



Full Length Article

Role of resilient and flexible urban space in disaster Management

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ABSTRACT

In recent decades, increasing population, especially in urban regions as a significant phenomenon has been made a mass of complexities and problems in different subjects. Among this, disasters are one of the important issues in urban planning and urban design domains to management of disasters, reducing risks and damages, increasing safety and life quality. In fact, the city as a context of the events is of utmost importance, therefore planning, understanding urban spaces and proper design is a way toward meeting various needs of people in Prevention, response and post-disaster measures. So, to deal with disasters in urban design attention to principle of flexibility as a one of factors to create resilient and desirable urban space, enables space to provide various alternatives at any time to deal and reduce risk and disaster impact to people. This study attempts to address explain the resiliency criteria and concept of flexibility and realization ways of it in urban space. Also, principles and criteria have been presented to achieve resiliency in buildings designing. It is mentionable, achieving to the space at first needs to prerequisites, including Permeability, Variety and Legibility, then essential elements of its; activities, places and people. To prepare mentioned elements, resiliency can be appeared in urban space to several frames for effective disaster management in micro scale and macro scale.

Key words: *urban space, flexibility, resiliency, disaster management*

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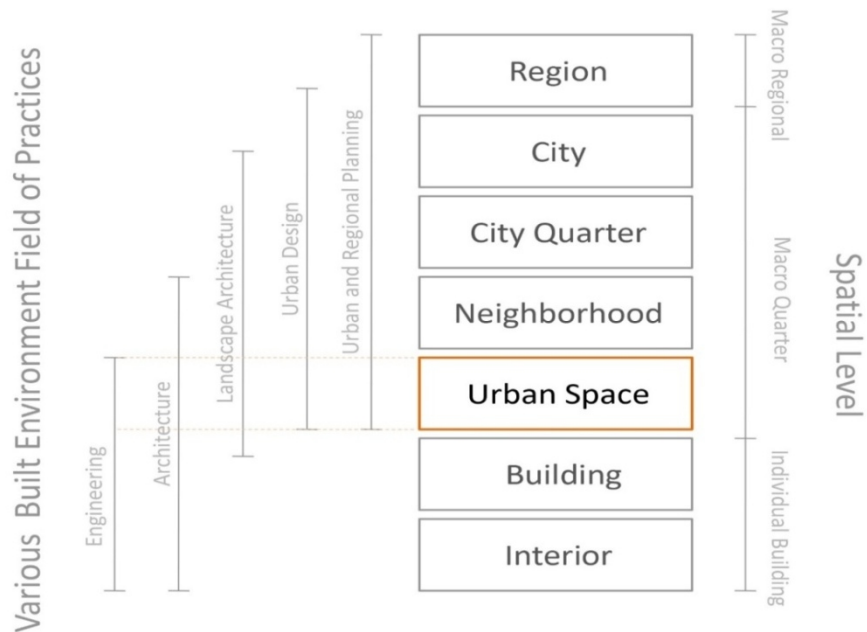
INTRODUCTION

Public spaces have a fundamental role in the formation of social life, the emergence of early civilizations and in biological complexes. According to an increasing population in the world, especially in cities that in 1900, only 13% of the world's population lived in cities, but by 2050, that number will have risen to 70%, then the mentioned issue requires a refreshing thought to urban spaces and their elements particularly in disaster managements subjects. Future prospects show that flexible and creative cities are as a substrate developer of economic, social and cultural in each club and urban spaces like streets, parks, squares and other blanks are significant sites for shaping cultural, societal and economic activities [2]. By paying attention to the grandness of the matter in the following have been fatigued after an explanatory concept of urban space and naming to the principles of resiliency, the concept of flexibility to be spoken in the urban area, also; criteria to achieve resiliency in the pattern of buildings is represented. Which utilizes them can reach to comprehensive of flexible urban spaces to cope and reduce the risks and impacts of the crisis.

NATURE OF URBAN SPACE

In a conceptual view urban space can seem as an organized phenomenon of data in different shape of form, function and meaning. Improving social life in any society has represented culture and urban style of civilization in the context of urban space [9].

Place of urban paces is very important among the elements created cities in different scale so urban space not only located like interdisciplinary domain, such as architecture, Urbanism, civil engineering in the building environment, but also understanding, flexible and resiliency urban space will be an approach toward respond to various demands of masses in three dimensions of Prevention, response and post-disaster measures in cutting down the harmful effects of events.



)Moughtin and Mertens, 2003(

Urban space as a clear city areas for responding to users' needs have been categories into urban public space, semi-public space and private space [8], that among them can be considered streets, squares and parks such as a public space, front yard as semi-public and finally private parking as a sample of private space. Generally, there are four types of public space could be found in urban area; the first type streets, including all hierarchy of streets, avenue, boulevard, & promenade the second type squares/ plazas the third Parks covering linear park, town park, pocket park, playing field, & playground and the last one waterfronts inclusive riverfront, Seafront, River & Canal [12].

EXPLANATION OF THE CONCEPTS OF FLEXIBILITY AND RESILIENCY

Generally, there are a set of similarities and overlaps in the definition of resiliency and flexibility. Flexibility in vocabulary means coordination with every situation and every environment [11] and to simple conceptual Variability to compatibility and suitability for the environment and changes in the different situation [10].

Flexibility in general is supposed to change the system, that this change in order to achieve the requirements, needs and practices comply with the new face. Usually in Latin sources resiliency in urban context has been borrowed from studies on the behavior of environmental systems in coping with stress and disorders caused by external factors such as natural disasters [5]. Flexibility, the ability of a system's to sense environmental change and respond quickly and efficiently to changes [14]. Inspired by the concept of resilient ecosystems, resiliency means the ability of a system or society in danger, to fight against external and internal threats, And recover from the impact of the risks identified and efficient practices include maintaining the fundamental structure and functions and efforts in the restoration of them [17, 4].

Resiliency is the capacity to withstand and rebound from disruptive challenges which is a concept incorporating a vast range of existing risks [3, 16]. Progress planning and action to decrease risks through the development of resilient cities, floods, earthquakes, hurricanes, and terrorist attacks [6]. Resilience is an important purpose for two reasons: First, because the vulnerability of technological and social systems cannot be completely predicted. Second, people and property should fare better in the resilient cities struck by disasters than in less flexible and adaptable places faced with uncommon stress [7].

Flexible and resilient design principles include three main parts that have been following:

1-Design Principles for creating more Resilient Cities

A new set design and planning principles to create more flexible cities, more resilient communities, and more resilient buildings. For starting point propose set of principles for creating resiliency in urban regions [13]:

1.1 Adaptation Capacity: capacity of Resiliency will be increased by the relative adaptability of the diverse organizations that make up a city. City organizations and infrastructure that is designed to rapidly adjust to shifting conditions and necessities will increase the overall resilience capacity of a metropolis.

1.2 Responsiveness and Environmental Integration: The resilience capacity of a city is increased by how responsive and integrated its systems and functions are with its natural systems, services and resources. Environmental responsiveness and integration will not entirely bring down the relative chance of infrastructure suffering significant negative impacts from the increasing environmental impacts and strains related with climate change, but dilute the monetary value of producing and maintaining technical infrastructure.

1.3 Diversity: Raising the variety of the various systems that comprise our cities is important because with greater diversity comes an increased ability to thrive, survive and bounce back from external shocks and stresses. Diversity of systems reduces the potential negative impact to the whole city of the failure of any one particular system.

1.4 Feedback Sensitivity: Feedback Sensitivity is a system's ability to detect and respond to changes in its constituent parts. The more quickly a system can detect and respond to changes throughout the system, the greater its potential for effectively coping with these changes, and thus for resilience. Social, economic, and technological systems designed with close feedback loops will increase resilience. In our cities, urban density is one of the significant foundations for loop tightness. Density provides for concentrated time and monetary values for moving data and materials throughout the organization in an efficient and effectual way.

1.5 Redundancy: The increased likelihood of more energetic weather events associated with global climate change means that cities and their communities will need to build the capacity for resilience to more frequent and powerful environmental shocks and stresses. An increased redundancy of key infrastructure systems, including electrical power, fuel supply, waste water processing and, most importantly, food and potable water supply - means that if one system is compromised, there is enough redundancy in the overall system to fill in for the compromised system until it can be replaced or fixed.

1.6 Independence and Modularity of System Components: Resilience capacity will be increased when system components have enough independence that damage or failure of one part or component of a system is designed to have a low probability of inducing failure of other similar or related components in the system.

2-Flexible Urban Design Principles

Designing flexible urban spaces meet with the conditions and realities of climate effects. Many of the practices that we now take for reducing risks and disaster management such as planned cities around, transportation, and zoning for single uses, will no longer be economically, environmentally, or culturally viable. To direct the changes in urban design and preparation, we are putting forth the following principles for resilient urban planning and invention in three dimensions of Prevention, response and post-disaster measures [13].

2.1 Transits supportive: Resilient cities and neighbourhoods will develop in a direction that is transit supportive. After walking and cycling, transit is the most sustainable mode of transportation. Resilient cities will need to re-orient their direction of reckoning, by transferring from car oriented urban patterns to transit oriented urban patterns and developments. Not only will pedestrian, and mass transportation friendly planning increase the quality of life of a city, as fuel prices rise after Peak Oil, the only cities that are viable without heavy dependence on the car will have the best chances of economic and social success.

2.2 Pedestrians first: Resilient cities and neighbourhoods will prioritize walking as the preferred manner of travel, and as a defining ingredient of a healthy quality of liveliness. Reducing car-dependency is a key objective and imperative. Luckily, the alternative modes of transportation, namely walking, cycling, and transit – result in more sustainable urban environments, and in an improved quality of life. It are the cities and neighbourhoods that have prioritized walking, that have created desirable locations to live, work, play, and invest in. (The term pedestrian, as used in these principles, includes persons with disabilities.)

2.3 Place-making: All successful cities and successful neighbourhoods include vibrant places, with a strong sense of identity, which are integral to community life and the public realm: parks, plazas, courtyards, civic buildings, public streets, etc. A traditional small town or an urban downtown, by contrast, has innumerable nooks and crannies, grand public spaces, gorgeous streetscapes, which make them desirable, successful, and sustainable. Heritage resources buildings, structures, and landscapes – represents a significant opportunity for place-making, as well as a significant environmental investment that should be conserved.

2.4 Density, diversity and mix: Resilient Cities and neighbourhoods will need to embrace density, diversity and mix of uses, users, building types, and public spaces. Creating resiliency and reducing the carbon footprint of urban development requires maximizing the active use of space and land. A vibrant and sufficiently densely populated urban environment, by contrast, is well used round-the-clock, all days of

the week, and during all seasons. This results from a closely knit mix of uses (e.g. Offices, residences, coffee shops, etc.) With sufficient density, and which are accessible to a variety of users (e.g. Children, youth, seniors, high-income, low-income). Dense mixed use neighbourhoods also allow for the efficient operation of all characters of business, social and cultural activities with very low inputs of energy for transportation and logistics, therefore increasing the resilience of these neighbourhoods.

2.5 Resilient operations: Resilient cities and neighbourhoods will develop building types and urban forms with reduced service costs, and reduced environmental footprints. Urban sprawl is extremely expensive to service and maintain – the amount of land, roads, pipes, and infrastructure required per capita is disproportionately large. A compact, mixed-use urban environment, by contrast, is far more efficient in its demand for municipal services and infrastructure requirements. Resilient cities will not subsidize inefficient forms of development (e.g. Building roads and assuming operating costs) and instead prioritize city patterns and built forms that have a reduced footprint on the environment and a reduced burden on municipal resources (e.g. Directing growth to where services exist).

2.6 Complete communities: Resilient neighbourhoods will provide the needs of daily living, within walking distance (a 500 m radius). Resilient communities, will reduce their carbon footprint by ensuring people opt to walk or cycle, instead of using a car. To achieve this, destinations must be accessible within a pleasant walking distance – people should be able and willing to walk from home to work, to school, to shop, to recreate, and to engage the activities of their everyday life. Longer distances should be achievable through transit. Streets and pedestrian walkways must be enjoyable to walk, must link key destinations, and must operate at a fine scale.

2.7 Redundant and durable life safety and critical infrastructure system: Resilient Cities and neighbourhoods will plan and design for redundancy and strength of their life safety and vital infrastructure organizations. Planning and design of these systems will aim for levels of redundancy and durability that are commensurate with the increasing environmental, social, and economic stresses associated with the impacts of climate change. The physical, social and economic health of the Resilient City and its citizens is directly connected to the city's ability to maintain the effective functioning of its key life safety and critical infrastructure systems – especially during episodes of intense environmental stress (such as during severe storms, floods, or other weather related events). Key infrastructure systems such as drinking water supply, electrical power, and residential heating in winter, and key life safety systems, such as police, fire, and emergency response services and their support systems, must be planned and designed for a level of redundancy and durability that will allow them to be durable enough to resist present and future environmental stresses.

2.8 Engaged communities: The development of resilient cities and neighbourhoods will require the active participation of community members, at all scales. Citizens have a role to play and a responsibility. It is only through the sum total of individual choices, of individual actions, that change will come about. Residents and stakeholders must be part of planning and designing their cities and their communities. They must also be part of delivering a new vision: by choosing to walk, by engaging each other, by generating awareness, and by demanding higher standards.

NECESSARY PREREQUISITES FOR ACHIEVING FLEXIBLE URBAN SPACE

Undoubtedly, creating a flexible urban space that able to provide multi options to people, require prerequisites, which include:

First permeability: that means encourage the place connected to its surroundings; preventing the place from getting isolated, so people can get into the place and use it. Second Variety: which defines easily accessible places is irrelevant unless they offer arrange of experiences, it offers a mix of activities to the wide strange of possible users. For that reason, the success flexible place needs this exciting quality to attract people to use the place with reason. Third Legibility: that illustrates a place has a clear image and easy to understand [1].

Flexibility in macro scale: At this scale, flexibility addressed to the ability of urban space as an integrated unit or a major part in creating the various options. Indirectly, the flexibility in macro scale can enhance public user's choice in the long-term.

Flexibility in micro scale: The flexibility of this scale is defined in dimensions, functional aspects and spatial components of the urban space and the ability of certain elements within the urban space are considered in order to be applied to a wide range of performance options [1].

3- Resilience Building Design Principles

Designing buildings to effectively meet the conditions and realities of Climate-Changed world will require a shift in our current understanding of what constitutes good building design and sound building practice. Many of the practices that we now take for granted, like cladding our buildings in curtain wall building envelopes, in the future, may no longer be economically feasible. To address these needed changes in

building design and construction strategies and techniques, proposed the following building design principles[13]:

3.1 Use low carbon-input materials and systems: Any materials and systems that require either significant amounts of energy, or are derived from oil by products in their manufacture, will become economically uncompetitive because of the relative increase in energy costs of the down side of the peak oil curve, as well as the probable additional costs associated with potential future carbon cap-and-trade regulations or tariffs. Materials such as wood and low-energy input masonry should be considered as more appropriate building materials. Moreover, the use of wood as a building material will be a very effective strategy for sequestering carbon as part of future regional, national, or international carbon sequestration strategies and policies.

3.2 Design and plan buildings for low external energy inputs for ongoing building operations: Buildings should be designed to be highly energy efficient and include the use of highly insulated building envelopes, triple insulated glazing, and, where possible, passive solar heating with thermal mass storage systems. Where required, lighting systems should use LED task lighting in combination with natural day-lighting. Design to allow for natural ventilation and simple low energy mechanical systems

3.3 Design buildings for maximum day-lighting: Daylight will be the primary source of lighting for buildings in a post-carbon city, so buildings should be designed to make the most of daylight for internal lighting. Because the pressure to reduce the overall surface area of glazing in building envelopes to reduce energy loss will be significant, the use of daylight will become of strategic importance in the design of building form. Narrower floor plates, internal courtyards, and atrium spaces are good examples of possible daylight effective strategies.

3.4 Design "generic buildings" for future flexibility of use: Because energy costs will be higher in the post carbon city, both construction materials and the construction process will be relatively more expensive than they are now. These higher costs of construction will create an impetus for building owners to design for future flexibility in their building designs, so that later renovations and alteration can be undertaken in the most cost effective manner. The most effective strategies for designing for future flexibility are the use of modularity and standardization in the planning of program spaces. Buildings should be designed for both first and future uses. Form should not "follow function" but instead follow many future functions.

3.5 Design for Durability and Robustness: To maximize the future resilience of buildings, buildings should be designed for durability and robustness. Use materials and construction methods must be durable in the face of more energetic weather, and increasing number of significant weather events that increasing climate change will produce.

3.6 Design for the use of local materials and products: Resilient cities will need to be much more localized in their use of materials and products. The increased cost of energy will dramatically increase transportation-related costs of non-local materials. That should in turn create a greater demand for locally produced materials and products for building construction.

3.7 Design and plan for low energy input constructability: Design and plan for buildings that can be built efficiently by manual labour and that do not require oil-fuelled machines and systems requiring significant quantities of fuel for operation.

3.8 Design for use of building systems that can be serviced and maintained with local materials, parts and labour: Climate change and peak oil will more than likely reduce global trade, and reduce easy access to materials, products and systems from other countries. Therefore, building systems should be designed to be serviceable through a local supply of parts and labour.

CONCLUSION

Nowadays, understanding urban spaces and appropriate design of space is a way toward meeting people needs of their society in all aspects, particularly in disaster management and reduce negative effects of it on improving life quality. However, in many cities have been saw formation of urban spaces as milestones city by paying attention to permanent and temporary function that do into, have been designed. Among this, attention to foundation of flexibility in forming urban spaces is very important, because cities and urban spaces are field of events.

To achieve resiliency in urban space the principles have been presented that considering to variables of space like activity, place in micro scale and macro scale. However, in this way achieving qualities like Permeability, Variety and Legibility are necessary as well as needs prerequisites to create resilient urban space. Finally, by paying attention to the formation of new life styles with different cultures and values and creation various needs, climate changes and increasing disasters, attempt to realization concept of resiliency in the urban space will be more functional from technology and new materials solution in

forming responsive urban space. With a better understanding of the concept of resiliency, can be optimized and efficient environments in present to people on reducing risks and improving quality of life.

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