far beyond their control. Moreover, the new perspective maintains that such conditions and the forces that created them have also undermined or subverted traditionally effective adaptive strategies developed through long experience with a region’s hazards. Seen in this context, the Guatemalans’ reference to the 1976 earthquake as a “classquake” or the Peruvians’ reference to a “five-hundred-year earthquake” after the 1970 disaster are bitterly accurate assessments of “natural” disaster. The American first lady’s remark on viewing the devastation after the 1970 Peruvian earthquake that the United States was going to help the victims until everything was “just rosy again” exemplifies the belief that the disaster was an “extreme event” and returning to normalcy would solve all the problems. There was little recognition that the destruction and misery in Peru in 1970 and after were as much a product of that nation’s historic underdevelopment as they were of the earthquake. In effect, then, the perspective of disaster research and analysis shifts from an exclusive focus on “extreme events” to include and give equal weight to the societal and human-environment relations that “prefigure” disaster (Hewitt 1983: 27).

This chapter focuses on these societal and human-environment relations in attempt to understand why the May 31, 1970, earthquake, which at 7.7 magnitude on the Richter scale would have been severe in any human context, in Peru became the worst historic “natural” disaster of the Western hemisphere. The earthquake, which devastated the north central coastal and Andean regions of Peru, can be seen as an event which in certain respects began almost five hundred years ago with the conquest and colonization of Peru and its consequent insertion as a colony into the developing world economic system, which has resulted in the severe underdevelopment of the entire region.

NATURAL HAZARDS IN THE ANDES

In order to assess the relationships between disasters, human vulnerability, and the conditions of underdevelopment in the Andes, it is necessary to survey very briefly the array of natural hazards which characterize the region. The Andes are and have always been a very hazard-prone region of the world. In general, the natural bases for this precarious condition lie in two dimensions: climatology and geology.

Strictly speaking, two factors—one climatological and the other oceanographic—interact to produce many of the disastrous atmospheric conditions which affect the Andean region. Under normal conditions the coastal desert of Peru is one of the driest regions of the world. There is virtually no annual rainfall, and annual temperatures vary only slightly. This context is extremely sensitive to any anomalies in the ocean-to-atmosphere energy transfer system with implications for global weather patterns (Moseley et al. 1981: 234).
Occasionally, major current perturbations in the form of warm air and water masses, known collectively as “El Niño,” have pushed down the coast of Ecuador, radically altering the ecosystem of the normally cold Peruvian current, and producing torrential rains in the western highlands. Major impacts include disruption of the marine food chain, with consequent reduction in coastal fishing economies (Caviedes 1981: 288), and torrential rains producing flash floods in the forty-six river systems which descend from the Andean cordilleras, killing people and inundating villages and fields as well as washing out roads and irrigation canals.

The central Andes rise abruptly from the narrow strip of coastal desert and descend somewhat more gradually to the Amazon in the east. The position of the Andean cordilleras is key in the distribution and seasonality of rainfall. The Amazon basin experiences year-round orographic rainfall, and the coastal desert receives almost no rain at all except when the pattern is disrupted by temperature changes occasioned by El Niño. The mountains between the jungle and the desert experience wide variation in rainfall and temperature (Winterhalder and Thomas 1978: 9).

The Andean highland region is noted for its wide variation of microenvironments with complex gradients of climate and vegetation. Such microenvironments, even those in close proximity, often experience extreme variation in temperature and rainfall. Localized frosts are hazards to crops, as are hailstorms, which can be even more devastating to agriculture in specific contexts. The Andean region has experienced both severe regional and local droughts, with little predictable regularity, which may persist for as long as three years, again with devastating agricultural losses and hunger. The uneven topography of the region also figures importantly as a variable in the distribution of precipitation, producing local high concentrations of rainfall, hail, and snow. Heavy rainfall may combine with unstable soils on steep mountain slopes to produce mudslides of varying proportions, with frequent tragic results for human settlements, agriculture, and infrastructure.

In effect, the Andes parallel the plate boundaries, where crustal deformation often produces orogenic uplift, tectonic activity, and volcanism. Indeed, the Andes are the product of the subduction of the oceanic Nazca plate moving eastward from the East Pacific ridge underneath the continental rim of the South American plate which began in the Jurassic period. The surface conformation of Andean environments is the product of the more recent and contemporary geological processes of glacial and tectonic activity, faulting, volcanoes, and erosion and deposition (Winterhalder and Thomas 1978: 6). These processes have produced deep V- and U-shaped valleys, frequently capped by deep glacial lakes dammed by terminal morainic loops. Such formations are characteristic of strong alluvial and glacial erosion exacerbated by both persistent faulting and uplift of the mountains. The two earlier processes of plate collision and volcanism so crucial in Andean geological time, as well as the more recent phenomena, continue to be significant forces in Andean cultural time.

Thus, the Andes, the second highest chain of mountains in the world, are characterized by extreme instability in the form of significant seismic activity, active volcanoes, unstable soils, and avalanches of both minor and major dimensions. The Peruvian Andes have experienced approximately fifty major earthquakes (greater than 7.0 magnitude on the Richter scale) and countless smaller ones since historic records began to be kept (Giesecke and Silgado 1981: 65-67). There are no fewer than ten active volcanoes in the same region. Many of the peaks in the Andes are extremely sharply angled, ranging from forty-five to nearly ninety degrees at their highest reaches, which are often over eighteen thousand feet. The combination of their extreme altitude and their location in subequatorial latitudes with sustained high insolation makes for a pattern of rapid alternation of snowfall and melt and results in extremely unstable glacial icefields susceptible to even slight tremors, producing ice and rock avalanches of varying proportions (Caviedes 1981: 284). When the descent of these avalanches ends in a glacial lake, a major flood is frequently created when the morainic loop dam gives way or is washed over.

Thus, as regions linked by climatological and geological processes, the Peruvian coast and highlands are characterized by a series of natural forces and phenomena with enormous potential for destructive power when combined with human populations in vulnerable configurations. As the location of human habitation for over ten thousand years and the site of major cultural complexity for the last four thousand years, the nature of human cultural adaptation to these complex and unstable environments becomes a compelling issue.

ADAPTATIONS TO HAZARDS IN THE PRE-COLUMBIAN ANDES

The adaptations of pre-Columbian Andean peoples to the existence of these natural phenomena can be grouped into five basic patterns: 1) control of multiple ecological tiers, 2) dispersed settlement patterns, 3) environmentally appropriate building materials and techniques, 4) preparedness, and 5) ideology and modes of explanation. Although environmental forces have played important roles in large-scale culture change in the Andes (Moseley et al. 1981, Kolata 1989), as a whole, these adaptations seem to have been relatively effective in enabling Andean peoples not only to survive, but to flourish, if population growth and cultural complexity are any measures of success. The archaeological record, while revealing the environmental traces of various disaster impacts, is less likely to display evidence of massive mortality and destruction due to sudden-onset disasters. However, the success of these adap-
tations is supported by the contention that the Inca empire was reaching the limits of its agricultural base. The evidence supporting this contention consists of plentiful examples of extension of cultivation into marginal areas such as ridged fields in flood plains and sunken fields on the coast and terraces on steep highland hillsides (Cook 1981: 108).

In both the coastal and highland contexts the exploitation of a variety of microenvironments has been a basic element of Andean adaptation. The development of Andean civilization has since the earliest days of habitation involved complex interactions between coastal and highland environments, each highly varied and complex environments in their own right. This control of multiple ecological tiers, usually referred to as the "principle of verticality," enabled coastal peoples and, particularly, Andean highlanders, to spread both risk and resources over a wide area, diminishing impacts of localized floods, hail, mudslide, and frosts and at the same time producing a varied diet (Murra 1972).

However, vertical control of the ecology was much more than a strategy of ecological adaptation. Verticality was a broad cultural principle not only shaping the social relations of production and exchange, but also forming an integral part of Andean ideology and worldview (Larson 1988: 20). Following this principle and pattern of dispersed production zone exploitation, pre-Columbian Andean rural settlement patterns tended to be equally dispersed, located on ridges and hillsides as well as in valley lowlands (Rowe 1963: 228; Hyslop 1990: 271–272). The location of Inca towns was dictated by a variety of factors, including access to resources, regional topography, proximity to sacred places, and specific settlement formal function such as garrison or administrative center (Hyslop 1990: 271–272). Most towns, even those planned and constructed by the Inca, were quite small, usually less than one hundred families, and did not resemble urban concentrations in the European fashion (Rowe 1963: 229). Many cities, although by no means all of them, were located in valleys, and, as population grew, particularly on the coast, exploitation of vulnerable flood plain areas was undertaken. However, in some cases, like the region around present-day Arequipa, which possessed both notable fertility and stable water resources but also high seismicity and volcanism, there was virtually no urban development and even relatively sparse rural populations (Cook 1981: 171).

Although major research on Inca architecture and settlement planning (e.g., Gasparini and Margolies 1980; Hyslop 1990) pays scant attention to adaptations to high seismicity, it is clear that the building techniques and materials employed by pre-Columbian Andean peoples provided a measure of safety, particularly from earthquake damage. The corners of walls of Inca buildings were always carefully bonded, and long vertical joints were scrupulously avoided. In houses constructed of adobe, which along with stone was considered an important building material, alternate rows of headers and stretchers, a technique known as "English bond," were used. Rowe considers Inca construction to be far superior technically to the best Mayan or Mexican work (1963: 228).

The Inca empire is justly famous for its fine stonework and feats of engineering skill in the construction of roads, bridges, and buildings. While the monumental stonework of the Incas has withstood many severe earthquakes, perhaps the most significant feature of pre-Columbian Andean buildings was the thatched roofs. All buildings in pre-Columbian Peru had thatched roofs, thus eliminating the threat of collapsing heavy roofs in earthquakes. Other possible anti-seismic design features employed by pre-Columbian Andean peoples include double-structure walls with earthen infill in the middle and trapezoidal-shaped doors and windows. In addition, domestic houses were constructed largely of fieldstone and mud or adobe with thin walls about the height of an average man (Rowe 1963: 222). While such construction and materials were not particularly anti-seismic, the modest height and thinness of walls and thatched roofs of ordinary houses reduced the potential for serious injury from falling debris in earthquakes.

The consciousness of potential threat from the various aspects of the environment led the complex political structure that eventually came to dominate the entire Andean region to establish a system of economic redistribution based on a large number of storerooms for surpluses and emergency use (Murra 1980). These storerooms, known as qollqas, were built by the hundreds in regions of dense habitation (Gasparini and Margolies 1980: 118). Indeed, the redistributive system of the state based on the infrastructure of efficient production and the storage capacity of the qollqas virtually precluded local long-term hardship as a result of natural disasters (Cook 1981: 108). While care must be taken not to wax too lyrical on the virtues of the Inca empire, from a material standpoint obedient subjects of the Inca were probably better off than the average European of the same era. There is certainly solid evidence of a compendium of empirical knowledge on hazards and hazard mitigation and its effective application in the pre-Incaic and Incaic periods in the Andes.

Further evidence of high levels of consciousness about disasters in the pre-Columbian Andes is seen in the ideology of the people. As demonstrated by contemporary sociological research, nothing heightens awareness of threat like recent experience of a disaster. While archaeological research reveals evidence of impacts in pre-Incaic and Incaic settlements (Dupuy 1971), evidence of large-scale damage and mortality is very scant. However, several post-conquest chroniclers do comment on recurring natural disasters, such as floods, volcanic eruptions, droughts, and earthquakes, and their resultant destruction and mortality in pre-Columbian Peru, calling into question the complete effectiveness of ancient adaptations.
What is certain, however, is that the region prehistorically experienced recurring impacts of natural phenomena and Andean culture responded both materially and ideologically to this condition. Andean time, like that of the Aztecs and Mayas, was measured in four "ages," expressed by the term *pachacuti*. According to tradition, the world had experienced four creations and destructions prior to the Inca empire.

The term *pachacuti* is composed of two parts, "pacha" meaning space, earth, or world and "cuti" meaning temporal end, moment, or alternative. In Quechua syntax the second term describes or modifies the first (Cuneo-Vidal 1978: 388). Thus, *pachacuti* becomes "world moment" or, as some have interpreted it, "world reversal" in the sense of cataclysm (Bouysse-Cassagne and Bouysse 1984: 57). Something that arrives at its *pachacuti* is over, has reached its end point. Various chronicles translated the term as a "world or time reversal."

**PERUVIAN HISTORY AND THE SUBVERSION OF INDIGENOUS ADAPTATIONS**

Certainly, the coming of the Spaniards in the third decade of the sixteenth century eminently qualified as a *pachacuti*. The destructive and "epoch-ending" character of the conquest is well documented. For the Andean peoples the conquest not only meant the end of the Inca empire, but it prefigured a cataclysmic demographic collapse and distortion or destruction of their adaptive systems to their environment. Although population estimates for the Inca empire on the eve of the conquest range from 37.5 million (Dobyns 1966) to six million (Rowe 1963), a recent effort offers a figure of nine million people for the entire region (Cook 1981: 109). In his study of demographic collapse in Peru between 1520 and 1620, Cook calculates that in the first fifty years of the conquest, the population of nine million fell to one million and in the next fifty years to a mere six hundred thousand or a 98 percent decline for the entire century (Cook 1981: 114).

Although much of this demographic collapse was brought about through indigenous vulnerability to European diseases, the ruthless exploitation of the population by the Spaniards in their quest for wealth doomed millions as well (Spalding 1984). Spanish attempts to control and exploit the massive population that fell under their power began a process the forms and effects of which are still being reproduced today. Many of these attempts to control the population subverted specific indigenous adaptive strategies to their hazardous environments. There are two levels at which this subversion of adaptive strategies took place: the specific and the systemic. By specific adaptations I am referring to actual measures or procedures followed by Andean peoples to reduce vulnerability to or mitigate impact of natural hazards in the environ-ment. By systemic adaptations I am referring to the larger adaptive capacities of the sociocultural and economic system of the Inca empire that enabled a large population to sustain itself in this extremely hazardous environment at levels of prosperity that exceeded or compared very favorably with those of Europe at the same time.

The Spaniards were both ignorant and largely uncaring about Andean notions of territoriality and settlement patterns (Larson 1988: 35). Spanish approaches to settlement location, placing towns often at the confluences of rivers where they were vulnerable to flood and landslide, flew in the face of pre-Columbian experience with the hazards of the Andean environment (Oliver-Smith 1992). The most startling case of putting people in harm's way was the settling of the city of Arequipa in 1540. As mentioned before, Arequipa is blessed with fertile soils and adequate water from seasonal rains and the Chili River. Evidently, it did not occur to the founders of the city to question why such a propitious area for settlement was so sparsely inhabited. Little did the settlers know that the nearby snow-capped peaks were not only located in one of the most seismically active regions of the Andes, but many were active volcanoes as well. In the seventeenth century alone the city of Arequipa suffered total or partial destruction by four enormous earthquakes and a volcanic eruption (Cook 1981: 171–173).

Although the Spaniards initially did not intend to transform the socioeconomic structures of the Andean community that had produced such impressive surpluses for the Inca, they did attempt to make the control over that population and the extraction of those surpluses more bureaucratically efficient through a massive program of involuntary migration and resettlement. In the 1570s it was ordered that Andean communities be concentrated or "reduced" from their dispersed settlements into new planned communities where the people could be more easily controlled.

Spanish building techniques and settlement design were employed in the *reducciones* for Indians and the new towns and cities founded by the Spaniards. Unlike the dispersed pattern of Inca towns in which houses were spaced out along long paths, Spanish settlement design favored the traditional grid pattern of perpendicular streets organized around a central plaza. The streets tended to be narrow and the houses adjoining or close together. Many houses in these Spanish towns had a second-story storage area as well, something which few domestic dwellings had in the pre-Columbian times.

While the building materials used in the pre-Columbian era—adobe, stone, and thatch—continued to be used, some dangerous changes in materials appeared. Clearly, the most dangerous of the changes was the gradual adoption of the ceramic barrel roof tile. Building techniques such as tying walls together at the corners also began to be abandoned, creating conditions for the construction of an exceptionally seismically vulnerable dwelling. Houses
with untied walls constructed of adobe bricks built often two stories high and topped with an extraordinarily heavy ceramic tile roof are death traps in an earthquake.

Changes in settlement patterns compounded the danger presented by such dwellings for their inhabitants. The more densely organized Spanish settlements, with their narrow, perpendicularly arranged streets lined with one- and two-story houses of adobe and ceramic tile roofs, created a situation of extreme danger and vulnerability in a seismically active region. Narrow streets, untied walls, heavy roofs, and seismic tremors are a dangerous combination.

The disruption and decimation of the population caused by the conquest and early colonial institutions led to the abandonment of many crucial dimensions of Andean adaptation to their hazardous environment. Survival on the desert coast, for example, was intimately linked to careful management of water infrastructure and resources. The irrigation systems of the pre-Columbian coastal civilizations had developed the science of hydrological engineering to high levels, managing water resources that brought extensive areas of the desert into cultivation. In the aftermath of the conquest, after the founding of the city of Trujillo on the north coast, there was a serious decline in the maintenance of water management systems. In 1578 El Niño appeared, causing heavy rains that destroyed the deteriorated water management system, flooded fields, and destroyed homes (Cook 1981: 139).

Another important adaptation lost not long after the conquest was the institution of the *qollgas*—the storage houses. The assiduous extraction of surpluses by the Spaniards quickly precluded any amassing of stores for contingency purposes. The *qollgas*, so vital in precluding long-term privation after natural hazard impact during the Inca empire, eventually fell into disuse and general abandonment in the first century of the Spanish colony, leaving the decimated and demoralized population even more vulnerable to further catastrophe.

It is beyond the scope of this paper to describe in detail the destruction that occurred throughout the entire structure of Andean systemic adaptations, since this would require a general summation of the vastly complex history of the entire colonial and much of the republican history of the nation. However, we can point to some general patterns of erosion that contributed to the accentuation of the overall vulnerability of Andean peoples to natural hazard.

In areas favorable to mining, large-scale agriculture, or textile manufacturing, the Spanish disrupted traditional forms and relations of production, replacing them with European relations of production. However, even in those areas left relatively undisturbed by European enterprises, the changes—though slow and imperceptible—over time fragmented and eroded basic relationships of reciprocity and cooperation that bound households and villages into larger units that sustained pre-Columbian levels of prosperity (Spalding 1984: 169). While considerable cooperative institutions still exist in some areas of the Andes today, neither their frequency nor level of activities approach those of pre-Columbian times.

The arrival of the Spaniards further signified major changes in patterns of social organization and structure in the Andes. The separation of society into social and ethnic groups was certainly an important aspect of Inca society, but such a system was elaborated with the purpose of integrating the disparate cultural groups which made up pre-Columbian Peru into all but the very highest stratum of the Inca empire. Inca social organization, however, did not result in the alienation of major groups of populations from the means of production or the mechanisms of distribution. After the conquest, however, the Spanish instituted a series of political and socioeconomic measures which ultimately deprived much of the Indian population of access to adequate land or control over most production. The final result of such policies and later measures taken under the republic was the marginalization of the Indian population, whether as serfs or marginal smallholders or sharecroppers, to the poorer lands on valley slopes and on the high plateaus. Large landholders meanwhile took up both residence and production in the better lands of valley floors.

The economic system which evolved in the colony focused on native production of value for European masters through the institution of market exchange. The shift in the balance between an economy of largely use values to one oriented toward the production of market exchange values constituted a change of profound consequences for the well-being of the Andean social whole (Larson 1988: 47). The extraction of tribute through the shift to production of commercial crops for Spaniards and later Peruvian landlords to sell in the market diverted resources out of communities and created systemic hardship and poverty in most sectors of indigenous society.

Indeed, the extractive nature of the entire system cast a mold which over the centuries since has produced an infrastructure for disunity, not integration, and, ultimately, an agricultural nation which is dependent for food on outside sources. The infrastructure of roads and communications that was imposed over the more integrative Inca system connected highland regions with the primate center of Lima but rarely or poorly with each other. After independence the coastal products of cotton and sugar, and for a brief time, guano, became the primary exports and sources of foreign exchange, and the infrastructure of the coast was developed to aid in their production and exchange. The fishing boom in the 1960s continued this coastal dominance. The highland regions, with the exception of certain mining sectors, provided few resources for foreign exchange and received little investment in either production activities or infrastructure. The political system which evolved to support those extractive institutions and devise that infrastructure in many ways mir-
rors them both in the flow of political power and wealth. The social system which articulated the various segments of Andean society reflected as well this concentration of power and wealth on the coast and, in particular, in Lima and was echoed in an ideology of racial and cultural bias, that historically denigrated the indigenous population and justified their poverty and rural underdevelopment.

THE GREAT PERUVIAN EARTHQUAKE OF MAY 31, 1970

Consequently, the society that confronted the major seismic event on the afternoon of May 31, 1970, was in many ways already a catastrophe. With an economy characterized by acute boom-and-bust cycles and chronic maldistribution, a rigidified productive system skewed toward foreign exchange generating commercial cash crops as opposed to much-needed foods, an infrastructure which served to articulate only a portion of the nation, a pattern of land distribution only slowly emerging from the nineteenth century, a small and vulnerable industrial sector, rates of illiteracy approaching 60 percent, chronic poverty with all the attendant features of malnutrition, infant mortality, and high morbidity rates, and a historically unstable political system alternating between “elected” coastal elites and military coups, Peru was and continues today to be in a vulnerable condition.

Thus, the worst “natural” disaster in the history of the Western hemisphere, as the earthquake of May 31, 1970, has become known, could only have happened in Peru or a nation suffering under similar conditions. The earthquake affected an area of about 83,000 square kilometers, or an area larger than Belgium and Holland combined. It claimed approximately 70,000 lives, injured 140,000 people, and destroyed or damaged more than 160,000 buildings, roughly 80 percent of the structures in the area. Over 500,000 people were left homeless, and the lives of approximately three million others were affected. Economic losses surpassed half a billion dollars. One hundred and fifty-two provincial cities and towns and over fifteen hundred peasant villages were seriously damaged or destroyed. In addition to homes, industries, public buildings, roads, railroads, bridges, and schools, electrical, water, sanitary, and communications facilities were also destroyed or seriously damaged. The forty-five seconds of the earthquake obliterated much of the fragile material infrastructure of this enormous region. While the above figures apply to the entire affected region, I will direct my attention for the most part to the intermontane valley known as the Callejón de Huaylas in the north central Andes, where I carried out extended fieldwork over a fourteen-year period between 1966 and 1980 (Oliver-Smith 1992).

The high mortality rates in the callejón and to some extent elsewhere in the impact zone were due largely to three major factors: settlement location, settlement plan, and building techniques and materials. Avalanches loosened by the earthquake tremors from Andean peaks careened down the canyons of rivers to obliterate several villages and cities located in these natural channels. The worst of these avalanches descended from Mount Huascarán, Peru’s tallest mountain at almost twenty-three thousand feet, upon the provincial capital of Yungay, burying the city and roughly forty-five hundred of its five thousand inhabitants (Oliver-Smith 1992). The second factor, settlement planning, combined with the third factor, building techniques and materials, to produce lethal destruction in town and city streets. When the earthquake with its severe lateral movement hit, the untied exterior walls of buildings under the excessive weight of tile roofs fell outward into the narrow streets, burying people who attempted to escape, while the heavy roofs fell into the house upon those who remained within. Highland cities and towns entombed their inhabitants. In the departmental capital of Huaraz, almost a third of the population, some ten thousand people, lost their lives in this fashion.

The lifeline systems of water, electricity, and medical care were all devastated by the disaster. The valley’s urban areas were only partially electrified before the disaster, powered by the hydroelectric plant located at its northern extreme in the Cañón del Pato. The rural majority had no electrical power and no immediate prospect of receiving any. Interestingly, electricity from the Cañón del Pato had been lighting and powering most highland provincial capitals as well as the coastal city of Trujillo for some time. Towns and villages that possessed antiquated gasoline generators had to activate them, or backup systems had to be brought in. Most people who had received electric power in the callejón, however, remained without it for months, even years in some cases.

Urban water systems in the callejón were haphazard affairs at best, and most of them were unable to supply uncontaminated potable water in part because the ceramic pipes in their shallow trenches or occasionally even aboveground were vulnerable to impacts. The earthquake totally destroyed these marginally functional systems, and it took weeks and in some cases months before water service, such as it was, could be restored.

The pre-disaster health care system in the callejón was largely accessible only to the urban middle classes and elites, and even then was not adequate for anything beyond routine maladies. Although hospitals existed in all of the major towns, they were all seriously under-equipped and undermaintained. All of the hospitals were rendered inoperative by the quake, and ultimately most emergency medical care as well as longer-term health concerns, such as epidemics, had to be met from outside resources.

The fragile infrastructure of roads, railroads, airports, and communication was completely incapacitated by the quake. The rails of the one railroad system leading into the Callejón de Huaylas were twisted beyond repair by
fissioning and swelling of the earth's surface. They have not been replaced yet, almost thirty years later. All the roads into the callejon were unpaved, and the tremors of the quakes literally dissolved their foundations. Many of them, including the two main routes into the valley, slid off their steep mountain perches, leaving much of the disaster area without access or escape routes for varying periods of time. One of the small airstrips was buried under debris from the avalanche that buried Yungay. The other had to be lengthened before it could accommodate cargo planes bringing in assistance. Indeed, the only airport in the nation capable of receiving the aircraft carrying the enormous outpouring of international aid was Lima's, which created bottlenecks so serious that huge amounts of materials stagnated there in some cases for years after the tragedy.

The bottlenecks in Lima were the symptom of a problem characterizing societies dominated by a primate city through which all goods traditionally flowed. Not only did all earthquake assistance flowing inward have to pass through Lima, but all decisions made regarding the stricken region were vested in a ministry-level organization created for that purpose and at first located in Lima (see Doughty, this volume, chapter 12). The fact that the principal agency in charge of relief and reconstruction was located entirely outside of the disaster zone resulted in a byzantine bureaucratic design and a bewildering division of responsibilities according to type of aid and scope of responsibility, seriously hampering delivery (Doughty 1988: 50). Such was the result of this elaborate bureaucratic structuring that even the president on visiting the disaster zone a year after had to admit that "virtually nothing had been done" for the survivors.

**CONCLUSION**

The early years of the decade of the 1970s were hard years for the survivors of the earthquake as they struggled to overcome their enormous losses and to rebuild their towns and villages. Despite the fact that aid and assistance have eventually led to some reconstruction, it is mostly cities that have been rebuilt, although roads and electrical and water services are better than they were before the earthquake. Little aid actually reached or has impacted the rural majority. They had to rebuild themselves. Indeed, the maldistribution of aid and the inefficiency of aid agencies over several years following the tragedy gave rise to the saying, "First the earthquake, then the disaster." There is as much truth as there is irony in this statement. Although the statement was clearly directed at the delivery of aid, it implicitly constitutes a mordant criticism of the structure of their society. The survivors saw their society as "disastrous" and the earthquake was just that, an earthquake, indeed a terrifying dimension of their known environment, but one that to a greater or lesser degree they had experienced before and would experience again.

In the last analysis, much of the devastation and misery caused by the May 31, 1970, earthquake in Peru was a product of the historical processes set in motion at the time of the conquest. These processes ultimately subverted the generally effective adaptations to the many environmental hazards worked out by the peoples and cultures of the Andes over the ten thousand years of human residence in the region. Thus, the accentuated vulnerability that the region exhibited and still exhibits is a socially created phenomena, a historical product brought into being by identifiable forces. Furthermore, although the viable adaptations developed by Andean peoples have been subverted, they should not be discounted as fruitful sources for vulnerability reduction and hazard mitigation measures for the future. Peru and other nations in the developing world are not empty vessels to be simply filled with Western technical information on hazard mitigation. As this brief exploration of hazards in the Andes reveals, third-world cultures developed valuable knowledge on hazards which, although largely subverted by the forces of colonialism, may yet, through careful research and combination with global technical expertise, contribute to the reduction of vulnerability and destruction in developing nations.

**NOTE**

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CONSTRUCTING VULNERABILITY IN THE FIRST WORLD: THE NORTHRIDGE EARTHQUAKE IN SOUTHERN CALIFORNIA, 1994

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INTRODUCTION: EXAMINING VULNERABILITY

This chapter examines the political and economic construction of vulnerability, applying insights gained from third-world research to a first-world setting. Drawing on Wisner (1993) and Cannon (1994), a framework is developed that identifies factors involved in the production of hazard vulnerability in the United States. The general framework is used to highlight vulnerability issues in two Southern Californian communities following an earthquake of magnitude 6.7 on the Richter scale in Northridge in 1994. The chapter traces the historical, economic, and political construction of vulnerability in the towns of Fillmore and Piru in Ventura County and how these have been revealed in recovery issues following the temblor. As anthropological research in the third world has documented (Oliver-Smith 1996: 314–317), political and economic practices create “at risk” populations through systematic processes of marginalization and exclusion (Blakie et al. 1994). Thus, disasters are seen as compounding the struggles that are part of many people’s daily lives (Watts 1991). In examining the sources of hazard vulnerability, issues regarding the distribution of social power and its particular expression in control over property, politics, and ideologies are central...