Peru:
An Andean Country with Significant Disaster and Emergency Management Challenges

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Introduction

Peru is a poor, developing country in South America. Like so many other countries in the world, Peru has experienced its share of increasing and more intense disasters. Its emergency management system, while making progress in the past few years, remains weak in certain respects and in need of more proactive measures. In particular, the government and the emergency managers in this country need to continue to develop more effective approaches to implementation of the phases of emergency management (e.g., mitigation, preparedness, response, and recovery).

This paper discusses Peru's disaster context; embarks on a short discussion of the vulnerability in this country; delineates the extreme past disasters experienced by her people; notes Peru's emergency management organization and laws, challenges and successes; and elaborates upon the lessons that have been learned as a result of studying Peru's emergency management system.

The Peruvian Context

Peru is located in South America and borders Chili to the south, Ecuador to the north, and Colombia, Brazil and Bolivia to the east. Its geography, climate, and people are diverse and somewhat unique. Peru's terrain includes relatively flat coastal areas, steep mountains in the central part of the country (rising to 5,000 meters or 16,400 feet in height in some cases), and rain forests in the east. The coastal areas are considered to be desert (particularly in the southern portion of the nation), while the central and eastern parts receive large amounts of rainfall. For example, Peru's general coastal climate area experiences semi-warm weather and is very dry with as little rainfall as 6 inches per year. On the other hand, other areas of Peru - such as the Sierra mountain regions - are sub-humid areas with rainfall amounts from 20 to 42 inches per year. The eastern slopes of the Andes receive upwards of approximately 80 inches of rain per year.

Peruvian Demographics

Peru with an area of 1.28 million sq. km. (496.225 sq. miles) is the third-largest country in South America and is approximately three times the size of California (U.S. Dept. of State

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2010; CIA – The World Factbook 2010; www.infoplease.com 2010; Wikipedia 2010).Peru is divided by the Andes Mountains into three sharply differentiated geographic regions (www.infoplease.com 2010; Wikipedia 2010). To the west is the coastline which is largely arid except for valleys by seasonal rivers (Wikipedia 2010). The mountain area with peaks over 22,000 ft. (6768 m), including Huascaran, has lofty plateaus (Altiplano) and deep valleys which lie centrally (www.infoplease.com 2010; Wikipedia 2010). The third geographic region, beyond the mountains to the east, is the heavily forested (Amazon rainforest) wide expanse of flat terrain (www.infoplease.com 2010; Wikipedia 2010). According to Wikipedia (2010), 60% of Peru's area is located within this region.

Administratively, Lima is the capital of Peru. The country has twenty-five administrative divisions and a province (CIA – The World Factbook 2010; Wikipedia 2010). The regions are: Amazonas, Ancash, Apurimac, Arequipa, Ayacucho, Cajamarca, Callao, Cusco, Huancavelica, Huanuco, Ica, Junin, La Libertad, Lambayeque, Lima, Loreto, Madre de Dios, Moquegua, Pasco, Piura, Puno, San Martin, Tacna, Tumbes and Ucayali. The only province in Peru is Lima, the capital city. Some major cities in Peru with population estimates over 100,000 people in 2002 are: Lima (7,603,500), Arequipa (733,900), Trujillo (600,900), Chiclayo (490,400), Piura (359,400), Iquitos (349,300), Chimbote (298,600), Huancayo (285,600), Cusco (282,600), Pucallpa (235,500), Tacna (229,100), Ica (186,600), Sullana (184,900), Juliaca (157,100), Huanuco (140,500), Chincha Alta (127,200), Ayacucho (111,100), Tarapoto (110,000), Talara (103,200) and Cajamarca (102,300) (Source: Butler 2003). The population distribution in the Peruvian major cities could be attributed to several factors such as being the capital city, a regional capital, employment centers, trade and financial centers or transportation nodes. For example, Lima, the largest city in this country, with a population of approximately eight million people, could be attractive to job seekers who may look for administrative jobs in various federal departments or in the transportation sector.

The country of Peru, with a population of about 29.11 million in 2009 (U.S. Dept. of State 2010) and 2010 estimate of 29.91 million (CIA – The World Factbook 2010; www.infoplease.com 2010), is the fourth most populous country in South America. In 2009, Peru had 1.11% annual population growth rate and approximately 30% of the population lived in the Lima/Callao metropolitan area (U.S. Dept. of State 2010). However, in 2010, Peru's annual population growth is estimated at 1.193% (CIA – The World Factbook 2010). As a multi-ethnic country, Peru's population consists of: Amerindians (45%); Mestizo (mixed Amerindians and white) 37%; White 15%; Black, Japanese, Chinese and Other 3% (CIA – The World Factbook 2010). Based on the 2007 census, 81.3% of Peruvians are Catholic; Evangelicals make up 12.5%; other 3.3%; and unspecified or none 2.9% (CIA – The World Factbook 2010). According to the 2007 census, 84.1% of Peruvians speak Spanish (the official language); another 13% speaks Quechua (official); 1.7% speaks Aymara; 0.3% speaks Ashaninka; 0.7% of Peruvians speak a native language (which includes a large number of minor Amazonian languages) while 0.2% speaks other languages (CIA – The World Factbook 2010; U.S. Dept. of State 2010).

Furthermore, the 2007 census indicated the literacy rate (age 15 and overcan read and write) at: 92.2% for total population; 95.4% for males; and 89.4% for females (CIA – The World Factbook 2010). In 2006, the infant mortality rate in Peru was 29.96 per 1,000 while life expectancy in 2007 was 68.33 years (U.S. Dept. of State 2010). In 2009, the unemployment rate in Lima was 8.4% while underemployment was 44.66% (U.S. Dept. of State 2010). However,

the CIA – The World Factbook (2010) estimated the national unemployment rate in 2009 to be 8.1% while metropolitan Lima had an unemployment rate of 8.1% in 2008.

Economy

Peru's economy can be seen at work in its varied geographic regions - that is, an arid coastal region, the Andes further inland and Amazon rainforest bordering Colombia and Brazil (CIA – The World Factbook 2010). With this recognition, abundant mineral resources are found in the mountainous areas while Peru's coastal waters provide excellent fishing grounds. Other natural resources and industries found in Peru are: copper, gold, silver, zinc, lead, iron ore, petroleum, natural gas and forestry (U.S. Dept. of State 2010). Reports indicate that during the period 2002-2006 the Peruvian economy grew 4% per year and had a stable exchange rate and low inflation (CIA – The World Factbook 2010). However, in 2007 and 2008 the Peruvian economic growth rate jumped to 9% per year primarily driven by higher world prices for minerals and metals as a result of the government's aggressive trade liberalization policies (CIA –The World Factbook 2010). This robust economic growth did not last, however, in the face of world economic recession and lower commodity export price and the growth rate fell to 1% in 2009. One important benefit of Peru's rapid expansion is the reduction in the national poverty rate by about 15% since 2002, though underemployment still remains high (CIA – The World Factbook 2010). Furthermore, inflation has trended downward in 2009, to below the Central Bank's 1.3% target (CIA – The World Factbook 2010).

As the CIA – The World Factbook (2010) observes, despite Peru's strong macroeconomic performance, overdependence on minerals and metals subjects the economy to fluctuations in world prices and infrastructure prevents the spread of growth to Peru's non-coastal areas. As such, not all Peruvians benefit from the economic expansion. Peru is one of the countries in South America that pursues and commits to free trade. As a result, since 2006, Peru has signed trade deals with the United States, Canada, Singapore and China (CIA – The World Factbook 2010; U.S. Dept. of State 2010). It has also concluded negotiations with the European Union and begun talks with Korea, Japan and others (CIA – The World Factbook 2010). The important US-Peru Trade Promotion Act (PTPA) has been in force since February 1, 2009, thus opening the way to greater trade and investment between the two economies (CIA – The World Factbook 2010). Peru belongs to the Andean Community, the Asia-Pacific Economic Cooperation (APEC) forum and the World Trade Organization (WTO), and also has limited trade agreements with Chile and Mexico (U.S. Dept. of State 2010).

In 2009, Peru's Gross Domestic Product (GDP) stood at $127.22 billion with per capita GDP of $4,365 (U.S. Dept. of State 2010). Sectorial contributions to the GDP in 2009 were: manufacturing 14.33%; agriculture 7.8%; services 54%; mining 5.7%; construction 6.2%; and fisheries 0.44% (U.S. Dept. of State 2010).

Poverty

Although Peru lacks statistics on poverty, researchers have been able to utilize two main national sources of data on household level income and expenditures to help determine these rates (Altamirano, Copestake, Figueroa and Wright-Revolledo 2004). According to Altamirano et. al. (2004), the first includes annual surveys carried out by the government statistical service (INEI). On the other hand, the second comprises 'ENNIV' (EncuestaNacional de Hogares Sobre Medicion de Niveles de Vida [National Household Survey for Measurement of Living Standards]), national household income and expenditure surveys carried out by the Instituto Cuanto following the methodology of the World Bank's Living Standard Measurement Survey

(LSMS) (Altamirano et al 2004). Using these data and based on the United Nations Development Programme (UNDP) methodology/format (see Altamirano et al 2004, 315), Altamirano et. al. (2004) found that in 2002, more than half the population were designated as poor in absolute terms, and 15% as extremely poor. Further breakdown indicates that nearly half of the latter lived in rural areas of the highlands (Altamirano et al 2004). The World Factbook (2010) states that in 2006 44.5% of Peruvian population was below the poverty line which gives support to Altamirano et. al. (2004) finding in absolute terms in 2002.

To overcome the limitations of the LSMS methodology of poverty estimation, the growing research emphasizes the multiple dimensions of human development and poverty in Peru (Altamirano et al 2004). According to Altamirano et. al. (2004), the first national "Human Development Report" for Peru by UNDP in 2002 had a distinctive feature of providing source statistics for and estimates of the human development index (HDI) for each province in the country. Furthermore, it provided a more comprehensive set of statistics on physical and human resources for the 24 departments (Altamirano et. al. 2004). (See Altamirano et al 2004, 316 for the reproduction estimates of the HDI at department level which is roughly organized by geographical zone.) In this study, Altamirano et. al. (2004) found that Peru's overall HDI increased from 0.639 in 1975 to 0.755 in 1999. This improvement notwithstanding, Peru's international ranking on HDI dropped over the same period from 45th to 73rd (Altamirano et al 2004).

Hazards in Peru

Although natural and man made hazards continue to concern us, disaster occurs when there is loss of life or destruction of property. According to Randolph (2004, 201), a hazard "is the inherent danger associated with a potential problem, such as an earthquake or avalanche." Furthermore, it includes regional susceptibility as well as relative hazard of specific areas within that region. For example, the Cordillera Blanca mountain range in Peru is a glacial-prone region, yet within the region around Huaraz, areas underlain by glacial lakes have a landslide and outburst floods hazard much greater than other areas (Carey 2005). The Cordillera Blanca region is problematic due to thousands of people inhabiting hazard zones of potential avalanches or outburst floods (Carey 2005).

In general, natural hazards are those natural phenomena that pose a threat to people, built environment, structures and economic assets of a locality (Gaillard 2007). Such hazards include earthquakes, volcanic eruptions, tsunamis, hurricanes, storms and cyclones, floods, landslides, mudslides, droughts, El Nino/La Nina and storm surges (Gaillard 2007; Oliver-Smith 1999;Zaman 1999; Philander 2004). The country of Peru is vulnerable to diverse hazards such as earthquakes, avalanches, floods, mudslides and El Nino/La Nina phenomena (Morales 1966; Carey 2005; McEntire and Fuller, 2002; Oliver-Smith 1999; Trenberth 1997). Due to its natural hazards which are typical and characterize the region, Oliver-Smith (1999, 75) has been prompted to describe the land as having "always been a very hazard-prone region of the world." This characterization may also be attributed to precarious conditions of climatology and geology (Oliver-Smith 1999).

Climatological and oceanographic factors are two major phenomena that interact to produce many of the hazardous atmospheric conditions which afflict Peru, Ecuador and other countries in the region (Oliver-Smith 1999). According to Oliver-Smith (1999), and to reiterate somewhat, under normal conditions, the coastal desert of Peru is one of the driest regions of the world with virtually no annual rainfall and only slight variation in annual temperature. In this

context and in conjunction with other studies Oliver-Smith (1999) notes that the region is extremely sensitive to any anomalies in the ocean-to-atmosphere energy transfer system with implications for global weather patterns.

With this in mind, "the ocean-to-atmosphere energy transfer system" (Oliver-Smith 1999, 75) has produced global weather phenomena known as El Nino and La Nina respectively (Trenberth 1997; Philander 2004). According to the extant literature on the subject, the term El Nino was given to an annual modest warm ocean current that appears along the coast of Peru and Ecuador around Christmastime with accompanying rains that transform the barren coastal desert of that region into a garden (Trenberth 1997; Philander 2004). "El Nino" is a Spanish term for "the boy" and refers to Child Jesus (Philander 2004, 105). The phenomenon has subsequently become associated with the unusually large warming that occurs every few years and that changes the local and regional ecology (Trenberth 1997). On the other hand, the opposite of El Nino is La Nina ("the girl" in Spanish) phasing consisting of a basin-wide cooling phenomenon of the tropical Pacific (Trenberth 1997, 2772).

Of the two phenomena, El Nino is the most dangerous and destructive. Though the rains associated with El Nino turn the Andean desert coastal region into a garden, people become "preoccupied with the roads, bridges, and houses that are washed away by the rains" (Philander 2004, 105). Additionally, heavy rains produced by El Nino have the potential of causing flooding and mudslides due to high and steep mountains. These hazards have come to dominate research in Peru as the nation's population grows (Oliver-Smith 1999). For example, Young and Leon vividly captured both regional contrasts of hazards present in Peru with human activities exacerbating disasters in that country in conjunction with poverty when they wrote:

> Peru is a land of contrasts, with natural hazards occurring in coastal deserts, high Andean mountains, and humid Amazon lowlands. Increasingly, however, population growth exposes more people to risks as cities spread and as land use must intensify. These social features interact with a heterogeneous distribution of seismic risks shaped by the way the Nazca plate subducts, causing earthquakes to occur throughout the mountains and on the coast, with active volcanoes in the south. Landscapes are shaped not only by catastrophic events such as landslides, but also by soil erosion and fluvial transport. In Peru, rains and floods during an El Nino year can rearrange surface features, in addition to destroying houses and infrastructure. Even if people perceive, recognize, and acknowledge the presence of risks from these natural hazards, they are often constrained in the way they can or will respond. Vulnerability in Peru to natural hazards is amplified by poverty and by a disconnection between what science can predict and what people will do (2009, 165).

With regard to some disasters in Peru, scholars note that many variables act as triggers to these events (Oliver-Smith and Goldman 1988; Maskrey 1992; McEntire and Fuller 2002). McEntire and Fuller (2002, 130) captured this view by observing that:

> Among . . . [such causes] were the inappropriate location of settlements, rapid and unplanned urbanization, improper construction of homes, insufficient or ineffective structural mitigation devices, deforestation, a failure to implement traditional coping mechanisms, constraining cultural attitudes, poverty, limited preparation, the impact of technology and hazardous materials, inadequate health care, a centralized response, and even the evacuation process itself.

Taken together, Young and Leon's (2009) observation of the locations of natural hazards occurring in coastal deserts of Peru and the historical study conducted by Biggs et al (2009) reveals why earthquake frequency occurrence in this region is high. Based on historical reports along the coast of Peru, there are three distinct zones of earthquakes behavior: The central region bounded by topographic features on the subducting plate, the Mendana fracture zone to the north and the Nazca ridge to the south (Biggs et al 2009). The presence of these features may explain why seismic activities occur on coastal regions of Peru as well.

Although Peru is a fledging democratic state, it is facing enormous security challenge from the Shining Path that is trying to wrestle the power from the elected officials (Manwaring 1995; Bourque and Warren 1989; McCormick 1990). Specifically, the organization does not want to follow the democratic principle of participating in the elections but is utilizing armed campaigns against public officials; particularly in the rural areas where it bases and is able to recruit followers who are disillusioned with Peru's poor economy (Bourque and Warren 1989). In 1982 the activities of the Shining Path was thought to be limited to a remote corner of the Andes (Bourque and Warren 1989). However, this proved inaccurate leading Bourque and Warren (1989, 13) to write:

> This appraisal has been increasingly belied by frequent urban *apagones* (blackouts resulting from sabotage of power lines), car bombings, an ever-widening circle of rural "emergency zones," and reports of Sendero control of the coca-growing zones around Tingo Maria.

Manwaring (1995, 162) further observed that:

> Sendero bombed public buildings and private companies; hanged dogs and cats from lampposts as warnings to functionaries and supporters of the illegitimate state; and initiated a series of attacks on and assassinations of local public figures.

The Vulnerability Issue

Broadly defined, vulnerability is the potential for loss which may result in damage and loss of life from extreme natural or man-made events (Cutter 1996). The vulnerability of Peru cannot be fully understood without recognizing the impact of poverty (as discussed above) in this nation. Such poverty constrains what people can do to protect themselves. For instance:

> Even if people perceive, recognize, and acknowledge the presence of risks from these natural hazards, they are often constrained in the way they can or will respond. Vulnerability in Peru to natural hazards is amplified by poverty and by adisconnection between what science can predict or what people will do (Young and Leon 2009, 165).

There are a myriad of reasons for disaster vulnerability (Oliver-Smith and Goldman 1988; Maskrey 1992; McEntire and Fuller 2002). In addition to its share of extreme events such as earthquakes, avalanches and El Nino triggered disasters, scientists have also expressed their frustration with the additional variables that lead to disaster. For example, another eminent threat to Peru is the presence of glacier lakes. Scientists have documented that global warming since the late-19th century has led to glacier retreat worldwide, and in Peru's Cordillera Blanca mountain ranges, "retreating glaciers have led to the formation of precariously dammed glacial lakes as well as to the thinning and fracturing of glaciers" (Carey 2005, 123). Historically, these new glacial lakes have generated at least twenty-four outbursts floods that have killed about 6,000 people in the past 150 years (Carey 2005).

Additionally, it is reported that the unstable glaciers have produced at least six avalanches that killed approximately 22,000 people during the 20th century. Since residents living near these glacial lakes do not have faith in information coming from the Peruvian government and scientists (based on the historical experience), they have every reason to be scared of the potential glacier dangers (Carey 2005). Even when hazards like glacial lakes are not active, the situation may become dire as Peruvian government keeps cutting Peruvian glaciologists and geologists working in Huaraz (Carey 2005). The scientists' frustration is underscored by Carey who described the situation as follows:

> The national government keeps slashing their budget, making it nearlyimpossible to monitor the Cordillera Blanca's ~600 glaciers and 374 glaciallakesor to maintain the region's 35 'lakes security projects' that have beencompleted since 1941. The situation in the Cordillero Blanca is thus problematic: thousands of people inhabit hazard zones of potential avalanches or outburst floods; local residents lack faith in the governmentto protect them and do not trust information from Peruvian scientists or government officials; and scientists have miniscule budgets with which toinvestigate new glacier-related threats, maintain existing programs, orinitiate new disaster mitigation projects at glacial lakes (2005, 123).

Brief History of Peru's "Extreme" Disasters

The history of extreme disasters in Peru is shaped by natural events as well as unplannedintrusions into the natural environment which upsets the ecosystem. Although these extreme events may be concentrated in some regions, more people are exposed to risks due to population growth as cities expand with intensified development to accommodate new growth.

What follows next is a chronological summary of major disasters which Peru has experienced. The description of these events will include, where possible, statistics on fatalities, injuries, property, infrastructure, cultivated land destroyed and financial loss suffered. In addition a triggering mechanism for the disaster may be described as well. Finally, this section will mention how these events may have impacted or changed policy in Peru.

The January 1962 Avalanche. For tourists, glacier peaks are things of beauty, both to watch and admire. But to residents living close to active glacier mountains or lakes, they may become a nightmare. Such was the case in Peru on January 10, 1962 in Peru's Santa valley, where a great ice avalanche occurred. It was the first one known in the country, which fell from nearby Mt. Huascaran, one of its highest and most beautiful peaks (Morales 1966; Carey 2005). The event was caused by the breaking off of the west front of the hanging glacier on the summit of the North Huascaran at the approximate altitude of 6300 m (Morales 1966). According to Morales (1966), the quantity of ice involved was estimated at 2.5 to 3 million m3, and the avalanche involved a great volume of granodiorite blocks from the precipice.

Morales (1966) further suggested that the avalanche travelled 16 km and descended 4,000 m in elevation destroying and demolishing everything in its path. Furthermore, it was estimated that the average speed of the avalanche was 60 km/h (Morales 1966). As Morales (1966, 311) narrated:

> The avalanche travelled at such a high velocity, that there was practically no warning for the inhabitants. Not all the people were aware of what was going on. Some people were running to Yungay but did not reach a safe place in time. Many others, as in Ranrahirca, ran into the Church and were killed there.

This devastating avalanche killed more than 4,000 people and nine small towns were buried (Morales 1966; Carey 2005). Farms were devastated and thousands of animals were killed while great destruction was reported in an area famous for its fertility and beauty (Morales 1966).

The May 1970 Earthquake. The May 31, 1970 earthquake "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" (Oliver-Smith1999, 75).

Even before the conquest and subsequent colonization of Peru, its geology had potential foractive seismic activities with three distinct zones of earthquakes behavior (Biggs, Robinson, and Dixon 2009). So, naturally and in conformity with Young and Leon's (2009) observation of "natural hazards occurring in coastal deserts, high Andean mountains," on May 31, 1970 at 3:23 p.m. the north central coastal and Andean regions of Peru were hit by a massive and destructive earthquake (Oliver-Smith and Goldman 1988; Oliver-Smith 1999a; Oliver-Smith 1999b, Doughty 1999; Carey 2005). The 7.7 quake unleashed destructive forces which Oliver-Smith and Goldman (1988, 105) described as "the worst natural disaster in the history of the western hemisphere."

The estimates of destruction and damages from the May 1970 earthquake vary but, suffice it to say, were enormous. For example, Carey (2005) suggested that the quake killed

70,000 Peruvians and triggered another avalanche from Mt. Huascaran that killed 18,000 people. On the other hand, Oliver-Smith (1999, 84) summarized the devastation in the region thus,

> 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 home, 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.

This devastating event has also prompted Frommer (2008, 157) to state,

> While aid flooded in from around the world, and Peru sent in its military to keep the peace and try to get the most drastically affected communities back on their feet, it will take years for them to recover, and many who lost their homes [e.g. more than 37,000 homes were destroyed] may never be able to rebuild.

The May 1990 Alto Mayo Earthquake. While the Alto Mayo region, like most of the Peruvian Amazon, has been systematically ignored in the official version of Peru's history and has little or no relevance in the country's political and economic life, disaster has drawn world attention to the area (Maskrey 1992). As Maskrey (1992, 162) astutely articulates, "if it wasn't for the spread of coca plantations, the actions of armed groups and the impact of the earthquake of 29 May 1990, it is improbable that the Alto Mayo would figure prominently in the national imagination at all."

However, the Alto Mayo region has a long seismic history with the last serious earthquake occurring in 1968 (Maskrey 1992; Schilderman 1993). On May 29, 1990, while the Alto Mayo region residents were minding their usual evening activities, at 9:36 p.m., an earthquake of magnitude 5.8 on the Richter scale struck (Maskrey 1992; Schilderman 1993). Though the quake was a moderate one, it nevertheless destroyed over 3,000 houses, killing 65 and injuring 607 people (Maskrey 1992; Schilderman 1993). Further reports indicated that Soritor was the worst affected citywith 26 deaths, 310 injuries and 1,100 houses damaged or destroyed (representing roughly 90% of the total housing stock) (Maskrey 1992). Every report of the May 29, 1990 Alto Mayo disaster destruction alluded to the vulnerability of the building forms and structure which predominated. For example, Maskrey summed up the vulnerability of structures in the region to the seismic event this way,

> Most of the houses which fell down and killed their occupants were built from rammed earth (tapial) and had serious structural deficiencies. The lack of maintenance, deficient building methods, the effects of rain and humidity and damages from the 1968 earthquake which had never been properly repaired were all factors which contributed to weaken foundations and walls. At the same time brick and concrete buildings were also damaged due to structural weakness and deficiencies such as an absence of reinforced concrete columns and beams (1992, 166-167).

The 1997-1998 El Nino disasters. The 1997-1998 El Nino resulted in flooding and mud-slides due to an excessive amount of rainfall and sea surges emanating from strong ocean currents and winds (McEntire and Fuller 2002). These phenomena left behind an incredible amount of fatalities in their wake. According to a local research institution, PREDESS (1998), about 374 people lost their lives, 412 were injured, and approximately 600,000 were affected. Furthermore, it was reported that roughly 114,000 hectares of agricultural land were flooded (Vallejos-Munoz 1998), nearly 40,500 homes were destroyed or badly damaged (El Camercio 1998b), and scores of schools were demolished (El Comercio 1998c). The events did not spare infrastructure. Thousands of miles of roads and bridges were washed away (El Comercio 1998d). The La Republica (1998a) reported that the destruction of the infrastructure severely hampered the distribution of agricultural products that were being harvested.

The August 2007 Pisco Earthquake. On August 15, 2007, a destructive earthquakeof magnitude 8.0 on the Richter scale struck offshore of southern Peru near the port of Pisco at 6:40 p.m. local time (Motagh, Wang, Walter and Burgmann 2008; Biggs et al 2009; Fierro et. al. 2007,www.eeri.org). The epicenter of the quake was about 45 km west-northwest of Chincha Alta and about 145 km south-southeast of Lima (Fierro et. al. 2007, www.eeri.org).According to Motaghet. al. (2008), the event produced strong ground shaking along the Pacific coastline between the capital city, Lima, and the Paracas Peninsular. This causedcausalities and destruction throughout the coastal regions in southern Peru. Reports indicated that the majority of the damage occurred in Chincha Alta, Ica, and Piscoand most of the buildings destroyed were adobe housing (Fierro et al 2007, www.eeri.org). Public buildings most affected were hospitals, schools, and other medium-to-large public facilities (Fierro et al 2007, www.eeri.org). These buildings were built using reinforced concrete frames and infill brick masonry rigidly attached to the frames (Fierro et al 2007, www.eeri.org).A preliminary report estimated that there were at least 519 fatalities, nearly 1,090 injured and many more left homeless (Fierro et al 2007, www.eeri.org). However, Tavera and Bernal (2008) suggested that in the towns of Chincha Alta and Ica, approximately 595 people were killed and 318 missing.

Terrorism from Sendero Luminoso (The Shining Path): 1980-1993. Although the Shining Path is far from ascending to the leadership of the Peruvian government, some argue it "slowly takes de facto control of more and more of the Peruvian national territory, destroys more and more infrastructures, and quietly erodes national and international stability – and tens of thousands of innocent people continue to die" (Manwaring 1995, 166).

Furthermore, in March 1982 Sendero Luminoso carried out a major attack on the Ayacucho Department prison and initiated what Manwaring (1995, 162) described as "the Robin

Hood-like release of its prisoners." This episode was followed in December 1982 "by another spectacular event" in which the "Sendero attacked Lima's electrical grid, destroyed four high-tension towers, and caused a complete blackout in the capital and six other cities (Manwaring 1995, 162). Another terror campaign that has been effective is the coordinated use of assassination and posted death threats to disrupt, paralyze, and eliminate local institutions (Manwaring 1995).

Organization and Laws

The National Civil Defense System in Peru is known as "Sistema Nacional De Defensa Civil" or "SINADECI"(translated into English as National System of Civil Defense). Through this system, the State is said to guarantee civil defense. While use of the word "guarantee" may sound like hyperbole, the national civil defense system is that mechanismthrough which the promotion of civil defense is promulgated. SINADECI is a part of the national defense of the country, and acts in agreement with the National Defense Policy and Plans of the country. SINADECI serves to protect the people of Peru, prevents damages, provides appropriate assistance, and assists with the population's rehabilitation no matter the origin of a disaster or calamity (Article 1 D.L. 19338).

The National Institute of Civil Defense (i.e., INDECI -- El Instituto Nacional de Defensa Civil) is the central Peruvian entity responsible for maintaining and implementing Peru's national civil defense system (Article 5, Decree law 19338). One of its main objectives is to create a culture of prevention and focus attention on all aspects of disaster management. Specific functions of INDECI are to organize the population, plan, coordinate, and control all activities of civil defense. Different laws are also set forth to address functions, implementation, and regulations factors conducted by INDECI in times of crises, for example, Supreme Decree law 005-88-SGMD, Supreme Decree law 059-2001-PCM, and Supreme Decree law 013-2000-PCM.

INDECI's vision consists of a modern organization that is efficient and effective, and one that depends upon the population's confidence and acceptance. More specifically, INDECI promotes constant capacity of manpower and resources, helps those in need, operates the center of emergency operations, establishes programs to help citizens become sustainable, promotes works related to prevention, conducts cleaning operations, and also oversees simulation exercises and activities related to diffusion ("Instituto Nacional De Defensa Civil" government materials).

The basic structure of the national civil defense system of Peru is shown below as follows:

- Presidency of the Cabinet – Multi-Sector Commission: Prevention and Mitigation
- Offices of Civil Defense – Sector Offices of Civil Defense
- INDECI—Regional Civil Defense Bureau

The basic structure of the regional civil defense system of Peru (which continues as a subcategory of the national system above) is outlined below as follows:

- Regional Government – Regional Civil Defense Committees

- Provincial Municipalities – Provincial Civil Defense Committees
- District Municipalities – District Civil Defense Committees

C**ommittees of Civil Defense**

The committees of civil defense (CDC) are organized internally and are classified as regional (i.e., "Departmental") civil defense. But they are also made up of provincial and larger regions. Such committees may also be organized within the adjoining smaller-region neighborhoods where a municipal agent exists and in the central less-populated regions where a municipal authority already has a noticeable presence.

The law of national civil defense in Peru establishes a hierarchical relationship between all the committees of civil defense, in all the activities related to mitigation, preparedness, response, rehabilitation, and recovery of emergency management. Some countries, like Peru, include a fifth phase of emergency management (e.g., rehabilitation).

These committees are divided into eight bodies based upon functions of all of the participants:

1. Actions and Works of Prevention is presided over by the Presidentof the regional committee of civil defense, and includes representatives from regional/local government officials and representatives of all the committees (both public and non-public who execute works related to prevention). This committee is designated to formulate an annual plan related to disaster prevention, and to promote permanent evaluations related to systems and operations.
2. Planning is overseen by the Planning Director of the regional government. This committee formulates and maintains the prevention plan and disaster contingency plans, and prioritizes all activities related to prevention.
3. Science and Technology is presided over by the designated President of the Committee and functions to assist in the assessment of dangers, to analyze vulnerabilities and to calculate risks that may occur.
4. Operations, Education, and Capacity is also presided over by the designated President of the Committee, which performs several diverse functions in the prevention of disasters, and is one of the most important units to the Center of Emergency Operations.
5. Logistics is also presided over by the designated President of the Committee. This committee is set up to perform diverse functions in the prevention of disasters, being an important controller and supervisor of humanitarian aid in the custody of INDECI.
6. Health is presided over by the Regional Health Director. This committee's job is to perform diverse functions in the prevention of and attention to disasters.
7. Law, Order and Technical Inspections includes a presiding officer who hails from either the Public Ministry department or the Defense Ministry department. Besides performing functions related to prevention of disasters, this committee promotes and

supervises the technical inspections of the Technical Security of Civil Defense that exists within the Office of Civil Defense, as accorded by law.

8. Communications is presided over by the designated President of the committee and is authorized to perform diverse disaster prevention functions, and to provide communication capabilities and a prevention mentality and culture that is within their reach and that is possible.

Notable Emergency Management Activities

Peru has taken and is exploring important measures in terms of mitigation, preparedness, response and recovery. For instance, the country has attempted to promote educational opportunities for adults and children which incorporate a culture of prevention. Emphasis has been placed on doctrine dedicated to prevention so that when disaster strikes the populace will be protected and be able to minimize more serious injury or damage. The prevention plan in Peru is therefore a strategic level (i.e., long term in nature) consideration that takes into account objectives and programs that orientate the institutional and inter-institutional activities to reduce risks, minimize damages, limit losses and protect people against natural phenomena or from man-made causes. These prevention strategies all emanate from national, sectorial, regional, provincial, and district levels (SINADECI: Manual of Basic Knowledge for Civil Defense Committees and Civil Defense Offices).

Another step Peru is taking is to challenge prior approaches to disasters. Schilderman (1993) has illustrated that contemporary assistance to vulnerable populations or populations affected by disasters is often inadequate since it is based on incorrect assumptions. Such populations are often considered helpless victims who are in need of relief instead of an active resource. For instance, after the May 29, 1990 Alto Mayo earthquake, Peruvian national agencies saw the affected local communities as helpless and passive recipients of relief. However, these agencies misunderstood the organizational ability of the locals which resulted in the emergence of informal institutions to take control of the situation. According to Schilderman (1993, 418) "in Soritor, where most of the damage had occurred, the local popular defense front had assessed damage and its own needs for relief and handed those over to the authorities within days." The Soritor residents' action changed the policy of "government knows all" in Peru post-May 29, 1990 Alto Mayo earthquake and ushered in the policy of cooperation and partnering between government and the local organizations that actually know the needs of the community.

Therefore, rather than wasting large sums of money on relief, effort should be taken to reduce the populations' vulnerability and increase their self-reliance and technical skills. Schilderman summed this up when he wrote:

> A reduction of vulnerability can probably be achieved, as the example of the Alto Mayo shows, by increased self-reliance, in technical, economical and organizational terms. A key element of such a policy lies in strong community-based organizations. But it also requires getting the various actors involved together and committed to a development plan (1993, 422).

Peru is therefore working cooperatively with local organizations, various levels of government and NGOs to minimize disaster occurrence.

Peru is also striving diligently to educate professionals in the emergency management area. It has produced many publications which are available to emergency management personnel and citizens. Examples of some of these publications are: 1) SINADECI: National Institute of Civil Defense; 2) A separate SINADECI journal whose theme is "La prevencion esta en nuestras manos," which translates to English as "Prevention is in our hands"; 3) Manual of Basic Knowledge for Committees of Civil Defense and Civil Defense Offices; 4) A book titled "Learning to Prevent: Methodological Strategies"; 5) A pamphlet titled "Doctrine of Civil Defense"; 6) A pamphlet provided by INDECI titled "Civil Defense: [the] labor of all; and 7) Terms of Civil Defense, a book that lists and defines words related with disasters and emergency management. These writings may prove useful for an emergency manager's preparation and the knowledge may be implemented both during and after a crisis situation.

In regards to recovery efforts, Peru has worked with the Intermediate Technology Development Group (ITDG). This international non-governmental organization (NGO), based in the UK, has worked closely with its office in Peru "to coordinate reconstruction efforts by drawing up an integrated reconstruction plan, in partnership with local community organizations and regional institutions" (Schilderman 1993, 419). The ITDG effort led to the inclusion of stakeholders and actors in the reconstruction such as dwellers, builders, neighborhood communities, planners, financial institutions, various levels of government, churches and NGOs (Schilderman 1993). This cooperative approach for the reconstruction went beyond the traditional post-disaster reconstruction projects "because it considered reconstruction in a much more widely integrated development context" (Schilderman 1993, 419).

The reconstruction plan focused on the reconstruction of dwellings and facilities in addition to the dissemination of appropriate building techniques, community awareness strategies, environmental improvements such as reforestation, vulnerability reduction and self-reliant in construction (Schilderman 1993). In the process of reconstruction, the ITDG officials gave hard consideration on ways to stimulate the region's economy and empower the people by restoring their confidence. One such way, and the most important aspect of the plan, was its emphasis on the use of local resources such as skills and materials as well as organization and management instead of relying heavily on aid brought to the region (Schilderman 1993). The reconstruction plan was based on:

- Development of an improved building technology applying more earthquake-resistant technology.
- Reforestation for environmental protection using a community-based approach establishing nurseries and undertaking education at community level.
- Housing programs focusing on the poorest sections of the population in partnership with local community organizations.
- Training and dissemination program to improve construction skills of the locals.
- Strengthening local communities involvement in local problems facing their communities, thus promoting self-help housing solution

Weaknesses

Because Peru's emergency management system is confronted with many disaster challenges, it is important that this country can do better in several areas related to emergency management. For example,

- While Peru's economy is doing better than ever, and even though economic growth is greater than most other Latin American economies since 2001 (Taft-Morales 2009), inflation must be reduced. Unmet expectations of Peru's citizens' must be addressed. Specifically, the percentage of poverty stricken individuals in Peru must be reduced, as those living in rural areas had poverty rates that had risen to 65% in 2007 (Taft-Morales 2009).
- Until just recently, political instability in this country was constant. The violent Sendero Luminoso, or Shining Path movement, is still prevalent in Peru. Efforts now in place to limit these violent movements are a good start to domestic tranquility in the country, but the Peruvian government and law enforcement officials must continue to defeat of these groups and other terrorists.
- Peru has historically had a very centralized emergency management system. For instance, the control of emergency management resources was concentrated at the central government level during the 1997/98 El Niño flooding and mudslides. This slowed down the response tremendously and limited the ability of local jurisdictions to handle their own disaster needs.
- Moreover, in places where a disaster has occurred and where towns have been devastated, the government must move faster to help those in need. As an example, after the town of Pisco was devastated by the August 2007 earthquake, it has taken a long time to relocate people. Today, more than three years later, many people are still living in makeshift shacks and tents (Operation Groundswell, Disaster Relief 2011).

Successes

There are many notable achievements in Peru, however. For instance, with regard to the violence and atrocities that have taken place within Peru in recent years, the current president of the country recently took "a hard line against terrorism, going so far as to propose a law that would make terrorism one of just two crimes in Peru to merit the death penalty (the other being child rape)" (Frommer 2008, 443). No doubt these actions have come about in response to terrorist groups such as The Shining Path as well as recent violent incidents that have taken place in such places as Ayachucho, Huancavelica, Junin, and San Martin (Travel.State.Gov.). The government's firm stance on punishment for these violent offenders will help deter such occurrences and prevent other groups from forming or taking up such violent acts and atrocities against the people of Peru. These decisions also bode well for Peru's judicial system, which in the past has been considered politically biased in favor of those in power at the time.

Second, Peru is working with other nations to address its security, development and disaster needs. As an example, Peru and the United States have continued to cooperate on several fronts (e.g., on counter-narcotics, matters related to maritime, also the trafficking of humans, and the improvement of disaster preparedness). As Taft-Morales (2009) contends, this strong cooperation between the two countries strengthens Peru's institutions, enhances democracy, promotes human rights, and improves the economy between these countries. It should also be noted that other countries (e.g., Bolivia, Brazil, Colombia, and Ecuador) are also

helping Peru to coordinate and improve counter-narcotics in the regional and neighboring areas (Taft-Morales 2009).

Third, and more closely related to emergency management, Peru's basic structure of National Civil Defense System is doing well and is firmly in place. The system provides guidelines for the leadership and supervision required for disaster management in this country. The SINADECI and the INDECI are doing their parts to foment through a national educational campaign a culture of disaster prevention among adults and children alike in the country. With more and more citizen socialization taking place, many lives will be spared and property destruction will be lessened.

Fourth, Peru has become more responsive country than in past years. Peruvian policymakers and emergency managers are becoming more in tune to the needs of the people and endeavor to serve them more effectively. While the size of the populous has made these efforts challenging, continued progress is anticipated over the next few years and decades.

Finally, disaster relief workers such as those from Operation Groundswell and Disaster Relief 2011 have been working on projects that will provide help for Peruvians in the following specific ways:

- Modular Home Projects
- Community Construction Projects
- Direct Home Assistance Construction Projects
- Community Involvement
- Biodiesel Project (e.g., converting waste vegetable oil used in restaurants to biodiesel which is eco-friendly. Local communities are also being educated on the conversion process so that they will be more self-sufficient and aware of environmental benefits from new technology, etc.) (Operation Groundswell, Disaster Relief 2011).

These types of private and non-governmental relief efforts will continue to assist Peru in its emergency management activities.

Conclusion

As illustrated, Peru is a developing country which is confronted with significant hazards and multiple causes of vulnerability. This country has also experienced its share of increasing and intense disasters. Peru has consequently organized itself for emergency management, and it has taken measures to improve its ability to deal with disasters. While weaknesses exist, other countries may learn from Peru's desire to implement programs to enhance disaster prevention, involve locals in the resolution of their own disaster problems, and work closely with non-governmental partners to enhance recovery. It is hoped that knowledge about Peru's emergency management system will help policymakers and emergency management personnel tackle emergency and disaster challenges for years to come.

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