Introduction

Aspects of community-based disaster management and disaster resilience

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Community-based disaster management (CBDM) is a bottom-up approach underpinned by the goal of disaster risk reduction. The central objective is to lessen people's susceptibilities and reinforce their ability to deal with vulnerabilities. Thus, the basis of policies, programs, and projects aimed at vulnerability decrease is a systematic and comprehensive appraisal of a community's exposure to hazards and an investigation of their defenseless conditions and skillfulness to cope with them. Although the community prepares for, mitigates, responds to, and undertakes recovery measures after disasters as needed, minimizing disaster risks is of prime importance.

Community members, especially the vulnerable populations who are the crucial actors in a community, actively participate in all the phases of disaster management, from planning and policy formation to implementation.[1]

The key features of CBDM are as follows:

- Disaster risk reduction is at the heart of CBDM, which is community-focused and in which the local community itself is the key resource that plays a central role throughout the process. The reduction of vulnerabilities and their root causes are achieved by developing and strengthening the capabilities, assets, and survival strategies of the community. These ensure that the community is the principal beneficiary of disaster risk reduction.
- CBDM links together poverty reduction, the development process, and disaster management, leading to the improvement of the quality of both the natural environment and the life of the local community as well as community empowerment politically, socially, and economically.
- CBDM uses a variety of multi-sectoral and multidisciplinary approaches to bring together a multitude of stakeholders for disaster risk reduction, thereby expanding the community's resource base. The local community works with a variety of sectors (public, private, and non-governmental) at all levels (from local to international) to address the complexity of developmental and disaster vulnerability issues.
- CBDR mobilizes the poor and the most vulnerable members of a community to actively participate in the decision-making process.[2]

Disaster risk management

Understanding *risk* (which comprises four elements: hazard, exposure, vulnerability, and consequence) and *risk management* (which includes risk reduction strategies) is the basis of building disaster resilience.[3] In the US, the key actors responsible for managing disaster risk include the government (at all levels), members of the construction industry, the private sector, homeowners, emergency managers, and researchers. Table I.1 illustrates some of their duties and challenges.

According to the US National Institute of Building Sciences (NIBS), every dollar spent on the execution of risk-informed mitigation measures results in averting four

Table I.1 Responsibilities, challenges, and opportunities of key interacting parties in risk management (in the US)[4]

Interested Party	*Responsibility*	*Challenges*	*Opportunities*
Federal government	Provides, and in some cases operates, protection structures for communities; supports NFIP; provides disaster assistance	No comprehensive or coordinated approach to disaster risk management	Stemming the growth in outlay of post-disaster recovery funds
State and local governments	Ensure public health and safety in use of land, zoning, land-use planning, enforcement of building codes, development of risk management strategies	Reluctance to limit development; difficulty in controlling land use on privately owned land	Reaping benefits of multiple ecosystem services by investing and strengthening natural defenses
Homeowners and businesses in hazard-prone areas	Take action to reduce vulnerability and increase resilience of property	May be unaware of or underestimate the hazards that they face	Creating demand for disaster-resistant or retrofitted structures that have increased value
Emergency managers	Oversee emergency preparedness, response, recovery, and mitigation activities	More focused on immediate disaster response than risk management	Reorientation of training and roles to balance focus toward prevention and overall disaster resilience
Construction and real estate	Incorporate resilience into designs; inform clients of risk	Actions may increase cost and reduce likelihood of sales	New opportunities in niche market
Banks and financial institutions	Require hazard insurance	No incentives to require insurance	Reduce overall risk in their portfolios
Private insurers and reinsurers	Offer hazard insurance at actuarial rates; identify risks	Limits may be placed on rate structures	Greatly expanded and risk-reduced market by offering incentives such as premium reductions for retrofit measures
Capital markets	Catastrophe bonds and other alternative risk transfer instruments	Availability limited due to globalized financial markets	Large resource base and new investment opportunities that could be directed in an anticipatory way
Insurance rating agencies	Identify stability of insurers	May negatively impact insurer position	Transparency to enable informed decisions on the part of consumers
Researchers	Collect, analyze, and communicate data, forecasts, and models about risk, hazards, and disasters	Insufficient or dispersed datasets; understanding how to share scientific information with broad audiences	Increased forecasting capability and improved data-based models of physical processes leading to disasters

dollars' worth of disaster losses, on average.[5] As disaster mitigation refers to methods of lessening the impact of disasters on the built environment, the components of risk assessment include: sabotage and terrorist attacks; natural phenomena such as hurricanes and floods; and any force that is likely to destroy, inflict casualties, and cause loss of function in the built environment.[6]

There are two types of mitigation measures: active (which focus on the hazard) and passive (which focus on the potential damage).[7] Active measures may be structural or non-structural. Passive measures, such as hazard mapping in land-use planning, are used to reduce the potential loss from a disaster by, for example, modifying the spatial and temporal character of either the damage produced by floods and debris flows or the related defenselessness. Disaster risk management strategies and measures for disaster risk reduction and mitigation may thus be structural (construction-related), nonstructural (non-construction-related), or a combination of the two, depending on the specific social, economic and environmental contexts, and are contingent on three main factors: hazards identified, the location and construction type of a proposed building or facility, and the specific performance requirements for the building.[8]

NIBS recommends a number of measures that should be taken into consideration when integrating disaster reduction measures into building design for earthquakes, hurricanes, typhoons, tornadoes, flooding, rainfall and wind-driven rains, differential settlement (subsidence), landslides and mudslides, wildfires, tsunamis, and areas of refuge.[9] It also provides a list of relevant codes and standards when designing for each of these natural phenomena in the US.[10] It should, however, be noted that

> compliance with regulations in building design is not sufficient to guarantee that a facility will perform adequately when impacted by the forces for which it was designed. Indeed, individual evaluation of the costs and benefits of specific hazard mitigation alternatives can lead to effective strategies that will exceed the minimum requirements. Additionally, special mitigation requirements may be imposed on projects in response to locale-specific hazards.[11]

Structural mitigation measures include the following:

- Hazard-resistant construction and design (e.g., earthquake-proof structures, engineering systems, and vibration-control systems). Examples of structural mitigation measures include building material and technique selections for all building construction types (*Masonry* – Unreinforced Masonry, Reinforced Masonry; *Reinforced Concrete [RC]* – RC Moment Resisting Frame (MRF), RC MRF with Unreinforced Masonry Infill, RC Shear Wall, Steel and RC Composite Frame, Precast MRF; *Steel* – Steel Frame, Steel MRF with Unreinforced Masonry, Steel-Braced Frame, Light Metal Frame), building code compliance, and site selection.
- Building designs that are fireproof both to prevent fires from occurring and to prevent them from spreading (e.g., fireproof structures and use of unburnable materials).
- Hazard-conscious ("Smart") building.
- Disaster-resistant construction and retrofitting existing building stock.[12]
- Stilted houses to reduce flood damage.