have been present since the early days of the colonia throughout the city's peripheral areas. However, the seriousness of these issues was laid bare after the 2017 earthquake. It is now clear and agreed upon by

officials that reconstruction in the area is unsafe. This is plainly stated in the government-produced *Atlas Nacional de Riesgos* (National Atlas of Risk), which classifies the area as "high risk".

The vulnerable conditions in which people in Colonia del Mar live are directly related to human decision-making via the historic processes of desiccation and underground water extraction. Further, government officials over multiple periods of growth over Mexico City's history either deliberately urbanized or allowed urbanization on a site with unsafe below-ground conditions. Two years after the 2017 earthquake the area is so openly recognized as unsafe, there is no clear government strategy regarding reconstruction or relocation for *damnificados* (victims) and affected people. The local community has organized and formed coalitions, particularly around learning about subsoil characteristics and demanding professional assessments of the feasibility of remaining on the site. According to neighbors representatives interviewed at the site, there are multiple lawsuits from residents looking to make the area safer by repaving the streets with permeable materials to prevent the exacerbation of underground caverns and cracks from excessive rainfall. Other lawsuits are complaints about underground water extraction, or petitions for reforestation to reverse erosion. Nonetheless, given the extremely unstable subsoil conditions these measures seem palliative and insufficient.

Disasters are regional, but risk is local, often influenced by community characteristics and vulnerabilities apparent at smaller scales.

Conclusion

Mexico City is prone to earthquake hazards, and like many Latin American cities also experiences increased disaster risk because of poorly maintained infrastructure, poor or nonexistent building code enforcement, neglect by official programs, and higher vulnerability due to poverty and unbalanced economic power through historical processes. It is clear that human decision making since the founding of Mexico-Tenochtitlan has led to increased risk for all of Mexico City. Established in the middle of a lake in a basin with high seismic hazard, and then developed over time for capitalist production schemes that first benefitted Spain, and later brought Mexico into modernity under the *Porfiriato*, Mexico City's disaster risk is distributed spatially and along geologic and class lines. Most of the Mexico City metropolitan zone

is exposed to multiple environmental hazards, including relatively frequent and widespread earthquakes and flooding.

Disaster risk can be understood with the assumption that risk is socially and politically produced throughout city histories, and that the functions of risk are sensitive to scale and coping capacity, which creates a *reactive* environment for prevention, mitigation, and recovery efforts in a given political and socioeconomic ecosystem. Disasters are regional, but risk is local, often influenced by community characteristics and vulnerabilities apparent at smaller scales, as we can see with Colonia del Mar in Tláhuac. Even leaving out the political corruption the city is known for, if we are thinking about the distribution of risk in this context of scale and history, is it any wonder the residents of Tláhuac and others so readily believe the stories about the below-ground conditions in Colonia del Mar? Isn't it *believable*?

If the risk assumed by residents of Colonia del Mar in Tláhuac is produced and made worse by government-led illegal processes, what should be the approach to reconstruct or relocate -- and which is the better option for communities largely forgotten by city leadership? Managed retreat from del Mar to another colonia where there is less risk, seems impossible. Recovery in place is difficult to fathom over the long-term, knowing the below-ground conditions are so dangerous in an earthquake. In Mexico's reactive political environment, planners and officials have turned to "resilient" strategies and more proactive approaches, attempting to tackle socioeconomic issues ahead of the next disaster. Yet, when the 2017 earthquake struck, the region was still in the later stages of recovery from the 1985 earthquake. In partnership with the World Bank and 100 Resilient Cities, the city's efforts include community outreach in other peripheral alcaldías adjacent to Tláhuac, like Iztapalapa and Xochimilco. One consultant for a related NGO told us that "Tláhuac is a big unknown" when asked about the recovery process in the alcaldía for this paper. Under the Peña Nieto administration, the city's ongoing recovery efforts were moved under Protección Civil and a new Reconstruction Plan was established. For the long term, the government has invested in well-intentioned but dubious multi-use community center programs like Pilares (*Puntos de Innovación, Libertad, Arte, Educación y Saberes*) intended to bolster commu-

nity ties and also serve as recovery centers in case of a disaster. Yet, other well-intentioned programs, like Infonavit (*Instituto del Fondo Nacional de Vivienda para los Trabajadores*) for subsidizing and developing social housing, continue to create risk in the periphery through loan-matching, bank credits, and public-private partnerships with developers who build on the lakebed areas (Mendo-Gutiérrez, Cortéz-Lara, 2018).

The Mexican government's lack of accountability contributes to the perpetuation of socially and historically produced risk and promotes distrust. Because risk is produced through human decision-making and seemingly unrelated historic and political processes, city authorities have failed to prevent or lessen risk with reactive policies and approaches. Communities affected by disasters not only have limited possibilities for recovery, but are also keenly aware that they live in high risk areas and fear the inevitable next disaster. Making their stories visible is only a small step towards addressing the official neglect.

References

Ahedo, A. (2017), *Se hunde la Colonia del Mar poco a poco: vecinos*, "El Universal", October 21.

Agostoni, C. (2003), *Monuments of progress: modernization and public health in Mexico City 1876-1910*, Boulder, University Press of Colorado.

Beck, U. (1992), *Risk Society: Towards a New Modernity*, London, Sage.

Blaikie, P., Cannon, T., Davis, I., Wisner, B. (1994), *At Risk: Natural Hazards, People's Vulnerability, and Disasters*, London, Routledge.

Candiani, V. S. (2014), *Dreaming of Dry Land: Environmental Transformation in Colonial Mexico City*, Redwood City (CA), Stanford University Press.

Carrillo, N. (1969), *Influencia de los pozos artesianos en el hundimiento de la Ciudad de Mexico*, in *El hundimiento de la Ciudad de Mexico. Proyecto Texcoco*, Mexico City, Secretaría de Hacienda y Crédito Público, pp. 7-14.

Castro, J. E. (2004), *Urban water and the politics of citizenship: The case of the Mexico City Metropolitan Area during the 1980s and 1990s*, "Environment and Planning A: Economy and Space", vol. 36, n. 2, pp. 327-346.

Comfort, L. et al. (1999), *Reframing disaster policy: the global evolution of vulnerable communities*, "Environmental Hazards", vol. 1, n. 1, pp. 39-44.

Crouch, D. P., Garr, D. J., Mundigo, A. I. (1982), *Spanish City Planning in North America*, Cambridge (MA), The MIT Press.

De Peraza, L. (1997), *Historia de la ciudad de Sevilla*, Colección Clásicos sevillanos, Ayuntamiento de Sevilla.

García Acosta, V., Pérez Zevallos, J. M., Molina del Villar, A. , Escobar Ohmstede, A. (2003), *Desastres agrícolas en Mexico: catálogo histórico*, Ciudad de Mexico, Fondo de cultura económica.

García Martínez, B. (2004), *La gran inundación de 1629*, "Arqueología Mexicana", vol. 12, n. 68, pp. 50-47 [Online]. Available at: http://arqueologiamexicana.mx/Mexico-antiguo/la-gran-inundacion-de-1629 [Accessed: 18 April 2020].

Gruzinski, S. (2004), *La Ciudad de México: una historia*, México, Fondo de Cultura Económica.

Kandell, Jonathan (1988), *La Capital: The Biography of Mexico City*, Estados Unidos, Random House.

Martínez, E. (1980), *Reportorio de los tiempos e historia natural de Nueva España*, Ciudad de México, Centro de Estudios de Historia de México CONDUMEX.

Mendo-Gutiérrez, A., Cortés-Lara, M. A. (2018), *Resiliencia urbana y reconstrucción habitacional en la Ciudad de Mexico. La atención gubernamental tras los terremotos de 2017*, "Análisis Plural", 19S, pp. 171-184.

Morales, M. D. (1978), *La expansión de la Ciudad de Mexico*, in A. M. Toscano (ed.), *Investigaciones sobre la historia de la ciudad de México (Vol. 1)*, Ciudad de México, Departamento de Investigaciones Históricas INAH.

Mundy, B. (2015), *The Death of the Aztec Tenochtitlan. The Life of Mexico City*, Austin, University of Texas Press.

Nikolaou, S., Diaz-Fanas, G., Garini, E., McElvain, B., Gazetas, G. (2019), *Dried Lakes Do Tell Tales: Seismic Soil Amplification in Mexico City*, "GeoStrata Magazine", vol. 23, n. 2, p. 40-46.

SEDESOL (ed) (2018), *Informe anual sobre la situación de pobreza y rezago social* [Online]. Available at: https://www.gob.mx/cms/uploads/attachment/file/32189/Distrito_Federal_011.pdf [Accessed: 18 August 2019].

Tellman, B., Bausch, J. C., Eakin, H. et al. (2018), *Adaptive pathways and coupled infrastructure: seven centuries of adaptation to water risk and the production of vulnerability in Mexico City*, "Ecology and Society", vol. 23, n. 1.

Tierney K. (2014), *The Social Roots of Risk: Producing Disasters, Promoting Resilience*, Stanford (CA), Stanford University Press.

Vitz, M. (2018), *A City on a Lake: Urban Political Ecology and the Growth of Mexico City*, Durham, Duke University Press.