DISASTER RECOVERY AND MITIGATION AS SUSTAINABLE DEVELOPMENT TOOLS: THE CASE OF THE 1993, MAHARASHTRA (INDIA) EARTHQUAKE

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SUMMARY

This paper discusses the link between disaster recovery and mitigation, and sustainable development, on the case of repair and strengthening of buildings following the Maharashtra (India) earthquake of September 30, 1993. It argues that the opportunity to mitigate future hazards presented in the aftermath of disasters is still unparalleled and that it should be used extensively. Partnership building of key stakeholders (communities, government, NGOs and the World Bank), community and government ownership of the program, NGO participation, and extensive training of communities and local technical cadre (engineers and artisans) in seismically-resistant construction techniques are identified as principal contributors to linking recovery and mitigation with sustainable development.

INTRODUCTION

Although sometimes used interchangeably, the terms recovery, reconstruction and restoration refer to different parts of the disaster management process, which is widely accepted to include disaster preparedness, emergency response, disaster reconstruction, recovery and mitigation. Only the concept of "recovery" has a meaning broad enough to encompass, as Dynes and Quarantelly point out in numerous studies (e.g., 1989), both reconstruction of physical infrastructure and the unfolding of social change: it is the social dimension that gives complexity to recovery, as it tends to deal with various social relationships and also involves a social "healing" process. Together with the long-term mitigation efforts, recovery presents the most intricate concept of disaster management, effectively unifying reconstruction and sustainable development goals (Pantelic, 1991). The old notion of competition for resources in which recovery was seen as diverting funds from development efforts has been replaced by conceptually linking recovery and sustainable development in the process of disaster mitigation.

Although implementation of "mitigation [measures] has had a checkered history over the past three decades [in the US]" (Platt, 1999:71), the last dozen years have seen a movement among the national and local government policy makers, members of the private sector – especially financial institutions and insurance companies, international donors and communities themselves, to internalize the message of the benefits of mitigation for sustainable development. In no small way international research effort furnished the bases for the decision-makers gradually to espouse mitigation as a tool for minimizing losses in future imminent disasters, and to achieve development objectives that would remain sustainable. This orientation is true of both developed and developing countries, but is especially critical for the latter ones: poverty lies at the root of disaster vulnerability and reducing this exposure through pro-active, forward thinking before future disasters strike is key for development sustainability.

In her pivotal 1990 paper, Mary Anderson documents that especially for developing countries, which are exposed to recurring disasters, it is not only more cost-effective to mitigate hazards than to keep rebuilding, but that "if sustainable development is indeed the goal […not to mitigate …] is both unnecessary and wasteful of

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scarce development resources" (p. iv). In 1997, Maskrey and Peacock elaborated on the need for "disaster reduction [to] be inextricably linked to sustainable development initiatives" (p. 5), and about the same time Florida's Sustainable Communities Center proclaimed in its April 1998 issue of *Hemisphere* that "Disaster Mitigation 'IS' Sustainable Development." Meanwhile, the United States Federal Emergency Management Agency (FEMA) defines mitigation "as sustained action taken to reduce or eliminate the long-term risk to people and property from hazards and their effects" (FEMA, 1998: 2), and increasingly tends to adopt mitigation strategy as one of its assistance tools.

Although the benefits of mitigation appear to be clear, in some situations the pressure to rebuild quickly can result in perpetuating vulnerabilities. As Platt (1999) asserts, "[w]hile universally supported in principle, [mitigation] has often proved to be the unwelcome guest at the post-disaster banquet. Rebuilding more safely may cost more, take longer, and sometimes conflicts with private property interests and public tax base and economic priorities" (p. 71). In this vein, in the United States, after the 1991 fire in the hills of Oakland (California), the city could have re-planned and re-designed the neighborhoods for maximum safety, through widening and opening of streets, clustering development densities, transferring development rights, and re-organizing open spaces. "This was not considered a viable option, … since the funding needed to accomplish this was not [readily] available and more importantly, it would have taken too long to meet victims' needs" (Topping 1998: 267). Similarly, following Hurricane Opal in 1995, "[a]ll of the [affected Florida] communities … defined rebuilding as quickly as possible as their main post-storm recovery goal. […] In doing so, most followed the path of least resistance, by rebuilding in ways that restored what existed before the storm" (Smith and Deyle, 1998: 244).

Despite these examples, many governments and communities use disasters as opportunities to introduce mitigation measures. For example, in Mexico after the 1985 earthquake, Emergency Building Code was in place shortly after the disaster and dwellings reconstructed in the process incorporated the features of seismic-resistant design and construction (Pantelic, 1988). In Santa Cruz and Watsonville, California (USA), after the 1989 Loma Prieta earthquake, recovery became a complex political and economic process that slowly evolved into changes in the downtown design, the historic fabric of the communities and their economic base. "As a result of the earthquake, both Santa Cruz and Watsonville are far safer places than before" (Eadie, 1998: 299).

Japan, too, accepts the concept that disasters can offer a "window of opportunity" for mitigation. This is clearly illustrated by Kameda (1999) in his discussion of the mitigation initiatives after the Great Hanshin-Awaji (Kobe) earthquake of 1995, which included the establishment of a number of institutions to assist in future disaster mitigation (e.g., Earthquake Disaster Mitigation Research Center in Kobe). In a discussion of the rebuilding in Kobe, Ikawa (1998) describes a number of infrastructure and institutional activities, including the strengthening of key city facilities, improvements in the disaster management plan for the city, supplementing the fire hydrant network, strengthening the various lifelines, and developing Community Development Associations that will play a large role in creating disaster-resistant communities. Some of these local activities include upgrading main roads and parks so they can be used during disasters, planting greenery that can help check the spread of fires, and involving women's groups, fire fighting groups, crime prevention associations and school district groups to develop disaster and crime prevention programs.

Similarly to these examples where disasters gave rise to developing hazard mitigation and enabling sustainable development, two recent major disasters in India– the 1996 cyclone and flood in the state of Andhra Pradesh[1] and the 1993 earthquake that affected the southern areas of the state of Maharashtra – turned losses into opportunities, and through recovery and mitigation created physical and social environment more resilient to natural disasters. In both of these cases, the World Bank Group provided major share of financial support for the recovery efforts.

THE WORLD BANK AND NATURAL DISASTER MANAGEMENT

The World Bank – International Bank for Reconstruction and Development (IBRD) – was created after II World War in order to assist the countries that were devastated during several years of world-wide animosities. Over time, the attention to reconstruction after war led to consideration of helping member countries affected by natural disasters and in urgent need of financial and technical assistance. A special lending instrument was

[1] *The project in Andhra Pradesh is still being implemented.*

created, Emergency Recovery Loan (ERL)[2], the main purpose of which is to assist affected communities reconstruct their lost assets in a three year period[3] A recent study by Gilbert and Kreimer (1999), covering a period since 1980, identified 199 disaster-related projects, 101 of which were reconstruction projects (valued at $7.4 billion in loans), and 95 for mitigation (equaling $6.4 billion in loans), a grand total of almost $14 billion in the past 20 years. Traditionally, The World Bank Group was concerned with development projects, and only reacting after natural disaster impact through ERLs. Pre-disaster mitigation effort – although encouraged by OP 8.50 guidelines – has only recently started to gain ground. The creation in 1998 of the Bank's Disaster Management Facility is a testimony to changing times and a growing recognition both within the Bank and

among its borrowers that preventive, mitigation measures can go a long way in sparing developing countries painful life loss, reducing economic and financial tolls, and preventing the interruption of the national productive cycle. For countries as vulnerable as Bangladesh, "mitigation indeed is development:" overpopulated, poor and visited by recurring devastating cyclones and floods, they must develop disaster management frameworks, looking into prevention and mitigation measures. In neighboring India, for the state of Maharashtra which is prone to a series of moderately frequent hazards – and until 1993 not considered to be within a significant seismic risk zone – it took a devastating earthquake to move the state government to look squarely into the eyes of future disasters and multiple risks statewide.

EARTHQUAKE IN MAHARASHTRA AND KEY COMPONENTS OF THE WORLD BANK SUPPORTED PROJECT

Immediately after the losses caused by the earthquake of September 30, 1993 (measuring 6.4 on the Richter scale) became known to the Government of Maharashtra (GOM) and the Government of India (GOI), the World Bank received a request for assistance and sent its first team within 10 days of the disaster. The pictures that the first missions encountered were devastating: the epicentral village of Killari in Latur District, that before the earthquake had a population of over 10,000, was reduced literally to rubble. An equally large village of Sastur in the neighboring Osmanabad District suffered the same fate, as did 65 other villages in these two most heavily affected districts. About 8,000 people found their graves and 16,000 other were injured in collapsed walls and roofs of heavily built, non-engineered stone masonry buildings; 225,000 houses were destroyed or damaged, with more than 58,000 families left homeless. GOM's and GOI's emergency response was highly exemplary and on international standards. Emergency shelters were quickly constructed by the government and numerous non-governmental organizations which joined the common effort. Meanwhile, the World Bank Group's team worked jointly with the representatives of the GOM and GOI in preparing and processing an Emergency Recovery Loan – Maharashtra Emergency Earthquake Rehabilitation Project (MEERP) (The World Bank, 1999).

As another paper (Greene et. al., 2000) presented in this conference discusses in detail the features of the overall project, suffice it to emphasize here that the MEERP was worth over $330 million (with GOM's contribution and co-financing from UK's Department for International Development, assistance from UNDP and other donors, including international NGOs, such as CASA, CARRITAS, AWARE, ADRA, Oxfam) and with $216 million in lending from the Bank. Over a period of 4.5[4] years, the credit and other donor's funds were fully disbursed and all project's objectives were achieved: to assist GOM (i) in the rehabilitation and reconstruction of earthquake affected areas, and (ii) in the development of a state-wide, multi-hazard disaster management planning process (Krimgold et. al., 2000); and (iii) to assist the GOI to strengthen its capacity for seismic monitoring and research. Within the component of rehabilitation and reconstruction of earthquake affected areas, 52 new villages with 28,000 new houses and associated infrastructure were built; about 211,000 houses that were partially damaged were strengthened and repaired, 30,000 of which were rebuilt *in situ*; a pilot program of retrofitting 5,000 undamaged houses in the wide impact area to demonstrate strengthening techniques was implemented; 500 model houses were constructed to demonstrate building with earthquake resistant features; infrastructure – such as roads, bridges, public, school and hospital buildings, water supply schemes – was built; social and economic rehabilitation was undertaken, including repairing or building new hostels for women, orphanages and day care facilities, district resource centers for women. This paper focuses specifically on the repair and strengthening (retrofitting) *in situ* of private rural houses.

[2] *ERLs are governed by guidelines OP 8.50.*
[3] *Conventional loans and credits of the World Bank Group last 5 years.*
[4] *The project was extended 18 months over its original 3 year duration and closed on December 31, 1998.*

REPAIR AND STRENGTHENING OF HOUSES *IN SITU*: ENHANCING THE RESILIENCE OF STRUCTURES AND COMMUNITIES

From among the studies revolving around the synergies between recovery and development sustainability that have been undertaken in the past decade, of conceptual importance for this paper is the research undertaken by Beatly and Burke between 1989 and 1992. At the focus of their attention were local recovery efforts and their influence on enhancing sustainable development, as well as the ways in which the donor community provides aid in developing countries with widespread poverty (in this case, Antigua and Barbuda, Jamaica, Monserrat and St. Kitts and Nevis following hurricanes Gilbert and Hugo). On the basis of their study, Beatly and Burke (1997) report (i) that international donor agencies (World Bank Group being one of them) need to incorporate natural hazards into the projects and programs funded; (ii) that NGO-strengthened, community-based approach to

recovery observed in some of the countries tends to be more effective and equitable than the traditional top-down approaches documented in others; and (iii) that one of the key measures to save lives, property and productive capacity in future imminent disasters is strengthening of building stock – both new construction and retrofitting of existing units. These three, empirically developed facets by the study were independently confirmed by the MEERP's repair and strengthening component.

While MEERP represents the largest rural housing project ever financed by the Bank, its importance goes beyond the sheer numbers, which are impressive even on their own: over 200,000 houses repaired, strengthened or reconstructed *in situ*. This was an owner-driven program, assisted by non-governmental organizations (NGOs), local governments and external donors. The synergy of this remarkable partnership – which was forged through time – managed to deliver tangible outcomes on the ground: safer residences for rural families, equitable distribution of "seismic resistance" component across the caste and income strata, full community involvement of affected families through NGO mediation[5] , and importantly, dissemination of knowledge in prudent rural construction practices to about 6,000 local artisans (see further EERI, 1999, and World Bank, 1999). In time, stakeholders adopted a consensus-building approach, which has recently been indicated by Mileti (1999) as a desirable point of departure in mitigation efforts, especially when it is initiated at the local level.

As the largest reported effort in the world to strengthen un-reinforced stone masonry following an earthquake, the repair and strengthening component was the most complex and challenging element in MEERP. To provide earthquake-resistant housing through knowledge dissemination and training, and to harness the strength and the resilience of the local communities who did not relocate, were the rationales behind the decision to embark upon a task of repairing and strengthening of more that 200,000 houses, scattered over 2,400 villages, in 14 districts, and covering about 40,000 square kilometers (15,440 square miles). Owners could choose between repair and strengthening of their existing homes, and building one "new room" on the existing property and using earthquake-resistant strategies. In majority of cases the families opted for the latter solution.

A massive training program was provided by the GOM for about 6,000 artisans and around 700 engineers (who also received several "refresher courses"). Technical assistance was extended to house-owners to make informed choices, including help with the design and its costing, and later supervision of construction. With inputs of international expertise, earthquake-resistant techniques were locally developed (for details please see EERI, 1999).

In June 1998, Government of Maharashtra issued *Manual on Earthquake-resistant Construction and Seismic Strengthening of Non-Engineered Buildings in Rural Areas of Maharashtra*. The manual is a technical legacy of the repair and strengthening program; it outlines earthquake-resistant construction techniques for rural buildings, covering seismic retrofitting of 10 types of traditional rural masonry buildings typical for the earthquake-affected area and also for the other areas of Maharashtra; technical information contained in the manual has been presented in a simple and easy to understand manner, and it assumes that local artisans with limited technical background are involved in the construction activities. Apart from the broad coverage of seismic repair and techniques used for retrofitting, the manual also includes recommendations for the construction of new non-engineered rural masonry buildings with seismic features. A limited edition of the Manual has been published in English language, and was subsequently translated to the local language, Marathi. In the future, local governments in the rural areas of Maharashtra will be encouraged for the first time to issue building permits with the requirement that the seismic-resistant provisions contained in the Manual be followed.

[5] *Some of the NGOs included SPARC and TISS.*

PILOT STRENGTHENING PROGRAM

There are more than 2.5 million traditionally built stone masonry buildings in Maharashtra's seismic zones identified after the 1993 disaster. In view of the complete destruction of or damage to more than 225,000 houses in the 1993 earthquake, and the documented vulnerability of un-reinforced stone masonry buildings in earthquakes elsewhere in the world, a Pilot Strengthening Program (PSP) was launched for 5,000 private buildings scattered throughout 13 districts in the state (EERI, 1999). The houses selected for this pilot program were similar in construction style to those affected by the 1993 earthquake (mainly unreinforced stone masonry dwellings with interior timber frames and heavy earthen overlays on top of the roofs), and they also required similar seismic-resistant features. In order to ensure the demonstration effect, the GOM policy required that the houses included in the PSP be located in the central village of each district. Implementation of the program was partially sponsored by the GOM grant assistance, and partially self-supported by the house-owners. Information

dissemination was considered to be a critical aspect of the PSP. The GOM prepared illustrative pamphlets, technical guidelines and posters on seismic strengthening techniques in Marathi, and circulated them in the villages included in the PSP. In order to highlight the seismic features, and commemorate the retrofitting, special plaques describing the strengthening work done were placed on each house.

WHY DO REPAIR AND STRENGTHENING OF RURAL RESIDENCES MATTER FOR SUSTAINABLE DEVELOPMENT?

Repair and strengthening of moderately damaged buildings, "retrofitting" of undamaged, but hazardous buildings to the standards that would withstand future disasters, extensive training of local technical experts (be they independent artisans, masons or engineers in government employ) in prudent building techniques, publishing guidelines for further spreading the knowledge, introducing the process of issuing building permits – all this means that the boundaries between recovery and mitigation become fuzzy and the process becomes one.

Seismic vulnerability of Maharashtra has been established beyond doubt by the 1993 earthquake which stunned not only the sleeping residents of the affected region, but also seismic experts around the world. In order for the development process to continue and accelerate, the government of Maharashtra used the great disaster that befell them as an opportunity to improve construction practices also in the future. Education and training of artisans and engineers testifies to this.

Great attention that was paid to repair and strengthening of rural houses also speaks about the link to long-term development goals. In addition to providing seismically-resistant structures for the occupants, rural residences fulfill numerous other functions: they are places of safety for women and children, cool places for rest in the afternoon heat, places for socialization. Houses are also symbols of their owners' pride, irrespective of the latter's social and economic status. Importantly, houses are a functional part in the continuum of rural economy: their roofs collect water or serve as flat surfaces for drying peppers; they are storage facilities for grain; and importantly, they are places of work and additional income generation for families. If rural houses stop providing these functions they cease to be homes, and social and economic life of a family or a community can be significantly impaired.

House-owners' direct involvement in the process by working with the NGO mediators and engineers trained in earthquake-resistant design, as well as the decision of many owners to invest their savings in extending their houses using newly espoused techniques, their diligence in understanding the basic principles of elementary seismic-resistant village construction, their participation in "informal supervision" of works done by artisans and family members' assistance to artisans to perform their work on time in a short building season, all indicate house-owners' and communities' ownership of the program and care devoted to its long-term sustainability.

CONCLUSIONS

Recovery and mitigation lead to sustainable development if the strategies adopted revolve around communities' direct participation in project design and implementation, genuine partnership between stakeholders (community, NGOs, government and external donors) and paying adequate attention to the soundness of built infrastructure. Stakeholders' ownership of disaster management programs is key for program's success. While MEERP was a challenging project from the beginning due to its volume, complexity, and vast geographical region of project impact, the adoption of a learning and consensus-building approach, donor commitment and partnership

building, as well as a continuous commitment of the people and Government of Maharashtra helped this project achieve its development objectives.

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