

SOCIAL CAPITAL IN LOW-INCOME NEIGHBORHOODS IN THE FACE OF FLOODS: CASE STUDIES IN MEXICO CITY, MEXICO

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ABSTRACT

The purpose of this article is to explain the relationship between social capital and flood risk in low-income neighbourhoods, based on two case studies within Mexico City: Peñón de los Baños in the borough of Venustiano Carranza, and the collective housing units of La Colmena and Ermita Zaragoza in the borough of Iztapalapa. The starting point of this research was that social capital in the face of disasters is the network of relationships established by individuals belonging to a neighbourhood, district, or town, which helps them to carry out preventive and mitigation actions in the face of adverse events such as floods in this case. Methodologically speaking, three forms of social capital were used as categories of analysis: bonding, bridging, and linking, for which questions were posed to key stakeholders through interviews. The case studies are based in low-income neighbourhoods with historical flooding issues; therefore, existing relationships between inhabitants and the way they act in flood prevention and emergency response actions were analysed. The results show the existence of a time-space relation that determines the extent of social capital. In other words, areas with historical flooding problems and areas with a larger territorial extension (Iztapalapa) tend to have greater social capital, whereas areas where severe flooding is more recent and there are fewer affected people (Venustiano Carranza) have a developing social capital. It is concluded that social capital has a direct impact on flood prevention and emergency response actions, and that inhabitant networks with better social capital are better prepared to collectively face any risk of disaster.

Keywords: social capital in the face of disasters, flood risk, low-income neighbourhood, joint actions.

1 INTRODUCTION

Climate change has had a meaningful impact during the first two decades of this century. Seasons, heavily marked in the past, now display unpredictable behaviour. Climate change, among other factors, has contributed to floods in several areas in Mexico City. Floods not only adversely affect roads but also housing and inhabitants.

Over the years, floods have been striking Mexico City. It is a problem faced by a large part of society every year and goes back to the pre-Columbian era. Attempts have been made to handle this problem but have failed to solve it. Unfortunately, the government does not get fully engaged in low-income areas, and inhabitants do nothing to remedy the damage. So, inhabitants only wait for the water to come down alone.

The phenomenon giving rise to this research involves flood risk in its different phases (precaution, prevention, mitigation, preparedness, emergency response, recovery, and reconstruction) and its relation to the efforts made by the community through cooperation and collaboration. Actions taken by the community depend on the relationships they have with their surroundings. This is called social capital.

Using social capital as the main concept, the following question is put to explain the relationship between social capital and flood risk in low-income neighbourhoods in Mexico

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City: “What is social capital like in the face of flood risk in low-income neighbourhoods in Mexico City?”

According to the general theory of social capital in the face of disasters, there are three forms of relationships that help society in taking actions toward mitigating the risk of disaster: bonding, bridging, and linking (Woolcock and Narayan [1]). Additionally, social capital is noticeably important depending on the following closely related factors: social trust level, social networks, and norms (Nakagawa and Shaw [2]). Using these factors, the degree of social capital of a given group is established.

This research was based on the following hypothesis: “Social capital strengthens prevention and emergency response actions in the face of floods”. The hypothesis was proven by performing a qualitative research study based on interviews conducted on key stakeholders in the case studies of Peñón de los Baños in the borough of Venustiano Carranza and the collective housing units La Colmena and Ermita Zaragoza in the borough of Iztapalapa.

Results show a conclusive relationship between social capital in the face of disasters and the actions that help mitigate flood risks in the prevention and emergency response phases. When a community, neighbourhood, or district has a higher level of social capital, organized actions are triggered to face floods.

Time also affects how social capital develops. For instance, in a community where floods have been striking for more than 50 years, social capital in the face of disasters would tend to be higher (Iztapalapa case study) than in a place where floods have been striking for ten years (Venustiano Carranza case study). There are also other elements involved, such as people’s idiosyncrasies, and the geographical region of the settlement, not so much the socioeconomic status.

2 SOCIAL CAPITAL IN THE FACE OF DISASTER

The social capital of a community can be used for many purposes: road improvement, calls to choose leaders, organization of assemblies and committees, use of resources to solve shared problems. Thus, social capital takes part when a disaster occurs. By using the social networks available in their community, inhabitants can organize to act upon a given disaster.

The first step towards learning this social capital is checking for organizations in a community, then identifying communal activities undertaken by the community in the face of disasters as such disasters occur, and finally observing people’s engagement in the face of a disaster risk.

For a community to have several social groups is a good sign of such a community’s social capital in the face of disasters, although there are other important elements that must be taken into consideration, such as learning if the activities of those groups include an interest in collaborating in actions in the face of different risks (Soares and Murillo-Licea [3]), namely flood risk, for this research.

2.1 Types of social capital in the face of disasters

Social capital in the face of disasters is mainly seen in emergency situations and not before, as during such situations all the social network resources of the affected people are mobilized. Being in an awkward and adverse situation forces the affected people to act jointly, and not alone, to get the best results. Social capital is crucial when, for instance, a community gets isolated or out of reach (there is no electricity or land access), because the affected people solve problems as they occur.



Woolcock and Narayan [1] and Nakagawa and Shaw [2] agree on the fact that there are three forms of social capital: bonding, bridging, and linking social capital (Table 1).

Table 1: Forms of social capital. (Source: Woolcock and Narayan [1]; Nakagawa and Shaw [2].)

Form of social capital in the face of disasters	Description
Bonding	Ties among family, friends, neighbours, and people living in the same territory.
Bridging	Ties among people from different cultural backgrounds, but a very similar economic situation. Ties may also be among different districts.
Linking	Ties between the community and key or influential stakeholders. For example, between the government and a district association.

2.2 Prevention actions in the face of floods

Prevention actions encompass every action taken in advance of a disaster (namely, floods for this research), in order to mitigate damages. These actions may be taken by the inhabitants of a given area, working people, the government, private companies, schools, etc. Prevention actions may be taken both individually and jointly.

2.3 Emergency response actions in the face of floods

Emergency response actions include every action undertaken during a flood, mainly to save human lives in the affected place; these actions also include trying to save people's property. During a flood, human lives may get lost, housing and streets may be damaged, electricity and water may be cut off, inter alia.

3 CASE STUDIES

In this research, the relationship between social capital and floods has been discussed, which has led to the creation of analysis diagrams applied to case studies by performing a qualitative research study.

Data was collected by interviewing key stakeholders in case studies. These stakeholders were inhabitants, leaders, and working people. Four interviews were conducted in Peñón de los Baños, and four interviews were conducted in the collective housing units La Colmena and Ermita Zaragoza, in both cases to key stakeholders. The people interviewed in Peñón de los Baños were the main town chronicler of Peñón de los Baños, the supporting town chronicler, a postdoctoral student, and a working person. The people interviewed in the collective housing units La Colmena and Ermita Zaragoza were a neighbourhood committee officer, a leader, a merchant, and a housewife. Interviews were conducted through WhatsApp, Zoom, and phone calls due to the COVID-19 pandemic in May–June 2021.

3.1 Peñón de los Baños

Peñón de los Baños is a town located in the borough of Venustiano Carranza, next to the International Airport, to the east of Mexico City. It is one of the two native towns in the district, and its land use is residential. An insufficient drainage system, which tends to get



plugged by garbage and by a volume of water larger than the cubic meters it can manage, causes the lower areas of the neighbourhood to flood on both sides of one of the main highways in the city (Circuito Interior) (Fig. 1).

This area was chosen for this research because significant flood problems occur every year. Therefore, alternatives need be found to mitigate damage to houses and protect lives.

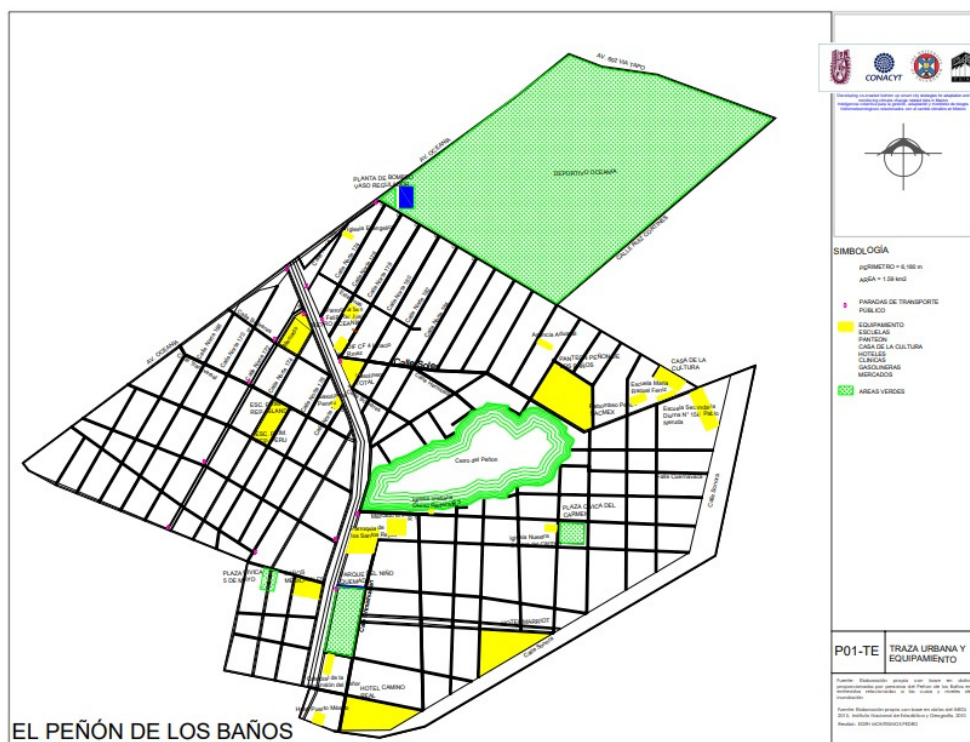


Figure 1: Map of urban layout and utilities of Peñón de los Baños in Mexico City.

3.2 Collective housing units La Colmena and Ermita Zaragoza

Built in the 1970s, these collective housing units are in the borough of Iztapalapa, to the east of Mexico City, and are adjacent one to another. These neighbourhoods were planned as social housing for people who were living in dangerous zones of the city and dealing with continuous disasters. The neighbourhoods are next to each other and are only divided by a large avenue (Sentimiento de la Nación). In La Colmena, floods occur throughout the entire housing unit, while in Ermita Zaragoza, there are four specific zones capable of getting flooded, towards the centre and the south of the housing unit (Fig. 2).

4 PRECIPITATION IN THE CASE STUDIES

The boroughs of Venustiano Carranza and Iztapalapa show differences in precipitation levels: the maximum level reached in the case studies of Iztapalapa, in a day, was 58 mm, while in the case study of Venustiano Carranza, it was 27 mm.

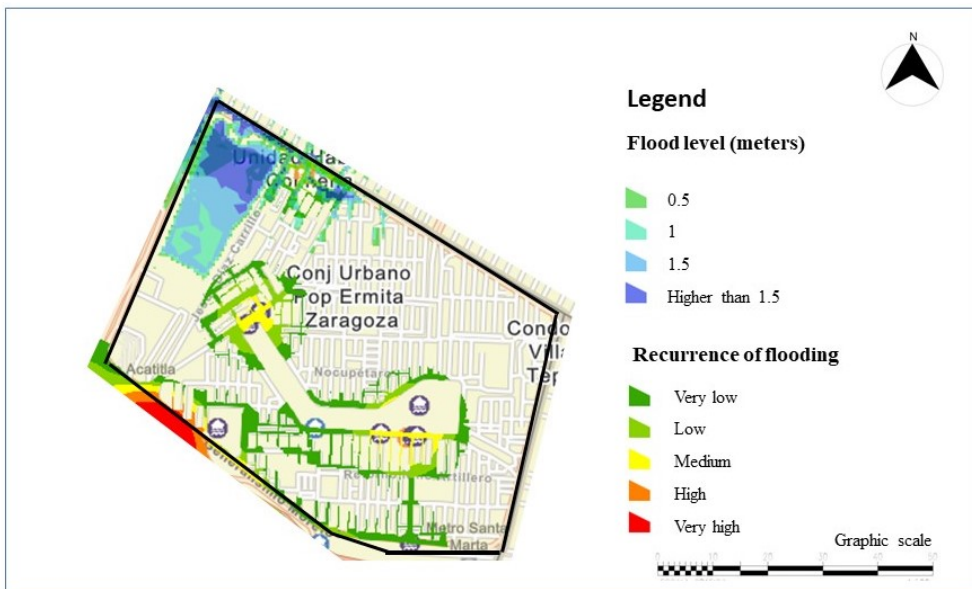


Figure 2: Locations of flood zones U.H. La Colmena and Ermita Zaragoza in Mexico City [4].

Precipitation behaviour is different concerning floods in both case studies. This is due to their geographic situation: Peñón de los Baños is settled on a hill where rainwater runs from the top to the lower parts, and La Colmena and Ermita Zaragoza is a land that is almost flat and gets flooded when the drainage collapses.

Flooding areas in Iztapalapa are larger than the ones in Venustiano Carranza. This is because their terrain and their maximum levels of precipitation are different.

5 MEASURING SOCIAL CAPITAL: METHODOLOGY

To understand the social capital for our case studies, social networks and relationships among inhabitants were identified. It was also necessary to identify how social capital relates to prevention and emergency response actions. That is the backbone of this research, and by studying it, it was possible to learn how the inhabitants face the flooding problem. For this measuring, interviews were conducted posing questions regarding three sub-variables of social capital: social trust level, social networks, and norms, which correspond to each level of social capital in the face of disasters: bonding, bridging, and linking. Thus, three questions were asked for each sub-variable, i.e., a total of nine questions. Due to the pandemics, the interviews were conducted through WhatsApp calls in May and June 2021.

5.1 Social trust level

Social trust level shows how confident is each person in the people around them, which leads to a certainty that things and events will happen, that a situation will or will not be positive, or that a person will act as they should (Serrano Rodríguez [5]). This series of questions is to learn how much people trust each other in the case studies, who are the more trustworthy and dependable people, and how much they trust the government.

5.2 Social networks

A social network is a structure made up of a group of people who exchange ideas and connect based on their values and interests in common (Portela [6]). This is a sub-variable that allows learning what structure is available in the case studies and how important is the use of internet social networks (Apps) concerning prevention and emergency response topics.

5.3 Norms

Norms help people manage their behaviour and provide tools that lead people to act appropriately in their daily lives. Through this sub-variable, it is possible to understand the norms of organizations and social groups and the way these norms affect social capital, to learn what inhabitants do when such norms are not met, and to document how their leaders and heads are elected and how their resources are used.

5.4 Prevention and emergency response actions

These actions are how people mitigate possible repercussions in the face of a flood. It is the way each person reacts and acts in the face of risk, helping people suffer less damage to their homes and their surroundings. This was used to know how people get along and what actions they perform to mitigate the flood risk in the emergency response phase during a flood, and to know what they are not doing and what they are lacking to reduce damage more effectively.

Questions were posed on *prevention actions in the face of floods and emergency response actions in the face of floods* relating each question to the level of social capital in the face of disasters (bonding, bridging, and linking), which means three questions were made per sub-variable.

5.4.1 Prevention actions in the face of floods

These are actions taken beforehand and painstakingly to prevent floods from adversely affecting much when they occur (CENAPRED [7]). This sub-variable helped us know the activities taken jointly by the residents of the case studies and how effective those activities were. A series of questions are posed to know what collective prevention actions in the face of floods are taken by the inhabitants.

5.4.2 Emergency response actions in the face of floods

These are actions taken during a disaster, flood in this case, that help affected people to overcome it (CENAPRED [6]). It is a decisive time that shows the time a crisis would last, so it is important to know how residents react, what they do jointly, whether they receive assistance from the government and agencies, inter alia. A series of questions are posed to know what collective emergency response actions in the face of floods are taken by the inhabitants.

6 RESULTS

Data collected from the interviews were analysed using ATLAS.ti, which is a computer software mainly designed to help search and analyse qualitative data (H-Luz [8]). In this way, very specific answers could be obtained for each sub-variable through the interviews. Then, by arranging the data, the main concepts were classified.



6.1 Social capital in the face of floods

Using the interviewees' answers, open coding was carried out. For the variable of social capital, the following are the results (Table 2).

Table 2: Interviewees' answers in the case studies [8].

	Sub-variable	Results in the case of studies	
		Peñón de los Baños	La Comena and Ermita Iztapalapa
1	Trust in neighbours	Good relationship	Good relationship
2	Trust in leaders and workers	Poor relationship	Good relationship
3	Trust in the government	Average relationship	Average relationship
4	Social networks with neighbours	Non existing	Non existing
5	Social networks with leaders and workers	No social groups	Some social groups
6	Social networks with the government	No participation	Average activities
7	Norms with neighbours	"Servants proclaimed by themselves"	"Dubious elections"
8	Norms with workers	No interest in taking part	Only individual actions
9	Norms with the government	Few resources	Few resources
10	Prevention actions with neighbours	None	None
11	Prevention actions with workers and leaders	None	None
12	Prevention actions with the government	Few actions	Few actions
13	Emergency response actions with neighbours	None	Some actions taken
14	Emergency response actions with workers and leaders	Few actions	Few actions
15	Emergency response actions with the government	Few actions	Few actions

6.1.1 Peñón de los Baños

For the social trust level, the neighbours say there is indeed trust, and cooperation and collaboration, so it is a good relationship. However, neighbours and workers in the area say there is no trust between them, and they do not come together, and they can only tell if they are either neighbours or workers, hence the relationship is poor. Trust with the government is average, meaning there is little relationship and interest by the authorities, and people stress that collaboration is forced.

Regarding social networks among neighbours, there is much apathy towards taking part in them, so neighbours do not belong to social networks. The same situation applies to

workers. Hence, social networks for both levels (neighbours and workers) may be classified as poor. Social networks with the government are limited and are described as average. This means there is room for improvement across all the levels of this variable.

Regarding the sub-variable of norms among neighbours, as per the analysis, there is no organization when holding elections, and representatives of streets and neighbourhoods proclaim themselves. Workers in the area show a lack of interest in involving in the neighbourhood norms. Therefore, for these two levels, norms are poor. As for the government, it is little involved in any events in favour of democracy and not many norms concerning floods, so this sub-variable is average.

6.1.2 Collective housing units La Colmena and Ermita Zaragoza

For the social trust level, the relationship is good as the neighbours have a good personal relationship and carry out continuous activities against floods, which is essential for the cooperation and collaboration among them. With the workers in the area, inhabitants also have a good relationship as there is some collaboration, including picking up garbage from the streets. However, with the government, social trust is found average as most of the times collaboration between inhabitants and the government is forced, and there are conflicts in issues concerning floods.

For the social networks, neighbours belong to at least one social group and communicate using WhatsApp when a flood happens, which means communication is good. Workers also belong to a social group, such as the Community Participation Committee. The government is in contact with the inhabitants in the area, which shows its belonging to social groups. In case of a flood, people approach the government to try to do something, so this sub-variable is classified as good.

For the sub-variable norms, the neighbours say there is no democracy and elections are always dubious. Workers do not collaborate with the norms in the place and act individually, so norms are poor in these two levels. The government does not collaborate much on these norms and provides materials, such as kits for picking up garbage from the streets and desilting the drainage, so this sub-variable is classified as average.

6.2 Prevention and emergency actions

For the variable of prevention and emergency response actions, the following are the results.

6.2.1 Peñón de los Baños

At the bonding level, in the prevention phase, there are no actions taken among neighbours, and they often act individually. The same happens in the emergency response phase, as there is no coordination by the stakeholders.

At the bridging level, in the prevention phase, there are no actions taken by the workers of the area. The interviewees say there is a lack of environmental education and empathy. However, in an emergency, actions are taken, mainly consisting of sweeping the puddles near stands or shops.

At the linking level, in the prevention phase, there are a few actions taken by the government, such as picking up garbage and desilting drains. In an emergency, actions are taken, i.e., desilting drainage and picking up garbage from the streets. Collaboration is reported to be forced at this level because the relationship with the government is not a good one.



6.2.2 Collective housing units La Colmena and Ermita Zaragoza

At the bonding level, in the prevention phase, there are no actions taken among neighbours. Neighbours do not cooperate because they say floods are out of their reach since the drainage has collapsed. However, in an emergency, they do take actions, consisting of cooperation mainly by putting sandbags outside their homes, desilting drainage, and picking up garbage from the streets.

At the bridging level, in the prevention phase, workers fail to take any actions jointly, as they do everything individually according to the situation in their working areas. In an emergency, they do take actions, such as sweeping puddles and removing garbage from their areas, but they do it individually and never jointly.

At the linking level, in the prevention phase, few actions are taken by the government, and there is cooperation with the inhabitants; sometimes streets are swept and drainage desilted. In an emergency, few actions are taken such as desilting drains with a desilting truck and picking up garbage from the most affected streets. Inhabitants and workers collaborate, but it is a forced collaboration. Normally, the government only speaks to zone leaders and/or representatives of the place.

6.3 Social capital and actions

Concerning the two study variables: social capital in the face of disasters and actions taken in the prevention and emergency response phases, these are the results.

6.3.1 Peñón de los Baños

Social capital in the face of disasters in this case study is poor; however, there are some signs of social capital, so it may be deemed in development.

The degree of social capital is directly related to prevention actions. At the bonding level, despite the trust among the closest people, no prevention or emergency response actions were found since there are not any social networks or norms governing their relationships. At the bridging level, trust, social networks and norms are poor, and some emergency phase actions are taken. At the linking level, there is an average social capital for the three sub-variables, which results in some prevention and emergency response actions (Table 3).

Table 3: Social capital and actions in Peñón de los Baños [8].

Social capital in the face of disasters in Peñón de los Baños				Actions	
	Social trust level	Social networks	Norms	Prevention	Emergency response
Bonding	Good	Poor	Poor	Non existing	Non existing
Bridging	Poor	Poor	Poor	Non existing	Few
Linking	Average	Average	Average	Few	Few

There is no doubt there is a relationship between social capital and actions taken in the face of floods. Little capital is proven to lead to few actions in its three forms. However, even if there are many complaints brought by the inhabitants to the government, the government is actually the one performing the most actions in the face of floods. This is easy to understand, as the government is responsible for protecting people's lives and property and has more tangible resources to face floods, such as trained staff, vehicles, equipment including brooms, picks, shovels, and wheelbarrows.

6.3.2 Collective housing units La Colmena and Ermita Zaragoza

For the case studies of the borough of Iztapalapa, concerning the two study variables: social capital in the face of disasters and actions taken in the phases of prevention and emergency response, the results are the following.

Social capital in the face of disasters in these case studies is average, and there are signs that it may develop fast.

At the bonding level, there is trust and social networks, and, even if norms are poor, existing relationships at this level cause actions to be carried out in the emergency phase. At the bridging level, there is trust and social networks; however, no actions are taken for prevention or emergency response. At the linking level, there is trust, social networks, and norms, which explains why there are prevention actions, and emergency response actions as well, even if these are few (Table 4).

Table 4: Social capital and actions in La Colmenta and Ermita Zaragoza [8].

Social capital in the face of disasters in collective housing units La Colmena and Ermita Zaragoza				Actions	
	Social trust level	Social networks	Norms	Prevention	Emergency response
Bonding	Good	Average	Poor	Non existing	Existing
Bridging	Good	Good	Poor	Non existing	Non existing
Linking	Average	Good	Average	Existing	Few

In this case studies, the population belongs to a type of social network, which makes it easy for them to organize to perform actions. Furthermore, social trust levels are good, which helps ties to strengthen. People have issues with norms because of a lack of clarity on such norms and a lack of knowledge on their part. However, this sub-variable, along with the other two, may change for the better, because the population is more receptive and empathic as compared to the first case study. In these case studies, people often are more committed to a common good and are willing to participate. People say they feel concerned for their surroundings and, even if they cannot always attend meetings due to their occupations, they try to keep up to date through groups in different virtual applications. Representatives exercise more leadership and often demand more from the government than in the Venustiano Carranza case study.

7 CONCLUSION

The degree of social capital influences directly on prevention and emergency actions. On the one hand, the common welfare, the interest in participating in collective actions, communication at different levels, relationships between neighbours and with authorities, as well as belonging to digital social networks are aspects that reveal a consolidated social capital directly related to a greater community participation facing the effects of floods. On the other hand, the apathy for organizing from the nearby communities, up to the communication and collaboration with different authorities, expresses an incipient social capital that results in the inexistence of prevention and emergency actions regarding floods events. In addition, the development of social capital is affected by the seniority of floods.

In Iztapalapa, as it is a place where floods have been occurring for a longer period of time, there is a greater social capital; unlike the case study of Venustiano Carranza, where rainfall has been less severe and recent, and where social capital is incipient.



The case studies of popular neighbourhoods in the municipalities of Iztapalapa and Venustiano Carranza in Mexico City, contribute to the understanding of the importance of strengthening social capital to better cope with flood risk. The population needs to have more empathy with their immediate and suburban neighbours in order to develop social capital. In the strengthening of relationships, the initiative of the inhabitants is of great importance; this transformation will influence a rapprochement with the authorities. By being organized, they will be able to prevent and mitigate future floods in partnership with the authorities.

For further research, it would be essential to analyse the relationship between social capital, flood prevention and emergency actions in more representative samples of the directly affected population and so of the suburban territories, as well as to know the perception of the institutions related to flood risk at different territorial levels.

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