Considering the Environment Resiliency by Use of Cause Model

Salehi,E.[1], Aghababaei,M.T.[2*], Sarmadi,H.[3], Farzad Behtash,M.H.[4]

1- Assist. Prof., Faculty of Environmental, Tehran University, Tehran-Iran. tehranssaleh@ut.ac.ir

2-M.Sc. of disaster management research group of RPC, Municipality of Tehran, Iran,

3- M.Sc. of Iran Water Resource Management Co. Tehran-Iran, sarmadi_h209@yahoo.com

4- Ph.D. of disaster management research group of RPC, Municipality of Tehran- Iran behtash@canada.com

Received: May, 2010 Accepted: Jan., 2011

Introduction

Urbanization is a complex dynamic process playing out over multiple scales of space and time. Virtually all of the world's future population growth is predicted to take place in cities and their urban landscapes – the UN estimates a global increase from the current 2.9 billion urban residents to a staggering 5.0 billion by 2030. Most of this growth will occur in the developing countries of Africa and Asia, mainly in small and medium sized cities rather than mega-cities. A recent review of worldwide natural hazard losses during 2001 identified 700 natural disasters, resulting in 25,000 deaths, $36 billion in economic losses, and $11.5 billion in insured losses.

There are a lot of definitions of resiliency which has been determined by scholars and institutions. The concept of resilience has been introduced by Holling (1973) in the field of ecology. According to Holling, "resilience determines the persistence of relationships within a system and is a measure of the ability of these systems to absorb change of state variable, driving variables, and parameters, and still persist".

Subcommittee on Disaster Reduction has defined the resiliency as "the capacity of a system, community, or society potentially exposed to hazards to adapt, by resisting or changing, in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures."

Vulnerability is the flip side of resilience: when a social or ecological system loses resilience it becomes vulnerable to change that previously could be absorbed. Vulnerability arises from the intersection of human systems, the built environment, and the natural environment. The most obvious factor contributing to community vulnerability is location or proximity to hazard-prone areas such as coasts, floodplains, seismic zones, potential contamination sites, and so forth. For example, communities on barrier islands are more physically vulnerable to flooding and hurricane-related damages than those inland. Poorly constructed buildings and infrastructure, inadequately maintained public infrastructure, commercial and industrial development, and certain types of housing stock (e.g., manufactured homes) all enhance the vulnerability of the built environment in communities.

Materials and methods

For determining the comprehensive pattern of resilient community, first, information was gathered from different resources. Library study and web search were carried out. Different frameworks and models have been studied. An abstract of this information is shown in table 1. Afterwards, findings were presented by cause model.

Proposal frameworks

To determine the resiliency of a given city, first the pattern of resiliency must be specified. Considering the frameworks and models mentioned above, and also monitoring previous experiences of different natural disasters around the world, the following framework was defined. The proposed framework explains different components and dimensions.

Corresponding author: Tel: 09131111668 E-mail: m_babaiehs209@yahoo.com

Six dimensions were defined, which comprehensively cover resiliency. Afterwards, according to the dimensions, components were specified (Table 2). Dimensions and components are related to each other. In establishing a resilient community, it is necessary to address all of these components. For determining this concept in an exact way, we use cause model and place these dimensions and components in the model (figure 1).

Table 1: models and frameworks of resiliency

Model or Study	Dimensions or Components
Harold Foster (1997)	General systems; physical; operational; timing; social; economic; environmental.
Center for Community Enterprise	People; organization in the community; resources in the community; community process.
Asian Disaster Preparedness Center	Community-Based Disaster Risk Management Framework: Selecting the Community; Rapport Building and Understanding the Community; Participatory Disaster Risk Assessment; Participatory Disaster Risk Management Planning; 5. Building and Training a Community Disaster Risk Management Organization; Community-Managed Implementation; Participatory Monitoring and Evaluation;
Community and Regional Resilience Initiative	Social Vulnerability; Built Environment and Infrastructure; Natural Systems and Exposure; Hazards Mitigation and Planning
Infrastructure Canada	Cultural attitudes; all-hazards approach; all-vulnerabilities approach; resistance; flexibility; Recovery capacity; adaptive capacity
CSIRO, Australia (2007)	metabolic flows; governance networks; social dynamics; built environment
Godschalk (2003)	Redundancy; diversity; efficiency; autonomy; strength; interdependence; adaptability; collaboration
Olshansky and Kartez (1998) and Burby et al. (2000)	Building standards; Development regulations; Critical and public facilities policies; Land and property acquisition; Taxation and fiscal policies; Information dissemination.
Bruneau et al., 2003	Technical; organization; social; economic
NOAA, 2007	Communities learning from previous experiences; economic risk reduction; business size; shared values and sense of place; leadership; local understanding of risk and responsibility.

Table 2: dimensions and components of proposed model

Conception	Dimensions	Components
Resiliency	Mitigation	Recovery Plan; Continuity Of Operation Plan; Response Plan; Land Use; Hazard Insurance; Vulnerability Assessment and Hazard Mitigation Plan; Standards and Codes; Infrastructure Protection Plan.
	Infrastructural	Life Lines; Critical, Sensitive and Important Facilities; Public Facilities
	Structural	Industrial and Commercial Units; Residential Units; Historic places; Hazardous Facilities
	Environmental	Hazards; pollutions; diversities; Stability; Geographical characteristics
	Socio-cultural	Individual characteristic; Beliefs; Social procedure; Social stability; Demographic; Public participation; Family structure; Interests.
	Economical	Economic Safety; Employments; Diversity; Occupation; Access to services; Growth; Stability; Income; Housing.

Conclusion

Cities are complex and dynamic systems in which different components interact. They are made up of dynamic linkages of physical and social networks. Planning for resilience in the face of urban disaster requires designing cities that combine diversity components and dimensions. Different models and frameworks of resilient cities and communities were explained. Our framework was described and each of its components was explained. The presented framework is a general framework which can be used in different areas and regions.

We are just beginning to realize the scope and magnitude of the components inherent in making our cities resilient to threats of natural hazards and urban terrorism. To improve these components, a national resilient cities strategy was proposed, aimed at the vision of the resilient city as the goal that bridges natural hazard mitigation and counterterrorism practice. To succeed, this strategy will require changes in national disaster policy, funding for basic and applied urban systems research, support for advanced education programs, and active collaboration among urban planning, design, and construction professions.

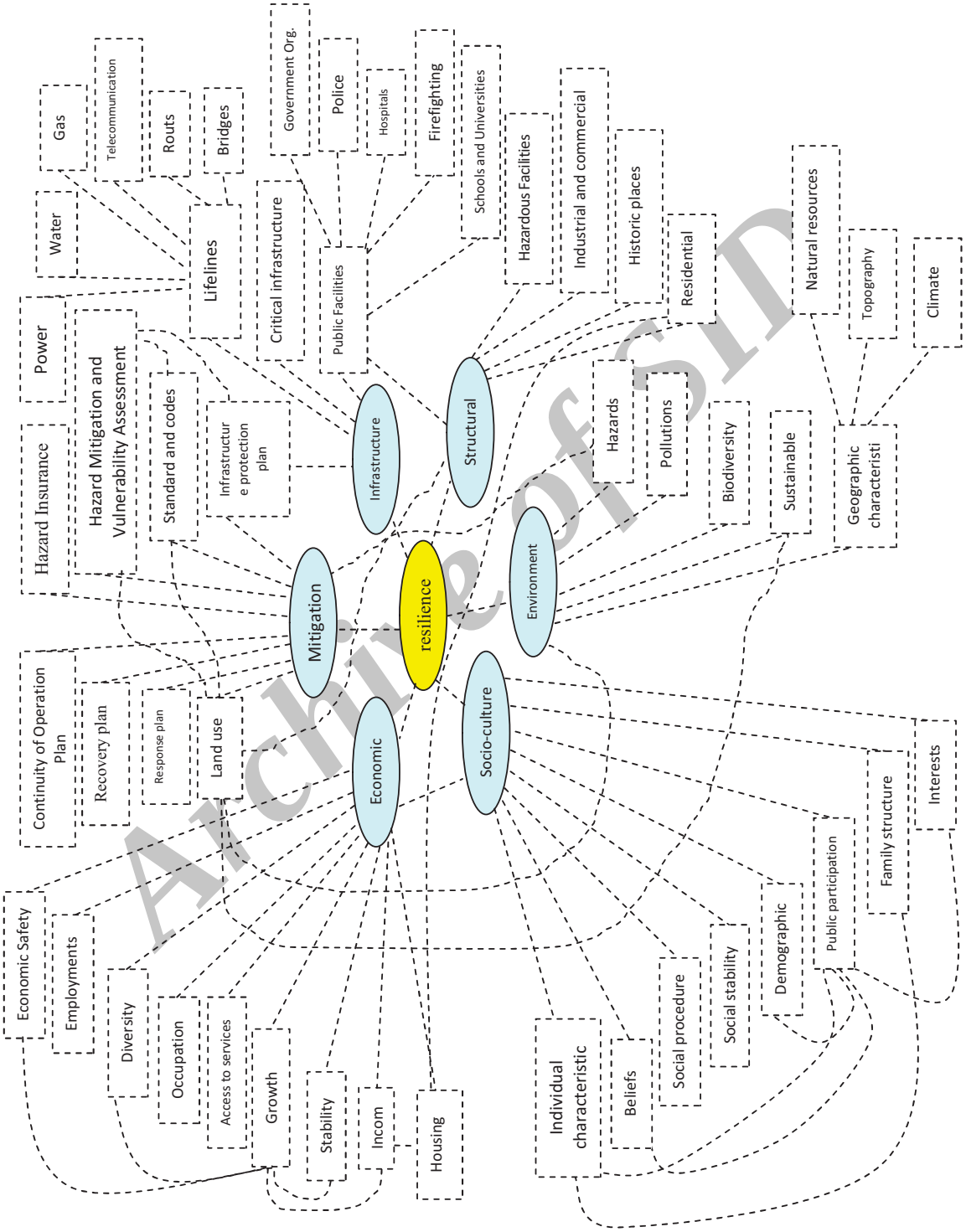

Fig. 1: Suggested model for resilient communities in form of cause model

Key word
Resilient Communities, Vulnerability, Urban Incident, Disasters, Cause Model.