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DISASTER RECOVERY AS A  
SOCIAL PROCESS

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## DISASTER RECOVERY AS A SOCIAL PROCESS

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### ABSTRACT

This paper takes the perspective that recovery from disaster is not merely concerned with the reestablishment of the physical or built environment; that is, community recovery should not be conceptualized as an outcome, but rather as a *social process* that begins before a disaster occurs and encompasses decision-making concerning emergency response, restoration, and reconstruction activities following the disaster. Put another way, reconstruction is less a technical problem than it is a social one. In order for successful post-disaster decisions to be made, however, there must be an awareness of the pre-disaster conditions that create situations of social and structural vulnerability, putting some segments of the society at greater risk in the event of an earthquake than others. From this perspective, what becomes important is how those decisions are made, who is involved in the decisionmaking, what consequences those decisions have on the social groups within the disaster-stricken communities, and who benefits from these decisions and who does not.

### INTRODUCTION

When we think about the immediate consequences of a disaster, vivid images usually come to mind. In the case of earthquakes, the images are of twisted metal that were highways and bridges, blocks of crushed concrete and broken glass filling city streets, heaps of brick and mortar rubble that were once homes, and pancaked or collapsed structures that had been places of employment.

While the Wellington region has not experienced the devastation of a catastrophic earthquake in modern history, similar to the one that struck Kobe earlier this year, projections of losses have been estimated. For example, Parr (1991: 6) estimates that if a Modified Mercalli Intensity X earthquake occurs in the Wellington region, the minimal governmental liability (deriving from claims under the Earthquake and War Damage Act) would be close to \$NZ 10 billion. However, this figure may be understating the actual losses since Falck (1989), using data from the 1987 Bay of Plenty earthquake, reports that 10% of the households had no earthquake coverage, and another 10% were underinsured.

#### **An Emphasis on Physical Reconstruction**

With an ominous earthquake scenario projecting catastrophic damage and disruption for the Wellington region, it would not be unrealistic to hear the term "recovery" used almost interchangeably with "reconstruction," "restoration," "rehabilitation," and "redevelopment." The emphasis is on putting the community back together again--on reconstructing the built environment so that people can again be housed, businesses can again serve customers and markets, and the infrastructure can facilitate the tasks and chores that must be undertaken in both peoples' and organizations' day-to-day lives.

In fact, this was the approach taken by Haas, Kates, and Bowden in the first study to specifically address this topic in 1977 in a book entitled, Reconstruction and Disaster. In this influential first academic work to investigate this topic, they identified three phases of the post-impact period associated with recovery. The first they called restoration, which refers to attempts to "patch up" the damaged physical and social systems. These were "temporary measures" taken in the first days or weeks after the disaster event

in order to make the community functional as quickly as possible. The next phase, replacement reconstruction, emphasized "restoring capital stocks to pre-disaster levels" and generally returning the appearance of the community to normal. This second phase could last from several months to a few years following the disaster event. The last phase was referred to as commemorative, betterment, and developmental reconstruction; and the emphasis was on promoting future economic growth and development within the community. This phase--which we now often refer to as "mitigation" and which has been associated with sustainable development--was expected to last until the onset of the next disaster.

This research was extremely useful in focusing the attention of those in the disaster research area on the different types of activities that take place during the recovery process; and on the importance of damage to building stocks and the infrastructure for the recovery process. The authors also incorporated a set of recommendations to planners and community decisionmakers about how to facilitate these processes; that is, how to make the reconstruction following disaster more efficient.

During the past 15 years, several researchers have used this approach, emphasizing the physical or material aspects of collective life to investigate how disaster-stricken communities become rebuilt (cf., Geipel, 1982; Oliver-Smith, 1993; Oliver-Smith and Goldman, 1988). They have conceptualized reconstruction in terms of replacement of what was lost or restoration of the original system. This approach has also been useful in cross-cultural comparisons of recovery from material losses sustained due to disaster events (cf. Kreimer, 1978; Bates, 1982; Bates and Peacock, 1993).

Researchers using this perspective have discovered that communities strive to re-establish themselves in forms similar to pre-disaster patterns (Aysan and Oliver, 1987); and that this desire for continuity and familiarity in post-disaster reconstruction may actually enhance psychological recovery (Marris, 1986; Oliver-Smith, 1992). For example, in their explanation of the difficulties families confront in their attempts to recover, Trainer and Bolin (1976) identified three types of general constraints on families' ability to recover. The first, and most obvious, is the physical constraint brought about by the destruction of community facilities and other commercial amenities that were available in the pre-disaster community. With the loss of these physical, structural resources, there are many functions that the family can no longer fulfill in normal ways. Because of the loss of these physical resources, the family faces a temporal constraint. The time it takes family members to carry out their routine day-to-day activities (such as finding food and cooking fuel, preparing meals, bathing, etc.) requires much more time and effort. Because routine aspects of family life are consuming more energy, time is taken away from other activities (work, leisure, neighboring) including rebuilding community structures. Because of these first two deviations from normal life, family members experience a third constraint--a subjective one. As the taken-for-granted nature of one's physical environment is shattered and as one's daily routines become radically altered, any comfort derived from integration into the social life of a community disappears.

A second group of researchers that have focused on reconstruction, using the model developed by Kates and his colleagues, have taken the view that disasters can be seen as opportunities to address long-term material problems in housing and infrastructural systems, recasting reconstruction into a developmental

process of reducing vulnerability and enhancing future economic capabilities (cf., Cuny, 1983; Anderson and Woodrow, 1991; Kreimer, 1979). Although this approach has most frequently been applied to developing countries where disaster losses are extremely high, including capital investments in new major economic and governmental projects, recent disasters in the United States--such as Hurricane Andrew in southern Florida--have demonstrated the desire among some social groups to use such an event as an opportunity to replan and redevelop a poor, economically ailing community.

#### **Recovery as a Social Process**

But if one takes this perspective that community recovery can be equated with outcomes in the built environment solely, the sociological significance of what really transpires in the post-disaster community is missed. Recovery is not merely an outcome, but rather it is a social process that begins prior to disaster impact and encompasses decisionmaking concerning restoration and reconstruction activities. It must also be recognized that what takes place during the aftermath of a disaster had its roots in the pre-disaster phases of response and recovery planning as well as mitigation implementation.

Dynes and Quarantelli (1989: 12), for example, have argued that:

...how recovery proceeds is rooted in the social structure and fabric of the impacted society. Put another way, reconstruction is less a technical issue than it is a social matter. Reconstruction only partly involves bricks and land use codes, it mostly concerns social values and group interests.

From this perspective, what becomes important is how those decisions are made, who is involved in the decisionmaking, what consequences those decisions have on the social groups within the disaster-stricken communities, and who benefits from these decisions and who does not.

Implicit in the sociological notion of "community recovery" is the assumption that social groups will experience the recovery process differentially. Communities are not monolithic entities, consisting of only one type of residential group. Although we do sometimes characterize cities by their major demographic and social trends, this tends to give the false impression that other social groups do not exist or, at least, are not significant. But all communities are made up of a variety of social groups--the elderly and the very young; the very wealthy and those on welfare; ideological conservatives and radicals; different racial and ethnic groups--to name only a few.

Because these social groups differentially experience the recovery process, the overall discussion of the community recovery process must include a consideration of pre-disaster intergroup dynamics and relationships, and their relative political influence. These groups will vary markedly in their ability to influence the decisionmaking process in their communities depending on: their relative size in the community; their political linkages to those in decisionmaking positions; the informal as well as organizational contexts within which contacts take place; and the cultural history of intergroup relations that has preceded the current encounter.

It must be remembered that these relationships do not change substantially in post-disaster contexts (cf, Nigg and Tierney, 1993). Although there may be brief periods of time following the actual impact of the disaster agent on the community during which social group barriers are lowered and an altruistic therapeutic community (Fritz, 1961; Barton, 1969) arises, providing a context in which supportive and altruistic norms can emerge and enabling a collective

response to victims of the immediate disaster event, these periods are usually very short-lived. As has been frequently evidenced, community conflict soon replaces altruism as communities move from the immediate impact period into the relief and long-term recovery phases of a disaster.

#### FAMILY RECOVERY

In all societies, the family is the basic unit of social organization. To date, the majority of the research conducted on disaster recovery has focused on the family, asking the following types of questions: What types of families are most disrupted? What types of families are likely to recover most quickly? What accounts for differential rates of family recovery? In most cases, this research has also focused on natural disaster agents rather than on technological (or human-created) agents.

During times of disaster, the extent to which families are disrupted--their dwellings damaged or destroyed, their members injured or killed, their inability to carry on the necessary daily tasks of providing shelter and sustenance for members--is an indication of the extent to which the general community will also suffer disruption.

Bolin and Trainer (1978) offer the earliest processual definition of what family recovery entails. Family recovery is the outcome of a sequence of activities in which families utilize resources to overcome disaster-induced losses. This conceptualization of recovery as process emphasizes the action-orientation of the family as it tries to cope with the losses it sustained by actively using resources available to it to return to some desired or acceptable pre-disaster condition. Families not only use their own resources but may also seek



assistance from their extended kin group as well as from extra-familial sources (such as governmental programs and non-profit organizations).

### **Generalizations on Family Recovery**

Several models of family recovery have been developed and tested by the research community using data from households interviewed at various intervals following the disaster to determine how well they recovered or how they attempted to do so (cf; Bolin 1976, 1982; Bolton, 1979; Drabek and Key, 1981). Not only have the components of these models differed but the passage of time between the event and when the data were collected varies from six months to ten years.

Despite these differences, generalizations can be drawn about how and what types of families are likely to recover. While the number of studies is relatively small, four topics have relatively consistent findings. In each of the following sections, these generalizations will be investigated for their application to the Wellington region.

1. **Importance of the extended family.** From Quarantelli's (1960) early comment on the protective functions of the family during crisis periods, researchers in the disaster area have generally found evidence debunking the notion that the nuclear family is isolated from its extended kin group whose importance has been increasingly diminished. Linkages to kin groups are strengthened immediately following the disaster event and continue into the recovery period as the victim family's extended kin group provides assistance to the victim family (Drabek and Key, 1976, 1984; Bolin, 1982). One of Bolin and Trainer's (1978) three models of the ways families recover is the "kinship" model whereby victim families rely primarily on resources from their extended kin group. The importance of these enduring relationships has consequences for both emergency and temporary housing,

and for the types of needs special population groups (e.g., the elderly, the disabled, and families with young children) who may become homeless will have.

Data from the 1991 Wellington census indicate that the Wellington region is rather stable with respect to population: 9% of the country's population live in this region and the population change rate is very low. Of the approximately 398,000 people living in the region 22% are under 15 years of age; while 14% are over 60. Of the approximately 142,000 households in the Wellington region, 75% are living in single-family dwellings; and 71% either own or are buying their homes. Currently 7% of the households in the area already consist of extended families, and another 7% contain unmarried people who are residing together. Fifty percent of those who are 15 years of age or older are married, only 15% are separated, divorced or widowed. The remainder of the adult population (35%) have never been married; a third of whom may still be living at home with parents due to their ages (between 15-19). Following a world-wide trend, 21% of the households in the Wellington region are single-person households, characterizing the region by a relatively low density rate of only 2.8 persons per household.

From this profile of residents of the Wellington region, what types of housing problems might we expect to result from the scenario earthquake; and how would those problems effect recovery? The first problem concerns the need to project the number of households that would become dislocated and in need of both emergency shelter as well as temporary housing following a high intensity earthquake. From the Northridge and Kobe earthquakes, it was learned that housing losses can have devastating effects on the recovery effort. In Kobe, approximately 21% of the population of the city became homeless within seconds. While some larger apartment buildings were effected, single family dwellings were

the most vulnerable type of housing units and resulted in the largest number of dislocated families. If 20% of the population in the Wellington region became homeless, are there plans for sheltering (including the provision of food, water, and medical care for a few weeks) or rehousing approximately 80,000 people? In Kobe, one of the most difficult problems the government is confronting with respect to the homeless victims is where to locate temporary housing units, given the severe scarcity of vacant land in the Kobe area. No recovery planning had taken place in Kobe prior to the quake to anticipate possible housing losses or to consider what types of programs might be needed to rehouse homeless victims. Unlike many other disaster events, the Kobe earthquake was unusual in that many of the homeless victims went to shelters, rather than to homes of relatives or friends in the same area. This was principally due to the widespread loss of homes, resulting in the inability of people to take refuge outside of government-operated shelters. In other words, extended families could offer some assistance, but it meant that victims had to leave the immediate area, disrupting neighborhood patterns and friendship networks. Similar situations have been observed, to a much lesser extent, in Northridge (the so-called "ghost town" phenomenon), which resulted in some heavily damaged neighborhoods being completely abandoned.

Following the Northridge earthquake, the City of Los Angeles alone had 22,000 people made homeless, with moderate to severe structural damage effecting 21,000 residential units. Unlike Kobe, however, only 2,000 of the damaged residential structures were single family homes (ad hoc Committee on Earthquake Recovery, 1995); apartment complexes were found to be most vulnerable. However, also unlike Kobe, the vacancy rate--even after the earthquake--in Los Angeles was sufficiently high (in the most damaged areas) to allow people to be rehoused

quickly through the provision of a variety of local, state, and Federal housing grant programs. By leaving people close to their original neighborhoods, employees were still able to get to work in usual ways and children did not have to be relocated from their schools, providing a minimum of broader social disruption.

Without knowing more about the condition of the housing stock in the Wellington area little can be predicted regarding the magnitude of potentially homeless victims. Questions that need to be answered include: What seismic design requirements have been required for single family dwellings--since those are the most frequent type of structure used by almost 3/4 of the population--in the Wellington region? For example, what proportion of single family dwellings might not be anchored to foundations; what proportion might not have roofs and walls tied together; what proportion might have cripple wall foundations; what proportion may have masonry chimneys tied to roof or wall systems without adequate independent support?

In terms of recovery planning, attention must also be directed to areas where the building stock is undergoing, deterioration, gentrification, redevelopment or changes in use. For example, in a report to the Wellington City Council on inner city housing needs (Housing and Community Development, 1993), an unmet need was identified for housing in the inner city, especially for students, young professionals, and older people without children. The report identified a high vacancy rate in the Central Business District of Wellington, principally in commercial buildings that were 30-45 years old, that could be converted to residential units by developers. However, the report cautioned that the conversion of these structures should be monitored since "developers may not give

adequate attention to the strengthening [for seismic resistance] of older buildings in this vulnerable area of the city" (p. 6). In this instance, earthquake hazard mitigation is directly related recovery planning; being aware of the changed uses of these structures may directly change both response and recovery strategies for the inner city area.

Among the population groups that may need additional consideration, the elderly may need special consideration. One of every six people in the region are over 60 years of age, many of whom will have health and mobility problems. According to the Quarterly Commentary for Wellington City (October-December, 1993), one-half of Wellington's elderly live in properties rented by the City. What is the likelihood that a proportion of these properties could become damaged in the scenario earthquake and what types of alternate housing might be available? If a sufficient proportion of the elderly live alone, what types of special emergency response efforts (like search and rescue) as well as long term services may be necessary to protect the health and welfare of these more fragile members of society, many of whom probably live on small fixed incomes and have medical needs that require professional monitoring? In the Northridge earthquake, several group living facilities (including mobile home parks and long-term nursing homes) for the elderly--those who required round the clock nursing as well as those who were relatively independent--were damaged severely, requiring the identification of group-like facilities in hotels farther from the impact areas to be found. This was an unexpected problem that required extensive efforts to be undertaken in both the immediate and longer-term time frames, often resulting in a great deal of disruption for the residents of these facilities because they often had to be moved more than once.

2. The effects of low socioeconomic status. Poorer families are not only more vulnerable to disaster-induced losses (Miller and Nigg, 1993) but also have more difficulty recovering (Drabek and Kilijanek, 1979; Bolin, 1984; Bolin and Bolton, 1986). Due to their lack of economic resources during normal times, poorer families are often housed in substandard structures in hazard-prone areas, making them more vulnerable to natural disaster agents. Despite the fact that poor families often have the greatest needs following a disaster, they have the most trouble acquiring extra-familial aid.

According to the 1991 Wellington census, 6% of the region's residents 15 years of age and older are unemployed and another 30% do not consider themselves in the workforce for various reasons--retirement, homemaker, student, or incapacity. Almost one in three of the region's adult residents has an annual income of less than \$NZ 10,000. The Quarterly Commentary for Wellington City (March 1994) reported that the number of jobs in Wellington declined about 15% between 1989-1993 and that the trend may continue.

Several questions must be answered about these poorer households before recovery planning can take place: where are these households located in the region; will some communities have more poor families with relatively few resources that they must prepare to shelter and rehouse; are these poorer households located in more vulnerable structures, making them more likely to become homeless victims requiring a large variety of services; are these households more likely to contain elderly on small, fixed incomes who may not be able to qualify for conventional loans to repair damaged homes; how many of these poorer households contain members who are physically handicapped who may require expensive medical assistance to live outside of their homes? What types of unemployment benefits

are available to the poor, who may be functioning on the margins of solvency under normal conditions and who become unemployed due to earthquake damage or disruption of their employers' facilities?

It must be remembered that the social relationships and conditions that exist prior to any disaster will be carried forward into the relief and recovery periods. Those individuals without financial resources will find it even more difficult to meet daily needs. Those with compound problems--the poor elderly; poor single-parent families; poor families with disabled members--will not only find it difficult to find temporary assistance but the organizational and social relationships that made it possible to function in normal times may be absent for an extended period of time following the earthquake, necessitating planning not only to provide immediate services but to replace the social supports that made it feasible for them to remain independent with augmented assistance programs.

3. **The effects of race or ethnicity.** While there are some cultural differences, racial and ethnic minority families generally have the greatest difficulty recovering from disasters (Moore, 1958). They are least likely to have insurance to cover their losses (Bolin and Bolton, 1986), their extended kin groups have fewer resources to provide, and they rely much more extensively on governmental aid for relief and recovery. However, they also have the greatest difficulty obtaining external aid (Dash, 1995). Even when they do receive external recovery assistance, however, they are more likely to evaluate it as inadequate and to recover economically more slowly. In most societies, socio-economic status and race are interrelated in complex and often different ways. Ethnic and racial minority groups disproportionately are poorer than the dominant racial/ethnic group in a society. Because they are poorer, they also are

disproportionately more vulnerable, both to the disaster agent and to the negative impacts of long-term recovery.

All recovery planning must take into account the "natural" spatial and social ethnic or racial communities that make up the metropolitan region. These groups will have historical relationships with local and national governmental systems that may either facilitate or hinder their post-disaster access to disaster services. To the extent possible, community-based groups in each of these communities should be included in the pre-disaster response and recovery planning in order to assure that their cultural norms and values can be accommodated within the recovery plans. For example, it may be more practical to have the community-based organization plan to set up shelters and feeding operations within their own neighborhoods than to expect groups that typically have not had good social relations in the past to co-locate in the same facilities. Also, by bringing into the planning process members of these different communities before a disaster occurs, members of those groups are more likely to become familiar with the governmental structures that will lead the response and recovery process. So-called "system awareness" may, therefore be higher, resulting in better outreach efforts within those communities following the disaster and a more equitable distribution of relief and recovery resources.

**4. Urban-Rural Differences.** A comment should also be made concerning urban-rural differences on family recovery. As crucial as this variable has been in explaining different patterns of family life, it has not received much systematic attention from disaster researchers. One reason for this omission is probably due to the single, case study method used in studying disaster events. However, Bolin (1982) was able to make some observations about the influences of



residential location--that is, family residence in an urban or rural environment--in his comparative study of disaster events. Rural victims were found to use their kin group as a source of emergency shelter more often than did urban victim families. In rural areas, high income victim families had fewer losses than lower income families. Rural families were also less likely to receive extra-familial assistance (that is, less aid and from fewer sources) than did urban victim families.

In recent work completed by the Disaster Research Center on disaster recovery, significant differences were found in the relationship between social context (that is, whether the community is basically in a rural or an urban area) and the recovery process (cf, Miller and Simile, 1992; Simile, 1995). Due to the physical and social invisibility of the rural poor, they are often overlooked in terms of efforts to assess their needs and to provide resources for their recovery.

#### BUSINESS RECOVERY

As significant as the economic sector obviously is in the recovery process for any community, it has received almost no attention from social scientists involved in disaster research. In his extensive review of disaster research findings, Drabek (1986) does not even mention the economic sector. After an exhaustive review of the literature on business recovery following a disaster, Dahlhamer (1992) found only three studies (Durkin, 1984; French et al., 1984; Nigg and Tierney, 1990) that addressed this issue.

However, sprinkled throughout the disaster literature are indications of the disruption of community life due to the disruption of the business community.

For example, one of the first events that documented the impacts of disaster on business communities was the Xenia tornado of April 3, 1974. The entire downtown area, housing the city business district, was devastated. Approximately 155 commercial and four industrial businesses in 121 structures were destroyed, including eight supermarkets. One hundred other businesses suffered major or minor damage (DRC, 1976). More recently, the downtown business district of Santa Cruz, California was devastated by the October 17, 1989 Loma Prieta earthquake. It was estimated that 60% (approximately 650) of the downtown businesses were destroyed or sufficiently damaged to require at least temporary closure (DRC 1993).

There are two compelling reasons why communities should actively address the business recovery process. First, businesses as units of analysis have many of the same characteristics as households: they vary in size, they have incomes, they age, they have socioeconomic locations in the social structure, they are physically housed in structures that are more or less vulnerable, they may be embedded in a network of community organizations, and the types and amount of resources they have access to varies. On the basis of these characteristics, some businesses are obviously going to be less vulnerable to a disaster agent and more capable of recovering from disaster impacts. This raises questions about the adequacy of programs available to businesses to assist them recover, and whether those programs have similar problems of availability for certain classes of businesses (as was found for certain classes of families). Dahlhamer (1992) did find evidence that some types of businesses have greater success in obtaining governmental loans. In general, he found that businesses with older owners, that were located in a building also owned by the business owner, and whose owner had good credit, could get a federal loan from the Small Business Administration

following a disaster. He also found that some business owners got more favorable loan terms than others. Dahlhamer concluded that the federal disaster loan program was systematically not assisting those businesses that need the greatest amount of assistance to recover but was aiding those businesses that could have gotten loans from commercial sources.

Second, businesses play vital roles in communities by providing goods and services to specific client groups, as well as providing employment opportunities for community residents. If businesses must close due to structural damage, inventory losses, losses of employees, or losses of markets, what consequences does that have for both family recovery and community recovery? Obviously, the longer businesses are closed, the greater the economic strain on families whose members were employed by those enterprises. Also, when businesses that provide basic goods and services (e.g., markets, clothing stores, gas stations, banks, utility companies) to community residents are not operational, the greater the temporal constraint--the length of time it takes household members to complete routine daily tasks--on family recovery (Trainer and Bolin, 1976).

Beyond these obvious implications for business recovery, community recovery can be affected in two important ways. First, the longer commercial enterprises are non-operational, the greater will be the impact on revenues for the local government. Local governments receive a great deal of their operational income by collecting fees and taxes on commercial transactions or from property taxes. Following a disaster, a community's revenues from these sources may drop dramatically, until property owners can repair commercial buildings and businesses can recover sufficiently to put employees back to work, providing goods and services. While there is some compensation for the decline in these

revenues to local government from the infusion of external aid, this intervention is short-lived. If the business sector does not sufficiently recover, community-based services (public works maintenance, social and health services, schools, cultural and recreational programs, and planned economic development initiatives) will put cut back, delayed, or eliminated.

Second, some businesses serve the needs of particular neighborhoods and rely on local residents to use their establishments. When such businesses can not recover from a disaster, what consequences does this have for the neighborhood or the community that business serves? Some research has suggested that the character of the community may actually be changed if people have to leave their neighborhoods to market, shop, bank, and use recreational facilities, or if their children have to go to schools at a greater distance from their homes. Bondedness to the neighborhood may decline; and the businesses that remain may actually be hurt by the general decline in foot-traffic or normal transportation patterns that had supported them in pre-disaster times. In Las Angeles, following the Northridge earthquake, at least a dozen "ghost towns" have been identified where the owners of both damaged businesses and residential properties have been unable to recover from the earthquake and, in essence, walked away from the destroyed properties, leaving abandoned, blighted neighbors.

In considering the ways that community businesses can be harmed, communities must not just concentrate on the primary causes of losses; that is, on the effects of ground shaking on buildings and their inventories. While this is the most dramatic form of loss, it must be remembered that businesses can also sustain secondary losses from interruptions to lifeline systems (e.g., electrical systems, water and sewerage systems, telecommunications systems, transportation

systems, and natural gas systems). In a project undertaken by the Centre for Advanced Engineering at the University of Canterbury (1991) that reviewed the likely performance of the Wellington region's major lifeline systems to two different types of earthquake events, it was concluded that lifeline systems throughout the region were likely to sustain major disruption and groundshaking, liquefaction, land slides, and land subsidence.

A question that has been recently addressed by the Disaster Research Center is the extent to which lifeline disruption effects business continuity; that is, how does the loss of specific lifelines effect the ability of a business to function if its physical facilities, equipment, and inventory have not sustained sufficient damage to cause the building to close (Nigg and Tierney, 1994). This is an extremely important question, as the recent Kobe earthquake illustrated, since the effects of lifeline failures go far beyond the immediate impact area and can effect the economic health of an entire metropolitan area, even to those businesses that could otherwise remain open and contributing to the region's general recovery, as was the case following the Northridge earthquake last year. In a study of businesses in Memphis, Tennessee--a metropolitan area that would be effected by an earthquake on the New Madrid fault system--a random sample of businesses was used to determine the importance of various lifelines to businesses in different economic sectors and the amount of time the business could remain open if that lifeline failed.

TABLE 1

Importance of Lifeline Service To Business  
Operations Under Normal Conditions

IMPORTANCE	LIFELINE SERVICES				
	Electricity	Water	Natural Gas	Wastewater Treatment	Telephone
Very Important	82%	27%	18%	23%	78%
Important	14	34	29	32	17
Not Very Important	3	31	39	33	3
Not Important At All	<u>1</u>	<u>8</u>	<u>13</u>	<u>13</u>	<u>2</u>
TOTAL	100%	100%	99% <sup>1</sup>	101% <sup>1</sup>	100%

<sup>1</sup>Does not total 100% due to rounding.

Table 1 presents the general importance of different systems for all of the businesses included in the study. Two clusters of services emerged: electricity and phone services were very important to businesses function; while the criticality of water, wastewater, and natural gas systems was modestly important. When asked how long the business could remain open without access to particular lifeline services, we see a similar pattern. Without electricity, the vast majority of firms would cease operating immediately; and most could operate only 1/2 day at most without telecommunications (Table 2). Business could continue for approximately two days without either water or wastewater; and natural gas customers could continue for almost a week without that service.

TABLE 2

Median Number of Hours Businesses Could Operate With Lifeline Loss

Utility	Median Number of Hours
Electricity	0
Water	48
Natural Gas	120
Wastewater Treatment	48
Telephones	4

Further analysis of this data, however, indicated that size of the business (i.e., the number of workers employed) and economic sector did matter for some lifelines. Table 3 presents the median numbers of hours that businesses, by size and sector, could continue to operate without water. It was found that 25% of all business would have to shut down immediately if their water system failed; but 12% reported tha they could function indefinitely without water. Although Table 3 indicates that there are some differences across sectors, these differences were insignificant. However, small businesses, regardless of economic sector, were found to be significantly less dependent on water availability than were larger businesses. Considering other lifeline systems' disruption, it was found that:

1. For electrical systems--59% of the area's businesses would have to shut down immediately; and this seemed to effect both large and small businesses, and businesses in all economic sectors equally.

TABLE 3

Median Number of Hours Businesses Could Operate  
With Loss of Water by Type and Size of Business

Type and Size of Business	Median Number of Hours
<u>Wholesale and Retail Trade:</u>	
Small <sup>a</sup> (N=124)	120.0
Large <sup>b</sup> (N=36)	24.0
<u>Manufacturing and Construction:</u>	
Small (N=64)	72.0
Large (N=26)	48.0
<u>Business and Professional Services:</u>	
Small (N=129)	24.0
Large (N=52)	23.5
<u>Finance, Insurance, and Real Estate:</u>	
Small (N=71)	120.0
Large (N=23)	8.0
<u>Other:</u> <sup>c</sup>	
Small (N=61)	168.0
Large (N=29)	72.0
<u>All Businesses (N=627):</u>	48.0

<sup>a</sup> Small businesses are those with 19 or less employees.

<sup>b</sup> Large businesses are those with 20 or more employees.

<sup>c</sup> "Other" consists of agricultural, fishing, forestry, mining, transportation, and public communications firms.



2. For telecommunications systems--45% would all businesses, regardless of size, would close immediately; but wholesale and retail businesses could stay open significantly longer than other types of businesses before closing.
  
3. For wastewater (or sewerage) systems--20% of businesses, regardless of size would close immediately; and those businesses in the service sector would have to close significantly sooner than other businesses.
  
4. For those companies that use natural gas--18% would close immediately, regardless of size or economic sector.

While these statistics reflect assumptions that business owners have about their dependence on lifeline systems for their ability to remain open, these are some of the best indicators we have available upon which to make assessments about the secondary impacts of an earthquake on business operations. By getting an indication of the effects of lifeline interruption on the economic viability of an entire region following an earthquake allows for various types of planning to take place--preparedness planning for businesses with respect to the identification of back-up systems (e.g., electrical generators and cellular phones); the prioritization of mitigation measures and restoration plans for lifeline providers, which would include the lesser damaged areas of the region if they contain sufficient economic enterprises. If one know what businesses are dependent upon which lifeline systems, it allows emergency managers, in conjunction with lifeline service providers and the business communities, to

engage in informed, strategic planning before and following a disaster for ways to reduce economic disruption.

## CONCLUSION

When we talk about community recovery from disaster, our orienting concept is one of a system that is responding to stress. System stress takes place when demands on the social system exceed the system's ability to respond to demands being placed on it (Haas and Drabek, 1970; Mileti et al., 1975). The greater the impact of a disaster agent on a community's built and social environments, the greater the amount of stress on the system. How communities respond to long-term stress in the post-impact years will have consequences for families, businesses, and the local government.

Our knowledge of recovery "lessons" is still in its infancy. This relatively new area of disaster research is still only minimally informed by theoretical approaches, has yet to develop consistent conceptual and operational definitions of key concepts, and is still in search of generalizable findings.

One thing that is certain, however, is that we are beginning to know what potential problems must be considered and resolved before the disaster strikes a community or region in order to reduce human suffering, minimize economic loss and disruption in the private sector, and maintain effective governmental action. We must remember that recovery is a very long process, having its roots in the pre-impact period when preparedness and mitigation are taking place--and where potential problems, risks and vulnerabilities can be identified--to a decade or two after a disaster has taken place when the region and its people will be experiencing different kinds and rates of recovery.

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