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The Importance of Public Space for Sustainable Urban Rehabilitation

Stream: Building Processes

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ABSTRACT

This study aims to reinforce the linkages between researches on urban planning and disaster risk management, through the clarification of the importance of public spaces for the improvement of disaster prevention planning.

Contemporary urban environments are presently facing preponderant challenges related to urbanization trends, which often result in urban vulnerability, with particular concern concerning expression in developing countries. Thus, there is a need to integrate resilience in the resolution of urban challenges faced in architecture and urban planning. In addition, there is an increasing need for research on and building projects promoting resilience of urban spaces through vulnerability reduction and reinforcement of resilience capabilities in urban environments. Japanese urban history is marked with the occurrence of numerous natural disasters, and presents a “mature” experience in disaster risk management process, with remarkable lessons for sustainable development towards urban resilience. However, in Japan, the importance of public space towards the construction of resilient city remains unrevealed. Despite the latest trend of diversification of public spaces typologies in this country, their link with resilience literature has not been revealed. This paper attempts to elucidate the extent to which the preponderance of small and medium public spaces in dense, urban areas lead to urban resilience, focusing Kobe and Tokyo cities as study cases. It will also provide new, improved factors for decision-making processes and to urban design codes in Japan, as in another countries. The main goal of this research is to establish a new bridge between research on public spaces and resilience, towards its future incorporation as a complex requirement of urban environments.

Keywords Public Space, Urban resilience, Urban Planning, Management/Disaster Prevention in Japan, Tokyo, Kobe.

1 Introduction

Many things that we know today are about to change. For the first time in history in 2008, more than half of the world population lives in urban areas (UN-DESA 2007). In addition, due to the present changes, as global warming and the increase of registered natural disasters in the last three decades (CRED, EM-DAT 2009), urban environments became particularly complex, increasing the need of interdisciplinary perspectives to understand urban problems. The cities of the 21st century are facing intense challenges; due to urban population growth resulting in significant urbanization pressures and growth of disqualified land use occupations, which often addresses high urban vulnerabilities (UN- Habitat 2003; Wisner *et al.* 2004). Such scenario is particularly concerning in developing countries, where urban population growth ratio is higher than in developed countries (UN-DESA 2007), where urban population had its “explosion” in the 20th century. Densely populated and unplanned urban environments are synonymous of vulnerable cities. Therefore, NOW (more than anytime ever before) there is a strong need to rapidly and efficiently affirm urban sustainability in the resolution of challenges faced in architecture, urban management, and urban planning. Sustainable urban rehabilitation must enlarge its action field, toward resilient solutions to natural disasters, through the minimization of vulnerabilities and reinforcement of resilience capabilities in urban environments. Thus, disaster-prone cities with high population density ratios, located in developed countries must present an example of urban development to other cities facing similar challenges in developing countries. Such example can be stated through, not only, strategical and

institutional frameworks, but also through physical measures adopted to develop natural disaster resilience capabilities (Wisner *et al.* 2004), in the several stages of disaster risk management/disaster prevention. Several Japanese cities are among such examples. Japanese urban history is particularly related with the occurrence of destructive events (Seidensticker 1990). In Edo period (from 1603 to 1868), many open public spaces in Tokyo were created to offer relief to overcrowded urban areas, but also to provide refuge from frequent fires (Jinnai 1995). Such experience represents in one hand, an important basis for the development of sustainable rehabilitation; and in another a remarkable lesson in the field of disaster prevention, to many other countries.

Regarding mitigation, preparedness, response, recovery and reconstruction measures in urban environment, where Japan presents to be an example of matured experience it is still important, as a challenge for sustainable urban rehabilitation, to clarify what is the importance of open public spaces, of small and medium dimension located in densely built neighbourhoods, toward a more disaster resilient city. Although there has been an increasing innovation regarding new uses and typologies of urban open public spaces in Japan, especially in Tokyo; the clear link between such interventions and disaster prevention remains unravelled. The examination of the importance of small and medium urban open spaces toward urban resilience, and their consideration in disaster prevention planning is the main aim of this research, as a first step attempt to provide a basis to new and improved notions to decision-making processes and to urban design codes, in Japan as in another countries.

I. I Purpose of the Study

As many things are about to change, the pressure over urban environments tends to increase, with the challenging requirement of sustainability and response to the necessities of a growing world urban population. The exposure risk to natural disasters is increasing everywhere in the world, due to climate change or simply due to the increasement of urban population in disaster-prone areas (Bosher 2008). Therefore, the present time presents an unprecedented need to affirm urban sustainability in the reinforcement of disaster resilient urban environments.

Japanese cities comproved a broad experience regarding disaster prevention due to its historical connection with disasters of various natures. Such experiential background places Japan as an example to other world nations, facing similar trends. In addition, interesting interventions in Japan, as pocket parks and urban farming suggest a growing concern, regarding the functionality of small and medium open public spaces. However, it still remains a challenge to strengthen the technical articulation between sustainable urban planning and disaster prevention, as to elucidate the importance of urban elements, with public utility, toward the minimization of vulnerabilities and reinforcement of resiliency in densely built neighbourhoods, through their integration in disaster prevention planning. Hence, the purpose of this research study is to examine the importance and consideration of small and medium open public spaces (with less than 1000sqm), located in densely built residential areas, for disaster prevention planning in two major disaster-prone cities in Japan, Tokyo and Kobe.

The reason to focus small and medium open public spaces: In the logic of agglomeration-related risk (Flüchter 2003), there are significant problems related with the accessibility to designated evacuation areas from inner areas of densely built neighbourhoods, emphasizing the need to integrate small and medium open public spaces in disaster prevention. In contrast designated evacuation areas, small and medium open public spaces are often located within dense residential areas, providing potential for development of spatial distribution strategies providing secondary support for main disaster prevention system. In addition, efficiently used small and medium open public spaces are inherently related with communal sense of organization and belonging, which may provide significant potential for the improvement of local preparedness capabilities.

I.II Research Questions

The main research question of the study is to what extent are small and medium urban open spaces, with public utility, important for local disaster prevention planning of two densely built neighbourhoods, located in two major disaster-prone cities in Japan, Tokyo and Kobe. A second question is how can small and medium open public spaces be important in the considerations of urban disaster planning, for the improvement of local resilience capabilities. Essentially, which features of small and medium open public spaces lead to

determinant importance in disaster prevention, or simply for the improvement of the neighbourhood's resiliency to natural disasters. These two questions are interrelated with a set of primary questions as what is the consideration and importance of urban open public spaces in local disaster preparedness, response and recovery plans and in local urban planning initiatives to improve physical resilience.

Another question is to which extent are small and medium open public spaces considered important for disaster prevention by the local governments, and how such consideration differs from their actual integration in local disaster preparedness, response and recovery plans.

Inherently related with all the former questions, it was important to examine the level of articulation between urban planning and disaster prevention in the local governments where study is focused, to ensure contextualization.

I.III Significance to the Field

There is a relevant need to develop holistic perspectives, integrating comprehensive urban planning and disaster prevention (Bosher 2008). In comparison to research achievements in the engineering field, disaster prevention still presents a thin connection with urban planning, and urban design. While acknowledging the great importance of engineering solutions for vulnerability reduction in urban environments, cities are still more complex than the mere sum of buildings and infrastructures (Alexander 2008).

Despite that the literatures on the relation between urban planning and disaster planning present recently developed theoretical advances, empirical research remains undeveloped in the field. Developing a study about the importance of an urban element's importance and consideration for disaster prevention is to bridge two literatures. Aiming to reinforce and develop the relation urban planning and disaster prevention, the research proposes making a step, for new and improved notions in both fields, revealing the importance of small and medium open public spaces for a secondary support in disaster prevention systems. Additionally, in terms of sustainable urban rehabilitation, this study purposes to identify new opportunities, challenges for the integration of open public spaces in disaster prevention, aiming the reinforcement of the linkages between the disciplines, toward sustainable disaster prevention.

III Research Design & Methods

Tokyo Metropolitan Government has been improving disaster prevention planning considering the potential exposure to a future inland earthquake (Nakabayashi 2001) integrating lessons from significant earthquakes that have occurred in Japan. Complementarily, Kobe's disaster prevention planning integrates factors of its own experience in the Great Hanshin-Awaji EQ., presenting a remarkable example in the field of recovery, and reconstruction processes (Edgington 2010). Thus, the research setting aimed to integrate two residential areas located in these two Japanese cities, intending the examination of two disaster prevention planning

systems complementary oriented for preparedness, and recovery and reconstruction processes. The purpose of such setting was aimed to amplify the set of variables, which may interfere in the importance of open public spaces in local disaster prevention planning; and not to develop a comparison between both cities disaster prevention systems.

III.I Setting, Selection Method of the neighbourhoods

The method of the neighbourhood's selection, for further sample construction of open public spaces was conducted through geographical information analysis, aiming to identify two residential neighbourhoods (one located in Tokyo, and another in Kobe) with 25 to 50 hectares of area, with a population density above twice the average population density of the city where they are located (considering Tokyo-To and Kobe-Shi). A third selection criteria referred to the need of the selected neighbourhoods to present a network of existing urban open public spaces composed, at least, by five open public spaces with dimensions equal or superior to 1000sqm, located in the study areas or in its immediate surrounding areas¹ (Fig.1) and other five open public spaces with less than 1000sqm located within the study areas. Additionally, other qualitative criteria were introduced, considering residential atmosphere, presence of wooden constructions, narrow streets and alleys, and tracks of former urban fabrics (in the case of the neighbourhood's selection in Kobe); local sense of belonging, evaluated through observations of the public spaces usage intensity; and toponymy unification referring to uniformity of place's names (town scale).

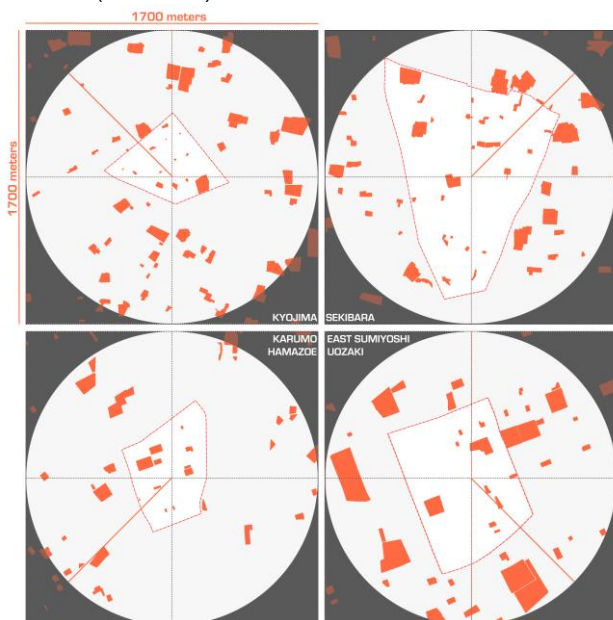


Figure 1 - Open Public Spaces located in the study areas and respective immediate surrounding areas of four pre-selected neighbourhoods.

III.II Case Studies: Kyojima (Sumida Ward, Tokyo) and East Sumiyoshi/Uozaki (Higashi-Nada Ward, Kobe)

1 Criteria of immediate surrounding area: Radius of 850 meters from the inner physical centre of the study areas (20 to 30 minutes walking, average of 5km/h walking speed) resulting in areas of 289 hectares (1700 meters per 1700 meters).

Kyojima (Sumida Ward, Tokyo), and East Sumiyoshi/Uozaki (Higashi-Nada Ward, Kobe), presented to be particularly appropriate for further development as case studies, considering the study on the importance of small and medium open spaces for local disaster prevention planning, introducing particular variables. Kyojima due to its high urban density, and strong local citizen participation expressed in recent *Machizukuri*² interventions, presented potential for positive results concerning the integration of small open public spaces in local disaster prevention. In opposition to most of neighbourhoods located in downtown Tokyo, due to local *Machizukuri* initiatives, Kyojima presents some diversity of open public spaces, among pre-existing parks, and recently built pocket parks. Since the first application of a method to evaluate the distribution of open public spaces (Kyojima District Machizukuri Centre 1999), the improvements have been significant (Fig.3), through the transformation of vacant lots in pocket parks and rehabilitation of the roadway system within the neighbourhood, promoted by the initiative of the local *Machizukuri* Centre, with financial support from the Ministry of Land, Infrastructure, Transport and Tourism.

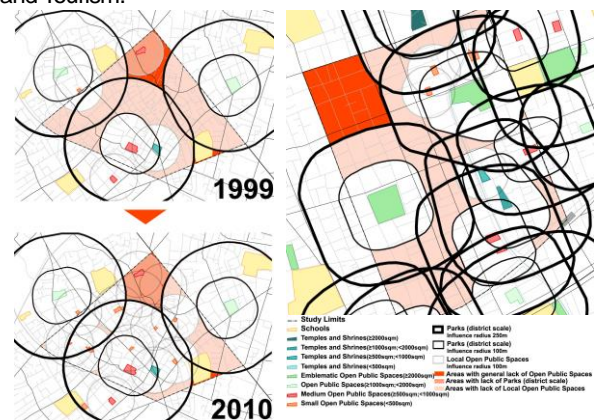


Figure 2 (left)- Evolution of the Network of Open Public Spaces in Kyojima. Figure 3 (right)- Present Network of Open Public Spaces in East Sumiyoshi/Uozaki (2010).

Complementarily, East Sumiyoshi/Uozaki area (Kobe), with a particular lesson of building collapse in the Great Hanshin-Awaji EQ in 1995 presented interest in a perspective of urban surgery, expressed by punctual reconstruction after the earthquake; and increasing initiatives of citizen participation in the development of local disaster prevention plans. The recent plan *Kobe 2010* (Kobe City Government 2010) aims to reinforce the articulation between local daily life support functions (integrating open public spaces), and local disaster preparedness centres, for the improvement of cross-scale cooperation for disaster prevention (local, city, and regional levels). Despite such planning framework, and the improvements achieved in Higashi-Nada Ward after the earthquake, the same evaluation method of open public space's spatial distribution applied to East Sumiyoshi/ Uozaki

2 Literally translated means "city making". However, this term refers to a recent developed system of urban planning in Japan, which promotes citizen participation and involvement in the processes of decision-making, and design.

study area, expresses that a considerable amount of city scale parks is not efficient to respond to the requirements of daily primary activities, in residential areas (Fig. 3). East Sumiyoshi/Uozaki is an example that an efficient spatial distribution of open public spaces requires a hierarchic proportion of spaces of different typologies.

III.III Samples of Open Public Spaces

Within the two selected neighbourhoods, previously developed as case studies, two purposive samples were created; in order to integrate the necessary criteria to analyze to which extend are small and medium open public spaces important for local disaster prevention planning. The differentiation between samples relying in a dimension criteria, also considered in the selection of the neighbourhoods, was the result of observations conducted in the open public spaces of each of the residential areas, considering the different characters of usage, and existing equipments, according to their dimension. Open public spaces with less than 500sqm are often located within the neighbourhoods, present a very intimate usage atmosphere, and often present lack of equipments apart from the usual playgrounds; while open spaces with dimensions equal or superior to 500sqm and less than 1000sqm, differ by a less intimate usage atmosphere and punctual existence of more equipments, such as toilets, and information boards. Open public spaces with dimensions equal or superior to 1000sqm and less than 2000sqm, especially parks, present a broader neighbourhood atmosphere of usage. With dimensions equal or superior to 2000sqm, the observations clarified the expression of city scale open public spaces, integrating parks, and public facilities, as schools. Therefore, the first sample of open public spaces and main study object, integrates 10 small (<500sqm) and medium open public spaces (≥ 500 sqm; <1000sqm), located within the neighbourhoods. Within this sample, 5 open public spaces are located in Kyojima (Sumida Ward, Tokyo), and other 5 in East Sumiyoshi/Uozaki area (Higashi-Nada Ward, Kobe). This sample was build from a set of valid of open public spaces with dimensions less than 1000sqm, integrating mostly pocket parks, and small neighbourhood parks.

A second sample refers to a purposive contrast sample, integrating 10 open public spaces with dimensions equal or more than 1000sqm, located within the neighbourhoods, or in the immediate surrounding areas (previously defined). This sample integrates mainly city parks, block parks, schools, and open spaces integrated in other public facilities, as welfare centres. This sample is mostly composed by emblematic open public spaces, which are recognized as reference public spaces within the neighbourhoods, and considered in local disaster prevention planning (local government level).

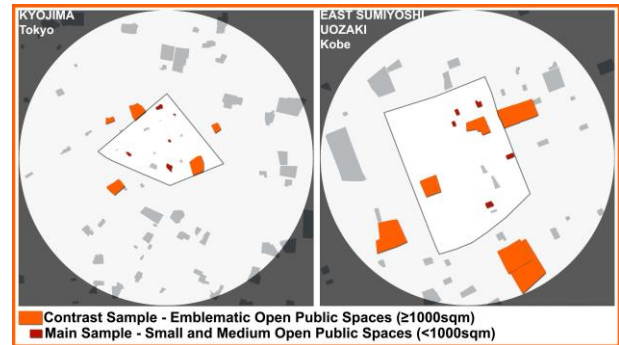


Figure 4 – Contrast Sample, and Main Sample (Kyojima and East Sumiyoshi/Uozaki).

III.IV Measurement Instruments & Data collection

Four measurement instruments were used to collect the research data. Three were integrated in questionnaires to the Disaster Prevention Bureaus of Sumida and Higashi-Nada Wards, aiming to verify (1) the level of articulation between disaster prevention and urban planning; (2) the integration of each open public space in the local disaster prevention of the respective neighbourhoods; and (3) to examine the differential between importance and integration of the open public space in disaster prevention, in the local governments' perspectives. The fourth measurement instrument integrated observations performed in each open public space, in order to survey the existence of disaster prevention equipments, information boards about disaster prevention, water equipments (rainwater collectors, pumps, tanks, retainers), and other physical features that may reinforce disaster prevention.

IV Results

The articulation between disaster prevention and urban planning presents some dissimilarity between the two local governments, since the local government of Sumida (Tokyo) argued an averagely strong articulation, while Higashi-Nada (Kobe) a medium articulation.

IV.I The integration of small and medium open public spaces in local disaster prevention

The results clearly express an inverse proportion in the integration levels in disaster prevention planning, between the two samples of open public spaces (Fig. 5). While in the perspective of the local governments, small and medium open public spaces are averagely integrated in local disaster prevention planning, and averagely important for the improvement of the system; in comparison to emblematic open public spaces (≥ 1000 sqm), small and medium open public spaces (<1000sqm) present lower integration in disaster prevention planning.

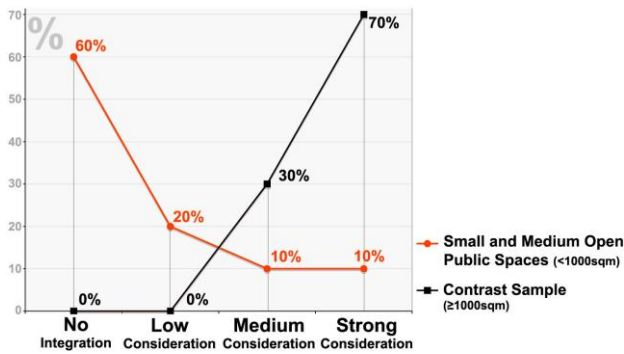


Figure 5 – Integration of Open Public Spaces in Disaster Prevention Planning.

Despite the lower patterns of integration in disaster prevention planning of small and medium open public spaces, some peaks of higher integration occur, such as, evacuation planning. 40% of small and medium open public spaces are prepared to perform at least one type of evacuation assistance, often related with fire fighting, through water access (30%). Although, within more detailed examination of the results, small open spaces (<500sqm) are rarely considered in disaster prevention planning, while the integration levels of medium open spaces (≥500sqm; <1000sqm) often coincide with the integration of some open spaces of the contrast sample (≥1000sqm; <2000sqm). Basically, small and medium open public spaces are presently not integrated in disaster prevention planning, as emblematic open spaces or medium open public spaces, but some variations on their integration occur, depending on dimension, management, and existing equipments.

IV.II Which features of small and medium open public spaces influence their integration and importance in disaster prevention planning?

While Kyojima and East Sumiyoshi/Uozaki present dissimilar patterns of articulation between urban planning and disaster prevention systems, and distinct urban densities (Kyojima presents higher urban density), some variations are expressed in the integration of small and medium open public spaces in disaster prevention planning. In Kyojima, 40% of the small and medium open public spaces are integrated in pedestrian evacuation networks, and 40% in the performance of evacuation drills; while in East Sumiyoshi/Uozaki none are considered in such disaster prevention planning. In opposition, the designation of small and medium open public spaces for fire fighting in East Sumiyoshi/Uozaki, through water access, exceeds Kyojima by 20%. Thus, the existence of water equipments, and management type, in relation to dimension, introduces variations in the integration of open public spaces in disaster prevention planning. Small open public spaces (<500sqm) with water equipments present an increase of integration in disaster prevention planning of 33.3%; while medium open public spaces (≥500sqm; <1000sqm) with some type of water equipment are totally considered in disaster prevention planning, at different levels. In convergence, the management also presents a relevant influence in the integration of small and medium open public spaces in disaster prevention planning. Medium open public

spaces managed by local governments present medium (50%) and strong integration (50%), while small open spaces with the same management, and less than 500sqm of dimension, are totally excluded from any consideration in disaster prevention planning.

V Discussion

The levels of articulation between urban planning and disaster prevention planning present some dissimilarity between the two Wards, Higashi-Nada and Sumida. The evaluation of such articulation, performed by the professionals of the Bureaus of Disaster Prevention in the questionnaires, may contain important nuances that express each local government's past experiences. Despite such dissimilarities, it is possible to verify that small and medium open public spaces are not comprehensively integrated in the disaster prevention of both local governments, for the improvement of resiliency in the neighbourhoods. Despite some variations of consideration in disaster prevention planning, small and medium open public spaces present to be underestimated, in comparison to emblematic open public spaces, mostly due to dimension criteria. However, it is possible to examine that small and medium open public spaces present already a certain aptitude to integrate several features that might be useful for prospects of improving local disaster prevention, or for the reinforcement of local resilience abilities.

VI Implications for the integration of small and medium open public spaces in local disaster prevention

Despite that in the perspective of the local governments, small and medium open public spaces are considered averagely important, or even important for disaster prevention; these type of public spaces presents less consideration and importance in disaster prevention planning, in the means of preparedness, evacuation and recovery planning. Such trend might be related with a certain lack of imagination of how small open public spaces located in densely built areas, be actually useful to perform any role in disaster prevention. Disaster prevention intrinsically requires planning for a considerable number of people, and due to this basic reason, small open public spaces seem to be potentially excluded from the possibility of ensuring assistance in case of disaster. Such condition is rather logic, since it is a matter of guaranteeing the safety of populations. However, considering the possibility of diversification within disaster prevention planning system, not all open spaces considered in the system have to be necessarily adequate to provide the same type of assistance. In areas where there are problematic accessibilities to designated evacuation areas, perhaps any existent open space, as small as it is, may be fundamental in case of disaster. Such possibility may actually be related with the fact that in East Sumiyoshi/Uozaki the number of small and medium open public spaces designated to provide water access for fire fighting, exceed the number of small and medium open public spaces with the same designation in Kyojima. If there is any relation between

recent past experiences and increase of imagination of how can small open spaces be useful for disaster prevention; perhaps this might be the closest evidence found in this research.

Summarily, due to dimension criteria, lack spatial distributional planning of open public spaces, and presently obsolete features, small open public spaces (less than 500sqm), in Kyojima and in East Sumiyoshi/Uozaki, are presently underestimated in disaster prevention planning, even though some positive trends may be verified in their performance, for the improvement of local resilience capabilities. However, medium open public spaces ($\geq 500\text{sqm}$; $< 1000\text{sqm}$), integrating mostly neighbourhood parks, are averagely important and considered in disaster prevention planning, but still, not as comprehensively integrated in the system, as emblematic open public spaces ($\geq 1000\text{sqm}$). In an approach of sustainable disaster prevention planning in communion with urban rehabilitation, the consideration of small and medium open public spaces deserves further research attention, ensuring an adequate integration in urban planning through spatial distribution, and the improvement of disaster prevention planning and local resilience capabilities.

VII Limitations & Recommendations for future research

Based on the results of this study, there are several recommendations for future research. First, the limitations outlined in this study may be reduced or eliminated if (1) the samples are less purposive, and composed by a larger number of open public spaces, (2) if the research question focuses in one of the disaster prevention components, such as preparedness, response, recovery, reconstruction or mitigation; and (3) if the measurement instruments are previously tested in the target entities.

Second, the research focused two neighbourhoods located in cities with disaster prevention planning systems particularly oriented for earthquake prevention. It is relevant to the field, to verify the importance of small and medium open public spaces in other disaster prevention planning systems, more focused in flood prevention, as in Bangkok (Thailand) or Venice (Italy); or in hurricane prevention, in which several American cities may contain lessons to be examined, particularly in the field of recovery and reconstruction. Additionally, within the development of this research, several discussions have crossed the influence of past experiences in natural disasters, and the possible increase of imagination of how urban elements, as small and medium open public spaces, may actually be useful for the improvement of disaster prevention and local resilience capabilities. The research on such influence would in fact present a significant relevance to the field, examining how memory of past experiences actually influences disaster prevention planning or local community awareness; comparing for instance the same two cities integrated in this study, since both have past experiences in natural disasters in different historical periods (Tokyo in 1923 in the Great Kanto Earthquake, and Kobe in 1995 in the Great Hanshin-Awaji Earthquake).

VIII Conclusion

It might be a determinant benefit for a densely built neighbourhood to be provided with small and medium open public spaces. First, since the structure of the neighbourhood's urban fabric does not have to be dramatically compromised in order to integrate them, ensuring better possibilities to preserve the characteristics of local atmosphere. Second because, an open space is an essential element to retain fire spread, through not only water access for fire fighting, but also because an open space is, already by its morphological nature, an interruption in the densely built fabric.

Presently, besides of not being generally integrated in disaster prevention planning, small and medium open public spaces are not integrated in any strategies, or plans to guarantee their spatial distribution within a network of public spaces of diverse typologies. Even though, small and medium open public spaces punctually present some tendencies to be considered for evacuation and recovery assistance, the lack of spatial distribution may be a key factor (cause and effect) for such fragile integration in disaster prevention planning. Essentially, the thin integration of small and medium open public spaces in urban planning may compromise, not only their performance as public spaces, but also their integration in disaster prevention. This contrasts with the ineluctable aptitude of small and medium open public spaces to perform a primary role in the neighbourhoods' daily life activities, (essential for preparedness), and secondary assistance in response and recovery, due to their location within densely built areas. Considering a sustainable Disaster Prevention Planning in communion with urban rehabilitation, it is necessary to include such discussion in future paradigms, toward the improvement of local disaster prevention, and resilience capabilities. Considering the possibility of such paradigm review, to which extent can city interveners afford not to consider small and medium open public spaces, located in densely built urban areas?

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