THE UNEXPLORED NEXUS: ENVIRONMENTAL MANAGEMENT AND EMERGENCY MANAGEMENT IN POST-DISASTER RECONSTRUCTION

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Abstract

The disciplines of environmental management and emergency management share many of the same concepts, issues, processes, and concerns. Yet they interact more by accident than design. This paper explores the contributions that environmental management can make to the theory and practice of emergency management – from preparedness and response through recovery and reconstruction. It explores the concept of "disaster" in the contexts of both environmental management and emergency management, and it addresses the significance of environmental degradation as both a contributing factor in disaster effects and an important criterion in setting priorities for long-term reconstruction. Research and planning in many areas of the world are serving to embed emergency management solidly in the practice of environmental management, and vice-versa. The paper notes the growing consciousness of environmental justice/equity issues that figure significantly in the impact of disaster effects and in the decisions to be made throughout the process of long-term recovery and post-disaster reconstruction. It concludes by identifying areas where environmental management and emergency management can and should interact more positively to support long-term recovery and reconstruction.

Keywords: Environmental management; environmental quality; recovery and reconstruction; survivability; sustainability; performance measurement

INTRODUCTION

The disciplines of environmental management and emergency management share many of the same concepts, issues, processes, and concerns. Yet they come into contact only rarely, and then it is usually by accident rather than design. Parts of environmental management include risk assessment, hazard identification, spill response, and emergency/contingency planning – all activities that are central to the practice of emergency management. Other parts of the field address such issues as water quality, protection of flora and fauna, and

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general health of the ecosystem – all of which may be affected by decisions and actions taken in the pursuit of emergency management.

Many practitioners in both fields tend to focus more on planning and immediate response and have only recently begun to consider the requirements and opportunities inherent in long-term mitigation and reconstruction. Environmental management professionals are now concentrating more on the sustainability of environmental quality and environmental improvement; emergency managers and planners are re-focusing their efforts more on the survivability of systems, organizations, and communities. 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. Both environmental management and emergency management have much to contribute to, and to gain from, the planning and implementation of post-disaster reconstruction.

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. What will happen during that period? Will the emphasis be on re-creating what was there before? Or on improving the built environment, the larger physical environment, and the quality of life? Or, perhaps, on enhancing the ability of the community to mitigate and survive future disasters? Will the community leaders evaluate recovery success through sector-specific performance measures (restoration of economic activity; construction of old vs. new buildings and residences; re-population of devastated areas), or will they engage in "an ongoing search for a 'new normal'" (Vale and Campanella, 2005). Environmental management professionals and emergency managers must have an integral part in creating that new normal in which a community not merely returns to what it was before but becomes a more environmentally sustainable and physically survivable community.

UNDERSTANDING THE TERMS

Environmental management is somewhat of a portmanteau term that comprises many of the more academically accepted disciplines. It brings together elements of science, engineering, policy, assessment, and auditing, as well as basic down-in-the-dirt/air/water analysis and action. At one end of the spectrum lies the realm of environmental policy and regulation; at the other end lies what has been described as "blue-collar science." As opposed to the specific definitions of ecology or environmental science/engineering, environmental management is the planning and implementation of actions geared to improve the quality of the

human environment. It embraces both public and private organizations actively dealing with environmental issues on a daily basis.

“Environmental” in the disaster context

The environment is often seen as the agent/cause of a disaster or perhaps as the carrier. In an earthquake or a flood, for example, the “environment” behaves in ways that bring harm to the communities affected by them – one suddenly finds the environment sitting in one’s living room. However, people make choices (e.g., farming practices, use and procurement of fuels, selection of building materials and sites, etc.) that significantly affect their vulnerability to environmental disasters (Aptekar, 1994; May, et. al. 1996). This view mirrors the idea that disaster is a social construct formed by the interaction of human development with natural processes. An earthquake is a disaster only when it impacts the human infrastructure (Mileti, 1999; Cutter 2001; Burton, 1993; Varley, 1994).

But the environment also interacts with human society and the built environment in complex ways. Floods may damage natural habitats and ecosystems; forest fires may harm forest ecosystems and damage the biotic stock in an area. Yet, floods are necessary to renew and enrich riparian corridors and wetlands and to recharge aquifers; forest fires thin out undergrowth that could fuel larger fires, and they can re-vitalize biodiversity (Sauri, 2004). In fact, natural disturbances or perturbations over geologic time shape the ecosystems, species composition, and species interactions within the environments they impact.

Floods can clog wastewater treatment plants, causing the release of untreated sewage into water bodies; floods can also mobilize contaminants and industrial chemicals that then flow downstream and possibly into those same aquifers. Thus, an “environmental” hazard may be difficult to define, and there can be a fine distinction between an environmental hazard (i.e., water out of control – a flood) and an environmental resource (i.e., water in control – a reservoir). It can often be a matter of perception regarding deviations about the norm – too much rain is a flood; too little is a drought (Smith, 1996).

There is a growing understanding of environmental degradation as a contributing factor in disaster effects – i.e., an exacerbating factor in damage, it worsens impact on victims and makes recovery more difficult. One example:

> Although the largest danger facing Turkish urban areas is earthquake, numerous other hazards exist. Improper handling of solid wastes causes explosive methane build-up, endangers the physical environment, reduces property values and destroys the scenic and tourist values of highly visited areas…. Near the larger cities, many bodies of water are so polluted that they are no longer suitable for recreational use. High levels of heavy metals are

> found in harbor catches, and massive fish kills are common. Marine accidents release massive, toxic discharges, sometimes causing explosions that destroy buildings and facilities. Dangerous chemicals enter the urban food chain…urban rivers are polluted…agricultural chemicals and waste water have contaminated precious aquifers… (Parker, Kreimer, and Munasinghe, 1995).

A recent example occurred in the South Asian tsunami – long-term damage to coral reefs and degradation of mangrove swamps in some areas reduced the capacity of natural systems to absorb or cushion the kinetic energy of the tsunami surge. In Louisiana, flood-control damming and associated upstream sedimentation created a situation in which – over many decades – the Mississippi delta regions failed to aggrade as they might have under less-aggressive development.

Deleterious effects of degraded environmental conditions are felt most keenly (though not exclusively) by the poor, residents of shantytowns, "favelas," and other marginal or hazardous areas. They are clustered on steep slopes subject to flash floods and erosion, in dwellings built of substandard materials, with poor water and waste disposal systems. Natural disaster effects can be greatly magnified by the poor environment in which these people live.

According to Pelling (2003), there is a tendency to focus on technical and engineering issues in addressing environmental problems or issues and to discount the influence of social characteristics on susceptibility to environmental risk. This bias toward technological and physical solutions (e.g., flood walls, or leachate mitigation systems) can encourage development in hazard areas when, in fact, hazards can surpass the margin of safety provided by technological solutions.

"Disaster" in the environmental context

The field of emergency management tends to focus more on harm to the human environment and the built environment and to pay less attention to the larger environment in which humans and structures exist. Also, the emphasis is on the more acute disasters (like earthquakes or chemical spills) and less on the slow-developing problems with chronic effects (e.g., Minamata or acid rain) or on acute events with long-lasting consequences (e.g., Bhopal, or the Tisza River). This no doubt reflects the understandable orientation of emergency management professionals to the needs of planning for and response to the immediate effects of a disaster and the desire for speedy restoration to something approaching the *status quo ante*.

Environmental professionals take a somewhat more comprehensive view, considering not only the human and built environments but also the matrix in which they exist. Environmental concerns include not only humans but also plants and animals, water and air quality, the fate and transport of environmental contaminants, the toxicology of human and animal effects, and the exposure and vulnerability (both acute and chronic) of the affected biota. The environment is also seen as an economic resource to be protected and preserved: oil spills affect fisheries; toxic run-off into streams kills fish; volcanic eruptions affect timber, fish habitat, and land use. All of these concerns can and should contribute in positive ways to the practice of emergency management before, during, and – especially – after disasters.

Environmental management confronts the full range of disaster effects, in one manner or another, and brings the full range of scientific, technical, and managerial skills and techniques to bear on preventing, mitigating, responding to, and recovering from their effects. Of course, the definitions of "emergency" and "disaster" are a bit different in the environmental field: "An environmental emergency is a tanker truck full of acid overturned and spilling in the middle of town. An environmental disaster is that same tanker spilling into a wetland or a river."

Environmental hazards are not independent of other types of hazards, and one may lead to the other or make the other worse. For example, floods can degrade water quality, release chemicals and other contaminants from impoundments or containers (or even float off the containers themselves to lodge in someone else's backyard). Earthquakes can cause transportation spills, industrial chemical releases through infrastructure damage, or damage to containment. Destruction of the World Trade Center released asbestos, respiratory irritants, polycyclic aromatic hydrocarbons (possible carcinogens), pulverized metals, and god-knows-what-else into the atmosphere, affecting rescue and recovery workers and undoubtedly contaminating the surrounding area (Mattei, no date). As we have seen in the example from Turkey, environmental hazards may only be waiting for a triggering event to make a natural disaster even worse.

Recent Illustrations of Environmental and Disaster Intersections

The City of New York re-opened the Fresh Kills Landfill to dispose of all the demolition debris from the World Trade Center. As that landfill is now permanently closed, the Office of Emergency Management is working with the State environmental regulators to identify suitable future disposal sites, establish environmental operating criteria, and prepare advance agreements for the use of these sites in future disasters. Demolition and reconstruction of 130 Liberty Street (vacant since 2001) will be conducted in accordance with strict

environmental quality criteria and subject to intensive monitoring for lead, asbestos, and other hazards (Marrocolo, 2005).

Disposal of disaster debris is a major problem in the recovery from Hurricane Katrina. The Louisiana Department of Environmental Quality initially mandated the incineration of construction and demolition wastes but ran into resistance from the USEPA, FEMA, and environmental interest groups. As a result, debris is being placed in landfills; given the interaction of land use, topography, and water tables in Louisiana, this may not be the most environmentally-sound solution over the long term. Research and an analysis of alternatives is needed, during re-construction and prior to future disasters, to identify effective waste/debris disposal methods that will meet recovery and reconstruction needs without degrading environmental quality (Meyers, 2005).

The World Conservation Union has addressed the recovery of communities from the South Asian tsunami, in part through a workshop on "Applying the Ecosystem Approach to post-disaster reconstruction and restoration," by stressing the performance and importance of coral reefs for coastal protection, and by developing a series of 14 "Best Practice Guidelines" for reconstruction in Sri Lanka that stress the use of environmentally sound principles. These guidelines include: "Materials For Reconstruction," "Restoring Coastal Wetlands," "Environmental Policies and Laws," and "Learning to Prepare for Natural Disasters" (IUCN, 2005).

EXPLORING THE NEXUS

Considerable research and analysis has been done by the European Union and the United Nations to illuminate the connections among environmental hazards, sustainable development strategies (especially in the poorer countries), and disaster response and management. *Living with Risk* (2004), produced by the UN International Strategy for Disaster Reduction, puts it most succinctly:

> The environment and disasters are inherently linked. Environmental degradation affects natural processes, alters humanity's resource base and increases vulnerability. It exacerbates the impact of natural hazards, lessens overall resilience and challenges traditional coping strategies. Furthermore, effective and economical solutions to reduce risk can be overlooked…. Although the links between disaster reduction and environmental management are recognized, little research and policy work has been undertaken on the subject. The concept of using environmental tools for disaster reduction has not yet been widely applied by practitioners (p.298).

Researchers in the Swedish Embassy in Bangkok have sought to link environmental programs with disaster risk in the context of sustainable development. They ask:

- How can investments in environmental management and sustainable development also reduce disaster risk?
- Is there a *prevention dividend* that accrues from wise land use planning and development programs? ("…*the values of foregone disaster losses that accrue from well designed and implemented disaster risk reduction measures, including environmental management and sustainable development initiatives*.")
- Can *prevention dividends* be measured; and, how might the ability to estimate these added values enhance policy and program planning? (Dolcemascolo, 2004)

Although they find evidence for positive answers to these questions, they acknowledge that more research and analysis is necessary in order to capture the rather elusive cost/benefit parameters of disaster reduction and sustainable development.

Living with Risk (2004) also outlines ways to integrate environmental and disaster reduction strategies:

- assessment of environmental causes of hazards occurrence and vulnerability
- assessment of environmental actions that can reduce vulnerability
- assessment of the environmental consequences of disaster reduction actions
- consideration of environmental services in decision-making processes
- partnerships and regional approaches to land use and nature conservation
- reasonable alternatives to conflicts concerning alternative uses of resources
- advice and information to involve actors in enhancing the quality of the environment.

Within this context, there are a number of areas where environmental management and emergency management can and should interact more positively for mutual benefit and support. Both fields would benefit from continuing and supporting the current movement in the disaster community from "reactive" disaster response to active risk management and from iterative recovery to pro-active mitigation and prevention. Parallel efforts would transition the environmental field from contaminant clean-up to risk reduction and pollution prevention, from discrete issues management to environmental management systems, and from flood control to floodplain management (see Philippi, 1996). Put another way:

> *Prospective disaster risk management* should be integrated into sustainable development planning. Development programmes and projects need to be reviewed for their potential to reduce or aggravate vulnerability and hazard. *Compensatory disaster risk management* (such as disaster preparedness and response) stands alongside development planning and is focused on the amelioration of existing vulnerability and reduction of natural hazard that has accumulated through past development pathways. Compensatory policy is necessary to reduce contemporary risk, but prospective policy is required for medium- to long-term disaster risk reduction. (*Reducing Disaster Risk*, 2004)

Integration of sustainability considerations into disaster mitigation and recovery can exploit the considerable overlap between environmental management and disaster management. Planners and practitioners in both fields must recognize that the overall objectives of these fields implicitly promote sustainable communities. Sustainability should be considered both prospectively (in sustainable development planning and mitigation) and retrospectively (in response and recovery). This integration would incorporate and enhance current trends toward "holistic disaster recovery" (also "sustainable recovery") that emphasize betterment of the entire community, including environmental improvement and enhancement, through the recovery process (*Holistic Disaster Recovery*, 2001). *Living with Risk* (2004) is even more direct:

> Disaster reduction specialists should be encouraged to anticipate environmental requirements under applicable laws and to design projects that address these requirements, coordinating closely with environmental institutions.

The application of international disaster assistance, especially in developing countries, can have an important influence on both the implementation and the outcomes of post-disaster reconstruction. The concept embraces both the ideas of sustainability and survivability at the heart of this paper:

> Mitigation…is defined as a statement of intent or a plan of action to reduce such significant hazard risks while incorporating sustainable values; this includes seeking opportunities to relocate inappropriate land uses out of hazard areas and to rebuild damaged homes and infrastructure in more resilient ways instead of replicating brittle, unsustainable development practices. Sustainable communities also recognize the interconnectedness of social, economic, and environmental goals, and strive to break down the de facto zoning of urban and rural living space, which has previously resulted in the poor occupying the more hazardous regions in frail dwelling units. (Ranganath, 2001)

Inclusion of environmental quality enhancement and disaster resiliency principles within the scope of post-disaster reconstruction planning and implementation provides a clear mechanism for addressing both environmental shortfalls and the requirements of building (or re-building) truly sustainable communities. Land-use planning, for example, offers an effective, flexible methodology for identifying environmental enhancements and disaster mitigation strategies in both community development and post-disaster reconstruction. Such planning can contribute significantly to long-term environmental quality and disaster survivability (Burby & Deyle, 2000). An encouraging development is the specific pairing of post-disaster reconstruction with disaster mitigation in the *Draft Disaster Risk Management Policy* (2005) by the Inter-American Development Bank:

> *"Disaster risk management"* is the systematic process that integrates risk identification, mitigation and transfer, as well as disaster preparedness, emergency response and rehabilitation or reconstruction to lessen the impacts of hazards.

Finally, environmental assessments should be integrated into disaster recovery and reconstruction planning processes, perhaps following the Environmental Impact Statement model mandated by the National Environmental Protection Act. Environmental Impact Statements should (but currently do not) specifically include disaster-hazard considerations. Rapid environmental assessments should be conducted as part of disaster damage assessment and should be an integral part of reconstruction and mitigation considerations (Kelly, 2001).

Environmental Justice/Equity

Both environmental managers and emergency managers must be cognizant of the importance of environmental justice/equity issues in the context of hazard and vulnerability. Hazards of any type have a disproportionate impact on the poor and disadvantaged. A number of thorny equity issues are coming to a head in the environmental management world, among them: industrial plant and landfill siting; development in industrial or depressed areas; residential settlement on slopes or in other marginal areas; higher population density; immigrants and language differences; differential access to social services and information sources. Most of these issues have not yet been adequately addressed in emergency management planning or community dialogue.

Agyeman (2005) raises the issue of "Just Sustainability" and stresses the potentially re-distributive function of developing sustainable communities. He links the principles of justice/equity, with both environmental quality and sustainable development. Indeed he foresees a more holistic approach toward

sustainability embedded with progress on economic, environmental, and social fronts.

Pellow and Brulle (2005) place the environmental justice issue squarely within the context of socio-economic inequality and environmental degradation. They explore the “winners and losers” aspect of disaster effects, whereby the distribution of environmental degradation adheres to the class/race pattern of the society – wealth accumulates at the top, risks at the bottom.

Shubh Kumar-Range notes the socio-economic and gender-based differentials in vulnerability to disasters and asserts that greater attention must be paid to the contribution and place of women in responding to and recovering from disasters.

> Structural adjustment programs of the past two decades have created increased competition for natural resources, with a resultant tendency to marginalize local populations at the expense of capital inflows into rural areas. Without an adequate framework for social equity or environmental protection, the outcomes are often literally disastrous. These failures in development can clearly [be] seen as a source of increased disaster vulnerability, and better disaster mitigation and recovery can be seen as instruments of sustainable and equitable development. Incorporating women’s role in economic development from this perspective becomes common ground for both effective development and effective disaster mitigation. (Kumar-Range 2001)

Vale and Campanella (2005) state this issue most clearly:

> What we call "recovery" is also driven by value-laden questions about equity. Who sets the priorities for recovering communities? How are the needs of low-income residents valued in relation to the pressing claims of disrupted businesses? Who decides what will be rebuilt where...Who gets displaced when new facilities are constructed in the name of recovery?

An important step toward addressing these equity issues is to involve all parts of the affected community in planning for and implementing post-disaster reconstruction and long-term mitigation. Maximizing community involvement will illuminate the physical, economic, cultural, social, psychological, and infrastructure problems that must be solved in creating (or re-creating) a more survivable community (*Participatory Planning Guide for Post-Disaster Reconstruction,* 2004).

CONCLUSION

Both environmental management and emergency management can contribute concepts, skills, processes, and worldviews that will make significant contributions toward maximizing the effectiveness of post-disaster reconstruction. The two disciplines can cooperatively seek solutions that will enhance environmental quality as well as meet the needs of disaster preparedness and recovery by identifying and implementing strategies that combine disaster risk and vulnerability reduction, post-disaster reconstruction, environmental sustainability, and community survivability.

Areas of fruitful interaction between the two disciplines include:

- Identifying enhancements to environmental assets/resources that support long-term recovery and reconstruction (e.g., enhancement of ecosystem elements, habitats);
- Identifying recovery options for environmentally sensitive areas that may serve to mitigate future disaster damage (e.g., creation, enhancement, or preservation of wetlands, mangrove clusters, and coral reefs for flood mitigation);
- Identifying and reconciling the tradeoffs between environmental enhancement opportunities and disaster-resistant construction and development practices (e.g., siting of dikes/levees; identification and pre-approval of waste disposal methods/sites);
- Identifying development techniques and practices that contribute to both environmental quality and long-term survivability (siting of industrial sites; stricter environmental management requirements for environmentally-risky facilities);
- Adapting and applying the process of environmental auditing and performance measurement to recovery and reconstruction (e.g., setting measurable targets for reconstruction projects; assessing whether projects are meeting sustainability and survivability goals).

Environmental professionals can assist in identifying areas of environmental regulation that may be relaxed or otherwise modified for some specified period post-disaster in order to facilitate recovery and reconstruction without compromising long-term environmental quality. Doing this in advance, or at least mandating a policy and procedure for establishing a post-disaster environmental regulatory regime, would be better than either ignoring environmental regulations or frustrating recovery and survivability goals that run afoul of regulatory restrictions. Additionally, investments in environmental quality enhancements or in survivability projects can assist in providing short-term (or perhaps even long-term) employment and income for those whose livelihood was destroyed by the disaster.

Planning for post-disaster reconstruction (including damage and hazard assessment, goal-setting, priority-ranking, organizing, and budgeting) is, of course, most important. Processes, projects, and activities that are identified and planned in advance are much more likely to be accomplished than those initiated on an *ad hoc* basis. Monitoring of progress during post-disaster reconstruction and systematic evaluation of outcomes will help to ensure that the full range of community needs is met.

It is vital that both environmental management and emergency management considerations be represented at all stages of reconstruction planning, implementation, and evaluation. If they are not, then important enhancements to the built environment and to the social infrastructure may be ignored. Significant contributions to the long-term success of the reconstruction and recovery effort may not happen, and the community may be less sustainable and less survivable.

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