

PUBLIC SPACE AND SEISMIC RISK IN MEXICO CITY: A BROKEN RELATIONSHIP?

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ABSTRACT:

September 19th 2015 marks 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. Although no one knows the day and time, experts agree that Mexico City will tremble again and perhaps with a higher magnitude than 1985. Given this latent risk, it is of the 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 an assessment of public spaces involving situations of a possible earthquake are presented here to answer two main questions. What were, 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 while seismic risk persists, public space has diminished in terms of quality and quantity towards 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 First, some spaces have been privatized and have been replaced by shopping malls, and secondly, other spaces are saturated with new buildings in and around public spaces.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 evacuation and organization during a disaster. 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.

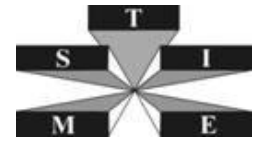
KEYWORDS:

Public space, Seismic risk, Emergency, Mexico City.

1. INTRODUCTION: URBAN FORM AND DISASTER

Traditionally, urban visions of reducing risk have been based on economic, political, sociological or cultural visions (Pelling and Wisner, 2009; 1-16). However, in recent years it has been asked if the urban form can likewise contribute to managing risk in other phases, such as may be the process of recovery in a city, particularly after a disaster in the case of earthquakes (Allan, et. al. 2013). In this manner a new field is emerging, within which the components of the urban form ¹ have been being independently analyzed with regards to the disaster and its different phases to a greater or lesser extent. With regards to urban layouts, for example, it has been shown that the configuration of the streets plays an important role in the emergency stage, above all for purposes of evacuation, or to give accessibility to refuges for victims of the disaster (see Sari and Kubat 2012; Fakhrurrazi and Van Nes 2012 and Dou and Zhan 2011). On the other hand, the configuration of buildings (the constructed space) has been being analyzed to know their vulnerability not just to seismic types of risks (see Guevara, 2009), but also to know how their morphology can allow more or less energetic efficiency

¹ According to Levy (Levy, 1999: 80) urban form is composed of the lot, the street, constructed space and open space.



before new threats such as climate change (Curdes, 2010).

For its part, and in spite of its importance, open space has received less attention with regards to the disaster. However, it has been shown that public space can come to play a crucial role in the resilience and recovery stage after earthquakes. Thus for example, Anhorn and Khazai (2015) 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. For its part, using urban design theories, recovery planning and urban resilience, Allan (Allan & Bryant 2010; Allan and Bryan 2011, Allan et. to 2013) has shown the importance of open spaces after an earthquake. For this author, integration between the urban design and recovery theory is possible if open spaces are considered as a "second city" (Allan, 2010). On the other hand, another group of authors have analyzed the public spaces of commemoration created after a disaster as a form of cultural production for survivors to express their emotions or remember the victims, all as a part of a collective conscience (Webb, 2007: 430-440).

In the framework of this background, the objective of this work is relatively modest and is limited to documenting the function which public spaces performed after the 8.5 Richter scale earthquake in the city of Mexico in 1985. This with the purpose of categorizing spaces according to the function mentioned and generally documenting the changes which have occurred in these spaces today, since we believe that in spite of their importance, the relation 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.

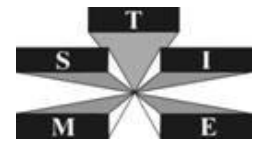
Although only the term "open space" appears in the literature related to this subject, for purposes of this article we understand open space as part of the definition of public space, since according to Lofland (1985:12, in Delgado, 2011:17), we understand public space as "Those areas of the city to 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 have also been the object of study.

Regarding the classification of public space, Carmona (2010:157-173) identifies three dimensions in which the countless typologies which have been created regarding public space could be grouped: typologies derived from a *design perspective* (created from the space's function); typologies derived from *socio-cultural perspective* (based on the types of users of the public space and their perceptions of this space) and last, typologies derived from *political-economic perspectives*, 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 at the end of the article (ibid: 168).

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, since we consider that the functional aspect of public space in situations of disaster momentarily shifts 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 & Stevens (2007: 23, in Carmona, 2010: 166) 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 which 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 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 (Meli, 2002: 125). 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 national territory and almost a third part (31 million in 2010) of the population exposed to this kind of risk (SEGOB / Banco Mundial 2012: 14). 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 (García and Suárez, 1996: 71). In a historic recount of the earthquakes which have caused the most impact, Audefroy (2008: 30-39) calculates 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 (Meli, 2002: 125).

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 relation, however, has been naunched by the historical, political and religious conditions of each era. For example, within these responses, religious practices for the colonial history era (centuries XVII-XVIII) are those which are most documented both in texts as well as oil paintings and votive offerings² (García Acosta, 2001:135). In recent years, public space is the reference framework to illustrate not only the panic among the population, but also the damages which architectural heritage suffered.

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 (García Acosta, 2001: 139). Within the processions, these rituals performed in public space also expressed "a strict hierarchal order. During the colonial era, the viceroy went in front, followed by the clergy (including the diverse religious communities), the members of the City Council and the Royal Court, the royal guard, and finally the place's population" (García Acosta, 2001: 141). Likewise, the intensity of the earthquake occurred is reflected both by the number of people as well as the extension of the route that they followed (ibid. 2001: 144). Practices such as this were no longer observed in the second half of century XIX, which can be explained based on the enactment of the *Reform Laws* (García Acosta, 2001: 139), issued between 1855 and 1863, which separated church from State, promoting secularization of the civil society.

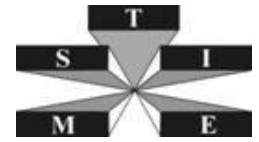
On the other hand, evidences of public shelters opened by the government are found towards the end of century XVIII and above all in century XIX (ibid.: 2001: 252), which cause one to suppose that places such as the *Alameda*³ operated as shelters and a place for storing supplies (ibid: 2001: 253), as occurred after the earthquake of 1858, - calculated with a magnitude of 8 on the Richter scale (Audefroy, 2008: 36; García Acosta, 2001: 305), and documented as one of the most intense during century XIX.

This quick sign reveals that there is information to understand the relation which public space and earthquakes have historically maintained in Mexico, which could constitute a study in itself. However, for earthquakes occurred during century XX and XXI, sources were not found which specifically address the subject, for which, taking the case of 1985, bibliographic sources were recurred 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 we occupied due to 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.

² According to Rodríguez Becerra (1985: 124) A votive offering is "any object offered publicly to a supernatural being as an answer to a favor received, whose donation had been previously promised". A votive offering "describes the miraculous act and the personal information of the beneficiary" (Ibid.: 123).

³ Main historic park of the city of Mexico, whose construction dates from century XVI.



- e) *Localization logic and advantages*: these correspond to the reasons and arguments for which that space was used, which were identified in literature.

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 which have suffered greater changes were subsequently identified along with the causes of these transformations.

3. THE USE OF PUBLIC SPACE IN THE EARTHQUAKE OF 1985 IN THE CITY OF MEXICO

Without a doubt, there are events that leave a mark not only in 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 a case of emergency. For the city of Mexico in 1985, a risk which 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 safe refuge. On the contrary, the street, open spaces, (plazas, parks, gardens) and institutional public spaces were then the safe places of 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 (see Figure 1).

3.1. *The use of streets*

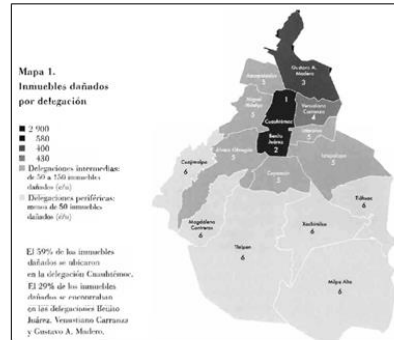
We normally use avenues and streets as communication roads, trajectories that we walk or which we cross in a car, a bus or on a bicycle to travel from one place to another. However, we also socialize in them and, depending on their scale and localization, we remain in them for a few hours; if we are in a neighborhood, they can even be recreational areas. We almost never think about performing all our everyday activities on the street, and much less sleeping in them, given that society says that we must have decent jobs to have a quality home in which to rest; however, we are not exempt from things suddenly changing, and we will then have to use the roads differently.

During the emergency phase in September of 1985, the city was used to its maximum capacity, giving it diverse uses. The streets of different neighborhoods were taken by the citizens, those of colonia Tepito and colonia Morelos were the most significant, given that in spite of the zone being a disaster, their inhabitants remained there, setting up camps close to their crumbled homes in order to safeguard their belongings, but also because there were strong roots to the place. At the same time, it was easy for them not to leave the place due to the fact that they also used the furniture that they could remove from the debris; with the passage of time, these camps became permanent until plans began to be made to reconstruct the city, and blankets could be seen in these streets which expressed the union of the inhabitants before social demands. This was the case of the historical neighborhood Tepito, with blankets that included the message "Tepito is united". However, the so-called "Tepito Plan", which was a reconstruction plan, took more than 10 years to be carried out, thus the permanence of the camps (Aguilera, 2005: 25-39).

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 the moment of the inhabitants' misfortune, given that the dimensions enabled improvised camps to be set up on them by complete families. Such was the case in Paseo de la Reforma (López, 1985) in which the dimensions allowed the only belongings that they had recovered to be placed and in which the openness and transparency of the space should have translated to safety; other avenues used for camps were: Álvaro Obregón or Circunvalación Avenue, which were a few steps from the official shelter in the Venustiano Carranza Sports Complex, in which about 550 people set up improvised camps while waiting for the official appraisal of their homes (Rodríguez, 1985).



Source: <http://www.skyscrapercity.com/showthread.php?t=635866&page=96>



Source: UNAM/PUEC (2005), *20 años después. Los sismos de 1985*. Universidad Nacional Autónoma Metropolitana. Coordinación de Humanidades. PUEC. P. 106.



Source: <http://www.mmh.org.mx>



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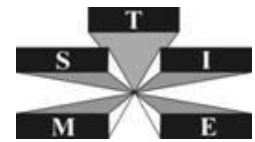


Source: <http://www.excelsior.com.mx/comunidad/2014/10/17/987353#imagen-2>



Source: <http://archivo.eluniversal.com.mx/nacion-mexico/2013/impreso/son-escenario-para-spot-pero-quedan-fuera-de-cruzada-207843.html>

Figure 1. Localization map of the damages occurred during the earthquake of 1985 (top right) and different public spaces used after the earthquake: shelters in squares and streets, search and rescue activities and organization of fatal victims.



The Government also saw the opportunity in these large avenues, for while reconstruction labors were performed in the City of Mexico, the center divider of some roads such as Zaragoza Avenue were used to implement provisional homes ("formal" camps) of twenty square meters each with common services, that is, shared bathrooms and common washing zones. Each camp had an administration (Aguilera, 2005: 37-38); however, they were not formed immediately, but rather until after the city's reconstruction programs began, and with the experience that they would in fact function as they did with the improvised camps; the intersection between Constanca street and Peralvillo is another example in which the government placed sheet metal homes for the people affected (*La ciudad de México en el tiempo*, 2011).

The solidarity of the citizens was shown before the disaster, using the streets not only to set up housing camps, but also to get organized as volunteers with food brigades to feed the people affected; an example of this is the road "20 de noviembre", in the Historical Center of the City, in which a help module for affected people was placed by volunteers who selflessly handed out food and organized help, moved by the misfortune of those who had lost everything (Video *Recorrido por México, temblor de 1985*, 2012: min. 15:50). This phenomenon was repeated in different streets of the city.

Automobile communication roads were not the only opportunity. The old downtown railways were also used to place informal provisional housing, cardboard and plastic camps which later became sheet metal and were even more permanent than those from Tepito, which lasted up to 10 years. In the case of camps such as those of the Atlampa neighborhood on the intersection of Naranjo street and the railroad tracks, they lasted up to 27 years while waiting for housing programs to benefit them (Cruz, 2013).

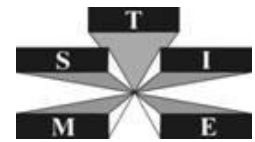
However, the streets were also used to manifest disagreement towards the government, for they did not see help or support from it; an example is the case of the seamstresses in San Antonio Abad and Avenida del Taller, in which they placed camps in protest for them to remove the bodies of their family members. Several well-known companies joined this movement, such as Dimensión Weld, Vestimmarks, Dedal S.A. y Amal (*Express Metropolitano*, 2014: 6-7).

3.2. The use of public spaces

The streets represented an opportunity to remain standing during days of emergency; extensive public spaces and better yet, with services which could be available for the people affected, such as were had by public squares and roundabouts which had lighting just as the streets, but also had enormous fountains and gardens, were used to pass the days before returning home or for those who were waiting to see what would become of their lives.

One of the places with most human and home losses was the Nonoalco Tlatelolco ensemble- However, although in pain, the neighbors had the strength to organize themselves immediately in the "Plaza de las Tres Culturas" to set up camps and prepare food for the people affected (Monsiváis, 2012: 97). Another important place was the "Plaza L. Cabrera" which is in the Roma neighborhood on Zacatecas Street. The "Solidaridad" shelter was placed on that street, in which volunteers fed the affected people, offered medical and psychological help, as well as handed out what was necessary from donations (Video *Terremoto en Mexico*, 2010, min. 8:28-10).

Suddenly, different Squares of Mexico City took on a different life, becoming help, opportunity, life lesson and solidarity centers. For example, "Plaza Tlaxoaque", which was deteriorated, at that moment became a supply center, and there clothes and medicines were received to distribute them there and to other shelters (*La Jornada*, 1985: 6). After this event, this square was born again and was a part of space rehabilitation programs; however, the population was confused and disoriented about where they could go to ask for help, for which orientation and information modules for affected people were placed in public spaces such as "Plaza del Estudiante" in Tepito, in which these places of information were placed in addition to camps (*Comité Supervisor de Ayuda a Damnificados*, 1985).



The main emblematic public space of the city "La Plaza de la Constitución", The Zócalo Capitalino, had several roles during the emergency stage of the 1985 earthquake, for on September 20th of that year after the replica, the people wandered toward the central square seeking something that could possibly be in its surroundings; powers. The last days of September, the Zócalo became a large "free warehouse", for the people went to it in search of clothes and supplies (Monsiváis, 2012: 68-69, 82); the square operated as a center for organizing survivor searches, a supply center, an information center and a place for manifestation. The desperation to receive reports of relatives in misfortune who were among the debris of the collapsed Juárez Hospital made the "Plaza San Pedro" become an information center regarding the bodies or survivors, so several families set up improvised camps in the square where they waited for the reports to be posted on trees with recent names and news (video *Terremoto en México*, 2008, min. 9:38).

The roundabouts could provide attention to different zones, given that their location and radial form had different access routes; on one hand, the "Glorieta de la Fuente de Cibele" which attended the population as a relief, medical and psychological attention post, but also as a shelter for affected people given that it had basic services (Villasana and Torres, 1985); and on the other hand, the "Glorieta del Metro Insurgentes" where information and orientation modules for affected people were placed, as well as supply modules due to the influx that this roundabout presents (*Comité Supervisor de Ayuda a Damnificados*, 1985).

3.3. Institutional public spaces

While people were already organized on the street, the Mexico City Government was as well, turning public spaces, but mainly institutional spaces such as Public Sports Complexes, Delegation esplanades, outside areas of government buildings and even metro stations into strategic places near the disaster so that all affected people could have access and be able to organize the donations well and thus have a record of the actions taken by the State. However, there was not a good response by the citizens affected in every case due to the fact that many people preferred to remain in the bordering streets of their damaged homes, as mentioned previously.

Public sports complexes were those which were easily adapted to the possibilities of serving as shelters and supply centers due to the fact that they had extensive open space to set up camps, but also closed spaces for shelters, supply centers and emergency health centers. Such is the case of the "Magdalena Mixiuhca Sports Complex", which is the largest sports complex in the country and in Latin America, which other than serving as that already mentioned, the dimensions of the hall of weapons allowed it to become the place of distribution of national and international donations to other shelters and distribution centers for the population. Another sports complex which was relevant in its immediate operation after the earthquake of 1985 was the "José María Morelos Sports Complex" in the Colonia Morelos, opened three months prior to the tragedy. It was immediately used as a shelter since it was close to the affected properties (De la Madrid, October 1985). On the other hand, areas which belonged to institutional public spaces, such as esplanades of government buildings, were used after the moments of disaster for camps which would last even longer while the city was reconstructed or while the helpless people were relocated through the housing reconstruction program; the "outside areas of the Legislative Palace of San Lázaro" formed a part of these reconstruction programs, for they adapted their space to set up one of the largest camps of the city. This had 40 rooms of 20 square meters each. The place had drinkable water, drains, electrical energy and gas (Aguilera, 2005: 38); in the case of the "esplanade of the Cuauhtémoc Delegation", information and attention to affected people modules were placed (*Comité Supervisor de Ayuda a Damnificados*, 1985).

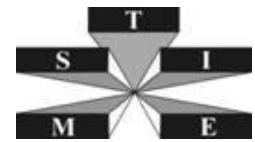
One of the key places during the emergency phase was the Mexico City metro, both in its subterranean facilities as well as the stations; the stations because they were easy for the people to locate and it was where the government decided to place citizen attention spaces to help the affected people, but also information spaces. The key stations were those close to the disaster, such as the Medical Center Station (ibid., 1985), close to fallen hospitals, housing centers and connected by avenues to places in which information about deceased or missing people could be quickly passed. It was close to the baseball stadium of the IMMS, which became the place where the bodies were gathered.



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.

Table I. Types of public spaces according to their relation to the earthquake

Source: Own elaboration based on information from newspaper clips from the time and diverse bibliographic sources (see section 3).



However, not only metro stations were of use; the tunnels of the facilities played a very important role. The central zone of the city of Mexico has a very muddy terrain, therefore special care and attention were given to the construction of tunnels by using a technique called *Milan Walls*, which is carried out with enough steel and cement to support the tunnels. They likewise compensated weights so that they wouldn't move; in such a way that for the emergency 1985, in spite of buildings falling on some stations, the metro facilities withheld and they served to be able to communicate and reach different parts to which there was no access above, such as the metro station Pino Suárez, where the Juárez Hospital had collapsed (Video *National Geographic Mega Ciudades, Ciudad de Mexico*, 2014, min 17: 35).

In total, eight different public spaces used in 1985 were identified (see Table 1). More than ten 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 institutional public spaces. Seen together, it is evident that squares were the spaces with greater capacity to adapt to the different uses, identifying up to eight different uses in them, although it is important to make emphasis on other spaces which due to their particularity enabled other very specific functions, such as metro tunnels. 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.

4. PUBLIC SPACE AFTER 1985: BETWEEN COMMEMORATION AND PRIVATIZATION

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 (see Figure 2). 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" (De la Madrid, 1985; Magadán and López, 1987: 15-22). 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*, a space in which the famous Regis Hotel and the Secretary of the Navy are located, among others. Another one of those spaces is the *Parque del Sol*, 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 (Monsiváis, 2012: 97-98).

While the earthquake of 1985 represented an opportunity to create new public spaces, on the other end were those public spaces which disappeared or were privatized (see Figure 3). One of these spaces was the *Delta Baseball Stadium*, which between 1925 and 1936 was the main area used for baseball games in the city of Mexico (it was known as the "Parque Franco-Inglés"). Posteriorly, 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" (Excelsior, 2014).

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 before the magnitude of the earthquake, for which the "field of the stadium served to stack hundreds of bodies in three tents with signs which said "identified bodies", "Unidentified bodies" and "Remains" (Alanís, 2014). Family members or friends who came close to the bodies had to first go through a cordon sanitaire and were then fumigated (Monsiváis, 2012: 72), 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" (Monsiváis, 2012: 72). In spite of its historic and social value as equipment, 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 and constructed a shopping center called "Delta Park" (Excelsior, 2014).

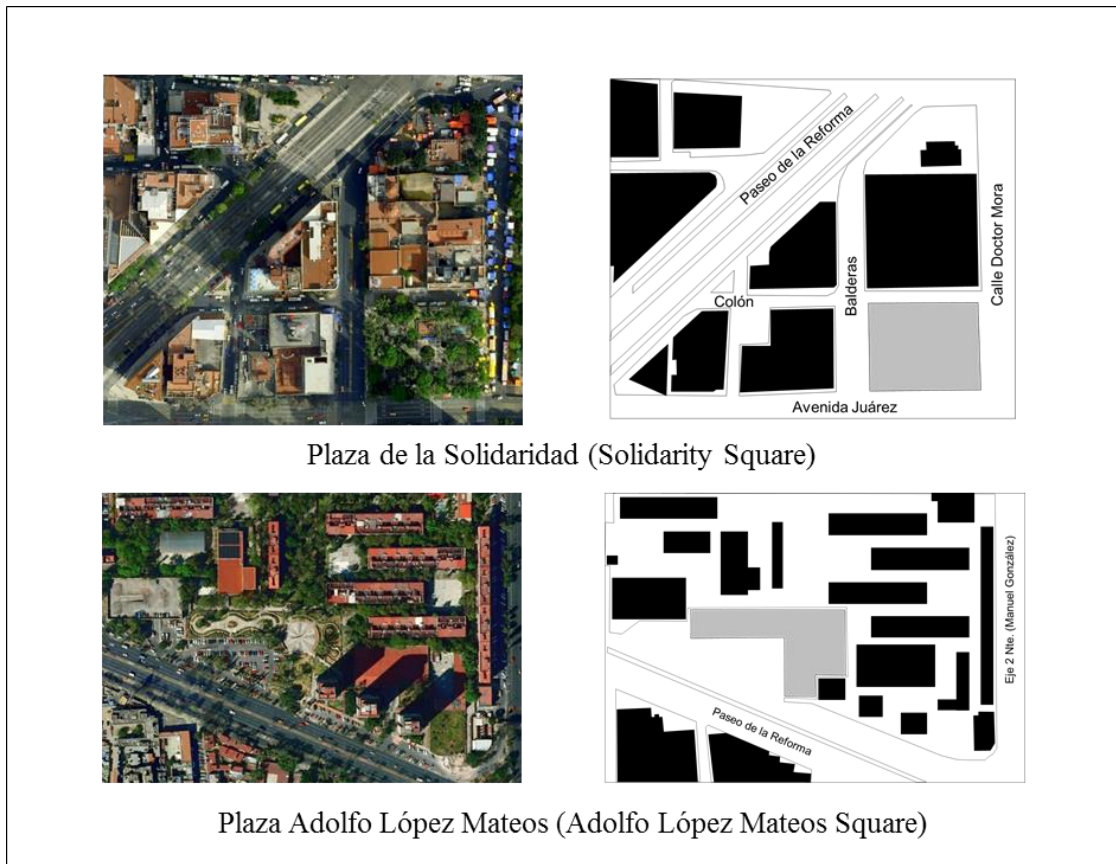
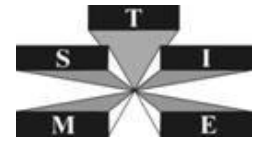
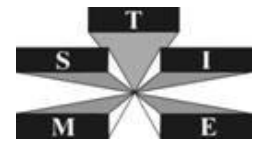


Figure 2. New public spaces created after the earthquake of 1985 in the city of Mexico (marked in gray). Source: own elaboration based on Google Earth



Figure 3. Privatization of public spaces used during the earthquake of 1985 in the city of Mexico. Source: Google Earth



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 1940's and beginning of the 1950's, 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 maximum 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 become urban parks.

The resulting public space was abandoned for ten years and became the passage for people towards the "Medical Center" Metro station. Over time, one of the resulting spaces of the part 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 (Páramo, 2012). The park currently suffers critical deterioration with regards to maintenance of green areas, lack of furniture, insecurity problems and rescue problems of the park in general, for which its neighbors were requesting resources and help from authorities for almost two decades (Páramo, 2012) until three million pesos were finally designated for its rescue in the year 2013 (Delegación Cuauhtémoc, 2013), in addition to other architectonic urban studies for its diagnostic and regeneration managed by the Cuauhtémoc Delegation of the Federal District.

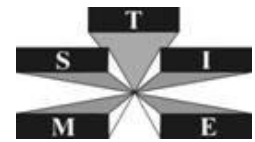
5. CONCLUSIONS

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 make 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 regards 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 which remain for the earthquake of 1985, for much fundamental data could not be consulted or has disappeared from libraries and newspaper libraries, such as localization and type of shelters, without mentioning the discussion which 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, for 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 and another, linked to the previous, due to their roots to the place.

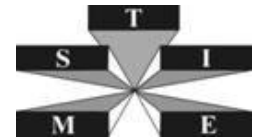
That found in this first approach truly helps to continue dismantling one of the myths that has been formed regarding the reconstruction, which indicates that the official refuges occupied the last place in the people's preferences after a disaster, houses of family or friends being first, followed by improvised refuges, and subsequently transformed buildings (Davis, 1978: 58).

Finally, it is drawn that public spaces, but particularly squares, as places with 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 a growing privatization of public spaces, the creation of new spaces would evidently have to be a priority for the city.



REFERENCES

- Aguilera Gómez, Manuel (2005), "Ensayo Introductorio", In UNAM/PUEC (2005), *20 años después. Los sismos de 1985*. Universidad Nacional Autónoma Metropolitana. Coordinación de Humanidades. PUEC. Pp. 21-56.
- Alanís, Laura (2014), "Parque Delta: de Estadio de béisbol a Centro Comercial". Available on-line at: <http://vivebj.com/parque-delta-de-estadio-de-beisbol-a-centro-comercial/> (Accessed on July 7, 2015).
- Allan, Penny et.al. (2013), "The influence of Urban Morphology on the Resilience of Cities Following an Earthquake", in *Journal of Urban Design*, 2013, Vol. 18, No. 2, 242-262.
- Allan, Penny and Martin Bryant (2011), "Resilience as a framework for urbanism and recovery". In *Journal of Landscape Architecture* / autumn 2011. Pp. 34-45.
- Allan Penny and Martin Brynat (2010), "The Critical Role of Open Space in Earthquake Recovery: A Case Study". In *Proceedings of the 2010 NZSEE Conference*. Available on-line at: <http://www.nzsee.org.nz/db/2010/Paper34.pdf> (Accessed on September 2014).
- Anhorn, J. and B. Khazai (2015), "Open space suitability for emergency shelter after an earthquake". In *Nat. Hazards Earth Syst. Sci.*, 15, 789–803, 2015.
- Audefroy, Joel and Nelly Cabrera (2008), *Riesgos y Vulnerabilidad en la ZMCM. Construcción de modelos geoespaciales*. ESIA-TEC / CONACYT / HIC-AL. México.
- Carmona, Matthew (2010). "Contemporary Public Space, Part Two: Classification". *Journal of Urban Design*, Vol. 15. No. 2, 157–173, May 2010.
- Comité Supervisor de Ayuda a Damnificados. Apartado de Información y Orientación. 18 de octubre de 1985. Consulted document at "Hemeroteca Miguel Lerdo de Tejada".
- Cruz, Alejandro. Periódico "La Jornada en línea". Nota: Inician Trabajos para demoler campamento Atlampa en el DF. 19 de diciembre de 2013. Available on-line at: <http://www.jornada.unam.mx/ultimas/2013/12/19/inician-trabajos-para-demoler-campamento-atlampa-en-el-df-6364.html> (Accessed on August 2015).
- Curdes, Gerhard (2010), "Urban Morphology and climate change. Which morphology can survive?". Paper presented at the 17th International Seminar on Urban Form 2010. Available on-line at: <http://www.isuf2010.de/Papers/Curdes%20Gerhard.pdf> (Accessed on October 2011).
- Davis, Ian (1978), *Arquitectura de Emergencia*. Editorial Gustavo Gilli, Barcelona.
- De la Madrid Hurtado, Miguel (1985), *Cambio de rumbo. "Situación general en la ciudad de México, en relación con los daños causados por los sismos"*. *Crónica del sexenio 1982-1988. Tercer año*. October 1985. Available on-line at: <http://www.mmh.org.mx/nav/node/442> (Accessed on August 2015).
- De la Madrid, Hurtado, Miguel (1985), *Cambio de rumbo. "Efecto de los sismos en la habitación: Programa de Vivienda de Emergencia"*. *Crónica del sexenio 1982-1988. Tercer año*. October 1985. Available on-line: <http://www.mmh.org.mx/nav/node/444> (Accessed on August 2015).
- Delegación Cuauhtemoc (2013), "ALEJANDRO FERNÁNDEZ RAMÍREZ Y GABINETE, CON BROCHA EN MANO, INICIARON TRABAJOS EN EL PARQUE MÉXICO". 19 de octubre de 2013. Available on-line: http://www.cuauhtemoc.df.gob.mx/paginas.php?id=nota&id2=noticias&idnota=115&c=noticias#.VcSwkPI_Ok (Accessed on August 2015).
- Delgado, Manuel (2011), *El espacio público como ideología*. Editorial Catarata. Madrid. P. 12.
- Dou, Kaili, and Quingming Zhan. 2011. "Accessibility analysis of urban emergency shelters: Comparing gravity model and space syntax". Paper presented at the *International Conference on Remote Sensing, Environment and Transportation Engineering (RSETE)*, Nanjing, June 24-26, 2011.
- Express Metropolitano*. (Newspaper), September 23 2014. Pp. 6-7, available on-line at: http://issuu.com/periodicoexpress/docs/metropolitano_316 (Accessed on August 2015).
- Fakhrurrazi and Akkelies van Nes. 2012. "Space and Panic. The application of Space Syntax to understand the relationship between mortality rates and spatial configuration in Banda Aceh during the tsunami 2004". *Proceedings: Eighth International Space Syntax Symposium*. Edited by M. Greene, J. Reyes and A. Castro. Santiago de Chile: PUC, 2012.
- García Acosta Virginia (2001), *Los sismos en la historia de México*. Tomo II: *El análisis social. Estudios de caso: Irene Márquez Moreno y América Molina del Villar*. Universidad Nacional Autónoma de México, Centro de Investigaciones y Estudios Superiores en Antropología Social, Fondo de Cultura Económica. México.



- García Acosta Virginia y Gerardo Suárez Reynoso (1996), *Los sismos en la historia de México*. Tomo I. Universidad Nacional Autónoma de México, Centro de Investigaciones y Estudios Superiores en Antropología Social, Fondo de Cultura Económica. México.
- Guevara Pérez, Teresa (2009), *Arquitectura moderna en zonas sísmicas*. Editorial Gustavo Gili.
- La ciudad de México en el Tiempo*. November 05 2011. Available on-line at:
<https://www.facebook.com/laciudaddemexicoeneltiempo/photos/a.187540277934667.39304.187533597935335/289272561094771/?type=3&permPage=1>
- La Jornada*, (Newspaper), *Sección El País*, pp. 6. 20 de septiembre de 1985. Consulted at “Hemeroteca Miguel Lerdo de Tejada”.
- Levy, Albert (1999), “Urban Morphology and the problem of the modern urban fabric: some questions for research”. In *Urban Morphology* (1999), 3 (2), 79-85.
- López, Saúl. Nota: “Las casas de campaña ubicadas en sitios inadecuados”. Newspaper “El Universal”. October 18, 1985.
- Magadán Marcelo and Francisco López Morales (1987), “El sismo de 1985 en México: destrucción y reconstrucción”; *Boletín de Medio Ambiente y Urbanización*; Comisión de Desarrollo Urbano y Regional, CLACSO; Buenos Aires. pp. 15-22. Available on-line at: <http://www.magadanyasociados.com.ar/pdf/CU6.pdf>. (Accessed on August 07 2015).
- Meli, Roberto (2002), “El sismo de 1985 en México”, en Lugo Hubp, José and Moshe Inbar, eds. (2002), *Desastres Naturales en América Latina*, Fondo de Cultura Económica, pp. 125-146.
- Monsiváis, Carlos (2012), “No sin nosotros”. *Los días del terremoto 1985-2005*. Ediciones Era. México.
- Páramo, Arturo (2012), “Parque Ramón López Velarde; exigen rescate desde hace 17 años”. *Excelsior*. July 26, 2012. Available on line: <http://www.excelsior.com.mx/2012/07/26/comunidad/850086> (Accessed on August 2015).
- Pelling, Mark and Ben Wisner, editors (2009), *Disaster Risk Reduction. Cases from Urban Africa*. Earthscan, London. Pp. 1-16.
- Rodríguez Becerra, Salvador (2003), “Formas de la religiosidad popular. el exvoto: su valor histórico y etnográfico”. En Alvarez Santaló, C, Ma Jesús Buxó i Rey, Salvador Rodríguez Becerra (coord), *La religiosidad popular*. Antrophos Editorial. 1989, segunda edición, 2003. Barcelona. Pp. 123-142.
- Rodríguez, Juan, Nota: “A 30 días del sismo, aún operan 63 albergues y 78 campamentos”. Newspaper “El Universal”. October 19, 1985.
- Sari, Firat and Ayşe Sema Kubat. 2012. “*Syntactic properties of evacuation and access routes in earthquake vulnerable settlements*”, *Proceedings: Eighth International Space Syntax Symposium*. Edited by M. Greene, J. Reyes and A. Castro. Santiago de Chile: PUC, 2012.
- SEGOB / Banco Mundial (2012), *El Fondo de Desastres Naturales de México-Una Reseña*. Banco Internacional de Reconstrucción y Fomento / Banco Mundial. Available on-line at: http://www.proteccioncivil.gob.mx/work/models/ProteccionCivil/Almacen/fonden_resumen_ejecutivo.pdf (Accessed on August 2013).
- Video *National Geographic, Mega ciudades, Ciudad de México*. Minute 17:35 published on Januar 31 2014 at: <https://www.youtube.com/watch?v=ss6hg9Q0qRs#t=1062> (Accessed on August 2015).
- Video *Recorrido por México, temblor de 1985*, minute 15:50, published on May 20, 2012 at: <https://www.youtube.com/watch?v=9oZKg5rXjRM&list=PL7YvFXeftTz7OqUnQNKLnV8CmUFc3Ztlp> (Accessed on August 2015).
- Video *3/7 Terremoto en México 19 de Septiembre de 1985*, minute 8.28-10. Published on September 29, 2010 at: https://www.youtube.com/watch?v=pG_3KR7bnAc (Accessed on August 2015).
- Video *Terremoto en México- 1985*, minuto 9:38. Published on December 22 2008 at: <https://www.youtube.com/watch?v=rx-X2BYs03o> (Accessed on August 2015).
- Villasana / R. Torres. 1985. Photo. *Centro de Acopio en la fuente de Cibeles*. Available on-line at: <https://www.facebook.com/laciudaddemexicoeneltiempo/photos/a.187540277934667.39304.187533597935335/630576156964408/?type=3&permPage=1> (Accessed on August 2015).
- Webb, Gary R. (2007), “The Popular Culture of Disaster: Exploring a New Dimension of Disaster Research”. In *Handbook of Disaster Research*, Havidan Rodríguez, Enrico L. Quarantelli, and Russell Dynes, eds. (2007), Pp. 430-440. Springer, New York.