DISASTER MITIGATION ISSUES WITHIN URBAN PLANNING

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Over the past two decades, numerous studies and practices have been developed to cope with the losses occurring from natural and human-made disasters. Rapid urbanization and changing economic balances increased the number of vulnerable populations and are being the primary reasons for the growth of disaster losses. The nature of disaster losses is multifaceted, and it is a composition of the results of direct and indirect hazards, which makes it impossible to develop a general solution to the whole problem and inevitable to separate the problem into components so that it would interest several disciplines. From the beginning of history, people have confronted:

- Predict,
- Prepare for,
- Survive,
- Recover against natural and human-made disasters.

Antiquity witnessed countless unrecorded natural and human-made disasters such as fire, flood, earthquake, volcano, drought, famine and tsunami. Sayings within the public like "disaster come from God" or "it is a punishment of God and cannot be avoided" have been replaced by awakening recognition with the contribution of expanding and publicly known scientific knowledge, technology and diminishing influence of unquestioning belief in a punishing God.

Urban planning and design are two of the major disciplines which disaster based losses can be mitigated via the use of their application tools, such as development and application plans and design projects. Earthquake related losses are one of the main problems in Turkey, with

90% per cent of land being in different degrees of earthquake danger and an increasingly urban population percentage of 74%. (World Development Indicators, 2000)

Structural retrofit and proper construction techniques have direct effects on diminishing the losses. However, these effects may not be sufficient enough. To realize these strengthening procedures may produce enormous costs when not accompanied by physical and social planning processes accordingly.

This paper focuses on vulnerability and disaster issues within the frame of urban planning and urban design disciplines. As first examples of disaster mitigation efforts in means of changing the urban policy, The Great Fire of London and Lisbon Earthquake are evaluated.

VULNERABILITY AND RISK

The vulnerability can be defined as the potential for losses or other undesirable impacts. People, buildings, ecosystems or human activities threatened with the disaster are vulnerable. (Mileti, 2000) According to ISDR, the risk is the probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions. (ISDR, 2005) The literature of risk and vulnerability overlaps which creates some confusion of differentiating the two concepts. (Mileti, 2000) Vulnerability is partly the manifestation of the human tendency to challenge hazard - by necessity (lack of better options) by evasion (ignorance) or by willfulness (desire to take risks). (Berz 1988; Kunruether & Roth, 1998 in Alexander, 2000)

Degree of vulnerability varies based on different components, such as lack of planning and preparation, bias and misinformation of the habitants, insufficient legislation and funding, shortage of political influences. When those components come together at an extreme natural or man-made hazard, they produce the disasters.

Each time a disaster strikes, it is followed by a sudden implementation of legislation and mitigation activities forced by public pressure and attention, which temporarily reduces the risks, but as soon as the media loses its focus, these activities are soon overtaken by forms of unprotected development that causes an increase in risk again. Natural disasters are dynamic and complex, which makes reducing vulnerability multifaceted and interdisciplinary teamwork. Strengthening physical structure, applying disaster mitigation plans and regulations for urban settlements is a big part of this reduction process and but have to be accompanied by strengthening of the society and community development studies. According to Cannon, the

vulnerability of individuals and groups of people is differentiated based on their position in society. It originates, in a complicated way, mainly from class, gender and ethnicity, and in the way that these are expressed in socio-economic terms which in the end affects to accessibility degree of personal and social preparedness. (Cannon, 1994) Reduction of vulnerability lies in the integrated study of different disciplines, and by having some of the strongest tools in regulating physical characteristics of the settlements, urban planning and design can be reorganized for being used in disaster risk mitigation.

Evaluation of the history of disasters contributes to rethinking and getting prepared for tomorrow's disasters. Policy changes, lessons drawn from the results of mitigation efforts, positive and negative sides, lead to new regulations, and further adjustments in the existing system. Two pioneering examples for triggering the initial mitigation studies; Great Fire of London in 1666 for resulting with the first building code of London, Lisbon earthquake in 1755 for being first to induce a coordinated state emergency response as well as a series of actions for reconstruction which included mitigation efforts to reduce future disaster affects, have been taken as two examples.

Great Fire of London, 1666

Great Fire of London happened in November 1666 and lasted for three days burning most of the medieval city, killing 17.440 out of the population of 93,000. (Burby, 1998) While big percentage of the medieval city was burned within the old Roman Walls In three days, the city officials acted quickly and formed the first disaster mitigation oriented public policy. Charles II addressed by proclamation of the need for restraint and foresight in rebuilding based on a detailed evaluation of the existing situation right after the fire. This code is the first complete code of building regulations. (Platt, R. in Burby, R., 1998)

- Reorientation of the streets to benefit from sun exposure in a maximum way,
- Connecting the commercial districts to royal areas of the city,
- Facilitation of circulation within the city,
- Creation of open spaces and access to the river.

In both examples mitigation efforts have focused on, increasing the urban safety in means of **facilitating accessibility, reorganizing land usage** and **orientation, intervening to the building materials, and increasing** and **providing more open spaces**, all of which are still fundamental components of risk mitigation efforts within urban planning and design. These efforts play a vital role both in normal times and in case of emergencies.

DISASTER MITIGATION AND COPING WITH VULNERABILITIES AT PLANNING LEVEL

Urban planning processes include main decisions which will appear as restraints/limitations as well as guidance for a smaller scale; architectural design. These restraints come from land use, density regulations, transportation and infrastructure decisions. Sustainable approach for land use decisions limits the expansion of urbanized areas towards hazard-prone/potential problem areas. Limiting the expansion, which is not eliminating but mitigating the vulnerability insignificant percentage can be a basic step for new developing areas. More efficient use of land and space, creating wiser density and land use patterns, producing less waste and pollution will prevent/decrease the danger of secondary/indirect hazards. Urban planning, besides its purpose of mitigating disasters, should also increase public awareness about hazard-prone areas. This can be achieved by public participation, which then will increase the applicability of the plan. Long term, comprehensive urban planning including all the stakeholders (residents, policymakers, local governments, etc.) taking into consideration the characteristics of the community and the specifications of hazards, providing applicability by using legal tools of urban planning, being flexible to give possibility for feedback, may succeed the application as well as disaster mitigation. (Mileti, 2000)

Urban Planning for disaster mitigation should be based on

Holistic approach for all possible disasters for the particular area: Synchronicity of some accidents may magnify the hazardous effects.

Coordinated and organized interdisciplinary work: Disasters' nature of complexity requires an interdisciplinary study and application, which should be well organized. These studies should welcome social aspects as well as physical aspects. Contribution of experts from various fields is a necessity.

Detailed analysis of urban pattern in both physical and social structures: Physical analysis: Parcel based analysis of buildings and detailed block analysis of usage densities for different times of the day. Social structure analysis should give a clear picture of the residents and regard the possible heterogeneity.

Participation- Residents Comments and Needs: For increasing applicability and reliability of the plan participation of the residents.

Environmental and Social **Impact Assessment:** Evaluating populations and properties that are exposed to hazards, and the likely damage in a disaster.

Loss estimation: quantitative information on property and people who are subject to possible damage.

Cost analysis: applicability of the plan depends both on wide acceptance within the community and the logical economic basis.

Legal tools of the urban planning process: for applicability, planning should contain all legal aspects which will facilitate the process.

Economic empowerment tools, in forms of generating opportunities for the inhabitants.

Social empowerment: To increase the applicability, plans should contain social strategic plans as well as strategies for physical and economic aspects of the settlement.

Joint acting of local and central government: parallel and coherent decision making within different planning levels is a must for a clear view of plans at the local level.

Development Plans for disaster mitigation should involve:

Detailed analysis and decisions of priorities: Schools, hospitals, buildings for security, communication and lifeline structures should be placed as the priority. Urban settlement centres should be cleared of facilities that are used to store and operate explosive, combustive and toxic materials.

Homogeneity in usage to have uniformity in structure: Structural restrictions which bring homogeneity should be considered for mixed usage buildings. Or controlled structural legislation for areas has heterogeneous use. Such as residential areas which have commercial usage on the first floors.

Precautions for the prevention of chain disasters: Especially for high populated areas, types of industry and commerce, which may produce secondary dangers should be prohibited. For example, in the 1995 Kobe earthquake, 80% of the total structural damage has occurred because of the fires at traditional timber housing structures that caught fire from the industrial structures nearby. (Hyogo Prefecture, 1995)

Distributed risk: Some of the critical structures such as administration offices, communication centers can be located to different points within the city to reduce the risk of losing them all and also to expand the area of their effectiveness after a disaster.

Usage of High-Risk Areas: Within the development plans leaving high-risk areas without any function, produces potential spaces for the formation of illegal structures. This situation dramatically increases the potential risk because these illegal structures made without proper technical guidance and assistance in the riskiest areas. These areas can be organized as recreational areas and or temporary low density usage structures such as green parks and sports facilities.

Controlled usage density: It is known from the previous earthquake disaster experiences that when the density of population increases, loss of human lives dramatically increases and evacuation operations becomes challenging. Also, usage density, which varies by day and night and different hours of the day, should be taken into consideration as a significant component for identifying the priorities.

Controlled accessibility: Functions/structures which are defined as the primary priorities should have continuous availability. Alternative routes should be developed for evacuation and rescue operations.

Strengthened Infrastructure Facilities: Electricity, natural gas and water systems should have early warning systems. Infrastructure basis should be placed at different locations to reduce the risk of losing them at once.

Organized Evacuation Areas: Evacuation area for each person as 1 square meter at least is considered as secure for many earthquake experiences. (Tokyo Disaster Prevention Plan).

DISASTER MITIGATION BASED PLANNING PROCESS

According to Burby (1998), a planning process composed of five steps is needed to form a partnership which will be put into practice by a Hazard Mitigation Committee. This committee will play a mediator role between the governmental branches and the local community and enhance the local community's capacity. Capacity building in both the communities and the local government will include training as well as these implementations. This process is developed depending on the merits of floodplain management planning process developed by the State of New South Wales on Australia. (Department of Public Works, Government of New South Wales, 1986 and 1990, in Burby, R., ed., 1998)

These steps are:

Step 1: Establish a Hazard Mitigation Board

Step 2: Conduct Hazard Assessment Studies

Step 3: Conduct Hazard Mitigation Studies

Step 4: Prepare a Plan

Step 5: Implement the Plan (Burby, 1998, pp. 20-25)

These steps could be modified to make it more effective with the implementation of the current planning process as follows:

- Preliminary Analysis / Data Gathering
- Definition of the Problem
- Detailed Analysis
- Synthesis
- Preparation of the Plan
- Implementation of the Plan

Combination of these two processes is adding a description of the problem and complete analysis step duty of Hazard Mitigation Committee

STEP ONE: Establish a Hazard Mitigation Committee

The first step is to form a committee including representatives of higher-level government who have expertise in hazard mitigation, and representatives of all the local groups who have a stake in mitigation.

Committee assists with:

- Defining goals and integrating local knowledge and information by using disaster risk mitigation tools,
- Directing and integrating supporting studies made at various stages of the planning process,
- Formulating and applying provisional development controls for use until the plan is completed, approved and implemented,
- Developing strategies for implementing the plan.

STEP TWO: Definition of the Problem

For every area, defining the issues according to the local data, and separating problems into simple, sophisticated and combined types to determine the priorities in the following sections.

The correct definition will facilitate the process and will bring success in the implementation phase. Especially in areas that carry multi-hazard risk, priorities of the combined hazards and their effects, make the right definition crucially important.

STEP THREE: Conduct a Hazard Assessment Study

The second step involves identifying and developing information about the hazards that threaten the community, and their effects (e.g. the number of people who could suffer losses, and potential damages and other economic consequences).

STEP FOUR: Conduct Hazard Mitigation Studies

The third step is to identify and analyze options for mitigation of the hazards identified in Step Two:

- Identify the institutions whose actions can affect the nature of the hazard,
- Identify community goals and objectives related to land use and hazard mitigation,
- Identify potential components of a hazard mitigation program and specific measures that are appropriate to the community

STEP FIVE: Prepare a Plan

- Description of the plan objectives,
- Discussion of the issues, problems, unique features and values specific to the areas covered by the plan,
- Analysis of hazard mitigation policies,
- Description of how hazardous areas are to be used and managed over the next 10 to 20 years,
- Description of the means and timing of implementation, including the designation of responsible individuals and agencies, specifications of any necessary legislative changes,
- Discussion of approaches to monitoring the implementation and impacts of the plan and specification of procedures for periodically updating the policy and program.

STEP SIX: Implement the Plan

After the plan has been adopted by the governing body, the hazard mitigation committee continues to meet regularly to monitor progress in accomplishing the measures that have been specified. (Burby, 1998 pp. 20-25)

DISASTER MITIGATION AT URBAN DESIGN LEVEL

As being an intermediary phase between urban planning and architecture, urban design applications, an act as a complementary tool for disaster mitigation. Relative location of buildings, Form of buildings, and urban open space design are the three main issues which mitigation activities can be performed on. Relative position of buildings, being detached, attached or standing as blocks affect their degree of harm to each other. Because of the hammering effect of different storey heights, detached housing types should be encouraged. The location also is a component which hardens or eases the evacuation and rescue operations. When developing evacuation plans, senior and disabled citizens should also be taken into consideration. It's known that buildings that have geometrically simple forms act with more strength relative to those with asymmetrical shapes. More vulnerable structures should be built with considering possible disaster affects, structurally and in material means stronger. Buildings that have L- T-H-U-Y shapes should be avoided for the reason that during earthquakes, these buildings vibrate in complicated directions and become weak. (Lagorio, 1990) Or structural considerations that diminish the vulnerability should be considered for these types of buildings. Mixed-use buildings, for example, those that have commercial usage on the first storey and residential in upper stories also result with a vulnerable first storey because of the significant openness in the façade and the first floor in general. (Soft storey damage)

Urban open spaces play important roles during and after the disaster. They can be defined as meeting places for right after an earthquake and can be used as temporary shelter areas in the following days. (Hyogo Prefecture, 1995) Design of urban open spaces should involve different scales of open areas serving for various purposes for disasters, starting from evacuation areas to fire breakers and meeting points. (Kobe Earthquake Prevention Plan Evaluation, in Uzer, 2002)

CONCLUSION

Disaster risk mitigation in urban planning and urban design form an important role in risk mitigation at the physical level. When thinking disaster cycle as a continuous route, to implement risk mitigation efforts to the existing planning and design processes is a necessity. Being ready for a potential disaster will cost less than recovery operations after a disaster. Tsunami disaster in South East Asia on 26 December 2004, showed how big and devastating can a natural event be in this century. Disasters become super disasters, as Coburn and Spence defined (2002), the occurrence of secondary disasters and the multiplication of loss multiplies caused by lack of preparation.

Urban growth and illegal settlements contribute to the increased influence of disasters in urban level. Complex nature of disasters' effects can be mitigated via coordinated, collaborative work of different disciplines. Urban planning and urban design tools and processes can be adjusted for mitigating disaster risks in settlement level. Urban level risk mitigation efforts will contribute to the mitigation efforts in structural level and by nature will provide a livable and safe environment in cities.

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