

THE ADAPTABILITY OF PUBLIC SPACE IN MEXICO CITY AFTER AN EARTHQUAKE: A PRELIMINARY CLASSIFICATION

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ABSTRACT

September 19th 2015 marked the 30th anniversary of the Mexico City earthquake in which thousands of people died and hundreds of buildings collapsed. During this disaster, public space played an extremely important role not only in the emergency phase but also in the reconstruction phase; streets and squares were used not only as shelter but also as strategic points for the collection of food and organization for reconstruction works. By being in a seismic risk zone, it is of utmost importance to assess the location, characteristics, and current situation of public space in Mexico City, as public space will be a crucial resource in an emergency both during and after a disaster of this dimension. Therefore, the results of a preliminary assessment of public spaces in Mexico City are presented here to answer two main questions. What and which characteristics had the public spaces used during and after the 1985 earthquake and what is the present state of these public spaces? Results show that although seismic risk persists, public space has diminished in terms of quality and quantity toward two trends. First, some spaces have been privatized and have been replaced by shopping malls, and secondly, other spaces are saturated with new buildings in and around public spaces. From this, we can conclude that the role of public space in relation to disaster has been demerited over the years, which reduces the possibilities of recovery in the aftermath after an earthquake. Therefore, urban policies and impact studies for new projects should reconsider the role that public space may play in case of a disaster in one of the most populated cities in the world.

Keywords: earthquake, Mexico City, public space, recovery, seismic risk.

1 INTRODUCTION

Urban visions of reducing risk have been based on economic, political, sociological, or cultural visions [1]. However, in recent years it has been asked if the urban form can likewise contribute to managing risk in some phases, such as may be the process of recovery in a city [2]. Particularly, if we consider open space as a component of urban form and as a crucial asset in earthquake-prone cities, four groups of studies in several countries may be identified (Table 1).

First, by using urban design theories, recovery planning, and urban resilience, Allan and Bryant [3,4] have shown the importance of open spaces after an earthquake. For these authors, integration between the urban design and recovery theory is possible if open spaces are considered as a ‘second city’ [3]. A second group of studies focused on the longitudinal analysis of public spaces in earthquake-prone cities [5–7], documenting how economic and urban factors may influence the reduction of such areas. Third, was the focus on the construction of scenarios based on the analysis of public spaces [8–10]; thus, for example, for the case of

Table 1: The study of public spaces located in earthquake-prone cities in several countries (examples).

Focus of the study	Location and year of the earthquake of reference	Authors
Role of open spaces in the aftermath of an earthquake	San Francisco, USA, 1906	Allan and Bryant [3]
	Concepción, Chile, 2010	Allan and Bryant [4]
	Christchurch, New Zealand, 2011	Allan <i>et al.</i> [2]
Longitudinal analysis of public space areas in earthquake-prone cities	Tehran, Iran,	Wzatollah <i>et al.</i> [5]
	Jiaozuo City, China	Fan <i>et al.</i> [6]
	Istanbul, 1999	Turer [7]
Construction of scenarios based on the analysis of public spaces	Kathmandu, 1897, 1905, 1934, and 1950.	Anhorn and Khazai [8]
	Santiago de Cuba, 1766, 1852, 1932	Espinosa-O'callaghan <i>et al.</i> [9]
	Valdivia (1960) and Concepción (2010), Chile	Vilagra <i>et al.</i> [10]
Public spaces left or constructed after the earthquake	Kobe, Japan, 1995	Allan and Bryant [11]

Source: Own elaboration based on the references.

Kathmandu, Anhorn and Khazai [8] developed a methodology to analyze adequate refuge areas in the event of earthquakes using quantitative and qualitative criteria, such as the estimation of the demand for space, suitability of spaces and accessibility. Finally, another group of authors analyzed the new public spaces constructed after earthquakes as a form of innovation and community participation [11], or the meaning of new public spaces as a form of commemoration and a form of cultural production for survivors to express their emotions or remember the victims, all as a part of a collective conscience [12].

In the framework of this background, the objective of this work is relatively modest and is limited to documenting the function that public spaces performed after the 8.5 Richter scale earthquake in the city of Mexico in 1985. This was done with the purpose of categorizing spaces according to the function mentioned and for generally documenting the changes, which have occurred in these spaces today, since we believe that in spite of their importance, the relationship between the space and the disaster has not received any attention by either the academic side or the governmental side. Therefore, a first classification of public spaces according to their function during disasters is the first step of a long-term project intending to underpin public space as one of the components for making this city more resilient.

Although only the term 'open space' appears in the literature related to this subject, for the purposes of this article we understand open space as part of the definition of public space, since according to Lofland [13], we understand public space as 'Those areas of the city to which all people have legal access, in general. I refer to the streets of the city, its parks and its places of public accommodation. I also refer to the public buildings or the "public zones" of

private buildings'. At the same time, this definition allows us to assess the classification categories of public space that will be used for this study, which in turn has also been the object of study.

Regarding the classification of public space, Carmona [14] identifies three dimensions in which the countless typologies that have been created regarding public space could be grouped: typologies derived from a design perspective (created from the space's function); typologies derived from a socio-cultural perspective (based on the types of users of the public space and their perceptions of this space); and last, typologies derived from a political-economic perspective, based on aspects of the property. As the same author mentions, each one of these typologies has limitations, for which a new typology will be required, which is the proposal that the author makes.

Although we are aware that public space is in fact a multi-dimensional phenomenon, we base this study above all on the typological classification that is made of public space from the design perspective, since we consider that the functional aspect of public space in situations of disaster momentarily shifts this perspective from other dimensions as a priority. In this manner, particular attention will be paid to the key trait of 'adaptability of the public space', from which authors Frank and Stevens [15] propose a typology of public spaces based on a *continuum* which goes from spaces with 'looseness' to spaces with too much 'tightness', to refer to the physical conditions that allow activities of a most diverse nature to be developed within a public space, both spontaneous as well as planned.

2 PUBLIC SPACE AND EARTHQUAKES IN MEXICO: SOME BACKGROUND

By being situated in a zone of interaction between two tectonic plates (the Cocos Plate and the North American Plate), Mexico is in a zone of very high seismic activity [16]. After risk of flooding, this makes the territory subject to earthquake risk in Mexico correspond to more than 540,000 km², which represents almost a third part of the national territory and almost a third part (31 million in 2010) of the population exposed to this kind of risk [17]. Of these 31 million, more than 20 million inhabitants are concentrated in the Metropolitan Zone of Mexico City (MZMC). However, this condition is not new, and there is information that earthquakes have occurred in the Mexican Valley since the pre-Hispanic era, placing the occurrence of the first earthquakes in the year 1445 [18]. In a historic recount of the earthquakes that have caused the most impact, Audefroy and Cabrera [19] calculate around 130 earthquakes between the years 1300–2000. Of these, it is known that eight earthquakes of a magnitude of 8 or greater on the Richter scale occurred in the country during the XX century [20].

Just as earthquake risks have been a part of the history of Mexico, the use of public space before the occurrence of earthquakes has also been a part of it. This public spaces–earthquakes relationship, however, has been naunced by the historical, political, and religious conditions of each era. For example, within these responses, religious practices of the colonial history era (centuries XVII–XVIII) are those that are most documented both in texts as well as oil paintings and votive offerings [20]. Within the practices of a collective nature performed in public spaces are the processions, masses, and public prayers after an earthquake has occurred, with the purpose of begging for mercy before natural threats [20]. On the other hand, evidences of public shelters opened by the government are found toward the end of century XVIII and above all in century XIX [20], which cause one to suppose that places such as the *Alameda* (the main historic park of Mexico City) operated as shelters and a place for storing supplies [20],

However, for earthquakes that occurred during century XX and XXI, sources that specifically address the subject were not found, whereas, taking the case of the 1985 earthquake, bibliographic sources were referred to as well as visual ones, such as photographs and videos, in order to know the functions performed by public spaces immediately after an earthquake. Once the information was identified, it was synthesized and classified taking the following categories into account:

- a. *Type of space*: which can be streets, Avenues, old railways, roundabouts, delegation esplanades (town halls), public building esplanades, public sports facilities, metro stations, and transportation tunnels of the collective metro system.
- b. *Definition of space according to the property*: which can be public, private, or institutional public.
- c. *Nature of use*: that is, if the public spaces were occupied due to the initiative of the population or due to official instructions, distinguishing between spontaneous and planned.
- d. *Functions, roles, and activities performed in that public space*: all those activities identified in literature.
- e. *Localization logic and advantages*: these correspond to the reasons and arguments for which those spaces, which were identified in literature, were used.

With the results of this classification, special attention was placed on the number of functions performed by each space with the purpose of observing the level of adaptability of the spaces. The spaces that have suffered greater changes were subsequently identified along with the causes of these transformations.

3 PUBLIC SPACES USED IN THE EARTHQUAKE OF 1985 IN MEXICO CITY: FROM THE EMERGENCY TO THE COMMEMORATION

Without a doubt, there are events that leave a mark not only on the lives of the people, but also on the city, consequently creating a communion between the space and those who live in it as a way of safeguarding social safety in case of an emergency. For the city of Mexico in 1985, a risk that remained latent unloosed its force in an earthquake with a magnitude of 8.1 on the Richter scale, provoking one of the largest disasters in its history, tearing down buildings and houses. A closed place then was no longer a safe refuge. On the contrary, the street, open spaces, (squares, parks, gardens) and institutional public spaces were then the safe places for the citizens; for some a new home while the emergency continued or while the city was rebuilt as camps, for others such as volunteers and governments, spaces of organization for supplies.

During the emergency phase in September of 1985, the city was used to its maximum capacity, giving it diverse uses. If the roads inside the neighborhoods had served as home, the different avenues of Mexico City were provided as an even greater life opportunity. Above all, those that had center dividers or ridges on the sides played an important role at that moment of the inhabitants' misfortune, given that the dimensions enabled improvised camps to be set up on them by complete families.

In total, 34 spaces were identified, which were grouped into eight different types (Table 2). More than 10 different activities were carried out within these eight spaces, the majority of which were spontaneously or unofficially organized both in public spaces as well as in institutional public spaces. Seen together, it was evident that squares were the spaces with greater

Table 2: A classification of public spaces occupied in the aftermath of the earthquake of Mexico City in 1985.

Category/definition of space/nature of use	Functions, roles and activities performed	Localization logic and advantages:
Streets/Public/Spontaneous	Improvised camps, organization of search and rescue activities, spaces of expression of social demands related to the disaster.	They are located close to the homes of the victims due to roots and fear of losing the home. Facility of moving furniture that they could rescue.
Avenues/Public/Spontaneous and officially planned	Provisional and permanent camps, organization of search and rescue activities, spaces of expression of social demands related to the disaster.	Large dimensions, especially avenues with center dividers.
Old railways/Federal public/Spontaneous	Provisional camps.	Has no other use.
Squares/Public/Spontaneous	Provisional camps; search and rescue organization, preparation of food, dining areas, spaces for medical and psychological help, center for supplies and distribution of donations, information center to search for survivors. Commemoration spaces after the disaster.	Large dimensions. Availability of services such as lighting and water. Availability of fountains and gardens.
Roundabouts/Public/Spontaneous	Post for relief and medical and psychological service, shelter.	Accessibility. The radial form gives it different forms of access.
Delegation esplanades and those of public buildings/Institutional public/Planned	Organization of donations, Provisional and long-term camps.	Large dimensions. Accessibility. Availability of services: drinkable water, drainage, gas, and electrical energy.
Public sports complexes and stadiums/Institutional public/Planned	Organization of donations, Provisional and long-term camps, organization and identification of fatal victims.	Closed spaces. Large dimensions. Availability of services: lighting and water.
Metro stations and transportation tunnels/Institutional public/Planned	Information centers	Accessibility, easy to identify, closed spaces, very structurally secure spaces, subterranean connectivity.

Source: Own elaboration based on bibliographical and visual sources.

capacity to adapt to the different uses, identifying up to eight different uses in them, although it was important to focus on other spaces such as metro tunnels, which, due to their particularity, enabled other very specific functions. On the other hand, we can see that even the geometry of certain spaces such as roundabouts was a factor for their use, although in general, the dimensions, the availability of services (water, energy, drainage), and accessibility, could be considered as the common characteristics of the majority of the spaces.

As a result of the collapse of diverse buildings or their necessary demolition, new public spaces were created, generally in the same place in which the buildings had been. This partly followed the ‘Expropriation Decree of Urban Properties in the Federal District’, which was created with the purpose of expropriating damaged properties to reconstruct the home in the same place, in addition to the ‘urban regeneration and improvement of expropriated properties’ [21,22]. Some of these spaces acquired a meaning of commemoration, and sculptures or places regarding the earthquake were placed in that place. Other spaces were simply left as green areas. Among the most significant spaces is the *Plaza de la Solidaridad* (Fig. 1), a space in which the famous Regis Hotel and the Secretary of the Navy were located, among others. Another one of those spaces is the *Parque del Sol* (Fig. 1), located in the Nuevo León Building in the Tlatelolco Housing Unit, which caused the death of hundreds of people upon collapsing. A monument was built in its place in honor of the tenor Plácido Domingo, who personally collaborated in the victim rescue activities [23].

While the earthquake of 1985 represented an opportunity to create new public spaces, on the other end were those public spaces that disappeared or were privatized. One of these

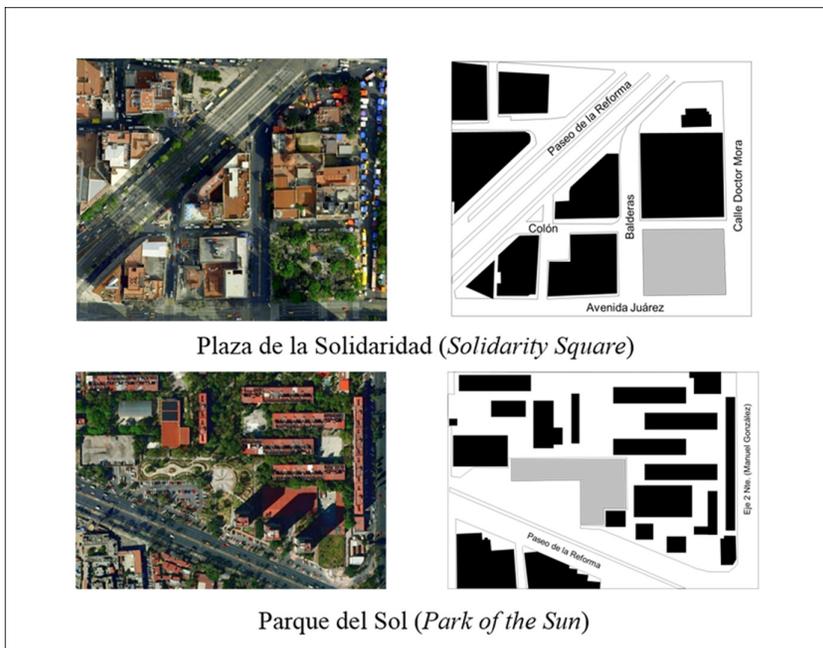


Figure 1: New public spaces created after the earthquake of 1985 in the city of Mexico (marked in gray).

Source: Own elaboration based on Google Earth.

spaces was the *Delta Baseball Stadium*, which between 1925 and 1936 was the main area used for baseball games in the city of Mexico. Subsequently, between 1937 and 1954, the place was remodeled and continued to function as a baseball stadium, better known as ‘Delta Park’. By 1955, the park had already been sold to the Mexican Institute of Social Security (IMSS) and was known as ‘Social Security Park’ [24]. The bodies of the victims were sent to this stadium during the earthquake of 1985, given that the hospitals, graveyards, and mortuary facilities were not enough considering the magnitude of the earthquake, for which the field of the stadium served to stack hundreds of bodies in three tents with signs that said ‘Identified bodies’, ‘Unidentified bodies’ and ‘Remains’ [23]. Family members or friends who came close to the bodies had to first go through a cordon sanitaire and were then fumigated [23], at the same time ‘the bodies are protected with lime, they are injected with formalin and surrounded by large blocks of ice to contain the process of decomposition in something’ [23]. In spite of its historic and social value, the sale of the stadium was announced in 1999 and the last game was played in that historic stadium in the year 2000. Several companies subsequently purchased it for almost 170 million pesos [24] and constructed a shopping center called ‘Delta Park’ (Fig. 2).

The second example is the *Ramón López Velarde Park*. The area in which this park is located belongs to the polygon of one of the most emblematic housing complexes of the modern movement built at the end of the 1940s and the beginning of the 1950s, the ‘Benito Juárez Urban Center’, better known as the ‘Multifamiliar Juárez’. This complex, like that of the previously mentioned Nonoalco Tlatelolco Housing Unit, was designed by Architect Mario Pani, one of the leading exponents of the modern movement in Mexico. Sadly, several buildings of this complex were damaged after the earthquake of 1985 and had to be demolished. Therefore, the surfaces of the fallen and/or dynamited buildings were added to the existing ‘Ramón López Velarde’ park, continuing to adhere to the presidential agreement mentioned, by which the places where buildings had stood were converted as urban parks. The resulting public space was abandoned for 10 years and became the passage for people toward the ‘Medical Center’ metro station. Over time, one of the resulting spaces of the part

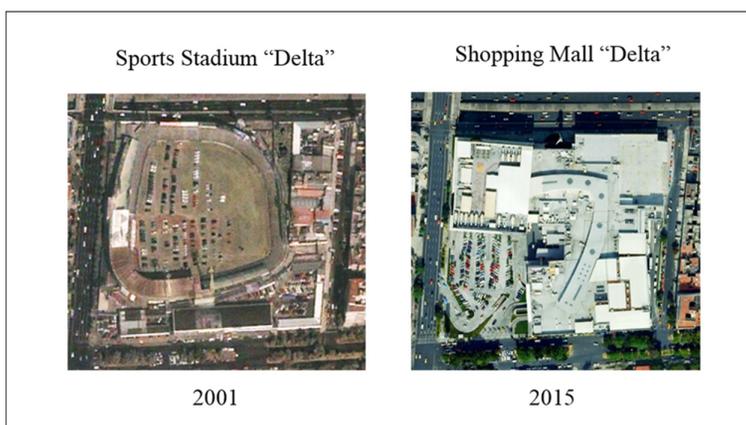


Figure 2: Privatization of public spaces used during the earthquake of 1985 in the city of Mexico.

Source: Google Earth.

on the north end became a center of exhibitions, better known as 'Exibimex'. This space was managed by the Federal District Government through the company *Servicios Metropolitanos* (Servimet). Subsequently, this property was sold to entrepreneurs who built the shopping center 'Pabellón Cuauhtémoc' in its stead [25]. The park currently suffers critical deterioration with regard to maintenance of green areas, lack of furniture, security problems and rescue problems of the park in general, for which its neighbors were requesting for resources and help from authorities for almost two decades [25] until a rehabilitation project started in 2011.

4 CONCLUSIONS

Although the results obtained to date belong to the early phase of a long-term project, at this point some conclusions can be drawn, which allow us to arrive a first balance regarding public space and earthquake risk in the city of Mexico, although many doubts arise from this first approach as well.

Firstly, with regard to the availability of information, it is noteworthy that although public spaces can be used again at any time in a similar disaster, more literature has been produced regarding the historical context in the previous centuries. In a certain way, this can be a consequence of many information gaps that remain with regard to the earthquake of 1985, for much fundamental data either could not be consulted or has disappeared from libraries and newspaper libraries, such as localization and type of shelters, apart from the discussion that remains regarding the true number of deaths. Therefore, for future phases of this project, testimonies and oral sources should be considered as primary sources, to the extent possible.

In the second place, the appropriation of spaces by the people is noteworthy, which gave them a use and meaning, such as the use of streets which in reality responds to factors that had nothing to do with the characteristics of traditional public spaces, but rather with factors of a psychological and economic nature. Although many official shelters were placed at the disposal of the affected people, the victims preferred to remain close to the remains of their homes for fear of their homes being looted, or because they had managed to remove some furniture and could not move them to other places due to fear of being relocated to another home, or due to their roots to the place. This first approach helps to continue dismantling one of the myths that has been formed regarding the reconstruction, which indicates that the official refuges were given the least priority in the people's preferences after a disaster.

Finally, it can be concluded that public spaces, and particularly squares, as places with the most potential for refuge and post-disaster organization, should occupy a place of priority in maintenance and regeneration programs, for they not only represent a crucial resource in a disaster situation, but also a symbolic resource and one of commemoration for the population. Along with growing privatization of public spaces, the creation of new spaces would evidently have to be a priority for the city.

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