|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Activity | Population mean (min) | Doer  mean (min)\* | Activity | Population mean (min) | Doer  mean (min)\* |
| Sleeping | 504 | 506 | Child care | 18 | 79 |
| Working | 194 | 424 | Active sports | 16 | 88 |
| Electronic media | 143 | 184 | Outdoor recreation | 11 | 134 |
| Travel | 109 | 118 | Cultural events | 10 | 143 |
| Eating | 89 | 93 | Errands | 8 | 41 |
| Socializing | 56 | 115 | Car repair | 6 | 48 |
| Personal care | 50 | 58 | Hobbies | 5 | 114 |
| Reading/writing | 48 | 104 | Bars/lounges | 4 | 101 |
| Education | 46 | 237 | Animal care | 3 | 33 |
| Cooking | 38 | 73 | Singing/dancing | 3 | 106 |
| House cleaning | 34 | 87 | Other | 2 | 29 |
| Shopping | 25 | 66 | Dry cleaners | 1 | 73 |
| Yard work | 20 | 111 | Services | 1 | 83 |

|  |  |  |  |
| --- | --- | --- | --- |
| Code | Activity | Code | Activity |
| 11 | Agriculture, Forestry, Fishing & Hunting | 53 | Real Estate & Rental & Leasing |
| 21 | Mining | 54 | Professional, Scientific, and Technical Services |
| 22 | Utilities | 55 | Management of Companies and Enterprises |
| 23 | Construction | 56 | Administrative and Support and Waste Management and Remediation Services |
| 31-33 | Manufacturing | 61 | Educational Services |
| 42 | Wholesale Trade | 62 | Health Care and Social Assistance |
| 44-45 | Retail Trade | 71 | Arts, Entertainment, and Recreation |
| 48-49 | Transportation & Warehousing | 72 | Accommodation and Food Services |
| 51 | Information | 81 | Other Services  (except Public Administration) |
| 52 | Finance and Insurance | 92 | Public Administration |

patterns of community governance.

Unfortunately, “normal” is almost inevitably what got the community in trouble in the first place. When cities allow too much development in floodplains, or in fireprone foothills, or allow substandard housing to be built that collapses in an earthquake, “normal” is an unsustainable condition. Consequently, a disaster resilient community learns from its harsh experience which areas of the community have excessive levels of hazard exposure. It also identifies the types of buildings, infrastructure, and critical facilities that have inadequate designs, construction methods, and construction materials. Finally, it recognizes which households, businesses, and government agencies have inadequate resources, lifestyles, or operational patterns that make them unable to recover effectively from a disaster.

Moreover, a disaster resilient community learns how to use the disaster as a focusing event that changes people’s beliefs about their hazard vulnerability, the availability of hazard adjustments to reduce that vulnerability, and the portfolio of hazard adjustments that is likely to be most suitable for their community. In addition, a disaster resilient community develops effective mechanisms for mobilizing community support to change development policies as well as government capacity and commitment for implementing those policies effectively.

# The Recovery Process

This section begins by examining the most prominent typologies of disaster phases—periods of time that are characterized by specific types of activities. Next, it describes the typical processes involved in household and business recovery.

*Phases of Disaster Recovery*

Researchers have divided disaster recovery into a number of stages, but these definitions vary. Kates and Pijawka’s (1977) frequently cited four phase model begins with the *emergency* period, which lasts for a period that ranges from a few days to a few weeks and encompasses the emergency response period when the EOP is implemented. Next comes the *restoration* period, when repairs to utilities are made, debris is removed, evacuees return, and residential, commercial, and industrial structures are repaired. This period can take weeks to months. The third phase, the *reconstruction replacement* period, involves rebuilding capital stocks and returning the economy to predisaster levels. This period can take months to years. Finally, there is the *development* phase, when commemorative structures are built, memorial dates are institutionalized, and attempts are made to improve the community. Sullivan (2003) used a similar typology consisting of four “intra-recovery elements”. These include *post-impact*, *restoration*, *replacement/reconstruction*, and *commemorative, betterment, and developmental* reconstruction.

Others have divided the recovery period into somewhat different phases. United Nations Disaster Relief Organization (UNDRO, 1984) called the period from the disaster impact to Day 5 the *immediate relief* period, followed by the *rehabilitation* (Day 5 to Month 3) and *reconstruction* (Month 3 onward) periods. Schwab and his colleagues (1998) adopted a similar three phase typology that broadly distinguished among *emergency response*, *short term recovery*, and *long term recovery*. Alexander (1993) described three stages of disaster recovery, with the first, the *rehabilitation* stage, involving the continuing care of victims. During the *temporary reconstruction* stage, temporary bracing is installed for unstable buildings and bridges and prefabricated or other temporary housing is established. Finally, the *permanent reconstruction* stage relies on good administration and management to achieve full community recovery.

As was the case with conceptualizing emergency management as a sequence of phases—hazard mitigation, emergency preparedness, emergency response, and disaster recovery—defining disaster recovery as a sequence of phases is also problematic. Even the early formulations noted that these phases often overlap in practice, shortening the whole recovery period (Kates, 1977). It is now generally accepted that disaster recovery encompasses multiple activities, some implemented sequentially and others implemented simultaneously. At any one time, some households might be engaged in one set of recovery activities while others are engaged in other recovery activities. Indeed, some households might be fully recovered months or years after others and there might be households or businesses that never recover at all. Thus, attempts to define finely differentiated phases of disaster recovery are inherently limited in their validity. Because of the simple and self explanatory nature of their typology, Schwab and his colleagues’ (1998) very broad distinctions among emergency response, short term recovery, and long term recovery will be used to organize the discussion in the rest this chapter. However, the sections that follow begin with a description of what happens to two basic social units—households and businesses.

*Facilitating Conditions for Disaster Recovery*

Rubin (1991) found that community recovery depends upon a number of variables. Three of these variables cannot be controlled by local government. These are *federal influences and conditions*, *state influences and conditions*, and *community based needs and demands for action*. By contrast, local governments do have some control over *personal leadership*, *ability to act*, and *knowing what to do*. One important commonality among the 14 cases Rubin, et al. (1985) studied is that the speed, efficiency, and equity of community recovery depended significantly upon local government’s ability to improvise effective recovery strategies. That is, communities recovered more quickly and effectively if they could identify and respond to the specific problems that arose from its unique circumstances.

Rubin and her colleagues’ (Rubin, 1991; Rubin, et al., 1985) research on disaster recovery is consistent with other researchers’ (see Drabek, 1986; Tierney, et al., 2001) findings on emergency response in suggesting that disaster recovery will be facilitated if local government agencies anticipate the most significant recovery demands in terms of their likelihood of occurrence and criticality to the recovery process. Anticipating recovery demands allows local agencies to plan their organizational structures and general strategies before disaster impact and improvise their tactics during recovery rather than improvise the entire recovery effort—organizational structures, strategies, tactics, and operational procedures—during the midst of the emergency response. Similarly, disaster recovery is facilitated if the recovery organization identifies the resources it will need, and the sources of those personnel, equipment, and supplies. Thus, preimpact recovery preparedness will increase emergency managers’ ability to act and enhance the personal leadership exercised during disaster recovery.

Predisaster planning is an excellent way to direct people’s attention to the demands of disaster recovery (Schwab, et al., 1998). These scholars view the recovery process as a set of sequenced tasks that are performed in different locations, rather than distinct phases. There are short term decisions such as where to locate displaced households and how to remove and dispose of debris. There are also long term decisions such as how to finance reconstruction, where to allow rebuilding, and how to revitalize the local economy. According to Schwab, et al. (1998), timely and effective recovery decisions benefit from a predisaster recovery preparedness process that is undertaken at the same time as emergency preparedness, comprehensive planning, and mitigation planning (see Figure 11-3).

Developing preimpact plans for disaster recovery allows a community to ensure hazard mitigation and sustainable development are incorporated into recovery. Preimpact recovery plans can help local officials resist postimpact pressure to restore their community to the *status quo ante* that caused the disaster’s physical and social impacts. By developing disaster resilience, communities can minimize disaster impacts, strengthen their ability to recover with minimal outside assistance, and facilitate the recovery of all population segments and economic sectors. These are complex issues that require time and preparation, both of which are in short supply immediately after a disaster. Preimpact recovery planning provides an excellent opportunity to incorporate sustainable development goals through a process termed “holistic disaster recovery” (Natural Hazards Research and Applications Information Center, 2001).

*Disaster Recovery Functions*

The strategic contingencies involved in the recovery process can be represented in terms of a network of tasks that need to be performed by community subunits. As Path A in Figure 11-4 indicates, affected households go through a process that can be described in terms of their movement through emergency shelter, temporary shelter, temporary housing, and permanent housing (Quarantelli, 1982).

**Figure 11-3**.The Relationship of Disaster Recovery to other Hazard Management Activities.

As Path D indicates, affected businesses pass through a slightly different sequence because they can suspend operations (represented as a dashed line) until they find a temporary operating location. As Path B indicates, households and businesses need utilities such as water/wastewater, electric power, fuel, transportation, and telecommunications before they can resume normal operations. Finally, Path C is especially important because disaster assessment and a federal disaster declaration are preconditions for the federal financial aid that the most severely stricken communities need to support the restoration of public infrastructure and the recovery of households and businesses. To explain this figure more completely, the following sections examine household recovery, business recovery, infrastructure restoration, and the disaster declaration process.

### **Household Recovery**

There are three basic components to household recovery. These are housing recovery, employment recovery, and psychological recovery (Bolin & Trainer, 1978). All three of these components require resources to recover. However, households must invest time to obtain these resources. This includes time to find and purchase alternate shelter, clothing, food, furniture, and appliances to support daily living (Yelvington, 1997). Time is also needed to file insurance claims, apply for loans and grants, and search for jobs. The time required for these tasks is increased by multiple trips to obtain required documentation and understaffing of providers (Morrow, 1997). FEMA provides telephone registration, but its value was undercut by loss of telephone service after Hurricane Andrew. Moreover, there will be increased commuting time to work, shopping, and services if cars, street signs, traffic signals, and landmarks are destroyed and no public transit is available for weeks. Adding to the time burden is increased cost for many items due to supply scarcities. Finally, victims needed skill and self confidence to cope with the disaster assistance bureaucracy (Morrow, 1997).

**Figure 11-4.**The Recovery Management Process.

*Housing Recovery*

Households typically use four types of housing recovery following a disaster (Quarantelli, 1982a). The first type, *emergency shelter*, consists of unplanned and spontaneously sought locations that are intended only to provide protection from the elements, typically open yards and cars after earthquakes (Bolin & Stanford, 1991, 1998). The second type is *temporary shelter*, which includes food preparation and sleeping facilities that usually are sought from friends and relatives or are found in commercial lodging, although mass care facilities in school gymnasiums or church auditoriums are acceptable as a last resort. The third type is *temporary housing*, which allows victims to reestablish household routines in nonpreferred locations or structures. The last type is *permanent housing*, which reestablishes household routines in preferred locations and structures. The process of housing recovery can, in principle, be described as a stochastic process in which there is a specific probability that a household will move from one housing type to another in a given period of time (Coleman, 1964). This produces a table in which the rows indicate the current housing type, the columns indicate the housing type to which households move, and the cell values are the conditional probabilities of households moving from the row type to the column type (see Table 11-3). These conditional probabilities are represented by the mathematical notation P(*B*│*A*), where the symbol P (*X*) indicates the probability of event *X*, *A* is the housing type *from* which the household moves, *B* is the housing type *to* which it moves, and the vertical bar indicates that this is the probability of a household being in type *B*, *given that it previously was in type* *A*.

Unfortunately, none of the studies of housing recovery following disasters has yet estimated the transition probabilities associated with this process, but qualitative descriptions of the occupancy levels in each of Quarantelli’s four housing types suggests that two distinct transition probability matrices distinguish the first week after a major disaster from later time periods. After a disaster strikes, a substantial number of households are forced to seek emergency shelter (*ES*) and in the following days most of them remain in that type of housing. Thus, according to the hypothetical probabilities in the table, the probability of remaining in emergency shelter is P(*ES*│*ES*) = 0.6). However, a significant proportion of the households move on to temporary shelter (*TS*), making P(*TS*│*ES*) = 0.4. None of the households is expected to move directly from emergency shelter to temporary housing (*TH*) or permanent housing (*PH*), so P(*TH*│*ES*) = P(*PH*│*ES*) = 0.0. In addition, the vast majority of those in temporary shelter remain in that housing type, so P(*TS*│*TS*) = 0.9, but a small fraction of them move to temporary housing, so P(*TH*│*TS*) = 0.1. Similarly, the vast majority of those in temporary housing remain in that status [P(*TH*│*TH*) = 0.1], but a small fraction of them move to permanent housing [P(*PH*│*TH*) = 0.1]. A small fraction of those in permanent housing move from that status to emergency shelter or temporary shelter because of occupants’ fears about structural stability or because building inspections have determined that the structures are indeed unsafe.

**Table 11-3**. Hypothetical Daily Housing Status Transition Probabilities.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Week 1 | | | | Week 2 and beyond | | | |
| Emer-gency Shelter | Temp-orary Shelter | Temp-orary Housing | Perm-anent Housing | Emer-gency Shelter | Temp-orary Shelter | Temp-orary Housing | Perm-anent Housing |
| Emergency  Shelter | .60 | .40 | .00 | .00 | .50 | .50 | .00 | .00 |
| Temporary  Shelter | .00 | .90 | .10 | .00 | .00 | .90 | .10 | .00 |
| Temporary  Housing | .00 | .00 | .95 | .05 | .00 | .00 | .95 | .05 |
| Permanent  Housing | .03 | .05 | .00 | .92 | .00 | .00 | .00 | 1.00 |

According to these hypothetical probabilities, Weeks 2 and beyond differ from Week 1 in two respects. First, the rate at which households move from emergency shelter to temporary shelter is higher in Week 2 than in Week 1. Second, the rates at which households move from permanent housing to emergency shelter and temporary shelter is lower than in Week 1. These transition probabilities can be used to generate a distribution over time of the postdisaster housing status of the impact area population (see Figure 11-5).

This figure shows that the utilization of emergency shelter peaks on the day of the disaster and declines rapidly thereafter. However, this decrease in the utilization of emergency shelter does not produce immediate increases in occupancy rates for permanent shelter. Indeed, the proportion of the affected population in permanent shelter continues to decline because many households must move to this state through the two intermediate housing types. Thus, the transition probabilities in Table 11-3 result in the displaced population continuing to rise, reaching a delayed peak some days after impact. These results are generally consistent with Bolin’s (1993) finding that it took nine days for shelter occupancy to peak after the Whittier Narrows earthquake. Other support can be found in data from Hurricane Andrew. Yelvington (1997) reported that temporary shelters experienced increased demand as buildings were condemned by authorities or landlords begin reconstruction on damaged structures. On 4 September, 10 days after Hurricane Andrew, there were 41 people at Harris Field and 58 people at Florida City. Three days later the figures were 1125 and 467, respectively. By the end of September, there were more than 4000 people in four tent cities.

Sites for temporary shelter include homes of friends and relatives, commercial facilities such as hotels and motels, and mass care facilities such as Red Cross shelters. Lindell, et al. (2004) reported that during Hurricane Lili 3% of evacuees stayed in Red Cross shelters, 30% in hotels and motels, and 53% with friends and relatives. The percentage staying in shelters averages 15% but ranges from less than 1% to over 43% (Mileti, et al., 1992). The location where a household seeks temporary shelter is relatively predictable. Severity of damage and the availability of relatives nearby predict who stays with relatives, whereas income, homeownership, and availability of relatives nearby predicts who accepts relatives (Morrow, 1997). Moreover, kin networks are likely to seek temporary shelter together, especially if all relatives became victims because they lived so close together (Yelvington, 1997). Households with higher incomes who lack nearby friends and relatives with undamaged homes seek commercial facilities, whereas lower income households in such conditions are forced to accept mass care facilities.

**Figure 11-5.** Impact Area Residents’ Changes in Housing Status over Time.

Areas with large minority populations can pose problems for disaster assistance administrators because of their extended households (Bolin, 1993; Yelvington, 1997). Some are multigenerational (grandparents, parents, and children), whereas others are multinuclear kinship (linked by siblings) or multinuclear friendship (originating from the same town or province). These complex household structures create problems in identifying a single *head of household* to whom an assistance check can be issued. In addition to the normal reluctance to seek mass shelter and housing, some victims hesitate to approach authorities because they have no immigration documents (Yelvington, 1997).

Similarly, sites for temporary housing include homes of friends and relatives, commercial facilities such as rental houses and apartments, and mass facilities such as trailer parks. Some of these sites are in or near the stricken community, but others are hundreds or even thousands of miles away. Lack of alternative housing within an acceptable distance of jobs or peers led some households to leave the Miami area after Hurricane Andrew. The population loss was 18% in South Dade County, 33% in Florida City, and 31% in Homestead (Dash, Peacock & Morrow, 1997). Other households remained in severely damaged units—or even condemned units—without electric power or telephone service for months (Yelvington, 1997) or doubled up with relatives (Morrow, 1997).

The loss of housing in a disaster can be extremely problematic in a tight housing market. After Hurricane Andrew, housing availability dropped to 1.6% from 5.5% a year earlier. This shortage increased rents by 15-20%, which priced low income victims out of the market (Yelvington, 1997). Even when temporary housing can be found, the return to permanent housing can be long. In one working class neighborhood, the average length of displacement was 95 days and the percentage of returnees was still only 62% nearly a year after the disaster (Morrow, 1997).

Households encounter many problems during reconstruction, including high prices for repairs, poor quality work, and contract breaches (Bolin, 1993). The rebuilt structures do benefit from improved quality and hazard resistance (Bolin, 1993, indicates 50% of respondents reported this) and this is especially true

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Problem Perceived To Be Large | Anglo | Black | Hispanic | Total |
| Dealing with mortgage companies about insurance money | 68 | 49 | 68 | 64\* |
| Dealing with building inspectors | 52 | 38 | 76 | 63\* |
| Living in damaged home | 59 | 63 | 59 | 60 |
| Neighborhood conditions | 55 | 60 | 39 | 47\* |
| Living in temporary quarters | 45 | 61 | 38 | 46\* |
| Dealing with insurance companies | 33 | 26 | 48 | 40\* |
| Dealing with contractors | 38 | 18 | 45 | 37\* |
| Unemployment | 11 | 29 | 30 | 25\* |
| Household finances | 14 | 40 | 20 | 22\* |
| Neighborhood crime | 34 | 23 | 16 | 22\* |
| Transportation | 2 | 28 | 17 | 16\* |
| Job relocation | 7 | 21 | 17 | 15 |
| Dealing with agencies | 11 | 20 | 13 | 15 |
| Behavioral problems with children | 19 | 18 | 10 | 14 |
| Family violence | 17 | 11 | 5 | 9\* |
| Gain of member(s) | 14 | 0 | 4 | 5\* |
| Loss of member(s) | 4 | 0 | 13 | 4 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Businesses Change (%) | | Employees Change (%) | | Sales Volume Change (%) | |
| Industry | Florida City | Homestead | Florida City | Homestead | Florida City | Homestead |
| Agriculture | -71 | +4 | -92 | +74 | -93 | +66 |
| Construction | 0 | -20 | +12 | -20 | +12 | -59 |
| Manufacturing | 0 | -12 | -67 | -19 | -59 | -32 |
| Transportation/  communication | -50 | +9 | -100 | +4 | -26 | +51 |
| Wholesale trade | -60 | -4 | -50 | +6 | -84 | +57 |
| Retail trade | -64 | -2 | -84 | +16 | -84 | -5 |
| Finance/  insurance/real estate | -20 | 0 | -59 | -1 | -32 | -32 |
| Business services | -63 | +6 | -94 | -5 | -65 | -14 |
| Professional services | -45 | -3 | -73 | +16 | -69 | +1 |
| Public administration | -50 | +38 | -69 | +7 | n/a\* | n/a\* |

|  |  |
| --- | --- |
| *Disaster Assessment* |  |
| Rapid assessment | Victims’ needs assessments |
| Preliminary damage assessment | “Lessons learned” |
| Site assessment |  |
| *Short Term Recovery* |  |
| Impact area security | Emergency demolition |
| Temporary shelter/housing | Repair permitting |
| Infrastructure restoration | Donations management |
| Debris management | Disaster assistance |
| *Long Term Reconstruction* |  |
| Hazard source control and area protection | Infrastructure resilience |
| Land use practices | Historic preservation |
| Building construction practices | Environmental recovery |
| Public health/mental health recovery | Disaster memorialization |
| Economic development |  |
| *Recovery Management* |  |
| Agency notification and mobilization | Public information |
| Mobilization of recovery facilities and equipment | Recovery legal authority and financing |
| Internal direction and control | Administrative and logistical support |
| External coordination | Documentation |

|  |  |
| --- | --- |
| Damage Assessment | Routine Construction Cost Estimation |
| Rapid Damage Assessment |  |
| Preliminary Damage Assessment |  |
| Site Assessment | Preliminary Cost Estimate |
|  | Detailed Cost Estimate |