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Monographic issue

Disaster profile of Peru and institutional approach for risk reduction

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Letter from the editors

The *Emergency and Disaster Reports* is a journal edited by the Unit for Research in Emergency and Disaster of the Department of Medicine of the University of Oviedo aimed to introduce research papers, monographic reviews and technical reports related to the fields of Medicine and Public Health in the contexts of emergency and disaster. Both situations are events that can deeply affect the health, the economy, the environment and the development of the affected populations.

The topics covered by the journal include a wide range of issues related to the different dimensions of the phenomena of emergency and disaster, ranging from the study of the risk factors, patterns of frequency and distribution, characteristics, impacts, prevention, preparedness, mitigation, response, humanitarian aid, standards of intervention, operative research, recovery, rehabilitation, resilience and policies, strategies and actions to address these phenomena from a risk reduction approach. In the last thirty years has been substantial progress in the above mentioned areas in part thanks to a better scientific knowledge of the subject. The aim of the journal is to contribute to this progress facilitating the dissemination of the results of research in this field.

This last issue of 2015 of Emergency and Disaster Reports is dedicated to Peru. The history of disasters in the country has its roots in the connection between a series of elements. On the one hand, there are the natural events related to the country's geographical and geological conformation reported in Peru since the time of the Incas. The country is located in a high seismic risk area due to its proximity to the Nazca Plate's subduction area on the South American Plate and it is subject to intense hydro-meteorological events mainly associated with the Niño and the Niña phenomena that are recurrent in the region. On the other hand, there is the relation between the structural and the non-structural vulnerability of the population with the political structure of disaster planning management, that nowadays is experiencing a phase of transition.

According to a World Bank study, Peru is located on the 20th spot of the world ranking of countries with highest economic risk due to threats caused by extreme events such as earthquakes, floods, frosts, among other. The diverse geography of Peru offers a high potential for natural hazards such as seismic activity, volcanoes, hydro-meteorological and climate oscillations, as well as landslides, droughts and heat and cold waves.

Climate change is also becoming an important issue for the country especially because of the increase in temperatures and in precipitations. The main major

threats are earthquakes, tsunamis and the oscillation of El Niño. Although a particular kind of hazard can be related to a specific regions of the country, the exposure to risks is obviously determined also by the demographical concentration of the population, especially due to the growing phenomenon of urbanism that affect areas like the Lima region. This particular situation generates the possibility of catastrophic events occurring in most of the areas with large population concentration in the country, such as Lima, Tacna, Arequipa, and Ica, among others.

In Peru disaster risk management is treated as a high priority at national level. This is in large part due to the high visibility in terms of media and political issues as well as to the economic impact of recent disasters. For example, the Pisco earthquake in 2007 and the Chile earthquake in 2010 have highlighted the significant risk and economic consequences of such events. A recent study estimated that El Niño would cost 8 per cent of Peru's gross national product.

However, as for many countries in the world, until less than ten years ago, most of the responsibility was falling on the state which was suppose to provide aid to the different affected sectors and assist them in their recovery. In many countries, to be able to properly handle an emergency, states usually resort to establishing funds for emergency relief, which, on certain occasions, are also used for risk reduction and mitigation prior to the occurrence of an event. Such funds are only one of the risk management policy instruments but they are generally among the financial mechanisms most prominently used. In the case of Peru, in the previous years the government provided very limited resources to handle emergencies and risk prevention or reduction was minimal. That became evident during the period of time after the earthquake that affected Pisco and other nearby towns in August 2007.

To cope with this problem, Peru is experiencing an ongoing process of institutional reform of disaster risk management at any level. This program of reforms, designed around the implementation of the Hyogo Framework Action (HFA), is mainly focused on five areas of intervention related to the HFA five priority actions and this actions are review in this issue.

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Table of Contents

Table of Figures

List of Acronyms

CAPRA	Central American Probabilistic Risk Assessment
CDC	Commetees of Civil defence (Peru)
CENEPRED	Centro Nacional de Estimacion Prevencion y Reduccion de Riesgo de Desastres.
CEPLAN	Centro nacional de Pleaniamento estrategico
CIA	Central Intelligence Agency
CISMID	Centro Peruano Japonés de Investigaciones Sísmicas y Mitigación De Desastres
CMRRD	Multisectorial Commission On Risk Reduction In Development
CRED	Centre For Research On The Epidemiology Of Disasters
DIGESA	Dirección General de Salud Ambiental
DIPECHO	Disaster Preparedness ECHO
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
ECLAC	Economic Commission for Latin America and the Caribbean
EMAPICA	Empresa Municipal de Agua e Alcantarillado de ICA (Peru)
FORSUR	Fondo de Recostruction de la Zonas afectas por los sismos de 15 agosto 2007 (Peru)
GDP	Gross Domestic Product
GFDRR	Global Facility for Disaster Reduction and Recovery
HFA	Hyogo Framework Of Action
IGP	Istituto Geofisico Peru
IMARPE	Instituto del Mar de Peru
INDECI	Insituto National de Defensa Civil (Peru)
INEI	Instituto Nacional De Estadística E Informática
INGEMMET	Instituto gelogico Miniero y Metalurgico (Peru)
MEF	Ministerio de Economia y Finanzas (Peru)
MRTA	Revolutionary Movement Túpac Amaru
NGO	Non Governmental Organization
SENAMHI	Servicio Nacional de Meteorología e Hidrología del Perú.
SIDERECI	Sistema Regional de Defensa Civil (Peru)
SIGRID	Sistema de Información para la Gestión del Riesgo de Desastres
SINADECI	Sistema Nacional de Defensa Civil (Peru)
SINAGERD	Sistema Nacional de Gestion del Riesgo e Disastres (Peru)
SL	Sendero Luminoso (Shining Path)
UN	United Nations
UNDP	United Nations Development Programme
UNI	Universitad nacion de Ingnenieria (Peru)
UNISDR	United Nations Office For Disaster Risk Reduction
USAID	United States Agency for International Development
USD	Us Dollar
VRAE	Valle del rio Apurímac y Ene (Perú)
WASH	Water, Sanitation And Hygiene
WHO	World Health Organization

- Fig. 1 Map of Peru
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- Source: Servicio Nacional de meterología e hidrologia (SENAMHI)

Introduction: Geographic, demographic, economic, social and cultural characteristics

GEOGRAPHY

Peru is located in South America, on the Pacific Ocean side. It borders Ecuator and Colombia to the North, Chile to the East and Brazil and Bolivia to the West (Map 1). With an area of 1.28 million squared kilometers Peru is the third-largest country of South America.

Geographically it comprises a wide range of characteristics, since it sits between a tropical zone and the Andes Mountains. These geographic zones divide Peru into three regions: to the West is the coastline, which is largely arid except for valleys with seasonal rivers (www.geographic.org 2013). The second is the mountain area with peaks over 22,000 ft. (6,768 m), including Mount Huascaran, that has highlands and deep valleys. Finally, there is the heavily forested (Amazonia) wide expanse of flat terrain region (*ibidem*). This results in a big variety in terms of *flora*, *fauna* and climates, with 28 of the 32 types of weather in the world and 84 of the 103 life zones present in the planet (*ibidem*). Peru's seasons are the reverse of those in the northern hemisphere. Summer in Peru is from December to February and winter from July to September (1).

ADMINISTRATIVE AND DEMOGRAPHIC INFORMATION

Administratively, Lima is the capital of Peru. The country is divided into twenty-five administrative divisions and a province around Lima (2). 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 CIA World Factbook reports that in July 2013 Peru's population was of 29,849,303, composed by different ethnic groups (Amerindian 45 per cent, Mestizo 37 per cent, i.e. Amerindian and white, white 15 per cent, black, Japanese, Chinese, and other 3 per cent).

According to the 2007 census reported in the same source, 84.1 per cent of Peruvians speak Spanish (official language); another 13 per cent speak Quechua (official language); 1.7 per cent speak Aymara; 0.3 per cent speak Ashaninka; 0.7 per cent of Peruvians speak a native language (which includes a large number of minor Amazonian languages) while 0.2 per cent speak other languages (ibid.). The same census indicated as well the literacy rate at 92.2 per cent for total population with 95.4 per cent for males and 89.4 per cent for females (ibid), in average with the rest of the South American region (ibidem).

Most of the country's population is urban (77 per cent). The urbanism phenomenon, an important issue for disaster prevention, can be explained with several factors mostly related to economy, job seeking and transportation (e.g. Lima, the largest city with a population of approximately eight million people). Almost 28 per cent of the Peru population is younger than 15 years old, while 39.2 per cent is between 24 and 50 years old. In terms of maternal mortality rate Peru occupies the 91st position in the world rank (67 deaths/100,000 live births, CIA Factbook 2013), an infant mortality rate of

0.85 deaths/1,000 live births (89 position in the world rank) with a life expectation rate on the total population of 72.98 years (ibid).

ECONOMY

In 2013 the country GDP of Peru was 10,900 USD per person (2012 est. *ibidem*). Reflecting its variegated geography, Peruvian economy has been growing by an average of 6.4 per cent per year since 2002 with an appreciating exchange rate and low inflation. The year 2013 is expected to be below the upper limit of the Central Bank target range of 1 to 3 per cent (*ibid.*). Despite Peru's strong macroeconomic performance, dependence on minerals and metals exports and imported foodstuffs subjects the economy to fluctuations in world prices. This has effects on poverty. In 2009, the National Statistics Institute (INEI) estimated that poverty was decreasing by an average of 1.4 per cent per year (34.8 per cent of the population). In 2009 extreme poverty affected 11.4 per cent of the population.

Some researchers used various national sources of data on household level income and expenditures to help determine rates on poverty (3). Using these data and based on the United Nations Development Programme (UNDP) methodology/format, Altamirano et. al. (ibid) found that in 2002, more than half the population was designated as poor in absolute terms, and 15 per cent as extremely poor. Further breakdown indicates that nearly half of the latter lived in rural areas of the highlands (ibid.). However, data on poverty are still a controversial topic. For instance, in 2007 GapMinder reports 15% of poverty, while INEI 11% (2009) and UNDP in 2012 15% (4).

HEALTH

The ambiguous economic status of the country is well reflected in the general health indicators. In 2013 Peru health expenditures amounted to 4.8 per cent of its GDP with a physician density of 0.92 and a hospital bed density of 1.5 respectively every 1000 inhabitants (5). In average with many middle income countries, these data reflect the process of growing developed by Peru in the last decades. However, There are still significant differences in health facilities distribution and quality between urban and rural areas. According to the latest WHO report on Peru of May 2013, the expenditure on health as a percentage of general government expenditure is registering an increase over the last ten years (6).

Despite an improvement, the general situation of the water and sanitation system still presents many challenges (*ibidem*). For this reason, Peru is still considered as high risk in terms of food and waterborne diseases (2). Finally, the country is also improving in the prevention and treatment of vector-borne disease such as malaria (7), due to the implementation of many governmental and international campaign that were developed in the last decades.

BRIEF HISTORICAL REVIEW ON POLITICS

Originally, Peru was the seat of several Andean civilizations, among them the Incas, defeated by the Spanish emperor in 1533. Peruvian independence was declared in 1821

and finally obtained three years later. After a series of militarized governments that endured almost the entire 20th century, Peru joined a democratic system in the 1980s. Nevertheless, the level of poverty remains high and challenging. This circumstance often led to a lack of stability that provoked violent insurgencies and episodes of terrorism throughout the country.

In 1990 the election of the president Fujimori was accompanied by a decade of relative development and improvement as well as guerrilla curtailing. Despite that, the decade ended with a sentiment of dissatisfaction amongst the Peruvians with the president, resulting in his ousting in 2000. In 2001 Toledo was the first president democratically elected who belonged to the Quechuan ethnicity. In June 2011, a former army officer, Humala was elected defeating the daughter of Fujimori. Supported by its, Peruvian Nationalist Party, and Peruvian Socialist Party), the Humala mandate is following the market oriented economic model and is open to external investments while focusing on social inclusion campaigns in order to defeat poverty (2).

History of disasters in Peru of the past 50 years

The purpose of this chapter is to report on the major disasters that affected the country in the past 50 years. It is based on the quantitative disaster criteria used by the CRED database (disaster = 10 dead, 100 affected). Thus, the selection is limited by the imposed restrictions to a short list of disaster cases. The aim is to give a general and varied overview. What follows is, therefore, a chronological summary of "extreme" disasters (both natural and technological), which happened in Peru since 1962.

The history of disasters in Peru has its roots in the connection between a series of elements. On the one hand, there are the natural events related to the country's geographical and geological conformation reported in Peru since the time of the Incas. The country is located in a high seismic risk area due to its proximity to the Nazca Plate's subduction area on the South American Plate and it is subject to intense hydro-meteorological events mainly associated with the Niño and the Niña phenomena that are recurrent in the region (Figure 2). On the other hand, there is the relation between the structural and the non-structural vulnerability of the population with the political structure of disaster planning management, that nowadays is experiencing a phase of transition.

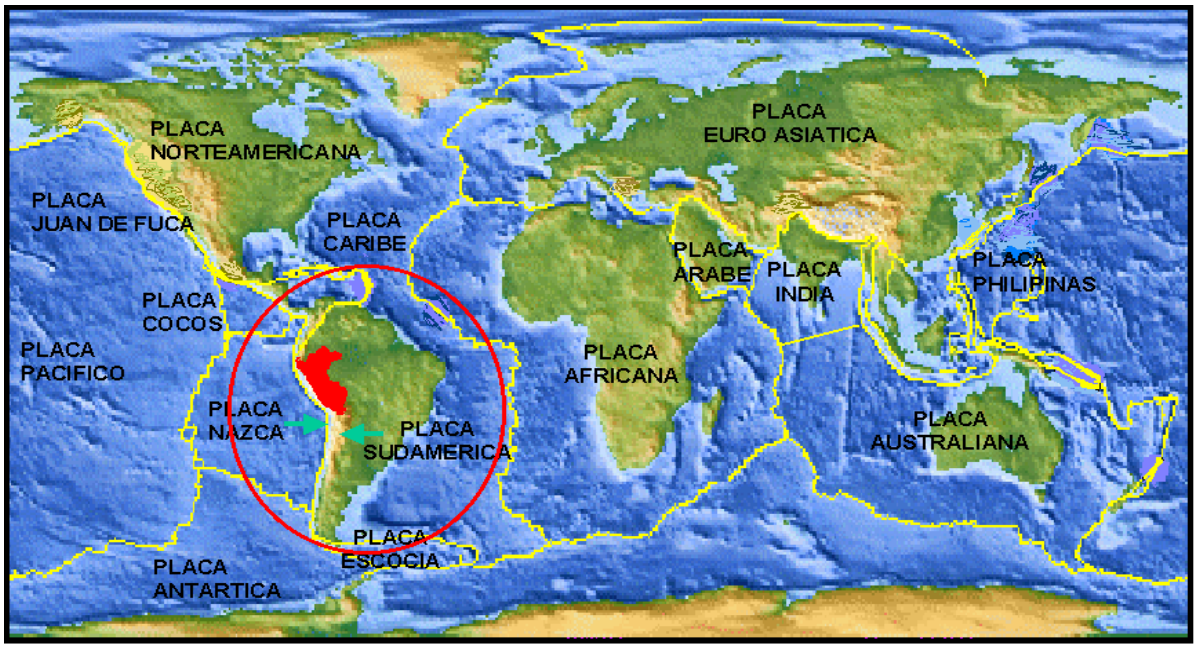


Fig. 2 Naztca Plate

Source: Instituto Nacional Defensa Civil, Peru (INDECI) 2011

This is very evident from the top ten disasters of Peru proposed by the CRED database, the UNISDR reports and the "preventionweb" website. As shown in the graphs, the major occurrence of disasters in Peru is related to floods, followed by mass wetland movement, and earthquakes. In terms of number of people killed during disasters and

amount of economic damages, earthquakes still occupy the first place. Data on numbers of affected people are controversial. In both preventionweb and CRED database, drought occupies a leading position in the top ten of disasters in Peru, followed by climatic events such as extreme temperatures or cold waves. These data need to be interpreted in the light of the climatological variety that makes Peru so particular. In the meantime, other kinds of hazards and events need to be considered to understand the history of disaster in this country.

For this reason, the structure of this brief historical report aims to be comprehensive while acknowledging Peru's disaster variety. Therefore, some disaster are reported in relation to their typology, although in the CRED standards top ten they occupy positions statistically "less important" (for numbers of killed or affected people and damage estimated in USD). Hence, the following listed disasters are divided in categories and then chronologically ordered into three main components: natural disasters, technological disasters, and man-made disasters.

Disaster	Date	No Killed
Earthquake (seismic activity)	31-May-1970	66,794
Epidemic	18-Aug-1991	8,000
Mass movement wet	Dec-1941	5,000
Mass movement dry	10-Jan-1962	2,000
Epidemic	31-Jan-1991	1,726
Earthquake (seismic activity)	10-Nov-1946	1,400
Epidemic	Jan-1992	690
Mass movement wet	18-Mar-1971	600
Earthquake (seismic activity)	15-Aug-2007	593
Storm	24-Dec-1997	518

Fig. 3 Top ten disasters in Peru source CRED

NATURAL DISASTERS

GEOPHYSICAL DISASTERS

The avalanche of Huarascan Mount On 10 January 1962

The event was provoked by the breakage of the west front of a glacier located at the top of the Mount Huascaran at an altitude of 6,300 m (8). According to the study conducted by Morales (ibidem), the quantity of ice involved is estimated to amount between 2.5 to 3 million cubic meters. The avalanche involved a great volume of debris and blocks. It

advanced for 16 km and descended for 4,000 m, destroying and demolishing everything that was in its way with an average speed of 60 km/h (*ibidem*). In the same study, confirmed by the interesting analysis done by Carey on glaciers issues in Peru (9), it is reported that the avalanche killed more than 4000 people, burring nine small towns (ibidem).

The qualitative description offered by Morales stresses also on the economical damage, mostly related to agriculture, environment and heritage (8). Technically defined as a dry mass movement in the CRED database, the data reported are discordant with the ones proposed by Morales, with a 2000 killed, non reported affected, and an estimated damage of 200 million of US dollars.

The earthquake of Huaco (North coast of Peru) on 17 October 1966

With a number of 120 killed people (CRED database) the earthquake can be remembered also for the high amount of damaged to low and high buildings (Wikipedia 2013) with 108,356 affected people and a damage amounting to 15 million USD (CRED database). A tsunami was generated by this earthquake, which was recorded in Callao and San Juan. Landslides and huge ground cracks were reported along the Pan American Highway north of Ancón.

The Ancash earthquake on 31 May 1970

In combination with a resultant landslide (9), this earthquake occupies the first place in the country's disaster top ten list proposed by CRED database for number of killed people (66,794) and affected people (3,216,240). It takes the third place in terms of economic damage (530 USD est.). With its 7.7 Richter scale power, this event is considered the worst disaster happened in the history of Peru and has been classified as VII in the Mercalli scale.

The anthropologist Oliver-Smith defined the quake as a man-made disaster with roots leading back to its colonial history in 1542, which "resulted in the severe underdevelopment of the entire region (10, 11)". According to Plafker *et alii* (12), the earthquake struck on a Sunday afternoon of 31 May 1970 at 15:23:31 local time and lasted for 45 seconds. The quake destabilized the northern wall of Mount Huascaran causing an avalanche composed by snow, ice and rock.

The two towns of Yungay and Ranrahirca were completely buried. The avalanche started at 910 m and advanced about 18 km to the village of Yungay with an average speed of 300 km per hour. It has been estimated that the fast-moving mass consisted of about 80 million cubic meters (80,000,000 m^3) of water, mud, and rocks by the time it reached Yungay.

According to Frommer (13), despite the government's use of military force and help by many international aid organizations, the economical and livelihood impact of the quake was tremendous. More than 40 years later, the damage of the disaster was still not completely repaired, especially considering the 370,00 destructed houses, which were yet to be rehabilitated.

The Chungar mass wet land movement of 19 March 1971

Although the entity of this earthquake can be considered as "small" in Richter scale the disaster of Chungar will be remembered in the history of Peru for the series of calamities, such as landslides, floods, and avalanches, that affected and destroyed the town. Chungar was a town erected close to a mining camp located in the Andes Mountains. The town was mostly inhabited by mine workers and their families.

The landslide caused a massive amount of dirt and water to plunge into a lake that sat above Chungar. The settled water from the lake flooded down the hillside toward Chungar, causing an avalanche of snow, mud and rock along the way. In a few seconds water, snow, rocks, and mud swallowed Chungar and its people. Despite being less considered in the Peruvian disaster literature, the events that affected and destroyed the city of Chungar are matter of interest in the CRED database, considering the number of victims (600). Unfortunately, there are no quantitative data available on affected people and on estimated damage.

The Pisco earthquake on 15 August 2007

This earthquake will be remembered in the history of the country for its destructive magnitude 8.0 on the Richter scale and for the destruction that followed. The quake struck offshore of southern Peru near the port of Pisco at 6:40 p.m. local time (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 (14). As reported in some studies (15), the event created a strong ground shaking along the Pacific coastline between the capital city Lima and the Paracas Peninsular. This ground shaking provoked causalities and destruction throughout the coastal regions in southern Peru. According to some reports available on the web, it is indicated that the majority of the damage occurred in Chincha Alta, Ica, and Piscoand (16).

The most affected infrastructures were hospitals, schools, and other medium-to-large public facilities (ibidem). According to Fierro et al 2007, these buildings were built using reinforced concrete frames and infill brick masonry rigidly attached to the frames (14). The CRED database reports that the Pisco earthquake has provoked 593 killed people, affecting 658,331 people and had a huge economic impact of more than 600 million of USD in damage (CRED). Despite the strength of the quake, it is worth to say that the local and governmental reaction had limited the damage in comparison to the huge catastrophe of 1970 (see above).

The response to the earthquake had been ruled by the National Civil Defense System (Instituto Nacional de Defensa Civil – INDECI) and supported by the military as well as the private sector (local, national and international). Many contributions arrived from civil societies and the international community, including governments, international NGOs and UN agencies. However, despite the readiness and the immediate and huge response, many critics have raised questions regarding overall preparedness and coordination (17). This criticism, recognized as "lesson learnt" by the National Defense of Peru (INDECI, 2007), has been used as a platform for reform the Peruvian Disaster Risk management plan.

BIOLOGICAL DISASTERS/EPIDEMICS

The 1991-92 Cholera outbreak in La Llibertad and rest of Peru

In late January 1991 an epidemic of cholera broke out in Peru (18). Within a few weeks, the disease spread throughout Peru and into other countries in South, Central and North America (19). According to the CRED database, in the first year 1,736 people died and more than 283,353 were affected. Rumors collected on the web attribute the origin of the outbreak to the bilge water of a Chinese freighter. Some other interesting observations, and a possible explanation for the appearance of cholera in this South American country is that the sea current El Niño (a hot current coming from the north to the south along the South American coast in the Pacific Ocean (ibidem) may have created the right kind of conditions along the Peruvian shores for human to become infected with cholera (ibidem)[1].

In general the reaction of the authorities performed well with 1 per cent case fatality rate (*ibidem*). A good awareness campaign and prompt re-hydration treatment made the difference (*ibidem*). In the following year, the CRED database reported an epidemic that killed 8,000 people. Although no other data are specified, it is apparent that this incident is related to the epidemic of the previous year, especially in light of the known high contagious nature of cholera. Other 690 fatalities were reported by CRED in the beginning of 1992 related to this cholera epidemic.

HYDRO-METEOROLOGICAL DISASTERS

The 1997-98 El Niño

According to CRED, the period of disaster provoked by El Niño at the end of the Nineties in Peru can be gathered between the end of December 1997 and the end on March 1998. In these four months, the effects provoked by El Niño resulted in flooding and mudslides due to an excessive amount of rainfall and se *Niño* a surges emanating from strong ocean currents and winds (20). Many cities were affected such as Cuzco, Lima, Ica and Tumbes.

These phenomena provoked a huge number of fatalities, affected people and caused economical damages. The CRED reports 518 people killed, a total number of affected 580,730 people and an estimated damage amounting to of 12 million USD. Furthermore, it was reported that more than 114,000 hectares of agricultural land were flooded (21), at least 40,500 homes were destroyed or badly damaged (22), and a lot of infrastructure was affected such as schools, roads, bridges (23, 24). In an article published by the

[1] According to Rita Colwell of the University of Maryland, when a *vibrio* is submerged in cold water it can shrink to be 300 times smaller than its usual size. Zooplankton that inhabits cold waters may carry large number of cholera vibrio on their bodies. Zooplankton feed by grazing on phytoplankton, which bloom with sunshine and warm conditions. Thus, a phytoplankton bloom leads to an increase in the population of zooplankton, which carry the vibrio. Zooplankton lives in the water of ponds and rivers that people may drink. Also, fish and shellfish eat zooplankton and raw fish. Shellfish consumption also leads to cholera if it is contaminated with the bacteria (19)

Peruvian newspaper La Republica (25), the devastation of the infrastructure had serious effects on harvest and distribution of agricultural products throughout 1998.

TECHNOLOGICAL DISASTERS

The Lima Stadium Disaster Of 24 May 1964

Although mentioned in the CRED database as an important accident in the 'miscellaneous' category in the top ten, there is lack of academic literature about the Lima Stadium disaster. Most information can be found on football or general sports websites (26, 27). According to these websites, the 'Lima Stadium disaster' is one of the most tragic events, which happened in sport shows during the former century in Peru.

The match, a meeting between Peru and Argentina, was played in the National Stadium of Lima. The game was the final qualification for the Tokyo Olympics of the same year. Argentina was successful accomplishing the game with a one to zero score, but, at the 88' minute, the referee negated a goal by Peru. This decision provoked an uncontrolled reaction in the Peruvian public. Different episodes of violence began between supporters and the policemen present in the stadium.

According to some rumors on the web, a famous local leader led some people to charge the fence, which separated the playing field from the public (*ibidem*). The reaction of the police was the use of tear gas canisters in the northern grandstand. The aim was to prevent an invasion of the football field. As a consequence, panic rose among the groups. This ended with a mass attempt of unplanned, crowded and confused exodus to avoid the gas and the violence. Many people who were not participating to the charge were innocently involved. Unfortunately, the structure of the stadium was not designed for an emergency as such.

The lack of proper escape exits provoked the squeezing of many people who died of internal hemorrhaging or asphyxia. According to the CRED database the final count of victims amounts to 350 killed and 500 affected. Following the incident, the Peruvian authorities reduced the seating capacity of the stadium from 53,000 to 42,000. This was increased again to 47,000 on the occasion of the American Football Cup of 2004.

The Mesa Redonda commercial center fire in Lima on 29 December 2001

The Mesa Redonda shopping center, located in the center of Lima, was a structure made "largely of wood and clay houses lining in narrow streets" (28). During the month of December, because of the Christmas celebrations, the market of fireworks was roughly present in the zone. Aware of the possibility of hazard and danger, the municipal government of Lima declared the area an 'emergency zone'.

Despite many press articles covering this event, it was not possible to gather precise information on the beginning of the fire. According to the news website online "Peru This Week' (29), an explosion occurred inside the shopping center in the afternoon. The article reports about witnesses on the scene who declared that the explosion occurred due to electrical issues. According to Ryan Missy, a journalist from *The Guardian*, the fire

began at about 7:30 PM on the night of 29 December instead, caused by a fireworks display that created a chain reaction, setting off the fireworks of other nearby vendors (30). The aftermath created a "wall of fire" that spread for four blocks and raged for several hours (ibidem).

Considered as the ninth world's deadliest fire in the fire world ranking (31), the event of Redonda is to date a matter of debate in Peru. According to the CRED database, the event provoked 291 killed, and 139 affected people. Many journalists expressed criticism on the social and political issues related to the tragedy. Plenty of polemic was raised about the need for a policy for fireworks, the necessity of a bigger control and a better planning in urban areas of Peru (32).

TRANSPORTS ACCIDENTS

Transport accidents do not occupy an important position in the CRED database. However, when related to road security, they are a matter of interest in the history of the country. Historically the country counts some important air and sailing accidents that had many victims. For example, the Maraon riverboat accident in 1991, that according to CRED, has caused the death of 150 people. However, the most dramatic number is that related to road accidents, a growing number in the last decade, and possibly related to the development of the country (33).

According to El Comercio, deaths caused by road accidents from January to August 2013 have risen by 36.5 per cent compared to the same period last year (34). This emerging data is used by the public and by some politicians to promote a sensitization campaign on road security and a political action based on some legal change (35).

INTERNAL CONFLICTS AND TERRORISM

Terrorism by Sendero Luminoso and MRTA between 1980 – 2012

Though terroristic events are difficult to pin down to a single event or hazard, violence and internal conflicts can still be considered as one of the main causes of disasters and emergencies in Peru. Two leading internal terrorist groups have troubled the country since 1980. These are the Sendero Luminoso or "Shining Path" (SL) and the Revolutionary Movement Túpac Amaru (MRTA). In 2003, the Peruvian Truth and Reconciliation Commission reported an estimated 69,280 people killed in the internal conflict in Peru from 1980 to 2000.

According to Global terrorism database (36), the number is raised to 70,000 in the last decade. A study (37) reported that the majority of victims were farmers (56 per cent), since most attacks occurred in rural settings (79 per cent). Sendero Luminoso was responsible for more than half of these deaths. The actions of the government and the management conducted by the police and the military during this period, "often at the expense of basic human rights" (ibidem), were exacerbating the growth of terrorism on Peru.

In the 1990s, the influence of terrorist attacks had outspread to urban areas. The event of 17 December 1996 is worth to be remembered as 22 members of MRTA took over the

Japanese ambassador's residence in Lima. The group kidnapped 72 hostages until the intervention of Peruvian Special Forces on 23 April 1997 (ibidem). In 1998, Peru's authorities begun to develop an improved emergency response system, with the establishment of the country's first emergency medicine residency training programme and the construction of the first dedicated trauma center in Lima (ibidem).

With the beginning of the 21st century, the activity of the terrorist groups reemerged with an attempt per year where many components of the military forces died. In February 2012 the leader of the group SL, Artemio, was captured (38). In May 2012 it was reported that, since 2008, 71 security forces personnel had been killed and 59 wounded by Shining Path ambushes in the VRAE region (39).

Main risk factors and contribution on disaster risk

According to a World Bank study, Peru is located on the 20th spot of the world ranking of countries with highest economic risk due to threats caused by extreme events such as earthquakes, floods, frosts, among other (40). The diverse geography of Peru offers a high potential for natural hazards such as seismic activity, volcanoes, hydro-meteorological and climate oscillations, as well as landslides, droughts and heat and cold waves (Fig. 4).

Climate change is also becoming an important issue for the country especially because of the increase in temperatures and in precipitations. The main major threats are earthquakes, tsunamis and the oscillation of El Niño (41)[2]. Although a particular kind of hazard can be related to a specific regions of the country, the exposure to risks is obviously determined also by the demographical concentration of the population, especially due to the growing phenomenon of urbanism that affect areas like the Lima region. This particular situation generates the possibility of catastrophic events occurring in most of the areas with large population concentration in the country, such as Lima, Tacna, Arequipa, and Ica, among others.

As stated above, the most probable events are intense seismic movement, tsunamis, floods and avalanches, landslides caused by rainfall and earthquakes and events related to volcanic activity (42). Climatological and oceanographic factors are also two major phenomena that interact to produce many of the hazardous atmospheric conditions, which afflict Peru. 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 (*ibidem*). In this context and in conjunction with other studies, the anthropologist Oliver-Smith (10) notes that the region is extremely sensitive to any anomaly in the ocean-to-atmosphere energy transfer system with implications for global weather patterns.

GEOLOGICAL HAZARDS

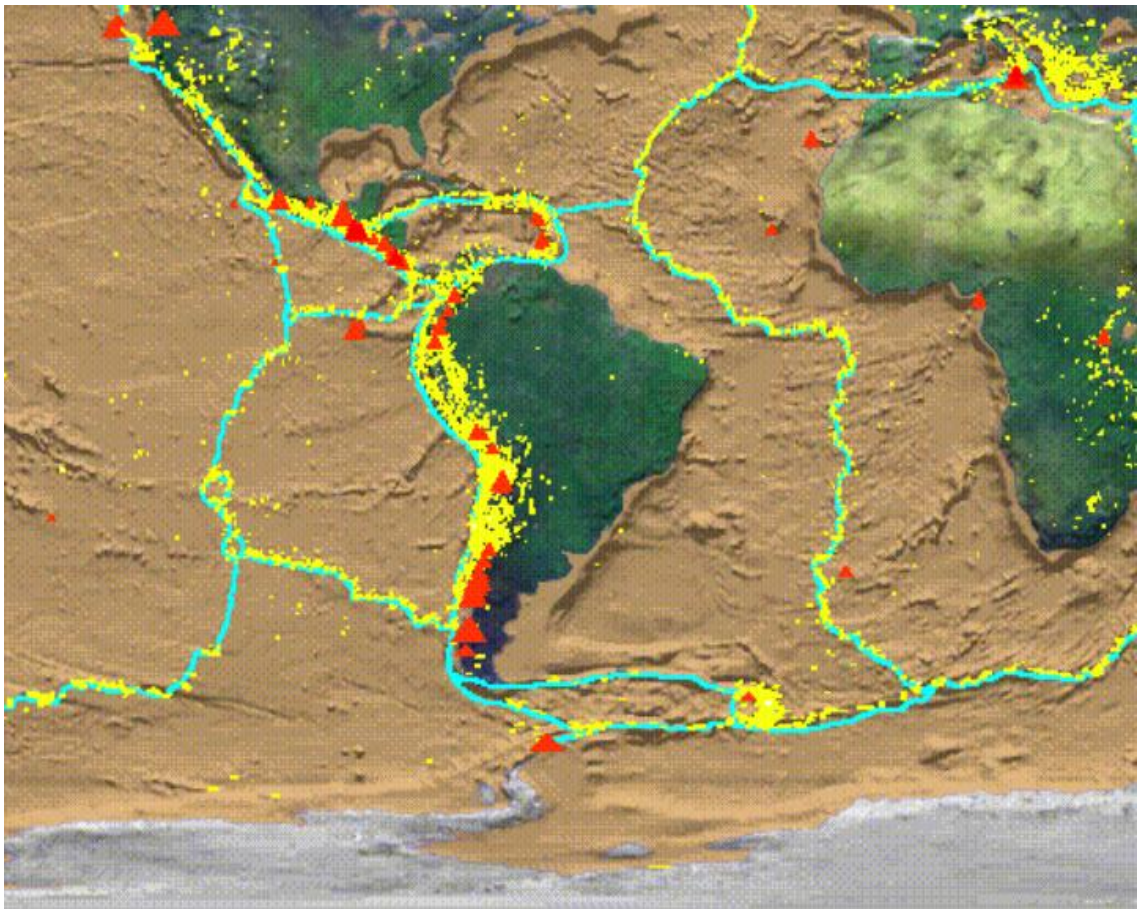
SEISMICITY

In Peru seismic activity is mostly originated in the subduction zone between the Nazca and the South American plates as well as the continental fault system in the Andes Mountains. Historical chronicles report (before the CRED database) how the country has been hit by more than 30 major earth quakes in the last four centuries.

Based on chronological reports along the coast of Peru, there are three different areas of earthquakes risk. The central region bounded topographic features on the subduction plate, the Mendana fracture zone to the north and the Nazca ridge to the south (43). The presence of these features may explain why seismic activities occur on coastal regions of Peru too.

[2] based on DIPECHO sources (http://practicalaction.org/dipecho_about) dived the risk profile in sections.

The highly seismic hazard zones are concentrated mostly along the coastal region where the capital Lima is located, the highest demographic place of the country. The combination of the natural factor of seismicity and the social factor of human settlements and concentration makes the risk profile of the area extremely prone to disasters, to the point that, even a perfect disaster management planning would not ensure a complete risk security. An alternative could be a new politics of settling of the major demographic zone to a less prone area, as well as an intense work and design of disaster ready infrastructures and buildings.



- Fig. 4 Hazards in Peru source INDECI

TSUNAMI

A consequence of this high level of seismicity located in the Peru coastal region is a series of records of tsunamis. The majority of the tsunamis who affected South America in the last four centuries have hit the coast of Lima. In a report of 2007 realized by the Marina of Peru (Marine Army), more than ten regions are considered as highly prone to tsunamis, these are: Piura, Lambayeque, Lima, Ica and Arequipa, where most of infrastructures are located (port, oil, gas).

VOLCANOES

The most dangerous volcanoes of Peru are localized in the southern part of the country. According to the GFDRR country notes on Latin America and Caribbean Region, there are 15 active volcanoes that can be considered as a menace. These are located in four regions: Tacna, Moquegua, Arequipa and Ayacucho. Arequipa, the second largest city of the country for number of inhabitants (778,000 plus the Hinterland adds up to more than a million people, 44), is of course the most exposed to the possibility of a disaster, for its proximity to the Misti volcano, and for some infrastructural development, close to the volcano. According to the GFDRR notes the most recent event was the eruption of the Sabancaya volcano, located 70 km northwest of Arequipa, from 1990 to 1992. The potential hazard in this case was also the possibility of ash falls into the Colca Valley.

LANDSLIDES

In the traditions of Sierra communities the knowledge on landslides has deep roots, since these are a recurring hazard. Although these have given an intense culture of resilience in these communities, today, landslides are also bigger problems in term of infrastructural damage. The most landslide-prone zones are mountainsides and flanks, the Pacific Coast, and the Andean valleys (Huallaga, Marañon, Apuriman and Urubamba rivers, etc.). The biggest risk in terms of infrastructure is the damage on roads. In the GFDDR country notes (cit), with this category flash floods are included, as well as avalanches, and torrential down-slope flows of water-saturated earth and rock, locally named as 'huyacos'. Particularly, the Machu Picchu is affected by such kind of events (see: 45). These catastrophes have occurred also in the Andean Mountains, because of the seismic activity or due to heavy rains, which provoked disasters and casualties well known and reported among the communities living in the cordilleras of Huaytapallana, Huayhuash, Urubamba, and Vilcamba (check also 46).

HYDROMETEROLOGICAL HAZARDS

EL NIÑO

The north coast of the country is extremely vulnerable to the meteorological phenomenon known as El Niño (lit. "the child", in relation to Jesus Christ). According to the extensive literature on the subject, the term El Niño was given to an annual modest warm ocean current that appears along the coast of Peru and Ecuador around Christmas time with accompanying rains that transform the barren coastal desert of that region into a garden (47, 48). ―El Niño‖ is a Spanish term for ―the boy‖ and refers to Child Jesus (ibidem). The phenomenon has subsequently become associated with the unusually large warming that occurs every few years and that changes the local and regional ecology (ibidem). On the other hand, the opposite of *El Niño* is *La Niña* (―the girl in Spanish) consisting of a basin-wide cooling phenomenon of the tropical Pacific (ibidem).

Of the two phenomena, El Niño is the most dangerous and destructive. Though the rains associated with El Niño 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‖ (ibidem). Additionally, heavy rains produced by El Niño 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 growth (10).

Typically characterized by prolonged torrential rain these oscillations affect mostly the regions of Tumbes, Piura, Lambayesque, La Libertad and Ancash except from the Nadean provinces (42). According to the GFDRR report (ibidem), the events of 1997-98 have devastated the economy of the country with losses of USD 3.569 billion respectively (ibidem), in terms of damage of buildings, infrastructures, production equipment, cropland and transportation stock. Following the event, the World Bank approved a USD 150 million loan for a project aimed in helping and supporting part of Peruvian government's reconstruction efforts.

FLOODS

According to UNDP (49), more than 23 per cent of Peru population lives in flood prone areas. Due to the presence of the Andes Mountains and due to the coast, in Peru flooding is more intense along the rivers that flow towards the coast, that are dry during the years and receive a big amount of water in the Sierra rain period (between November and April). Particularly, floods affect the regions of Puno (Titicaca watershed), Piura, Lambayeque, and Ucayali. According to an assessment realized by the Multi-Sectorial Commission on Risk Reduction in Development (CMRRD), 55 provinces of Peru can be classified as high flood risk.

DROUGHTS

According to the GFDDR report (42) the southern part of the country is prone to drought, frosts, and other hydro-meteorological events. Particularly, the south Andean region (Puno, Cuzco, Apurimac, Arequipa, Moquegua and Tacna) is the most risky area. In that part of the country more than 1,3 million people live beyond 3,500 m above the sea level on farming and cattle raising. Because of their agro-pastoral economy these people are the most vulnerable to drought and other meteorological events. Frosts usually occur from May to August and affect mostly Sierra regions, at 2,900 m above sea level. Generally, the cumulative effect of these events can be considered as an important factor on agriculture having long-term impact on the development of livelihood of these local populations.

ENVIRONMENTAL RISK

CLIMATE CHANGE AND GLACIERS

In addition to its share of extreme events such as earthquakes, avalanches and *El Niño* 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 (9). Historically, these new glacial lakes have generated at least 24 outbursts floods that have killed about 6,000 people in the past 150 years (ibidem).

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 (ibidem). 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 (ibidem).

MAN-MADE DISASTERS, VIOLENCE AND TERRORISM

TERRORISM: SENDERO LUMINOSO

Although Peru is a fledging democratic state, it is facing enormous security challenges from the Shining Path that is trying to wrestle the power from the elected officials (50, 51, 52). 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 is based and is able to recruit followers who are disillusioned with Peru‘s poor economy (51). In 1982 the activities of the Shining Path were thought to be limited to a remote corner of the Andes (ibidem).

ELEMENTS OF VULNERABILITY TO ADVERSE NATURAL DISASTERS IN PERU

Natural hazards, soil and water quality degradation, unplanned urbanism and poverty are the highest vulnerability challenges for Peru. The impact of these factors on Peru is not only physical losses and the need to replace or repair the damaged components of said infrastructure but also indirectly derived economic and social losses, meaning not being able to provide the services.

WATER AND SOIL CONDITION

Forty per cent of the coastal region soils exhibit some degree of salinization from over irrigation and poor drainage. Water and wind erosion owning to sparse or no plant cover, overgrazing, and stubble burning affects 60 per cent of Andean farmlands (42). Pollution caused mainly by the mining and the metal industry is growing in the last 20 years. Moreover, water and sanitation systems coverage (only 68 per cent) and the quality of those services are very limited. As a result, several million of people have no access to safe drinking water or sewage systems.

Informal management of potable and wastewater is an important factor of degradation, especially on mountainsides. Due to the above, it is also safe to assume that there will be a high social impact that will mainly affect two sectors: the health sector and the residential sector (the population at large) (57). In the first case, water supply is essential for emergency relief and when there is no proper service provisioning to hospitals and other buildings that are essential to the community, there is bound to be a

problem with a high social impact. In the second case, although in the past the community has proven to be relatively tolerant during the first few hours after an event, that attitude gradually changes and then there are usually protests, which generate another social problem.

Environmental impact must also be considered a topic worthy of attention, given that the occurrence of catastrophic events that produce significant damages to the infrastructure may also, in particular case of water supply and sanitation systems, generate chemical component spills, mainly at the water treatment plants. That may have a considerable impact on nearby populations, water sources, and vegetation. Sometimes industrial fires or fires generated by gas installations also occur and such firefighting generally requires water, which may not be available.

GROWING AND UNPLANNED URBANIZATION

Unplanned urban development, especially concerning the cities of Lima and Arreuipa have intensified the level of vulnerability to disasters of Peru. In the last three decades the development of the country, favored by the installation of a democratic government, has brought to the reach of 77 per cent of urbanization. These data that can be easily shared by more developed countries, become a problem in Peru because the process of urbanization is not controlled and planned.

As reported by GFDRR country notes (42), cities are growing quickly and haphazardly, regardless the level of seismicity or other hazards prone factors in the areas. To give just a couple of example, the data reported by the Instituto Nacional de Estadisticas e Informatica (INEI), can help to understand the phenomenon. Today, the coastal area of the region, where the most seismic zones are located, is home for 54.6 per cent (53) of the total population, the Andean region 32 per cent, and the Amazon Basin to 13.4 per cent. More than one third of the provinces of the country are at very high seismic risk.

The case of the city of Lima is the worst one, not only for the demographical situation but also for the level of corruption, and lack of awareness who brought the ongoing formation of illegal settlements account for a large share of city growth, with several consequences on development and safety. Even if less important in terms of demography, other cities are experiencing the same problem. According to Habitat International Coalition (42), more than 4,000 human settlements and 900,000 households are still in the process of being regularized legally (50 per cent of Lima settlements). As a consequence, residents of these areas are living out of the coverture of essential services in terms of water and sanitation as well as safe housing programmes (ibidem).

POVERTY AND EDUCATION PROBLEMS

According to the Instituto National de Estadísticas e Informática (53), today more than one third of the population of the country lives below the level of poverty, and 13.7 per cent live in extreme poverty. This population represents 25.4 per cent of the urban areas and 64.6 of the rural population. The national information system on disaster prevention and management reports that between 1995 and 2007, the disasters occurred (i.e. El Niño and the 2007 earthquake) affected the regions of Apurimac,

Loreto, Cajamanca, Lima, Puno and Cuzco, which present the highest level of poverty of all the country. In the meantime, despite the politics of social inclusion of the Hulala government, most institutions are still weak in tackling the problem, and there is still a need of instruments and tools aimed to respond and solve the problem. Practically, there is a need of new policies aimed at radical change.

Recent developments of Peruvian disaster risk management under the HFA

In Peru disaster risk management is treated as a high priority at national level. This is in large part due to the high visibility in terms of media and political issues as well as to the economic impact of recent disasters. For example, the Pisco earthquake in 2007 and the Chile earthquake in 2010 have highlighted the significant risk and economic consequences of such events. A recent study estimated that El Niño would cost 8 per cent of Peru's gross national product (57). The Pisco earthquake destroyed much housing, incurring a high reconstruction and rehabilitation cost for the government, and future earthquakes in Peru are likely to affect the country's most economically strong regions (ibidem).

However, as for many countries in the world, until less than ten years ago, most of the responsibility was falling on the state which was suppose to provide aid to the different affected sectors and assist them in their recovery. In many countries, to be able to properly handle an emergency, states usually resort to establishing funds for emergency relief, which, on certain occasions, are also used for risk reduction and mitigation prior to the occurrence of an event. Such funds are only one of the risk management policy instruments but they are generally among the financial mechanisms most prominently used. In the case of Peru, in the previous years the government provided very limited resources to handle emergencies and risk prevention or reduction was minimal. That became evident during the period of time after the earthquake that affected Pisco and other nearby towns in August 2007.

To cope with this problem, Peru is experiencing an ongoing process of institutional reform of disaster risk management at any level. This program of reforms, designed around the implementation of the Hyogo Framework Action (HFA), is mainly focused on five areas of intervention related to the HFA five priority actions.

First of all, the country is working on a process of decentralization aimed to the building of an institutional capacity and on the implementation of a comprehensive disaster risk policy. This will mean to gradually involve in the disaster risk management framework all the political actors at three levels, such as regional, provincial and district. This process begun in Peru in 2002 and is starting to collect results in the last two years with the approval of the law 29664, which converted the approach from disasters management to disasters risk management.

The second important effort of the Peruvian authorities is aimed to improve the quality of the monitoring system and on the information technology tools in order to support the sub-national government and the interested sectors. This process begun as well before the approval of the HFA and is nowadays experiencing a moment of transition related to the change due to the modification of the law 29664, cited above.

In the meantime, the process of improving the monitoring is also involving the education system. On one hand, the education system is involved at research level, on the other (especially regarding primary and secondary school) in an awareness program on preparation, mitigation and response, focused on childhood.

In addition, to cope with risk management related to climatic change and pollution, Peru is strengthening its environmental institutions. In 2008, the National Environment Ministry was created.

This reform process will involve also the emerging needs in decreasing the exposure to hazards of the Peruvian infrastructure as well as the productive sectors, especially in relation to the risk of earthquake and to the oscillation of El Niño.

Finally, the plan will involve preparedness at structural and non-structural level. On the one hand, this will mean to improve, or better say, to radically regulate the uncontrolled urban planning. On the other hand, this process will involve the approval of preparedness in rebuilding affected areas in relation to an adequate level of resilience. All these elements will be discussed in detail and in relation to the five priorities of HFA in the following.

AREAS OF INTERVENTION FOR THE HYOGO FRAMEWORK FOR ACTION 2005-2015

HFA 1: TOWARDS A DECENTRALIZED SYSTEM

To implement and improve the institutional capacity and consensus building for disaster risk management, Peru is ending a process of decentralization begun in 2002. The main objective of this process is to boost up the institutional capacity and to implement policies of disaster risk management at comprehensive level. In a first phase, this process involved regional, provincial and district governments.

In Peru, the mandate to respond to disasters belongs to the Sistema Nacional De Defensa Civil or —SINADECI (National System of Civil Defense). The SINADECI is part of the national defense of the country, and acts in agreement with the national defense policy and plans of the country. This centralized approach was used also regarding the structure of response and mitigation. Into this system, the responsibility of maintenance and implementation for the Peruvian national defense belonged only to the Instituto Nacional de Defensa Civil ,INDECI (National Institute of Civil Defense).

Until a couple of years ago, the structure of the national civil defense system of Peru was:

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

After a series of events (earthquake 2007, El Niño, etc.), the national authorities realized that this kind of structure could not cope with the huge amount of hazard risks all over the country, and that there was the necessity to invest more on mitigation and prevention rather than only in response.

This new awareness reinforced by the HFA boosted an ongoing decentralization process of Peruvian disaster risk management. Launched in 2002 by the INDECI, the initial part of the decentralization was focused on transferring powers and responsibilities to the regional governments, where regional Civil Defense Systems (SIDERECI) were set up.

The committees of civil defense (CDC) have been organized internally and classified as regional civil defense. But they are also involving provincial and larger regions. Such committees are also 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 basic structure of the regional civil defense system of Peru (which continues as a subcategory of the national system above) can be outlined as follows:

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

The law of national civil defense in Peru established 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. In this system, the regional governments were responsible in designing and delivering disaster prevention following national guidelines. Regional governments and the national government are the ones called upon to generate the resources that can be used as a protection and compensation mechanism for the poorest households, so as to minimize the drop in social wellbeing.

However, this kind of process needed also a reform from a legal point of view, in order to establish institutions and plans that could foster the new approach focused on preparation, mitigation and risk management promoted by the HFA. After a long period of institutional reform, the Presidency of the Council of Ministers promoted the National Risk Management System (SINAGERD). This agency promoted the law number 29664 through which the National Disaster Risk Management System was created.

The new National Disaster Risk Management - SINAGERD is aimed to correct risks in planning and development management, and to improve management dynamics of civil defense. The new law facilitates base the design and implementation of a financial strategy on a budget set of programs, which allow having a contingency fund, budget programme vulnerability reduction and emergency disaster, and municipal incentives for risk management actions for disaster.

Through the new Peruvian risk management law, the Ministry of Economy and Finance (MEF) was empowered to establish financial risk management strategies, which means that, for the sector in particular and in general, topics related to contracting contingent loans, establishing reserve funds, taking out insurance and reinsurance or using capital market financial instruments. Financially this means that risk management covers different aspects that must be gradually carried out after a policy has been traced.

In short, the main contribution of the law 29664 was to shift the attention and the effort of the government from the disaster management and reduction to the disaster risk and prevention. This new approach on disaster risk management was defined as “a social process whose ultimate end is to prevent, reduce, and permanently control disaster risk factors in the society, as well as to properly prepare for and respond to disaster situations, taking into consideration national policies with a special emphasis on those related to economic, environmental, safety, security, national defense, and territorial issues in a sustainable manner.”(54)

Today INDECI is a public body that forms the SINAGERD executor. However, to implement this new strategy a National Disaster Prevention Center (CENEPRED) has been created. CENEPRED is a public body that makes up the National System for Disaster Risk Management (SINAGERD). Its role is to coordinate, facilitate and oversee the development and implementation of the national disaster risk management. This means to process estimation, prevention, risk reduction and reconstruction, as well as, to advice, to develop and to establish technical guidelines and mechanisms for the proper development of those processes by different public and private entities that make up the system indicated.

In addition, the institute is responsible to coordinate, facilitate and oversee the development and implementation of the national policy and the national plan for disaster risk management in the processes of preparation, response and rehabilitation. This new plan is being implemented in the country allowing a decentralized management and a reconstruction planning reconstruction based on the greater participation of those affected.

A policy of capacity building in risk management is being designed. The Plan GRD National is being approved, along with monitoring and evaluation indicators. Into this new system, INDECI remains the public body that forms the SINAGERD executor from the technical point of view. The main responsibilities of INDECI are: to coordinate, facilitate and oversee the development and implementation of the national policy and the national plan for disaster risk management in the processes of preparation, response and rehabilitation.

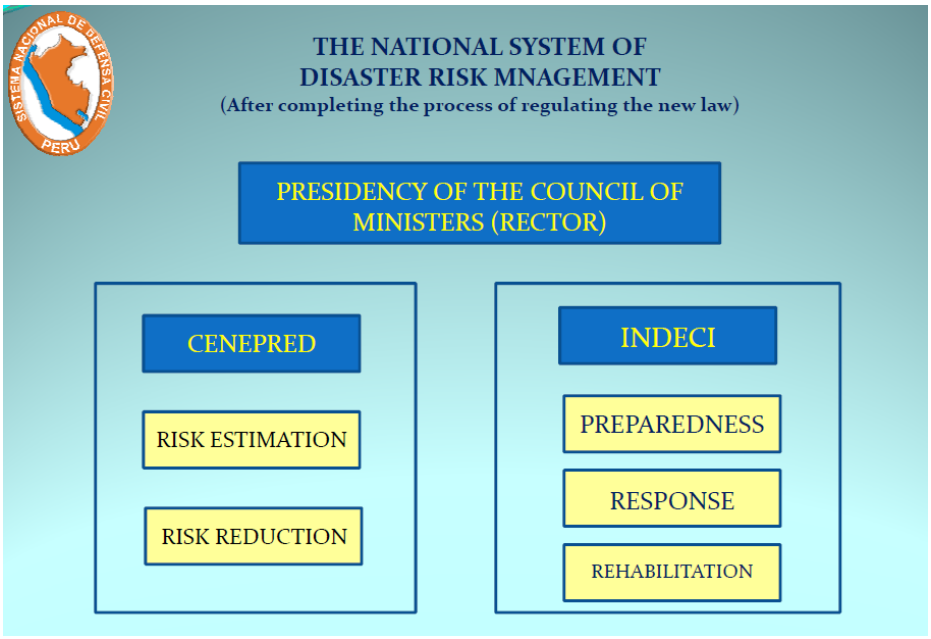


Fig. 5 The national process of decentralisation in DRM of Peru source INDECI

As reported in the website of the institute, basing on this new framework the mission and the vision of the INDECI are integrated into the National System for Disaster Risk – SINAGERD. This is defined as an inter-institutional system, synergistic, decentralized, cross and participatory, in order to identify and reduce the risks associated with hazards or minimize their effects, and avoiding the generation of new risks, preparedness and response to disasters by establishing principles, policy guidelines, components, processes and tools of disaster risk management (DRM).

The cooperation between the two institutes, the INDECI and the CENEPRED, is aimed to the design and the implementation of the Programa Prepustal 068 Reduction de la Vulnerabilitad y Atencion de Emergencia de Desastres (programme for vulnerability reduction and attention for disaster emergency) - PREVAED, that will be matter of strategical action (especially in terms of financial funding) for the next decade. In conclusion, despite the last report on the implementation of the HFA 1 is still listing many problems regarding the coordination of all these actors, and the new challenges emerged from this transitional moment due to the change of the national law, a relevant progress can be observed in Peru.

HFA 2: THE NEW LAW AND THE DISASTER RISK ASSESSMENT AND MONITORING

Despite the transitional moment brought by the changes related to the new law, before the establishing of SINACERD the country made considerable efforts to produce and distribute information on hazards at national level. The best example is given by the 2004 Atlas of Natural Hazards in Peru produced by INDECI, in collaboration with other science and technology institutions. The Atlas contains important data on potential adverse geological and hydrometer logical hazards as well as on epidemics and environmental pollution.

Before the changes due to the implementation of the new law mentioned above, six institutions were collaborating in the country risk and hazard assessment. These institutions were: Instituto Geofísico del Perú (IGP), Instituto del Mar de Perú (IMARPE), Instituto Geológico, Minero y Metalúrgico de Perú (INGEMMET), Servicio Nacional de Meteorología e Hidrología (SENAMHI), Dirección de Hidrografía y Navegación de la Marina de Guerra de Perú (DHN), and Japan-Peru Center for Earthquake Engineering and Disaster Mitigation (CISMID).

In the meantime, also an interesting number of university and academic organs were collaborating to the strategy. The main activity was to boost the institutional capacity, at any level, with technical assistance (42). The initial step was therefore related to the implementation of monitoring systems and information technologies aimed to provide these national sub governmental actors with an adequate support in all sectors of risk management. According to the GFDDR notes, because of lack of resources, in 2010 this process was still a challenge. The Peruvian government could not ensure easily all these appropriate tools, in order to create a network aimed at managing and accessing hazard and risk information. A good suggestion given by the same report, and utilized for example in a study on WASH in disasters in Peru (2012), is the implementation of the Comprehensive Approach for Probabilistic Risk Assessment (CAPRA) as a platform. If in the country notes (GFDDR) these efforts were considered as a point of strength, in the meantime the same report denounced th lack of a proper coordination, as well

targeting, in order to fulfill the main priority of the strategy, as well as the priorities related to the country need.

The role of the new institution such as CENEPRED is aimed to strengthen the weakest part of this collaboration. It was crucial in fact for Peru to ensure to the regional governments some tools, technologies and mechanism in order to manage and access hazard and risk information pertinent to their particular needs. In order to fulfill this mandate, GFDDR notes suggested the approach of the CAPRA platform, for the monitoring systems facing lack of tools and technologies suffered by the country in the past years. Adopted for example in the WASH study of 2012, the effects of this new approach need to be evaluated.

In the last two years a new Information System for Disaster Risk Management (SIGRID) is available for Peru. This virtual platform is aimed to integrate hazard information, vulnerability and risks of technical institutions, scientific, academic and social geo-referenced scale detail among others.

Peru participates also in various areas of coordination mechanism with other countries of the South American region for the reduction of disaster risks. Among these, for example, the country participates to the Ibero-American Association of Governmental Entities Civil Defense and Protection, serving the post of Secretary General, in promoting the adoption of the Strategy Iberoamericana for Disaster Risk Management. In addition, Peru is part of the Standing Commission South Pacific – CPPS for the monitoring of the El Niño phenomenon. Another example of boundary work on disaster management is done on the border between Peru - Ecuador and Peru - Chile.

HFA 3: TOWARDS A CULTURE OF RESILIENCE. THE IMPORTANCE OF THE EDUCATION SECTOR AT ANY LEVEL

The transitional moment due to changes implemented by the new law 29664 is having a deep impact also on the relation between the disaster risk management promotion in the education system (at any level) and the building of a culture of resilience in all the country. However according to the GFDDR country notes, INDECI is promoting the campaign “learning to prevent” aimed to integrate disaster risk management in the academic curriculum.

This program has boosted the grooving of initiatives among public and private universities towards the topic of disaster risk reduction, like the National Engineering University (UNI), which has created some graduate programs in disaster risk management. In the meantime, this sensibility is going to be extended also to school and community based project management in all Peru. These projects are supported by the government as well as by international agencies like UN, European Union, USAID, and NGOs, such as COOPI (Italy). The core curriculum that is used by schools includes a theme on environmental education, which is underpinned by three topics – eco-efficiency, health and risk management.

However, despite the outcome of these programmes has a relevant importance in term of social resilience and preparation, in many cases lack of coordination between the institutions involved has been noticed as a big challenge. A case study on disaster risk education in Peru (55) shows how the lack of coordination between the Ministry of Education and the INDECI is complicating the institutional structure for education on

risk management. According to the study, INDECI has a long history of providing education on disaster management, although due to MINEDU's focus on civil defense, this education is concentrated on earthquake and tsunami response and is implemented separately from the school curriculum.

By contrast, the MINEDU/DIECA work on education integrates risk as one part of an environmental curriculum, using a rights-based approach, and as such is focused on the whole range of risks that may face a community (such as environmental, safety and natural disasters), using a much more integrated approach. EEPCT/DIPECHO funding has been key in supporting the development of tools and training in both of these ministries.

To add to the complexity, the government changed hands in July 2011. Alongside the resulting changes in staff (and high levels of uncertainty for the government staff that remain), new mandates and laws have been issued, and it was clear that most institutions are still trying to navigate and understand these changes and their consequences for institutional responsibility in education and disasters.

The main focus of the EEPCT/DIPECHO programme in Peru is targeted towards strengthening and building the capacity around the national-level framework for DRR and education. Many of the activities have been targeted at this level, and have primarily focused on trainings, development of tools and other support to build the institutional framework necessary for furthering DRR and education. While the immediate impacts for children are not necessarily evident, it is clear that this structure will provide the national-level 'infrastructure' needed to roll out and support an effective curriculum across the country.

HFA 4: THE STRENGTHENING OF ENVIRONMENTAL AND PLANNING INSTITUTIONS IN PERU

In awareness of the importance of understanding and promoting environmental intervention related to disaster risk management, Peru recently strengthened its institutional framework. Despite the sensibility on the relation between disasters management and environment is pretty recent, this institutional process has deep roots in the country (51). Since 1940, the Government has created several agencies to address environmental health problems.

Currently, the General Directorate of Environmental Health (DIGESA) is the only agency with regulatory power. In 2008, the Ministry of the Environment has been created, and environmental impact studies are mandatory for approval of economic ventures (ibidem). Into this institutional and operative framework the National Center for Strategic Planning (CEPLAN) was launched. Environmental departments have also been established in the Ministries of Production, Transport and Communications, Housing, Construction and Sanitation. According to Bajar (51) despite these efforts, the sectoral approach to environmental management and pollution control is disorganized, weak and has limited institutional capacity.

Newly adopted environmental policies suffer from a lack of overall coordination and clarity. Government action to date has amounted to little or nothing compared to the

challenge of ceaseless environmental deterioration and the overwhelming strength of the global powers destroying the country. However, the effect of these new institutional and political configurations will contribute at policy level to increase the resilience of the country in terms of disaster management. According to the GFDDRR country notes (42), Peru's infrastructure as well as productive sectors are still highly exposed to natural hazards.

According to a World Bank study, Peru is located on the 20th spot of the world ranking of countries with highest economic risk due to threats caused by extreme events such as earthquakes, floods, frosts amongst others (40). The basic necessity is to improve the infrastructural level or resilience in all the country, on one hand promoting a disaster based approach in the new building, on the other making the existing infrastructure more resilient to earthquakes, floods and landslides. The huge amount of economic damages of El Niño, reported in the CRED database, has created awareness on how the most exposed sectors of the Peruvian production to hydro-meteorological hazards are tourism, fishery, agriculture, and oil and gas industry, basically, the most important productive sectors in Peru's growing economy. A good example of this new effort can be given by the report Disaster Risk Management in Water and Sanitation Utilities, funded by World Bank (40).

As part of the support that the World Bank offered the Peruvian government in facing reconstruction, infrastructure seismic risk evaluation was developed for SEDAPAL and EMAPICA, two Peruvian companies that provide drinking water and sanitation services. The study looked to quantify the probable losses that these companies are exposed to for damages on their infrastructure due to the occurrence of future earthquakes. The results of this evaluation divided in two volumes are constituted in a fundamental input for future analysis in the design and prioritization of disaster risk reduction measures of these companies.

The study features some recommendations of risk management policies and emphasizes on the need to continue improving the knowledge of threats and risks. Due to its reach and methodology (probabilistic risk modeling, using the CAPRA platform) it is the first to be developed in the water and sanitation sector in Peru. In this sense, the study also offers an excellent opportunity to review and learn the usefulness of the probabilistic approximation and to promote new studies in other regions of the country (ibidem). The main contribution of this study is to boost up a new approach on assessment in infrastructure, aimed to the improvement of the sector in all Peru.

The transition rate between the SINADECI the new SINAGERD, has had a limited progress, but there are some experiences of sub-national governments that have achieved to integrate it into their development plans agreed (PDC) and / or annual operating plans (POA) shares of GRD, especially the reactive component.

Land management plans are being made and with risk maps be taken into account for the upgrade of the PDC. It has been conducting joint bicentennial plan review to integrate DRM into development planning at all levels of government. This review is allowing to modify reactive management criteria that were written in the first plan-approved version of the bicentennial. The year 2013 is expected to have a component GRD integrated into the final document.

HFA 5: DISASTER PREPAREDNESS, RECONSTRUCTION AND RECOVERIES. TOWARD A NEW STRATEGY FOR URBAN PLANNING IN PERU

The impact of the last earthquake of 2007 has provided number of lessons about the country capacity of managing major disasters and of reconstruction. A research conducted by INDECI, aimed to the evaluation of the capacity of self-response in Peru (57), rose up many crucial points and areas of intervention. On the one hand, the evaluation conducted few months after the quake revealed the need for improvements in coordination and planning, as well as capacity development, communication and logistics.

On the other hand, from the research emerged the main point of weakness: lack of structural and non-structural resilience for public and private infrastructures, as well as housing and communities. Lima, as well as most of Peruvian cities, is at high risk for natural hazards because of the unplanned urbanization and the lack of resilience-building programs for housing and infrastructure.

Catastrophes provoked by events like earthquakes, as well as flood, can have a deep impact, not only on victims in terms of killed and affected but also on the economic grow of the whole country. To face this problem, Peru is called to fix up at policy level the unplanned urban development. In the meantime, a deep regulation system regarding occupation of quite-prone areas, especially in relation of building of infrastructural community facilities such as schools, hospitals, or related to housing is crucial. In sum, in the following years Peruvian government has the mandate to work on resilience of existing infrastructures and in the planning of new ones.

As a result of this, the provisional agency of Peru, the FORSUR, started a project of reconstruction management of affected and new areas. Again the main task of the last years has been the implementation of plans for improving the condition of coordination in terms of legal and technical hurdles, especially in terms of relationship with local and regional governments. This new strategy, based on the new legal framework, will bring the possibility of developing new capacities in terms of risk management, as well as response, at any level.

To this end, the country is planning a new comprehensive financial strategy aimed at improving the condition of preparedness and response in existing infrastructures and in the meantime at managing the post disaster situations. From the financial point of view this new awareness has driven the development of the establishment of funds customized around the kind of disasters and hazards that can potentially affect the country.

The aim is to built capacity in order to prevent and to respond with appropriate instruments to the different types of emergencies in Peru. As for the other strategies mentioned above, this plan is based on the new legal and institutional reform, in which regulations on states of emergency are aimed to ensure solid institutional coordination and efficient expending of resources. In practical terms, this plan starts from the implementation by the Ministry of Economy of different measures such as contingency credits (one of these is the *Corporation Andina de Fomento*), and the continued negotiation with the World Bank for some loans aimed to develop new capable tools to respond to catastrophes.

According to the last report on the HFA published by the Peruvian authorities (CENEPRED and INDECI), 2013 is the year of changing for structural and non-structural resilience in Peru. New budgets are addressed to the improvement at structural and on structural level, including the reconstruction of affected areas, and urban planning. This new vulnerability reduction programme is organized through three lines of action: (a) strengthening the institutional, regulatory and policies for risk management ; (b) identification of priority areas and needs-based vulnerability reduction; and (c) strengthening financial protection mechanisms for disasters

According to the last report on HFA (53) its implementation has been occurring progressively and it has increased funding during all of 2013. One issue to consider is the deployment of financial resources available under the administrative procedures. There is a construction of risk scenarios that include climate change at national and some regional levels. Some result can be registered already now. For example, in agreement with UNDP the government of Peru developed the Plan for Earthquake and Tsunami events in Lima and Callao.

In addition, a new methodology of rebuilding is being implemented in the country, declared emergency zones, the Cusco and Arequipa regions have been taken as validation case of this new country proposal. This plan of reconstruction involved the following areas: infrastructure reconstruction (roads included), housing reconstruction, revitalization of the economy, urban and rural planning, and recovery of life. Moreover, there are advances in the incorporation of structural and/or non-structural preparedness and response actions at the possibility of occurrence of phenomena of recurrent natural disasters. This is getting evident in the health sector. The Ministry of Health and Social Security, through the National Committee Hospitals, is implementing a national hospital policy on disasers. In 2013, about 130 health facilities are going to be evaluated to be certified by civil defense.

Finally, this program is promoting awareness and participation towards the improvement of urban planning. In the 2013 HFA report is stated that in many cases unplanned urban growth, spontaneous (invasions in many cases) exceeds the carrying capacity of the ecosystem, causing environmental impacts in a dangerous and unsustainable way, and seriously compromising the physical safety of human settlement upon the occurrence of natural phenomena.

According to CENEPRED, it is essential to make a commitment to future generations to make all necessary efforts to ensure preventive measures so that the cities are safe, healthy, but also attractive, orderly and efficient in terms of operation and development. This strategy, understandably, involves the implementation of plans of medium and long term, with an emphasis on physical security of cities and, therefore, in the protection of life and health of the inhabitants. Despite this kind of plan is still on its embryonic stage, it is relevant that a new level of awareness and participation has been incorporated in the new national strategy (53).

Review of trends in disaster risk management in Peru

In the last ten years Peru is experiencing a new phase of changes, that is involving all the sectors at any level. One of these sectors is the security of the citizens in terms of disaster risk management and response. As for many other countries, most of these changes find their root in the lessons learnt from the former catastrophes that affected the country. In this case, Peru has really a very interesting profile, especially in regards to vulnerability. This can be easily calculated considering on the one hand the hazard risk profile of the country, in particular due to the geographical location and the climatological situation of Peru.

On the other hand, this can be understood based on the capacity to prevent and respond to disaster in Peru, in other words by the level of resilience. This is a cross cutting issue that passes through many factors, from the political one, to the socio-economic, finally touching also the cultural level. The level of vulnerability is the main issue that matter in disaster management at structural and non-structural level. This profile has tried to review vulnerability based on the history of disasters that affected the country since 1962, and focusing on the strategies that have been adopted in the years, especially in reference to the Hyogo Framework of Action. Based on the HFA and on the lessons learnt after the many (and sometime preventable) tragedies and catastrophes that have affected the country, the Peruvian government is taking actions towards a reform of the disaster management. This reform is currently in a transitional phase, thereby delicate and slow, but is bringing results that only recently have become feasible.

A legal change has brought the approval of a new law, the 29664, changing completely the country's way of tackling disasters. The approach of this law is in fact aimed to manage the risk of disaster, abandoning the former approach, which was focused only on a centralized response. This kind of approach, of course, was not only common in Peru, but in many other countries of the "so called" developing and developed worlds, in it has provoked tragedies in any part of the planet. However, as elsewhere, the new mentality brought by the HFA has a deep impact on the Peruvian priority risk management.

In the last decade, in fact, many objectives have been established: (1) Developing local government capacity at any level (national, regional, district) through a process of decentralization; (2) Improving the level of resilience at structural and infrastructural level with educational, urban planning and reconstruction programs; (3) Investing on an approach focused on the prevention, as well as on the improvement of response through a new coordination plan.

Effectively, according to the national reports, these kind of objectives are being part of the government agenda. For example, thanks to the approval of the 29664 law, the ongoing process of decentralization of the disaster prevention, mitigation and response structure is becoming a new reality. Regional, provincial and district governments are starting to develop an improved capacity for risk reduction with the policy design, as well as involve new coordination strategies. This is mostly aimed at gaining results on three levels: risk diagnosis, technical assistance, and training. It needs also to be

mentioned that the plan is focused on a community and participative approach, recognizing the strength of Peruvian people in reaching of this task. In the meantime, the government in collaboration with border countries, as well as international actors (such as UN and EU agencies and NGOs) is making many efforts in monitoring hazards, especially in case of extreme weather disturbances like El Niño.

The promotion of the PREVEN programme is one example. However, monitoring is also involving the improvement of early warning systems, construction of networks, and education plans. This is possible due to the promotion of a partnership with the private sector. This collaboration not only will help to considerably reduce exposure to socio-natural hazards, but also will be the key element in the prioritization of intervention on the improvement of existing and new infrastructures in terms of resilience, especially in relation to the country's seismic, landslide and flood profile.

Peru is working hard in improving the construction of a culture of resilience at population level. This is possible thanks to plans that are inserting disaster awareness into the study curriculum at any level, with an intensive approach on the primary and secondary school curricula. In the meantime, there is a growing new academic curricula aimed at the creation of professional experts in disaster management and response. This is possible due to the government's openness to international programmes, and to NGOs.
However, some weaknesses are still creating many challenges in this system. They are not only attached to the disaster management sector but concern the country at large. It is relevant to explore how these can be still a challenge in case of catastrophes such as earthquakes, floods or El Niño.

First of all, the economical development experienced by the country is still battling a huge level of poverty. This factor is especially relevant at urban level the main boost of unplanned urbanization, and therefore, of demographical risk in terms of disasters. This involves the infrastructural resilience but also the non-structural culture of safety. At the same time, in rural areas the level of poverty is roughly higher and this can have effects on health and capacity of responding to disasters for lack of resources.

Second, despite undergoing a political situation of tranquility in the past years, the ghost of instability is still present in Peru. This is due to the recent past of the country, which was characterized of political instability, reverberating in the present. The presence of terrorist groups, such as Sendero Luminoso (Shining Path), is still an issue affecting the stability of Peru. The government is focusing a lot of efforts on prevention but there remains still a lot of work in ensuring security and political stability.

Third, although the transitional phase under the law 29664 is bringing about change with large steps, ,decentralization is still a far-fetched goal in Peru. This is evident in the lack of coordination emerging in any report, case study, and official document that have been reviewed for the assembling this profile. The government with its institutions such as INDECI or CENEPRED is working hard on change, but district and local are difficult – though necessary – to fully include. This can be possible only through promoting local and community participation in any action and decision of disaster risk management. Only through a good level of coordination and management, hazards such as

earthquakes and El Niño can be limited in casualties and economic damaged at any level, from infrastructure to production.

Fourth, the 2013 reports are highlighting the establishing of funds for affected populations for reconstruction but the process of recovery is still far from achieved. In a report of 2011 (59), it is stated that many people affected by the last earthquake of 2007 are still living in tents and camps, and other kind of "temporary" housing. Some websites report also rumors of abandoned populations from much earlier earthquakes such as the one of 1970. This can affect political stability as well as local participation to the new plan of risk management.

Ultimately, as in the 2013 governmental report, gender unbalance in disaster risk management is still an important issue, which remains to be addressed if the disaster risk management plan under HFA shall bring about final change.

On a positive note, in the last decade Peru has reached many objectives set by the national and international actors in accordance with the HFA. For example, regarding the level of terrorism and violence the government is taking serious actions. Some years ago President Humala affirmed that it is necessary to have "—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" (13).

The main objective is to act versus those terrorist groups such as Shining Path that are spreading fear in all of Peru since the beginning of the 1980s. This process of safety and stability is involving collaboration also with other countries of the South American continent. As Taft-Morales (60) contends, this strong cooperation 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 (ibidem). For this reason, in the last two years, the government is discussing a new design of law against terrorism, in which necessary actions are established (61).

Of course this process needs proper monitoring, as stressed by Human Rights Watch, in particular with regards to the fact that the law is still in need of improvement. Otherwise the opposite can be created if aimed only to punish the apology of terrorism.

Conversely, the most important steps related to emergency and disasters risk management are being achieved with the ongoing process of reforms that is rolling across the country in particular in institutions. Results reported in the recent reports are optimistic. This is verifiable especially by the high level of expectation generated by the decentralization and the monitoring campaigns. The biggest hope is that this plan of action will be reflected in the infrastructural activity as well as in the improvement of the existing and the future urban planning and management.

Lastly, it is important to mention that these changes are influencing the construction of a culture of resilience at local and community level. This seems to be the biggest aim of the decentralization and institutional reform. Only when relying on Peru's citizens, the level of vulnerability of the country can be improved.

Conclusions obtained from this analysis

Peru is a developing country with a deep and interesting history in term of disasters. Its risk profile on hazards and vulnerability is still matter of debate for actions to be taken in order to prevent other tragedies like the one who have irremediably changed the history of the country (56).

As reported above, Peru is experiencing a transitional moment. The economy of the country is growing but still a lot has to be done in terms of poverty, security and disaster management. This transitional moment is well expressed by the ongoing decentralization reform that is involving the disaster risk management at any sector and at any governmental level.

The approval of a new law (29664) allows an institutional and legal framework for these changes to come. Many weaknesses are still evident in this system, especially regarding the level of coordination and the condition of urban and infrastructural planning but the country is diligently following the mandate of the Hyogo Framework of Action. In addition, it can also be said that many of the project implemented in the country are reaching a level considered as good practices for other countries interested in the improvement of their disaster preparedness and response.

It is hoped that a future of economic growth and political stability will help in reaching Peru's important and ambitious objectives of DRM – turning it into a role model for others once and for all.

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