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## Knowledge-based Approach for Sustainable Disaster Management: *Empowering emergency response management team*

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### Abstract

Over the past two decades, the impact of disasters has been devastating, affecting 4.4 billion people, resulted in 1.3 million casualties and \$2 trillion in economic losses. Post-disaster reconstruction and rehabilitation is a complex process with several dimensions. Government, nongovernmental, and international organizations have their own stakes in disaster recovery programs, and links must be established among them as well as with the community. Concerning post-disaster reconstruction scenario, the most significant factor is prompt decision making based on best possible information available. Effective sustainable post-disaster response is crucial and lies at the heart of disaster management agencies in almost every cautious country around the globe.

Development is a dynamic process and disasters provide the opportunities to vitalize and/or revitalize this process, especially to generate local economies, and to upgrade livelihood and living condition. The success of the reconstruction phases, i.e., rescue, relief, and rehabilitation, is mainly dependent on the availability of efficient project teams and timely information to make informed decision. By having the knowledge-based system to make well-informed decisions, combined with the efficiency of a project team and strong coordination, project success should increase.

This paper presents a theoretical framework of a knowledge-based approach for enhancing prompt and effective sustainable disaster management. The conceptual model consists of two main IT based components of knowledge-based system, i.e., a knowledge-base and a decision support shell for making more informed decisions for effective, timely and sustainable response in post-disaster reconstruction scenarios. The system is expected to assist in improving reconstruction project processes, coordination, and team building process because the most likely areas on which to focus can be identified during the early stage of the post-disaster scenario. Tapping into the past

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experiences of post-disaster scenarios, the knowledge-based system provides a wealth of pertinent and useful information for decision makers and will eventually enhance collaborative ventures for sustainable disaster management.

The system would be helpful for emergency response management teams to take proactive measures by learning from past similar experiences, making informed decisions related to team building and project coordination processes undertaken by disaster management agencies. Professionals need to work in close cooperation with each other to give rise to a better and more efficient system for sustainable disaster management. Hence, the study is valuable for all professionals involved with research and development of sustainable disaster management strategies.

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## 1. Introduction

Integrating disaster risk reduction into sustainable development strategies, by strengthening risk assessment, disaster prevention and humanitarian responses, will be critical to protecting the gains of development, particularly among those most deprived [1]. The complex and multi-faceted processes of post-disaster recovery and reconstruction extend well beyond the immediate period of restoring basic services and life support infrastructure. While immediate restoration of services can be a matter of weeks, full recovery can stretch out 10-15 years [2].

Post-disaster reconstruction and rehabilitation is a complex issue with several dimensions. Many professionals in both fields tend to focus on planning and immediate response and have only recently begun to consider the requirements and opportunities inherent in long-term mitigation and reconstruction [3]. Government, nongovernment, and international organizations have their own stakes in disaster recovery programs, and links must be established among them, as well as with the community [4]. In other words, a post-disaster rehabilitation and recovery programs should be seen as an opportunity to work with communities and serve local needs. Relief and development often leads to burdens on the recipient government, and also often fails to serve the actual purpose and to reach the people in need.

To minimize the damages caused by disasters, various efforts are taken by government, international communities including donor agencies. However, in spite of participation of these sectors during the project period, it has been observed that many of the disaster management programs have failed to be sustainable at local level after the completion of the project. Without sustainability, disaster management efforts will not preserve. A critical element of sustainable disaster management is communities' participation in these activities. The most common elements of community involvement are partnership, participation, empowerment and ownership by the local people [5].

Environmental management professionals are now concentrating on the sustainability of environmental quality and environmental improvement; emergency managers and planners are re-focusing their efforts on the survivability of systems, organizations, and communities [3]. Sustainability and survivability are, in truth, two aspects of the same concept, namely: how to encourage and achieve continual improvement in ecosystems, the built environment, and human society [6]. Both environmental management and emergency management have much to contribute to, and to gain from, the planning and implementation of post-disaster reconstruction.

Understanding the urban vulnerabilities is as complex as managing a disaster and is an essential step in developing an effective disaster management system. The bigger the vulnerability the bigger will be the impact of the natural and manmade disasters. Urban vulnerability within the context of the effective emergency response indicates that an urban texture will face a critical situation if confronted with any type of disaster. In order to identify and classify vulnerable urban areas it is essential to study the urban areas based on the type and level of vulnerability with an integrative vision to understand the urban infrastructure and its social, cultural and interconnected complex layers [2].

The rehabilitation process has three major stages i.e., Principles and Planning, Implementation, and Ensuring Sustainability [7]. Rehabilitation was not just a short term, gap filling exercise. There is a huge amount of

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