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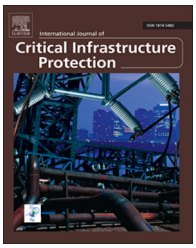

Designing an emergency continuity plan for a megacity government: A conceptual framework for coping with natural catastrophes

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ABSTRACT

The destructive power and frequency of natural catastrophes, such as hurricanes, floods and droughts, have seemingly increased during the past few years, and they cause substantial damage to urban communities. Disasters result in significant infrastructure damage and render vital municipal services unavailable. Natural catastrophes have complexities, uncertainties and dynamic characteristics that cause many problems and challenges for megacity emergency management. A key problem is how an emergency continuity plan – as a complex system – can ensure the sustainability of emergency response following a natural disaster. Bridging the gap between theory and practice and responding effectively to natural catastrophes require detailed planning that addresses the complexities and uncertainties.

This paper describes an innovative conceptual framework for emergency continuity planning that incorporates a safer, less vulnerable agenda and requires the evaluation, analysis and mitigation of risk. In addition, specialized continuity plan measures are proposed that include a resource continuity plan, task continuity plan and process continuity plan. Each interlinked measure supports a comprehensive strategy for megacity emergency response. For example, it is essential that a megacity designs its continuity plan by adopting a resource continuity plan. This measure relates to the range of resources that are available to respond to a natural catastrophe. The numbers and types of available resources must be balanced against the potential of a natural catastrophe and the required emergency response level. Calculating the resource requirements for a given period facilitates continuity when they are stipulated within the planning assumptions. The proposed framework supports disaster emergency management and operational urban infrastructure planning of basic physical and organizational system needs together with the services and facilities necessary for the functioning of a megacity economy.

1. Introduction

In recent years, major catastrophes have taken numerous lives and have caused significant damage to urban infrastructures [1]. The 2008 Wenchuan earthquake, with an epicenter in Sichuan Province, China, impacted Gansu, Shanxi, Chongqing and sixteen other provinces. The disaster area covered 44 square kilometers; 87,000 people were killed and the consequences affected more

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than 45 million people with an economic loss in excess of $170 billion. The 2009 earthquake in Yushu, China also took many lives and caused massive damage to the infrastructure and economy [19].

It is recognized that not all catastrophes are foreseeable. However, for those catastrophes that are, megacity governments and other response entities have statutory and moral obligations to determine their potential scale and prioritize the associated response tasks [14]. Megacity governments and other response entities increasingly realize that it is difficult to ensure completely effective responses to catastrophes using a common approach. In fact, an emergency continuity plan must incorporate adaptive and flexible approaches in response task decision making [15,21]. In order to reduce the impact of a catastrophe and improve emergency response capacity, a 2010 report by the United Nations International Strategy for Disaster Reduction (UNISDR) [20] states that megacity governments and other response entities must be prepared to develop continuity plans to make megacities resilient.

Emergency departments should consider the abilities of organizations in their megacities to provide effective response mechanisms and emergency response capabilities in the event of natural catastrophes. For each potential risk of a natural catastrophe, there should be a plan focused on saving human lives. The purpose of a continuity plan is to provide a process for emergency responders and other response entities to buttress their ability to respond to local, regional, national and transnational emergencies. An emergency continuity plan enhances the ability of an organization to determine its operational capabilities to respond to a natural catastrophe. The ability of emergency responders to provide coordinated, effective and sustained responses, as well as acceptable levels of protection for themselves and citizens, are directly dependent on the capabilities and preparedness levels of individual organizations and megacity governments [9].

To address these challenges, this paper presents an innovative conceptual framework for emergency continuity planning that incorporates a safe, less vulnerable agenda and requires the evaluation, analysis and mitigation of risk. The continuity measures include a resource continuity plan, task continuity plan and process continuity plan. Each interlinked measure supports a comprehensive strategy for megacity emergency response. For example, it is essential that a megacity designs its continuity plan to incorporate a resource continuity plan. This requires the numbers and types of available resources to be balanced against the potential of a catastrophe and the required emergency response level. Calculating the resource requirements for a given period facilitates continuity when they are stipulated within the planning assumptions. The proposed framework supports disaster emergency management and operational urban infrastructure planning of basic physical and organizational system needs together with the services and facilities necessary for the functioning of a megacity economy.

2. Emergency continuity planning

This section discusses the challenges involved in emergency continuity planning. Specifically, it covers resilience and business continuity management and their consideration in developing an emergency continuity plan.

2.1. *Resilience and business continuity management*

The concept of an emergency continuity plan is borrowed from business continuity management, which includes the concept of resilience. Both emergency continuity planning and business continuity management incorporate preparation tasks before a disaster occurs. At the earliest stages of implementation, business continuity management primarily examines and investigates potential approaches for disaster recovery and then gradually moves to emergency planning or unexpected events planning. Following these steps, business continuity management focuses on strategic management procedures. These procedures follow a comprehensive management process that unearth potential threats to the organization and provide a framework for resilience. The procedures also recognize that no single approach will guarantee accident avoidance. Most experts agree that such a prevention method can help response organizations to cope with crises, especially during the preparation stage just after a crisis has begun [8,22].

The resilience of a social system refers to its ability to respond and recover from catastrophes. It incorporates features that enable the social system to absorb impacts and cope with emergencies, including post-incident conditions [2]. The resilience of an organizational system is defined as its ability to withstand major disruptions within acceptable degradation parameters and to recover within the bounds of acceptable time and composite cost and risk [11].

Adaptive processes facilitate the ability of a social system to reorganize, change and learn in response to threats [4]. According to Mintzberg [17,18], a business continuity management process has four components: (i) initiation and redefinition; (ii) planning for business continuity; (iii) implementation; and (iv) operational management.

Fig. 1 presents the business continuity management stages as described by Elliott et al. [6]. This work leverages business continuity management theory and the concept of resilience to design an emergency continuity planning process.

During the initiation stage of business continuity management, an organization must redefine the goals and scope of business continuity management to resist threats and ensure that the entire process focuses on preserving existing organizational processes. In the contiguous redefinition stage, the organization creates support for the demand, interest, financial and collaborative relationships of the business continuity plan. In the implementation stage, the organization considers how the changes resulting from catastrophe scenarios should be adapted. The operational management stage involves the assignment of recovery tasks after a crisis has occurred.

The emergency response stage of emergency continuity management parallels the implementation stage of business continuity management. The recovery stage is similar to the