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Master Thesis

Strategic Management of Natural Disasters:
Italy, Japan and the United States in comparison

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Abstract

Italy, Japan and the United States are exposed to numerous natural hazards. In particular, geophysical, hydro-meteorological and climatological extreme events have produced loss of human life, injuries and extensive damage to homes, businesses and other infrastructure.

In this dissertation, the Italian, Japanese and American disaster planning and management abilities of the last twenty years are analyzed and evaluated according to two common frameworks in disaster Literature: Hyogo (2005) requirements for good preparedness planning and Quarantelli's (1997) ten criteria for good disaster management.

Moreover, while authors prevalently confine the application of stakeholder theories to private sector contexts, this thesis approaches disaster management issues by applying Freeman's (1984) definition and Savage et al.'s (1991) model of stakeholder management.

As a result of the combination of disaster management principles and stakeholder theories, the conclusions reached through this research may inspire Italian, Japanese and American policymakers and emergency managers on how to ideally plan for and manage natural disasters, while taking into consideration and appropriately approaching the involved emergency management stakeholders.

Acknowledgements

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Third, I would like to thank all the students I've met in Lisbon and Oslo, they became my family abroad and they taught me how to look the world from very different perspectives. If I am at the end of my studies it is also because of their support and inspiration. Thank you all!

Finally, my gratitude goes to my family and friends. Roberto, Concetta and Giuseppe, all your sacrifices to support and finance me are infinitely appreciated and there are no words to say how precious you are to me. Rocco, your love and trust support me every day. Nonna Assunta, Nonno Angelo, Nonna Tanina and Nonno Pippo, you are my greatest luck. None of what I am and I did - this thesis included - would have been possible without you. Grazie mille!

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Abbreviations

ADPC - Asian Disaster Preparedness Center

AIST - Geological Survey of Japan

AMI - Italian Air Force

ANCE - National Assiciation of Construction Enterprises

CEA - California Earthquake Authority

CERT - Community Emergency Response Team

CRED - Centre for Research on Epidemiology of Disasters

CRESME - Centre for Economic and Social Market Research regarding Building and Land Development

DGGS - Division of Geological & Geophysical Surveys

DPRI - Disaster Prevention Research Institute

EOC - Emergency Operation Center

FEMA - Federal Emergency Management Agency

GEF - Global Environmental Facility

HDI - Human Development Index

HI - Heath Index

INGV - National Institute of Geophysics and Volcanology

ISIG - Institute of Iternational Sociology

JMA - Japan Meteorological Agency

LEMA - Local Emergency Management Agency

Mw - Magnitude

Mph – Miles per hour

NERT - Neighborhood Emergency Response Team

NIED - National Research Institute for Earth Science and Disaster Prevention

NOAA - National Oceanic and Atmospheric Administration

NORC - National Opinion Research Centre

NOVA - National Organization for Victim Assistance

NGO - Non-Governmental Organization

NPO - Non-Profit Organization

NWS - National Weather Service

OGS - National Institute of Oceanography and Experimental Geophysics

PAI - Hydrological Plan of Basin

SEMA - State Emergency Management Agency

SEMS - Standardized Emergency Management System

SRI - Stanford Research Institute

UNISDR - United Nations International Strategy for Disaster Reduction

USGS - U.S. Geological Survey

WNO - World Nature Organization

WWF - Word Wildlife Fund

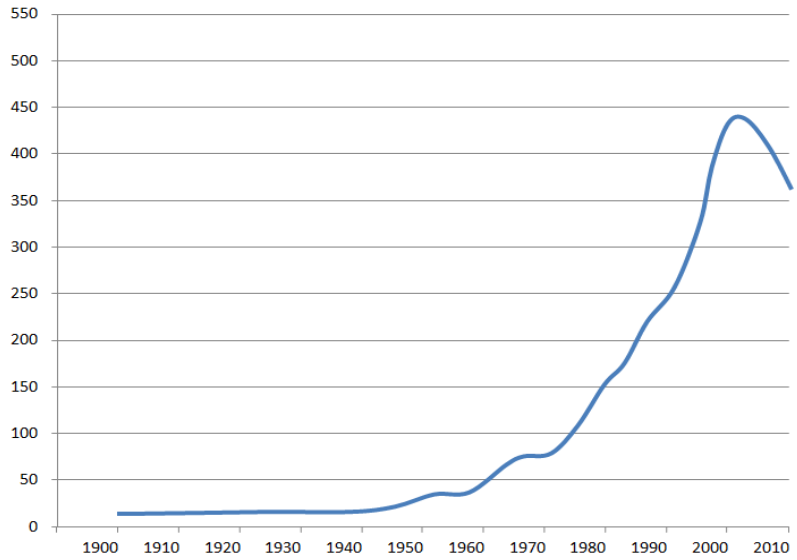
Introduction

Problem Definition

Every year severe natural disasters impact societies all over the world, producing great damages and destruction. Only in 2012, natural disasters killed around 13,000 people and caused economic losses of US$ 198 billion (CRED, 2013). All countries are impacted regardless of their economic development, and the consequences in terms of deaths, injuries and financial losses are often dramatic.

Since the beginning of the 19th century, the number of reported disasters has sharply increased (*Figure 1*), partially due to the intesification of monitoring and reporting activities (Bresch et al., 2011). Some categories of extreme natural events, however, have been increasing because they were negatively influceced by human activity (e.g. deforestation exacerbates the number of flooding disasters[1]).

Figure 1 – Natural disasters reported 1900 - 2010



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Moreover, comparing to the 1970s, the death toll from natural disasters has notably decreased (*Figure 2*), but significantly more people are affected by extreme natural events, in absolute terms (*Figure 3*).

Figure 2 – Number of people reported killed by natural disasters 1975 - 2010

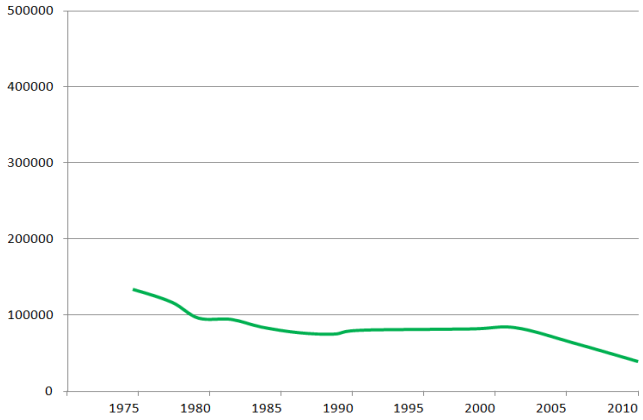

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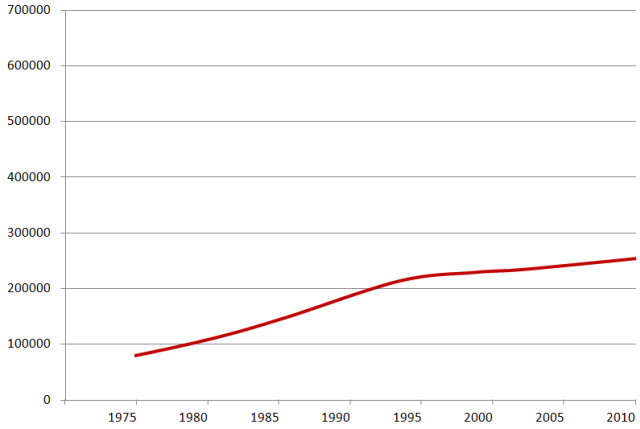
Figure 3 – Number of people reported affected by natural disasters 1975 - 2010



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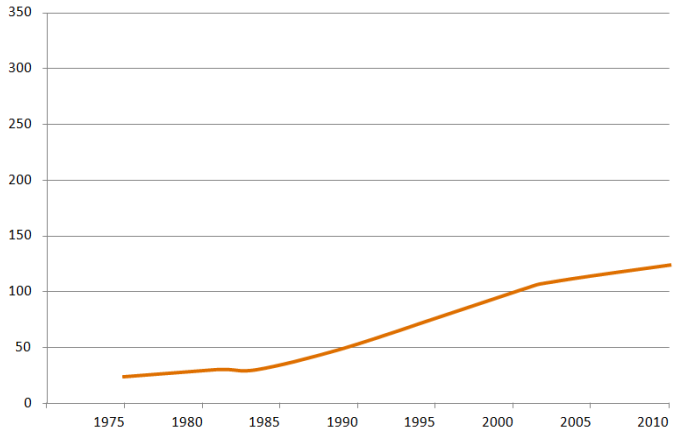
Finally, the increase in the economic cost of natural disasters over the last thirty years is impressive (*Figure 4*).

Figure 4 – Estimated damages (US$ billion) caused by natural disasters 1975 - 2010



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[1] Bradshaw, Sodhi, Peh, & Brook, 2007

The reported trends are driven by several factors. First of all, in the period between 1980 and 2012, the world population increased from 4.43 to 7.04 billion (The World Bank, 2013): much more people are exposed to natural hazards. Second, population has been growing more in developing and underdeveloped countries, where preparation to withstand natural events is typically low (Soubbotina, 2004). Third, urbanization happened in uncontrolled and hazardous ways, further worsening disaster risk. Forth, as countries are accumulating more wealth, more economic assets are under the threat of natural disasters. Finally, human action exacerbates disaster trends, for example by increasing the occurrence of certain categories of natural events or triggering large-scale technological failures.

Investments in preparation and response activities are key to reduce the impacts of natural disasters on people and properties. Over the globe, all countries are engaged in activities of disaster risk reduction; however, planning and managing natural disasters, per se, is not sufficient and what is relevant, instead, is good disaster preparedness and management. Within this research, the comparison among three disaster prone countries is used to investigate over the critical elements making for good disaster planning and managing processes, according to two frameworks commonly referred in Literature and internationally adopted. In particular, Italy, Japan and the US are analyzed in their preparedness planning and managerial action during three relatively recent natural disasters. The analysis is based on Hyogo recommendations for the planning phase and on Quarantelli's framework for the managing part. Moreover, the Italian, Japanese and American emergency management stakeholders are identified, analyzed and classified according to Savage et al.'s framework and general lessons for disaster risk reduction are conclusively discussed.

Personal Motivation for choosing the topic

No matter how frequent, strong or long-lasting, natural phenomena are mere geophysical, meteorological, hydrological and climatological events; it's solely by human action that they are turned into disasters (Dynes R.R., 1993): the concentration of wealth and high population densities in hazard-prone areas, ignored mitigation measures, unpreparedness, unorganized response and improper recovery are the only reasons why disasters afflict societies. As an example, in 2006 a 8.3 magnitude earthquake occurred approximately 500 kilometers off the coasts of Kuril Islands (Dengler, Uslu, Barberopoulou, Yim, & Kelly, 2009): because of the low population density and appropriate planning and management measures locally adopted, there were no fatalities nor major damages and only one subject was injured (US Geological Survey, 2010). Yet, economic, strategic, political, cultural and historical reasons have induced people to settle in hazard-prone areas, and only good actions of disaster planning and management may reduce the impacts of natural phenomena.

Across the globe, underdeveloped and developing countries have the highest vulnerability to natural disasters, because of their high population densities, poor infrastructure, undisciplined urbanization, scarce monitoring technologies, limited resources for prevention and so on. However not only underdeveloped and developing countries suffer disastrous natural events. When looking at the Italian experience, in fact, we get the picture of a disaster-prone developed country that has been historically incapable of dealing with natural forces. Among the most frequent natural disasters, between 2000 and 2012, earthquakes, floods and extreme temperatures have killed 20,600 people while producing US$ 35 billion of economic damages.

My interest towards the topic of disaster management is strictly linked with the problematic Italian Emergency System, often criticized and blamed for the produced disaster causalities. Looking beyond the Italian national borders, I think that the analysis of the good practices of disaster management from other countries can bring some food for thought to inspire new resolutions to be adopted by the Italian government, as by any other country facing the same issues and sharing similar social, cultural, political and economic features.

Usefullness and limitations of the study

This study fits within the broader disaster Literature and it specifically belongs to the cross-national comparative stream of research. Several studies in the disaster research field compare the experiences of different countries and evaluate them according to predefined criteria. Within this group, examples are the confrontations between US disaster management practices with the British (Parker, 2000), Australian (Britton & Clapham, 1991), New Zealand (Parr, 1997 - 1998), German (Dombrowsky & Schorr, 1986), Japanese (Nagata, Rosborough, Frances, Gómez, & Campbell, 2009) and Mexican (Clifford, 1956; Hundley, 1965) ones, as well as the comparisons between emergency management in Italy and other European countries (Campos Venuti, Risica, Rogani, & Tabet, 1997), or between the UK, Spain and Germany (Sahin, Kapucu, & Unlu, 2008), Japan, Turkey and India (Özerdem & Jacoby, 2006) or also Japan, Turkey and Iran (Ajami & Fattahi, 2009).

Few studies have compared Italy, Japan and the US apart from McLuckie's (1975) research, where it is investigated the degree of centralization of the Italian, Japanese and American disaster responses. The current work expands the McLuckie's (1975) comparisons, by looking at the evolving planning and management processes of the same countries, while providing a detailed stakeholder analysis of the key actors involved in emergency management. In particular, stakeholder analysis is atypically adapted to contexts of public management, with advantages and limits that will be specified. The contents of this dissertation, then, may be interesting for - both national and local - government representatives and emergency managers, as a complete picture of an idealistic disaster management framework is delineated and the roles of action of the involved stakeholders are discussed.

Due to practical constraints, this research is based only on three events per country and may not describe the average disaster planning and managing abilities of Italy, Japan and the US; rather, the research highlights the performances of the examined countries on occasion of three remarkable natural disasters, extra-ordinary because of the impressive human or economic losses they produced. As a consequence of the chosen sample, moreover, the concluded results are mainly applicable to developed countries with economic, social, cultural, political and environmental characteristics very similar to the Italian, Japanese and American ones, as outlined in the methodology section. Different recommendations, not

discussed in this research, are to be addressed to developing and underdeveloped countries.

Moreover, data and information sources used, sometimes, are produced by the emergency departments of the impacted countries themselves and may not be completely objective; especially for the Italian cases, the personal involvement of the author as Italian citizen and the influence of Italian journal sources, television reports and political debates inherently subjective and emotionally charged, may bias the perspective from which the analysis is conducted.

Finally, a full discussion on the roles played by the Italian, Japanese and American cultural and social influences is beyond the scope of this study, and may represent a stepping stone for future research. Future research agenda should also consider case specific policies that Italy, Japan and the US could adopt to solve the deficiencies outlined in this dissertation, as well as international planning and managing systems involving different countries across the globe, with benefits shared between developed, developing and underdeveloped countries.

Research questions

The research question expresses the rationale for a research to be done (Stone, 2002). Once the research objective is defined, the success of a research project greatly relies on the ability of the investigators to transform a problem of interest into appropriate, meaningful and purposeful research questions (Thabane, Thomas, Ye, & Paul, 2009).

In the current research, to explore what makes for a successful disaster management process and what doesn't, three natural disasters from the Italian, Japanese and American recent histories are selected and analyzed. For the research objective to be solved, the following research questions are addressed:

1. **HOW DO COUNTRIES PREPARE FOR AND COPE WITH NATURAL DISASTERS?**

   To answer this question, the risk profiles of Italy, Japan and the US are presented together with the measures they adopted to plan and manage natural disasters.

2. **WHY NATURAL PHENOMENA OF EQUAL MAGNITUDE LEAD TO DIFFERENT LEVELS OF DEVASTATION ACROSS COUNTRIES?**

   Certainly, natural phenomena of similar intensity result in different effects depending on the area where they occur, its population density and its accumulated wealth: the death toll and the economic damage produced will significantly vary according to these variables. An earthquake impacting a desert area is, of course, less devastating than an earthquake of the same magnitude striking a rich densely populated city. However, each country approaches differently the risk coming from natural phenomena and, as a consequence, it differently reduces their impacts in terms of loss of lives and properties.

   The resolution of this question is achieved by presenting the features of the planning and managing processes undertaken by each country, for the selected cases. In particular, in each case, the goodness of the adopted disaster preparedness plans and of their implementation is judged according to two theoretical models: Hyogo requirements, for what concern the process of planning, and Quarantelli's ten criteria, for the process of managing disasters. A cause-effect relationship is assumed to link planning and managing activities with the extent of the devastations produced by natural agents.

3. **WHO ARE THE EMERGENCY MANAGEMENT STAKEHOLDERS? HOW SHOULD THEY BE MANAGED?**

   All Italian, Japanese and American inhabitants directly or indirectly affect and are affected by disaster management policies: applying Freeman (1984) definition, thus, they all are emergency management stakeholders.

   To answer this question, based on what has been observed in the selected natural disaster cases, the attributes, interests and roles of action of emergency management stakeholders are thorougly analyzed and policy recommendations are drawn.

4. **HOW CAN NATIONS SUCCESSFULLY MANAGE NATURAL PHENOMENA, THEREBY REDUCING THEIR RISK OF INCURRING IN MAJOR DISASTERS?**

   Natural phenomena are inevitable, but their immense devastations are not. Countries should increase their disaster preparedness while simultaneously improving their ability to manage natural events. As a consequence, they will be able to reduce their risk of incurring in major disasters and catastrophes. Achieving this result, however, is not as straightforward as it may seem, because economic, social, political and environmental factors will constrain it.

   In the light of the analyzed cases, the answer to this question gives insights on the most critical elements to be considered by the Italian, Japanese and American authorities when formulating and implementing national plans for disaster management.

5. **WHAT LESSONS CAN BE LEARNT FROM THE ANALYZED CASES? TO WHAT EXTENT CAN THEY BE GENERALIZED BEYOND THE RESEARCH SAMPLE?**

   The answer to these questions is part of the conclusion, where general lessons are inferred from the performed analyses and the applicability of the findings to countries other than Italy, Japan and the US is debated.

History of disaster management

Disaster is a word of Latin origin composed by "dis", that means "without", and "astrum", that means star; it literally indicated an "ill-starred" event, more precisely an extraordinary occurrence blamed on unfavorable influences of the stars, over which humans had little or no control (NeSmith, 2006). The etymology of "disaster" goes back to ancient times, when it was believed that disasters were Acts of God, difficult to be predicted and controlled. Eventually the word began to be used to define major physical phenomena, i.e. earthquakes, floods, volcanic eruptions, fires and so on, and scientific studies started to be conducted, under the heavy influence of religion and superstition. Mechanism of prevention and protection were set up, as the Egyptian irrigation canals of the 20th century B.C., the Greek dam protections made in 1260 B.C., the professional fire corps organized in Rome since 64 A.D., the earthquake-proof Armenian architectures of the 5th century A.D. or the Polish medieval flood defense systems of dams and piles (Quarantelli, 2009).

In the beginning of the 16th century, scientific studies disanchored from religion emerged and disasters started to be seen as secular phenomena; as an example, in 1596, the Dutch cartographer Abraham Ortelius first hypothesized that continents were slowly moved "by earthquakes and floods", anticipating the 20th century Tectonic Plates theory (Kious & Tilling, 1996).

A turning point in disaster history took place on November 1st, 1775, when a major earthquake hit the Portuguese city of Lisbon, provoking tsunami waves and several fires around the city. Historical accounts report between 5,000 and 70,000 dead people, 17,000 building destroyed and considerable economic losses for local and foreign companies. Not only is the event remembered for being tremendously devastating, but also it is considered the first modern disaster (Dynes R. R., 2003). By the time the earthquake occurred, in fact, coordinated emergency and reconstruction efforts were methodically organized by the Portuguese minister of the government, the Marquess of Pombal: priests were instructed to gather dead bodies and sunk them in Tagus River, military to bring food and maintain security and citizens to construct new temporary buildings; moreover Lisbon was promptly rebuilt with anti seismic provisions (Cardoso, Lopes, & Bento, 2004), political stability was enforced and economy was fostered by tax reliefs, business incentives and nationalization initiatives.

Even if the Lisbon earthquake is the first modern scientific example of disaster management, a systematic disaster management research only arouse in the 20th century. The oldest disaster research is acknowledged to be Eduard Stierlin's (1909) PhD dissertation on the social impacts of the 1908 Messina earthquake, followed by Samuel Prince's (1920) paper on the 1917 Canada ship explosion (Quarantelli, 2009). After their works, disaster research went slowly forward until the 1950s when, principally at the National Opinion Research Centre (NORC) of the Chicago University, on commission of the Ministry of Defence, more studies on disasters were conducted with the objective of inferring useful strategic solutions to adopt in case of military conflict. In 1963, at the Ohio State University, professors E.L. Quarantelli, Russell Dynes and Eugene Haas founded the Disaster Research Center and started gathering and fostering studies on disasters; in the same period. In Japan similar research activities were set up at the National Research Institute for Earth Science and Disaster Prevention (NIED) and at the Disaster Prevention Research Institute (DPRI). Differently, only in the 1970s a less institutionalized research activity began in Italy, around the Institute of International Sociology (ISIG) and the Universities of Milan, Bologna, Modena and Bari.

Academic research on disasters brought to the establishment of an international platform of discussion where sociologists, anthropologists, psychologists, physicians, economists, engineers, geographers, medics and statisticians can address current issues in disaster management, through country specific and cross country studies, ex-ante and ex-post event assessments and multi and single hazard analyses. From their multidisciplinary collaborations, a multitude of papers has been published in specialized international journals (e.g. Disasters, Disaster Management and Response, International Journal of Disaster Risk Reduction, Natural Hazards, Natural Disasters, International Journal of Emergency Management, Disaster Prevention and Management, Disaster Management and Response) and the most varied issues concerning natural disasters have been tackled. As a result of their efforts and studies, Disaster Management - alternatively defined Emergency Management - has become the autonomous discipline "of applying science, technology, planning and management to deal with extreme events that can injure or kill large numbers of people, do extensive damage to property, and disrupt community life" (McCreight, 2011:125).

What is a disaster?

Definitions of disaster

According to Perry (2007), as there are multiple possible perspectives to analyze disastrous events, the many definitions that have been given of the word *disaster* by social scientists can be classified into three major types: classic, hazard/disasters and socially focused. In the two extremes of disaster conceptualization, on the one side, the hazard/disasters tradition emphasizes the destructive physical agents (Burton & Kates, 1964; Burton, Kates, & White, 1978; Wisner, Susman, & O'Keefe, 1983; Hewitt, 1983), while on the other, the social perspective focuses on the socially disrupted dimension (Erikson, 1976; Clausen, 1992; Barton, 1963; Alexander, 1993; Quarantelli, 1966; Cutter, 1996; Dynes, 2007); in an intermediate position, the classic view sets forth disasters as transitory events of social failure caused by some agent (Killian, 1954; Moore, 1958; Wallace, 1956; Fritz, 1961).

For the purpose of this dissertation, among the variety of definitions of the term *disaster* arisen since the mid-1990s, only the socially founded ones will be referred. According to them, disasters are social phenomena, stemming from the vulnerability of the society where they occur and thus happening when "many members of a social system fail to receive expected conditions of life from the system" (Barton, 1969:38). The chosen definition is coherent with the purpose of this study, as it focuses on the societal dimension of a disastrous occurrence, allowing for a proper consideration of the strategic and managerial implications linked with natural disasters.

Specifically, as claimed by Quarantelly (2000: 682), disasters:

a) are sudden on-set occasions;
b) seriously disrupt the routines of collective units;
c) cause the adoption of unplanned courses of action to adjust to the disruption;
d) have unexpected life histories designated in social space and time;
e) endanger valued social objects.

Typically, disaster Literature differentiates the conceptual meaning of the word "disaster", "accident" and "catastrophe" and the ones of "hazard", "risk" and "crisis"; following, a short review of the prevailing interpretations.

The difference between accidents, disasters and catastrophes lies in the extent of their impacts: *accidents* - also defined *everyday emergencies* – affect a small number of individuals and/or provoke modest physical damanges each time they occur, involving only the established and limited range of local emergency organizations (Dynes R. R., 2007); *disasters* produce property damages, deaths and/or injuries to communities (FEMA, 1990), overwelming the capacity of the local emergency oganizations to cope with them (Quarantelli, 1987); *catastrophes*, finally, generate an even bigger severity of damages with long term complex implications where they occur: entire regions rather than single cities are affected, most of the community structures are damaged, local organizations are unable to perform their usual roles, the majority of everyday community functions are discontinued, the economy and national morale are shocked and extraordinary national and international resources are needed[2] (Quarantelli, 2006).

Figure 5 - Magnitude crescendo of collective crises

(FEMA, 2011a)

Equally important in the disaster Literature is the distinction between "hazard", "risk" and "crisis": for *hazard* is intended the potential for harm to communities or environments coming from natural agents or anthropogenic causes, while the disaster is the actual event (Drabek, 1997); differently, *risk* indicates the possibility of suffering from a hazard (Cohrssen & Covello, 1989) and expresses the estimated impact that a hazard would have on a community, in terms of deaths, injuries, property damages and other undesirable consequences (Lerbinger, 1997); and, finally, *crises* are short periods of extreme uncertainty

[2] e.g. Everyday emergencies are the approximately 200.000 car accidents happening every year in the italian territory and causing a bit less than 4.000 deaths per year (ACI - ISTAT, 2012). Differently, a disaster is, for example, the earthquake that hit Mexico city in 1985, as it significantly shocked and damaged the city, but it destroyed less than 2% of local housings and life proceeded normally in neighboring areas. Finally the US Hurricane Andrew of 1992 or the Haiti earthquake of 2010 can be labeled as a catastrophes, since the majority of the local facilities were seriously damaged, local personnel was unable to cope with all the emergencies and everyday community functions were temporarily suspended.

during which life-or-death situations need to be faced for the acute emergencies to be solved (Farazmand, 2001)[3].

The above provided interpretations are utilized in the current research, as they represent the most recent academic orientation and are the official definitions used by international disaster agencies; certainly, disagreement still persists and discording meanings may be attributed to the same words in other papers, depending on the different authors` perspectives.

Classifications of disasters

Disasters can be distinguished into *natural* and *technological* (Baum, Fleming, & Davidson, 1983), the former resulting from natural forces interacting with human beings, the latter deriving from the failure of human hand or human made products (Weisæth, Knudsen, & Tønnessen, 2002). As the demarcation line between natural and man-made disasters is getting more and more blurred, disasters result in hybrid forms (Smith, 1992): the *quasi-natural* disasters, which occur when the effects of physical agents are exacerbated by anthropogenic actions (e.g. the frequency or intensity of flooding increased by deforestation), and the *natural-technological* disasters – '*na-tech*' shortly – taking place when natural forces trigger technological failures (e.g. a petroleum pipeline rupture set off by an earthquake).

Figure 6 – Disaster classification

NATURAL DISASTERS:	TECHNOLOGICAL DISASTERS:
- Geophysical: earthquakes, volcanoes, mass movements (dry); - Meteorological: Storms, tropical cyclones; - Hydrological: floods, mass movements (wet) ; - Climatological: extreme temperatures, droughts, wildfires; - Biological: epidemics, insect infestations, animal stampedes. Guha-Sapir, Vos, Below, & Ponserre, 2011	- Transport systems (air crashes, large scale road accidents, train derailments and collisions, passenger ships and other maritime catastrophes); - Collapse of man-made constructions; - Large fires of all sorts; - Technological and toxic (nuclear power plant accidents, leakage of hazardous substances from waste disposal etc.). Weisæth, Knudsen, & Tønnessen, 2002

[3] A seismic hazard threats the city of San Francisco. The potential losses in terms of people, infrastructures and income are the risk to which the Californian city is exposed; the actual losses will depend on the magnitude of the event that will occur, on the local preparedness to cope with it and on the effective response that will take place. When a major earthquake will strike in the region, a crisis will endanger local communities, requiring collective reactions to limit damages and re-establish normal conditions of life.

The attention of the current study will be centered on natural climatological, hydro-meteorological and geophysical disasters, which are not generated by human action nor are under human control; the reason for the choice lies in the commonalities in the human counter measures of mitigation, preparedness, response and recovery required by this category of events. Moreover, only disasters directly impacting communities will be taken into consideration. In fact, disastrous events may also happen in unpopulated regions of the earth (e.g. pipeline accidents or plane-crashes in deserted areas), but different planning and management activities may be required.

Disaster taxonomy differentiates between *rapid* or *slow onset* events, depending on the duration of a disaster occurrence (Berren, Ghertner, & Beigel, 1980). *Sudden impact* - or *rapid onset* - disasters take place in a matter of seconds, minutes or hours, as it is for earthquakes, tornadoes, landslides and tropical cyclones, while *slow-onset* - or *creeping* - disasters occur in weeks, months, years or even centuries, as it happens for volcanic eruptions, droughts, certain types of mass movements and soil erosions (Alexander, 1993).

The impacts of disasters accounted for in this research, are both *physical* and *social*; the former are the concrete damages, destructions and loss of properties, while the latter are the psychosocial, political, economic and demographic consequences for social units (e.g. individuals, households, businesses) deriving from the hazardous agents (Lindell & Prater, 2003).

Finally, disasters can be also categorized according to their:

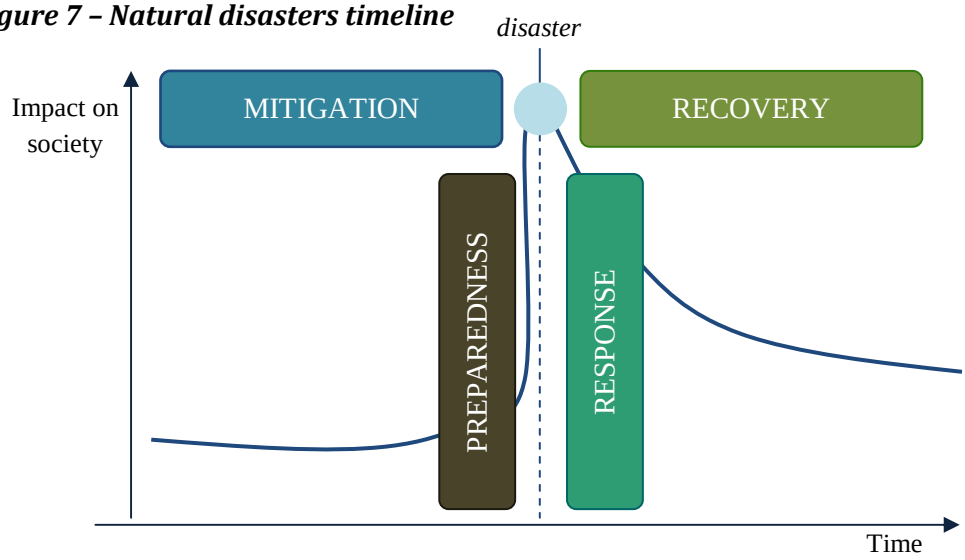
- low or high *potential for re-occurrence* (e.g. volcanic eruptions are unlikely to come from extinct volcanoes while earthquakes are likely events in seismic areas);
- *controllability* (ADPC, 2004), depending on the extent to which disasters can be forecasted by means of their observable precursors (e.g. while it is not possible to reliably predict with sufficient anticipation location, time and intensity of tornadoes, modern technology allows for timely and quite precise hurricane forecasts).

Theoretical framework

Criteria for good disaster planning and management

Current thinking and prevailing governmental approaches define four continuous and integrated phases of disaster management, as in *Figure 7*: mitigation, preparedness, response, and recovery (FEMA, 2012). In order, *mitigation* refers to the long term activities taken for minimizing the probability of occurrence and/or the effects of disasters while simultaneously maximizing public safety (Department of Homeland Security, 2009); *preparedness* indicates the measures adopted to prepare for, immediately respond to and initially recover from disasters; *response* begins immediately before and during a disaster occurrence and denotes the time-sensitive activities aimed at addressing disasters' short term effects (Peterson & Perry, 1999); *recovery*, to conclude, is the long term action intended to reconstruct the infrastructure of the impacted community and restore its normal socio-economic status (Michigan EMD, 1998).

Figure 7 – Natural disasters timeline

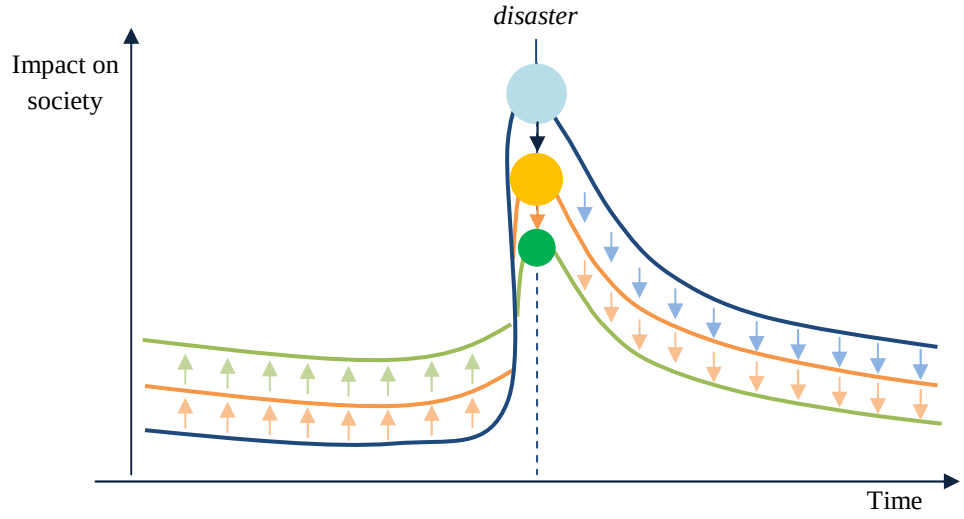


(Bresch et al., 2011)

Figure 7 represents the lifecycle of a natural disaster, plotting its impact on society over time; the area below the lifecycle curve represents the damages produced by natural disasters to communities, in social, economic and environmental terms.

As shown in *Figure 8*, an effective disaster management will seek to reduce this area by investing more resources in mitigation measures, lowering the impact of disasters by the time of their occurrence and accelerating the recovery process[4]. Investments in mitigation, preparedness, response and recovery should be realized up to the point they are cost-effective, and be replaced, after this point, by the recourse to financial instruments of risk management: for example, it may not be cost-effective to invest resources in seawalls to protect coastal areas from 1-in-100 years tsunami events, but it would be appropriate to transfer the risk of a tsunami devastation to specialized financial institutions (Bresch et al., 2011) - e.g. insurance companies, banks.

Figure 8 – The goal of disaster management



(Bresch et al., 2011)

While the four phases of disaster management are intertwined and significantly overlap over time, other two related but very distinct processes can be recognized: the one of planning and the other of managing. In fact, disaster management is the discipline dealing with risk and risk avoidance (Haddow, Bullock, & Coppola, 2008) and it distinguishes planning activities from managing ones. Planning means producing general strategies to be adopted when community disasters will occur; managing signifies applying the concrete tactics required by contingencies. The distinction derives from the ancient Greek military world, where the term "στρατηγός" (strategós), literally meant "general in command of an army"

[4] Optimal disaster management activities will gradually move the disaster lifecycle curve from the blue line to the orange one, first, and to the green optimal one, ultimately. Additional financial measures could lower even more the peak of the green curve. As a result, less harmful natural phenomena would occur and disasters and catastrophes would be avoided.

(Evered, 1983): military strategy was applied to business contexts beginning with Socrates[5] (Bracker, 1980), back in the 5th century B.C., as he believed that both businessmen and generals needed to plan and manage the use of their limited resources in order to reach their desidered goals; moreover, it was reckoned that the conflict of human interests taking place in commercial exchanges reproduced the antagonism of major interest clashing in wars (McNeilly, 2012). When preparing for being successful in a war, a strategós had to formulate general strategies based on previous experiences, scenario analyses and personal expectations; nevertheless, no matter how good his plans were, when directly facing the conflict, specific unexpected contingencies would have emerged and concrete unforeseen actions would have needed to be performed; at this point, the strategós' ability consisted in inferring specific tactics from the general strategies he had previously developed.

Very similarly, coping successfully with disasters requires good planning and managing activities, separately formulated, strictly linked to each other and inherently sequential. As illustrated in *Figure 9*, during the planning process, general strategies to cope with potential disasters are formulated; disaster research is used to the extent it helps to deduce multiple tactical suggestions. When disasters occur, the general (planned) strategies are adjusted for the concrete situation and applied as case-specific tactics. By the end of the disaster crisis, the lessons learned are integrated in the next planning process and systematically analyzed in new disaster research.

Disaster studies evidence that poor plans - i.e. superficial, agent specific, unrealistic, unintelligible and/or over articulated - will most likely result in poor management activities (Quarantelli, 1988); likewise, failures in recognizing the distinction between the processes of planning and managing, will probably produce inefficient reactions to disasters.

[5] Xenophon reports the conversation between the Greek philosofer Socrates and the soldier Nichomachides. After Nichomachides failed to be elected General (strategós) against the other candidate - the businessman Antisthenes - Socrates explained the reasons of Nichomachides' lack of success by illustrating the similarities between a good businessman and a good commander: by effectively using the resources they own, the two professionals are similar in the way they both struggle to get advantages over their counter-parts.

Figure 9 - The planning – managing circle

Representation of the concepts presented in Quarantelli (1988)

In 1989, in the light of the devastiting impacts of natural disasters on people, resources and environments, the General Assembly of the United Nations declared the International Decades for Natural Disaster Reduction starting on January 1st, 1990. The initiative was aimed at establishing an international platform of dialogue, opinion sharing, cooperation and policy definition for reducing disaster losses. In 1994, in Yokohama (Japan) was held the first world Conference on Natural Disaster Reduction, concluded with the adoption of some inspirational strategic guidelines to reduce the impacts of natural phenomena on societies[6]. Following, in 2005, a second world Conference on Natural Disaster Reduction took place in Kobe (Japan) and an updated version of the previous strategic guidelines was approved: the so-called Hyogo Framework[7]. The framework proposes five guidelines to increase the resilience of nations to natural disasters, thus it contains the principles to follow for an ideal disaster preparedness planning (*Figure 10*).

Figure 10 – Priorities for action in disaster preparedness planning

5 CRITERIA FOR DISASTER RISK REDUCTION

1) Prioritize disaster risk reduction at national and local institutional levels;
2) Define, assess and control the possible disaster risks;
3) Spread up the existent knowledge and nurture disaster studies;
4) Lower disaster risk factors;
5) Enhance community preparedness at local and national levels.

(World Conference on Natural Disaster Reduction, 2005)

[6] Yokohama Strategy and Plan of Action for a Safer World, 1995, Yokohama, Japan.

On the other side of disaster management, after working within the Disaster Research Center (DRC) and conducting field studies for more than 30 years, Quarantelli (1997) published his suggested 10 criteria to successfully manage disasters (*Figure 11*), specifically designed for developed countries. In his work, the definition of good principles for disaster management is not ideal and it is rather rooted in the scientific findings of the disaster research conducted by multidisciplinary professionals, mainly within the DRC. It is also recognized that the stated criteria only represent aspirational objectives that social, economic, political, cultural and environmental factors will impede: analogously, to recall a parallel used by the same Quarantelli, it is very well known how to stop the deadly diffusion of AIDS, but it is also known that the existing social, economic, political and cultural limitations will not make it happen.

Figure 11 – Criteria for evaluating disasters management

10 criteria for good disaster management:

1) Differentiate agent-generated needs (specific to the agent) from response-generated demands (common to every emergency response);
2) Properly put into practice generic functions;
3) Efficiently employ the available human resources and physical capital;
4) Appropriately divide labour and delegate tasks;
5) Accurately register and transfer the available information;
6) Opportunely exercise decision-making;
7) Adequately coordinate actors and activities;
8) Integrate new emergent factors with usual ones;
9) Disseminate through the mass media truthful information and data;
10) Have an efficient Emergency Operation Centre in function.

(Drabek, 1986, 1987; Quarantelli, 1988, 1989, 1997; Perry, 1991; Harrald & Wallace, 1992; Dynes 1981, 1993, 1994)

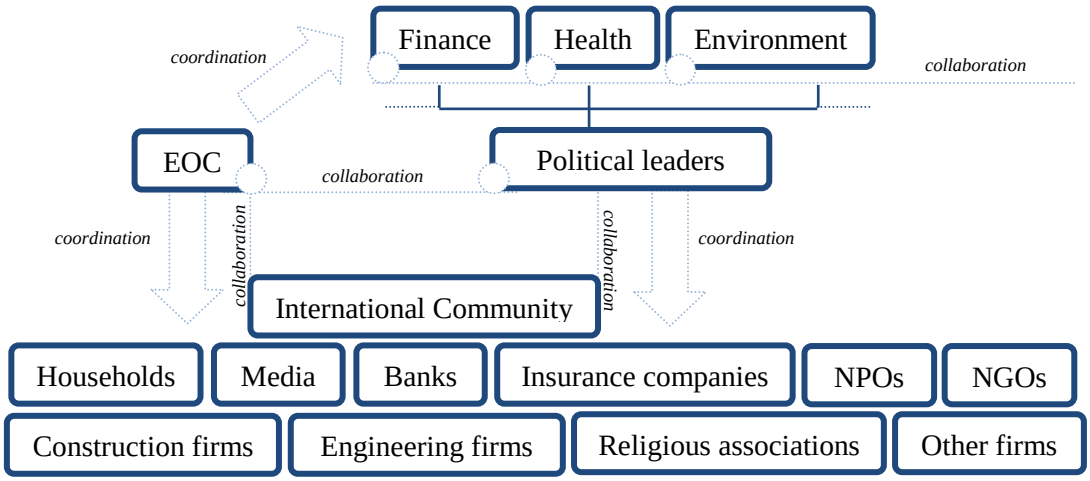
Roles of action

The application of the above reported planning principles - derived from the Hyogo Framework for Action - and management criteria - taken from E.L. Quarantelli's works - is the responsibility of the public sector of each country, in association with private, non-profit and international actors.

[7] Hyogo Framework for Action: 2005- 2015, 2005, Kobe, Japan.

The public sector, composed of political leaders and national, regional and local administrations, is in charge of disaster planning and management, according to its resources and institutional capacity. Public authorities, together with the Emergency Operation Center (EOC)[8] - namely the Country Risk Manager and his/her collaborators - are supposed to adopt a 360-degree approach to reduce disater risk, by framing national, regional and local plans, implementing disaster management measures and coordinating all the involved stakeholders (*Figure 12*). Private actors are social and economic groups of the impacted social and business community, internal and external volunteers and specialized associations professionally dealing with disasters (e.g. insurance companies, environmental associations etc). The public sector should coordinate the whole private stakeholders and connect with them by means of the information it can get from insurers and other organizations specialized in disaster management activities (e.g. medical organizations, construction firms etc.). Finally, the international community is made of the worldwide governments, associations and individuals, typically providing the missing funds when natural disasters strike, especially in developing countries, at low or no costs. The existence of this kind of help, however, is not fully beneficial for the donors nor for the receivers, as it creates disincentives to invest in mitigation and preparedness measures and protracts a condition of inability to efficiently deal with disasters[9] (World Bank, 2010).

Figure 12 - Stakeholder groups and roles of action



(Bresch et al., 2011)

[8] The EOC is the central location that centralizes information while planning and coordinating all emergency operations. There is one in Rome, Tokyo and in every State capital city of the US.

[9] 95% of international funding is invested in recovery rather than in mitigation and preparedness activities (Bresch et al., 2011). However, studies from the World Bank (2010) show that for every US$1 invested in mitigation and/or preparedness, expenses in recovery are diminished of US$7.

Stakeholder approach

Preparing for and coping with natural disasters require an appropriate management of the intricate mix of relationships and connections among disaster actors. Although stakeholder interests have been considered in previous disaster studies (Kunreuther, 1984; Petak, 1985; Siegel, 1985; Jackson & Janssen, 1990; Smillie & Helmich, 1993; Sorenson, 1995; Bruce, Burton, & Egener, 1999; Ulmer, 2001; Pearce, 2003; Heath & Norman, 2004; Wamsler, 2007; Saldaña-Zorrilla, 2008; Bosher, Dainty, Carrillo, Glass, & Price, 2009; Thabrew, Wiek, & Ries, 2009), applications of the stakeholder approach to the public management of disasters have been limited (Tennert & Schroeder, 1999; Mojtahedi & Lan Oo, 2012). In fact, stakeholder theory is explicitly developed for business environments - thus for private sector enterprises - to complement traditional financial criteria with ethical principles (Freeman & Phillips, 1996). As claimed by Freeman (1984), at the base of stakeholder approach is the idea that the long term success of a firm depends on setting objectives that are shared by who's affected or can affect its existence. The implication of such a vision, however, can be fruitful in different settings: not only for-profit businesses, but also public sector organizations, non-profit and non-governmental associations, regulators, politicians and other public authorities are indeed trying to adopt the stakeholder view in order to manage their activities and sustain their long term success (Haarman, Fontaine, & Schmid, 2006). In this research, stakeholder theories are applied to public sector organizations, with the objective to identify the involved disaster actors, evaluate their salience, define their connections and consider their actual and potential involvement in disaster planning and managing activities; therefore, the focal point of the analysis is shifted from private sector enterprises to central governments and emergency managers.

Accoriding to Preston (1990), the essence of the stakeholder concept is discussed for the first time within E. Merrick Dodd's (1932) paper, where it is reported the identification, by General Electric management team, of four stake-holder groups: shareholders, employees, customers and the general public. Similarly, in 1947, one of the three founders of Johnson & Johnson health care company - Robert Wood Johnson - identified four major stakeholder groups within his company: customers, employees, managers and shareholders; from this vision, Johnson & Johnson "Credo Values" eventually developed (Johnson & Johnson, 2013). In the same way, in 1950, Sear's chairman Robert E. Wood denoted in order of

importance “customers, employees, community and stockholders” as the “four parties to any business” (Worthy, 1984: 64). Beyond these first isolated attempts to identify a company’s stakeholders, a formal introduction of the stakeholder theory is reckoned to happen in 1963 (Freeman & Reed, 1983); by that time, indeed, at the Stanford Research Institute (SRI) was advised that a company’s success relied on the oppurtune balance of all stakeholders’ interests rather than on the solely favouritism of stockholders’ claims. Stakeholder theory came into fashion in 1984, when R. Edward Freeman published his seminal book, building on SRI definition of stakeholders. According to professor Freeman, the dominant focus of companies on efficiency and effectiveness issues, needed to be integrated in an innovative strategic management framework, in which the interests of “any group or individual who can affect or is affected by the achievement of the organization’s objectives” (Freeman & Phillips, 1996: 73) - the so defined *stakeholders* - are balanced. Stakeholder theory overcame the previous emphasis on shareholders’ enrichment, the profit-oriented traditional managerial approach for which the “business of business is business” (Davis, 2005) - as made famous by Milton Friedman - and moved to an innovative managerial vision for which the “business of business is people” (Kelleher, 2008). Accordingly, the Kantian categorical imperative is applied by the supporters of stakeholder theory: those who hold stakes in a company are not *means* for the maximization of shareholders' profits, but they rather are *ends* themselves. Indeed, stakeholders are “those groups who are vital to the survival and success of the organization” (Freeman, 2004: 42).

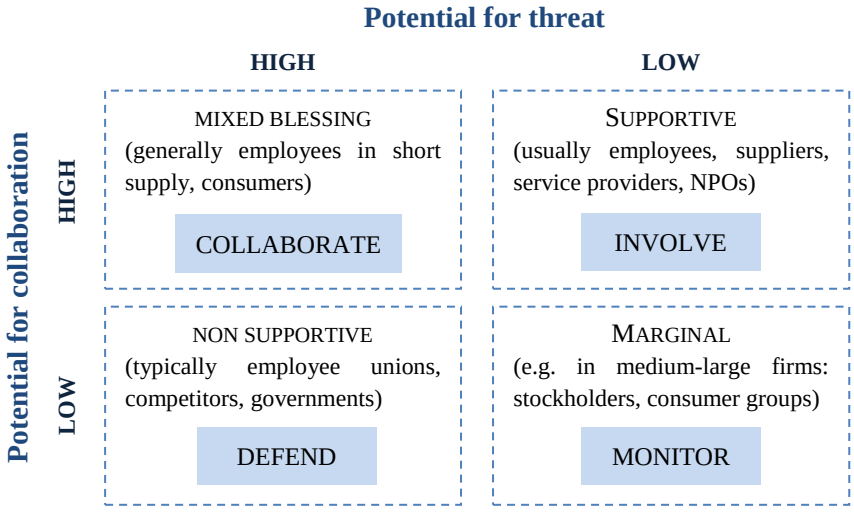
Since 1984, a myriad of studies on stakeholder management has been conducted within three research strands: the descriptive/empirical research, the normative research and the instrumental research. The descriptive research stream reports how stakeholders are actually managed within firms; normative research investigates how organization should desirably manage their stakeholders; and last, instrumental research examines linkages between stakeholder management and corporate objectives to achieve (Freeman & Phillips, 1996).

In stakeholder Literature, there are both narrow and wide definitions of stakeholders. Narrowly stakeholders are only those groups whose existence is vital for the survival of a company, namely stockolders, employees, suppliers, customers and the local community (Freeman, 2004). Broadly, a stakeholder is anyone affected by and affecting business objectives, id est, in addition to the

previous list, "trade union representatives, trade associations of suppliers and distributors, NGOs, governments, regulators, policymakers, financiers other than stockholder, business partners, academics, future and past generations, the media, the public in general, the natural environment" (Friedman & Miles, 2006:14), and even those who can endanger the firm, as competitors or terrorists (Phillips, 1997). Similarly, widespread in stakeholder Literature is the differentiation between primary and secondary stakeholders. Primary stakeholders are linked to a firm by "formal, official or contractual" (Savage, Nix, Whitehead, & Blair, 1991:62) ties and have direct economic impacts on its operations. Differently, secondary stakeholders are not involved in a firm's economic activity in a direct manner nor are vital for its existence, but can affect or be affected by its operations (Clarkson, 1995).

A dynamic theory for stakeholder identification and analysis is proposed by Savage et al. (1991) who classify stakeholders according to their "capacity, opportunity and willingness" (Savage, Nix, Whitehead, & Blair, 1991: 63) to be source of danger or collaboration for an organization. In line with Savage et al.'s (1991) theory of stakeholder salience and engagement, also used in this research, stakeholders should be categorized in four groups - supportive, marginal, non-supportive and mixed-blessing - and their interests should be managed accordingly (*Figure 13*). As the defined categorizations may evolve over time and depend on the issues considered, the framework provides a flexible and dynamic perspective to analyze a company's stakeholders.

Figure 13 – Stakeholder classification and related managerial strategies



(Savage, Nix, Whitehead, & Blair, 1991)

The potential for threat is function of the relative power of a group of actors and of their relevance to a given issue. The higher a company dependence is on a group of actors, the more is the power this group of stakeholders has. In this sense, clients, difficult to find employees, labor unions, competitors and govenments are examples of powerful stakeholder groups and, depending on the issues a company is facing, they may represent a relevant source of threat. Collaborative or defensive strategies should be adopted to approach them. In addition, organizations should also consider the potential for collaboration coming from stakeholders, as it could be used to generate positive sinergies.

Before applying the above framework to the public settings of the current research, a fundamental clarification is needed. Surely, central actors of the stakeholder analysis of this dissertation are not private organizations, but central governments and emergency managers. This choice conflicts with the prevailing application of the stakeholder theory in Literature: advocates of the stakeholder theory believe its application is confined to private-sector firms, whose activities, values and objectives are inherently different from public-sector organizations (Scholl, 2001). In fact, among the other differences, public sector organizations generally exist to serve public interests and not for profit maximization (Klein, Mahoney, McGahan, & Pitelis, 2010); moreover, while private companies typically get resources by selling their products and/or services, public organizations are financed by taxes and use their coercive power to enforce their decisions. However, both private and public sector organizations affect and can be affected by different interest groups when pursuing their objectives. Moreover, managing the interests of these groups is critical for both the organizations' survival. Put differently, Freeman's definition of stakeholders can be applied to governmental settings and stakeholder analysis can be extended to public sector organizations (Scholl, 2001).

Methodology:

Research method

In a research project, the research methodology is the overall approach towards a problem (Remenyi et al., 1998; Collis & Hussey, 2009). The current research approaches the objective of defining what is crucial for a national system to reduce natural disaster risks, by analyzing the emergency management stakeholders and comparing the disaster planning and managing practices of Italy, Japan and the US. In detail, to discern between good and bad planning and managing intentions and actions, a model from stakeholder Literature and two major frameworks from disaster Literature are utilized: Savage et al.'s (1991) model of Stakeholders engagement, Hyogo Framework for Action (2005) and Quarantelli's Ten Criteria for Disaster Management (1997). As previously illustrated in the Theoretical Framework section, in 1991 Savage et al. proposed a model to analyze an organization's stakeholders and define how to advantageously approach them. Quite differently, the Hyogo Framework for Action was undersigned in 2005 by the United Nation General Assembly and it outlines the five strategic goals that communities should pursue in order to perform good disaster planning activities. Finally, Quarantelli's (1997) criteria consist of ten principles to be applied by communities when disasters occur. Within the current research, first, Hyogo requirements are used to critically evaluate the planning capacity of Italy, Japan and the US prior to three disasters selected from their recent histories. Afterwards, Quarantelli's ten criteria are referred to as ideal principles for effective disaster management. Finally, Savage et al.'s model is used to categorize the involved stakeholders and define which strategic approach central governments and emergency managers should desirably adopt in order to manage them.

Sample selection

The choice of analyzing Italy, Japan and the US is not random. In reality, the three countries have been chosen because they all are highly exposed to natural hazards; furthermore, in the last 20 years, they all suffered very high costs, in absolute terms, due to natural disasters; and finally, according to Banks and Textor's (1963) classification, they all have large populations, developed economies, westernized politics and modern advanced mass media. The mentioned environmental, social, economic, political and cultural similarities offer the possibility to draw a case comparison among the disaster planning and managerial

practices implemented in recent times by the Italian, Japanese and American Emergency Systems. As a consequence, the results of this research are applicable at least to the analyzed countries, with possibilities of extension to similar western societies; relevance for developing countries is uncertain and not explored within the scope of this research.

Three events per country are selected, one from the 1990s (the Piedmont Flood for Italy, the Kobe Earthquake for Japan and the Northridge Earthquake for the US) and two from the 2000s. In this way, the resulting sample not only allows for cross country comparisons, but also highlights the progress realized by each country in reducing disaster risk over the last two decades. Moreover, in the selection of the sample cases a catastrophe per country is included (the L'Aquila Earthquake for Italy, the Tohoku Earthquake for Japan and Hurricane Katrina for the US), in order to evidence which were the major deficiencies in the planning and/or management processes for the "disaster beyond the typical disaster" (Quarantelli, 2006) to occur. Finally the sample includes a very recent event per country (the Emilia Earthquake for Italy, the Kumamoto and Oita General Flood for Japan and Hurricane Sandy for the US), in order to evaluate which lessons each country learned from its previous experiences and what are its present abilities to prepare for and deal with natural agents.

Data collection

In order to identify each country emergency management stakeholders and assess their performances on Hyogo requirements and Quarantelli's criteria, both qualitative and quantitative data are used. Specifically, quantitative data is taken from national Italian, Japanese and American databases, independent observatories and research centers, and it consists of the numerical specificities describing each disaster (fatalities, causalities, injuries, number of involved organizations etc.). Qualitative data, differently, is used to analyze in-depth the selected events, their premises, consequences and protagonists, and to link them with the national planning and managing activities - both intended and implemented. Qualitative data was always taken from reliable sources, namely academic papers, governmental reports, scientific publications, journal articles, companies' reports and radio interviews, as specified in the reference list.

Research design

To reach the objectives of defining good and bad disaster planning and managing practices and exploring roles and relationships of emergency management stakeholders, the comparative case study is chosen. By definition, the case study is "a detailed investigation, often with data collected over a period of time, of phenomena, within their context" (Cassell & Symon, 2004: 323). Accordingly, this research investigates the disaster planning and management abilities and the emergency management stakeholders of Italy, Japan and the US, using data about events happened in the last two decades. For the research to be feasible, boundaries are placed in terms of time and place (Creswell, 2003): the unit of analysis only consists of nine events - three per country - occurred in the last two decades in Italy, Japan and the US.

The selected research strategy is particularly appropriate because:

- **IT SATISFIES YIN (2003) CONDITIONS FOR SELECTING THE CASE STUDY**

According to Yin (2003), firstly the case study design is to be considered when the research questions are of a "how" and "why" nature. In the case of this research, how and why questions prevail: 1. How do countries prepare for and cope with natural disasters? 2. Why natural phenomena of equal magnitude lead to different levels of devastation across countries? 3. Who are the emergency management stakeholders? How should they be managed? 4. How can nations successfully manage natural phenomena, thereby reducing their risk of incurring in major disasters? 5. What lessons can be learnt from the analyzed cases? To what extent can they be generalized beyond the research sample?

Secondly, the case study design fits with studies in which the behaviors of those involved are not modifiable or controllable by the researchers. The unit of analysis of the current research, in fact, are behaviors undertaken during events of the recent past. As they already occurred, the researcher has no possibility of controlling or manipulating them.

Thirdly, case studies typically relates to research projects in which contextual conditions are relevant to study the phenomenon under analysis. In the case of this research, context and phenomena are strictly intertwined. Who are the emergency management stakeholders, what their roles are and how national emergency policies are planned and implemented all result from the political, economic, environmental and social factors typical of the Italian, Japanese and American contexts.

Lastly, the case study suits research studies focusing on contemporary events and problems. This research, consonantly, focuses on the Italian, Japanese and American emergency management stakeholders and on the planning and managing activities implemented in Italy, Japan and the US during the last twenty years; the issues debated in this thesis, moreover, are contemporary as, in current times, they still are source of concern for nations.

- **IT ALLOWS THE ADOPTION OF DIFFERENT RESEARCH TECHNIQUES**

Multiple data sources can be used to build a case study (Patton, 1990; Yin, 2003). Among the possible data sources both qualitative and quantitative data can be included; documentations, archival records, direct observations and physical artifacts can all be used in the research process of data collection (Yin, 2003). For this research, quantitative data is used to describe the specificities of the natural occurrences, while qualitative data, especially in the form of documentations and archival records, is used to analyze in-depth the realized planning and managing activities as well as the involved emergency management stakeholders.

- **IT FAVORS THE COMPARISON BETWEEN DIFFERENT EVENTS**

Among the different types of case studies, there is the multiple - or comparative - case study (Baxter & Jack, 2008). The comparative case study is appropriate for the objective of this research, as it permits to compare the different Italian, Japanese and American cases both in precise periods, in their evolution and in their totality. As a result, under the common framework provided by Hyogo requirements, Quarantelli's criteria and Savage et al.'s model, the comparative case study allows for the confrontation between the countries' planning or managing systems in specific time periods; it permits to observe whether a country's emergency management system has been worse/equally efficient/superior comparing to the ones of the other examined countries; it gives the possibility to see how disaster management improved in a country over the years; and, finally, it leaves space to speculate on the current capabilities of a country to deal with natural disasters.

Comparative case study

This section of the dissertation applies the frameworks outlined in the theoretical section to the selected Italian, Japanese and American cases of natural disasters. For the comparison to make sense, first, the profiles of Italy, Japan and the United States are traced: for each country, the physical geographies are defined, the major natural threats are presented and the legislations in vigor are overviewed. Following, Hyogo requirements and Quarantelli's criteria are used to respectively evaluate disaster preparedness and management abilities on the occasion of the selected cases. Finally a stakeholder analysis of the countries' emergency actors is performed and the way stakeholders' interests were - and should have been - managed is discussed.

Country profile: Italy

The Italian peninsula is extended in the Mediterranean Sea and comprehends two big islands in its territory: Sicily and Sardinia. Big part of the country is surrounded by sea (7,375 km of coastline); the majority of population (48.4%) lives where the land is flat (23.2% of total territory), less people (39.1%) resides in hilly territories (41.6% of total territory), and only few (12.5%) populate mountainous lands (35.2% of total territory)[10].

Italy is overhung by relevant geophysical and hydrological natural hazards: large part of the national territory is exposed to earthquakes, volcanic eruptions, landslides, mudflows, avalanches and flooding (CIA, 2013). Nearly 90% of Italian cities are exposed to hydrological hazards (ANCE / CRESME, 2012), over 60% of municipalities are in seismic zones and around 2 million people live under high risk of volcanic eruptions (Cineas, 2005). Every year, in Italy, an average of 839 people are killed by natural disasters, other 21,511 are affected by them, and an economic damage of US$ 1,926,986,000 is produced (UNISDR , 2011a). The most frequent, costly and deadly natural disasters are, by far, floods and earthquakes, while mass movements, extreme temperatures, storms and drought less frequently degenerate into disastrous events.

Located where the African plate converges with the Eurasian one and dives under it, above all, Italy faces a high seismic risk (*Figure 14*): it is exposed to frequent and medium-intensity earthquakes (5.5 - 7.5 events in the Richter Magnitude Scale); its cultural and historical heritage and the dated, fragile and low quality infrastructure are not adequate to resist earthquakes; the population density and the concentration of wealth in seismic prone regions are quite high[11].

Figure 14 - Seismic risk assessment

(Italian Civil Protection Department, 2013)

Italy's intense seismic and volcanic activity is documented by numerous written records, dated as back as 461 BC (Comeci, Fumanti, Signorino, & Mauro, 2006):

[10] (Central Intelligence Agency, 2013)

[11] ANCE and CRESME estimated that 30% of the national production facilities and 35% of Italian commercial buildings are located in zones under high seismic threat (ANCE / CRESME, 2012).

in the last 2500 years, more than 30,000 earthquakes above magnitude 4.5 on the Richter Scale have rattled Italy and, only in the 20th century, 7 earthquakes have had a magnitude above 6.5 on the Richter Scale (Italian Civil Protection Department, 2013). Since 2003, with the Decree of the Prime Minister n.3274/03, the Italian territory has been classified into 4 zones, according to their seismic risk: the highest seismicity is in the Central-Southern part of the peninsula - along the Apennines, in Calabria and Sicily - and in some Northern areas - in Friuli and Veneto. The classification should be used to enforce safer building codes for new constructions and to encourage proper retrofitting, but major obstacles are the overwhelming Italian building speculation and the low standard of execution and maintenance of national constructions[12].

Earthquakes are not the only risk coming from Plate Tectonic dynamics: tsunamis and volcanic eruptions, in fact, are also concrete threats to which the Italian territory is exposed, especially in the Southern regions - namely Calabria, Campania, Basilicata, Puglia and Sicily. With the current technologies, however, volcanic eruptions are foreseeable phenomena and significant prevention measures can be taken to contain causalities and deaths. Conversely, tsunamis are less predictable events, as they may be originated by volcanic eruptions, submarine landslides or strong earthquakes with epicenter in the sea; as a consequence, tsunamis risk reduction requires fast and sophisticated warning systems - of which Italy is well equipped - combined with high community awareness and preparedness - over which, instead, more attention need to be addressed.

Concluding, every year in Italy meteorological and hydrological hazards cause considerable economic damages and kill and affect many people. Evenly spread over the national territory and dependent on the geomorphologic aspect of the national land - with a young orography and uplifting mountain ranges - the most common hydrological instabilities are landslides, floods, avalanches, mudflows and land subsidence, while the most typical meteorological phenomena are storms, heat waves, fogs and snowfalls. These hazards are natural in origin, but they have been heavily worsened by the uncontrolled human action: illegal house building, undisciplined urbanization, neglected river maintenance and imprudent

[12] 62% of Italian infrastructure has more than 40 years and it has been subjected to little or improper maintenance, according to current security standards (Stella, 2013).

deforestation have eventually increased the loss of property and life caused by hydro-meteorological events. Beginning in 1989, the Soil and Water Conservation Act - Law n.183/89 - required each local administration to work on the elaboration of an Hydrological Plan of Basin (PAI), a document assessing the hydrological hazards endangering local communities and presenting the compulsory measures to adopt for reducing disaster risk; however, not only the administrative authorities have not rigorously enforced the national discipline against hydro-meteorological events, but also it is still highly necessary to increase the population consciousness on the overwhelming risks, possible mitigation measures and ideal response behaviors.

Country profile: Japan

Positioned in the Eastern coast of Asia, the Japanese territory is made of four main islands - Honshu, Hokkaido, Shikoku, and Kyushu – and around 6,800 small islands (Alterman, 2001). On all sides, Japan is surrounded by sea[13], three fourths of its terrain are predominantly mountainous and the habitable area is scarce (Schreurs & Imura, 2005). The population of 127,253,075 inhabitants is concentrated in urban areas[14] and the density of 327 inhabitants per km^2 (MLIT, 2007) is one of the highest in the world (CIA, 2013).

Due to geophysical and meteorological conditions, Japan faces a high risk of experiencing earthquakes, volcanic eruptions, tsunamis and typhoons: every year, since 1980, natural disasters have killed an average of 276 people, affected 108,451 people and produced economic damages of US$ 6,717,123,000 (UNISDR, 2011b). However, because of the high costs of private insurances and the typical human underestimation of low-probability-high-risk events (Kunreuther, 1984), only 17% of Japanese has private insurances, while the remaining 83% relies on the governmental coverage system (Schoen, 2011).

Even though Japan occupies only 0.25% of the world area, its seismic and volcanic activities are amongst the globally most intense: 20.5% of the world earthquakes above magnitude 6.0 takes place in Japan (Director General for Disaster Management, 2011); also, about 50% of the worldwide tsunamis happens in the country (Bressan, 2011) and as many as 7% of the planetary active volcanoes are Japanese. The numerous episodes of volcanism and the frequent intense inland and submarine earthquakes are acknowledged to derive from the morphological conformation of the land; in fact, Japan, not only sits along the intersection between the Pacific, North American, Philippine and Eurasian Plates (OECD, 2006), but also it is located in the geologically active subduction zone known as Pacific Ring of Fire, where nearly 90% of the world's earthquakes occur and almost 75% of the global active and dormant volcanoes are (Kious & Tilling, 1996). In Japan, every year about 1,000 perceptible earthquakes are recorded, 15 of which above magnitude 6 on the Richter Scale; there are around 15 volcanic eruptions per annum and tsunamis are moderately likely to occurr

[13] Japanese coastline is 29,751 km long, almost four times bigger than, for example, the Italian coastline of 7,600 km, even though the land area of the two nations is approximately the same – Italy: 301,340 km^2 and Japan: 377,915 km^2 (CIA, 2013).

[14] In 2010, the urban population was 67% of total population (CIA, 2013).

along coastal areas (JMA, 2012). Moreover, the typically high population density creates high potential for damage to people and wealth. For being so prone and exposed to earthquakes, volcanic eruptions and tsunamis, in the World Risk Index Report (2012) computed by the UN University Institute for Environment and Human Security - in Bonn, Germany - Japan ranks four out of 173 analyzed countries: Japan is one of the riskiest countries in the world, under a natural hazard perspective. However, by reason of its low infrastructure vulnerability as well as its sophisticated coping capacities, the country manages to significantly reduce its natural risks. In particular, since 1961, the Disaster Countermeasure Basic Act[15] has introduced an extensive and strategic approach to disaster management, imposing mitigation, preparedness, response and recovery measures that position Japan at the forefront of setting risk reduction - anti-seismic in particular - standards (Dusi, 2009). Subsequently, several international platform of cooperation and information sharing have been created with the involvement of Japan, for the objective of learning from Japanese avantgard important lessons of disaster risk reduction (e.g. the Japanese-South African collaborative projects going on since 1991[16]; the US-Japan numerous collaboration began in 1996[17]; the Japan-Turkey joint studies on earthquake engineering conducted since the 1980s[18]).

Equally capable of great devastation, typhoons are another category of natural phenomena occurring in Japan from May to October and peaking between July and September. While in the US they are identified by person's proper names and referred to as *hurricanes*, in Japan the same tropical cyclones are called typhoons and identified by numbers, indicative of their order of occurrence thoughout the year. Typhoons pose under high risk Japanese coastlines and may also trigger landslides and flooding. In the period between 1951 and 2007, an average of 5.6 typhoons per year approached the coasts of Japan, resulting in 14,659 deaths, 73 680 injuries and US$ 10 million damages (Grossman & Zaiki, 2009). Even though it is still under discussion the influence of climate change on tropical cyclones' destructiveness (Emanuel, 2005, Webster et al., 2005), it is undebated the human irresponsibility in placing increasingly human and physical resources in typhoon

[15] Law No. 226/1961.

[16] Durrheim & Ogasawara, 2009.

[17] US-Japan Earthquake Policy Symposium Observer Panel, 1997.

[18] Henkel, 2011.

prone regions (Baker, 2012). Thanks to the knowledge of the Japanese scientific community and the technologies of the Meteorological Agency (JMA), it is possible to predict and monitor typhoons; people are trained on what behaviors they should ideally adopt; indication on how to switch off manmade technologies are largely spread up and recontruction activities are tempestively started and orderly organized. However, some parts of the population - especially elderly citizens - still struggle to be integrated in the emergency management system and measures to overcome this issue need to be adopted.

Country profile: the United States of America

The United States of America are the third largest country in the world, after Russia and Canada, and the third most populous, after China and India. Divided in 48 States plus Alaska, Hawaii and the Federal District of Washington, the US cover six time zones with very different climates, from the polar of Alaska to the tropical of Hawaii and Florida. US terrain is mainly mountanious westward and hilly eastward, with vast plains in the center (CIA, 2013). The population of 311,591,917 Americans owns the highest GDP in the world (The World Bank, 2012) and it's highly concentrated in urban areas (80.7 %).

Given the vast size of the country and the very diverse geomorphological and meterological features, the US are subjected to manifold natural hazards: hurricanes, tornadoes, volcanic eruoptions, tsunamis, earthquakes, mudslides, floods and forest fires are amongst the most frequent and intense ones, causing approximately US$ 17,557,645,000 losses every year (UNISDR, 2011c); in particular, hurricanes, earthquakes, and floods produce 75% of the national damages (Van Der Vink, 2012), while extreme heat, hurricanes and tornadoes are the deadliest natural hazards (NOAA, 2013).

Seismicity is particularly high on the West Coast, but the earthquake risk is moderate also in other States throughout the US, posing under noticeable risk 75 million people in 39 States (USGS, 2006); specifically, earthquakes have high chances of occurring in California[19] and Alaska - as they lie where the Pacific Plate slides on the North American Plate - and Hawaii, the achipelago in the Pacific Ocean formed by volcanic activity. Every year an average of 1,400,000 earthquakes shake the US and about 10,000 of them hit Southern California, mainly without being perceived by human senses (U.S. Department of the Interior, 2012). In California, approximately 70% of population lives in proximity of fault lines highly likely to provoke intense earthquakes in the next 50 years and around 40% of local businesses is expected to experience medium-high devastations (Sherrouse, Hester, & Wein, 2008). In Alaska, on the other side, numerous earthquakes occur every year[20], but the low population density makes the country less exposed to big economic and life losses (Folger, 2011).

[19] Scientific estimations value California earthquake risk equal to two-thirds of the US overall seismic risk (CEA, 2012).

[20] In Alaska, approximately 1,000 earthquakes are registered each month and a 7-8 magnitude earthquake tends to happen every year (DGGS, 2010).

As they are surrounded by the ocean and over an hotspot - Hawaii - or on top of one of the most active plate boundary in the world - California and Alaska - the earthquake risk is strinctly associated with tsunamis' threats and a vivid volcanic activity: in the last century, over 200 eathquake-generated tsunamis have killed more than 500 people in the US (Bernard, Maier, McCreery, McLean, Rhoades, & Whitmore, 2008); also, since 1980, over the approximately 170 American active volcanoes, about 30 of them have produced 95 episodes of eruption (Diefenbach, Guffanti, & Ewert, 2009). To deal with the high risks generated by natural forces, in 1988 the Stafford Act[21] was promulgated and adopted at a federal level; the legislation provided a first comprehensive framework for disaster management and it instituted the Federal Emergency Management Agency (FEMA), the American authority responsible for mitigation, prepraredness, response and recovery activities; since then, the federal territory has been periodically classified according to its probability of experiencing earthquakes, volcanic eruptions and tsunamis and, subsequently, building codes and safety measures have been enforced.

Earthqueks, volcanoes and tsunamis are not the only source of concern in the US. In fact, the deadliest and most frequent natural hazards belong to the category of meteorological events and are tornadoes, hurricanes and heat waves: in the US, each of these phenomena is responsible for more than 100 deaths per year[22] (NOAA, 2013). In American cities, heath waves combined with urban pollution deteriorate air quality and cause numerous deceases, especially among elderly, infants, overweight and sick people (American Red Cross, 2010). The National Weather Service regularly computes the Heath Index (HI) of each American city, correspondingly signaling the community's threat level, while media and emergency related organizations spread up emergency information and first-aid responses. Besides extreme hot weather, every year almost 1,000 tornadoes hit the US continental plains between March and May (Plumer, 2013) and 6 hurricanes form in the Atlantic Ocean between May and November. Florida and the south-central Tornado Alley, register the highest frequency of tornadoes; while Florida -

[21] Stafford Disaster Relief and Emergency Assistance Act, Public Law 100-707.

[22] Heat waves kill about 175 Americans per year, while the number of annual fatalities from tornadoes and hurricanes - for each phenomenon - averages out to about 109 people (NOAA, 2013).

again - and Texas are the States the most prone to experience strong hurricanes[23] and, consequently, to suffer the biggest human losses and property damages. Advanced forecasting technologies, timely early warnings and diffused population awareness have significantly reduced the fatalities due to metereological events, but outlying phenomena are still highly disatrous (e.g. Hurricane Katrina, Missouri tornado or Hurricane Sandy).

To conclude, a last major class of natural hazards in the US are hydrological events: every year, mudslides and floods cause 85 deaths and US$ 8.22 billion damages (NWS, 2013). Worldwide, the US are ranked fifth for population exposure to coastal flooding, with both Miami and New York among the top ten cities with the most economic resources under flooding threat (Nicholls et al., 2007). Education on geological specificities, possible landslides and flooding, prevention measures to ideally adopt and actions to advisably perform in case of disaster occurrence, contributes to reduce the death toll of hydrological events, but more landslides and flood resistant infrastructures are needed in numerous cities (Jones et al., 2006).

[23] Nine over the ten costliest American hurricanes occurred in Florida and Texas. In the same States also happened 83% of category 4 and 5 hurricanes, the strongest on the Saffir-Simpson Wind Scale (Blake, Rappaport, & Landsea, 2007).

Evaluation of disaster preparedness planning

Table 1 – Application of Hyogo framework

SELECTED DISASTER	HYOGO 1	HYOGO 2	HYOGO 3	HYOGO 4	HYOGO 5
Piedmont Floods	Yes	No	Partial	No	No
L'Aquila Earthquake	Yes	No	Partial	No	No
Emilia Earthquake	Yes	No	Partial	No	Yes
Kobe Earthquake	Yes	No	Yes	No	No
Tohoku Earthquake	Yes	Yes	Yes	Yes	Yes
Kumamoto Flood	Yes	Yes	Yes	Yes	Yes
Northridge	Yes	No	Partial	No	No
Hurricane Katrina	Yes	Yes	Partial	No	Yes
Hurricane Sandy	Yes	Yes	Partial	Yes	Yes

Original table created by the author

STRATEGIC GOAL 1:

PRIORITIZE DISASTER RISK REDUCTION AT NATIONAL AND LOCAL INSTITUTIONAL LEVELS

By the time the selected disasters occurred, in all the three countries a national policy for disaster management was already enforced, providing a legal framework to follow in the circumstance of violent natural events. In chronological order, Japan was first to adopt a system for emergency management[24] (1961), followed by the US[25] (1988) and Italy[26] (1992). The three legislations comprehensively define the planning and management processes to be performed in emergency situations and, by the time the current study is completed, they represent the main legislative reference for disaster management, around which a prolific group of hazard-specific laws has emerged.

According to the Law (*Figure 15*), in Italy and Japan, disaster planning activities are prerogative of the central Government that, backed by technical advices from the scientific community, formulates and enforces national plans for mitigation, preparedness, response and recovery. As soon as disasters strike, the Prime Minister of the countries proclaims the state of emergency and allows decentralized units - prefectural and municipal, in Japan, regional, provincial and

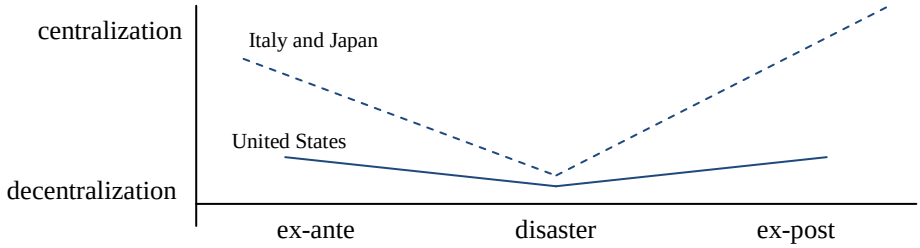
[24] Act No 223 of November 15, 1961: Disaster Countermeasures Basic Act.

[25] Public Law 100-707, 1988: Stafford Disaster Relief and Emergency Assistance Act.

[26] Act No 225 of February 24, 1992: Institution of the National Service of Civil Protection.

municipal, in Italy - to perform with great autonomy their emergency functions, adapted to the practical contingencies. Centralization in decision making is re-established during reconstruction activities. The same dynamics are not possible in the United States, where the amplitude of the territory as well as the hazard variety and the great number of inhabitants obstacle the concentration of decision making at a Federal level. Quite differently, than, each State has its own emergency coordinator, systematically devising plans for local disaster management; in the occurrence of disasters, the President of the United States declares the state of emergency and disaster response activities are begun by the impacted State - and its county and municipal divisions. Decentralization is maintained during the reconstruction, as the highest level of information and knowledge is still at local, rather than federal, level.

Figure 15 - Decision making in disaster planning and management



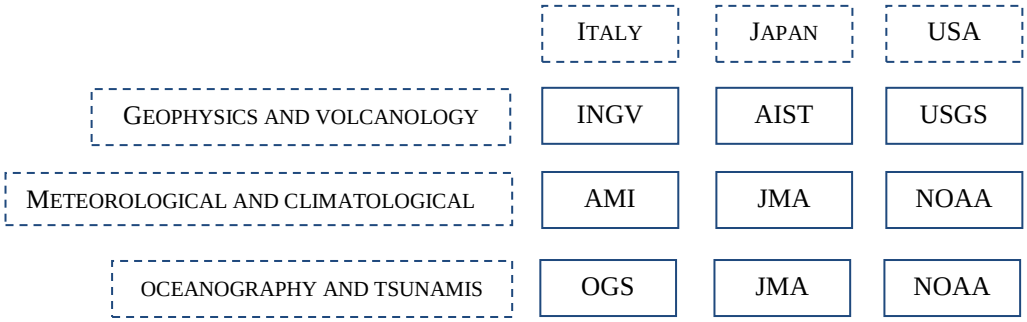
(McLuckie, 1975)

STRATEGIC GOAL 2:

DEFINE, ASSESS AND CONTROL THE POSSIBLE DISASTER RISKS

Since the modern disaster management disciplines came into force, Italy, Japan and the US established research centers specialized in the scientific and technical study of the national most typical hazards: numerous observatories were spread out throughout the whole national territories, with professional personnel gathering, organizing, summarizing, analyzing and interpreting data; central stations were instituted at a national level (*Figure 16*), each focused on one or few natural hazards, for the purpose of monitoring the national situation and having direct contacts with Administrative personalities; last, an integrated system for studying and keeping under control natural phenomena was created by the interaction of local observatories, central stations and administrative authorities.

Figure 16 - Main Authorities for National Data Monitoring



Original graphic created by the author

However, the existence of a national system for disaster monitoring, with interacting observatories and administrations, does not itself guarantee the implementation of good control and warning practices and it only constitutes a starting point. Moreover, the possibility to save lives and limit economic damages by efficiently using the information detected with a monitoring system, strincly depends on the caracteristics of the natural agents themselves: for slow-onset disasters early warnings can be given sufficiently before the event occurrence (e.g. tropical cyclones, flood), while for rapid-onset events detecting the phenomenon is usually possible only few seconds before its arrival (e.g. earthquakes, tornadoes).

Given these premises, an evident unpreparedness characterizes Italy, when it comes to monitor natural hazards and alert the interested communities. During the 1990s and before the Administrative Decentralization Law of 1998[27], the national hydrographic and geologic services had insufficient resources and their scarce personnel was relegated to office functions, intensively conducting research without taking the necessary concrete actions (Zia, 1994). This feeble italian system failed to send alerts to local communities when, in 1994, in Piedmont, some watercorses flooded in several cities, even though the disaster had been forecasted since one month and rains were abundant and continuous since one week (Mattioli, 1994); differently, given the intrinsic impredictable nature of earthquakes, sending early warnings was not possible for L'Aquila 2009 and Emilia 2012 earthquakes. However, penal and moral responsibilities are linked with the failure of the italian disaster management system in its interaction with L'Aquila inhabitants during March and April 2009, prior to the quake. In fact,

[27] Legislative Decree No 112 of March 31, 1998: Administrative Decentralization Law.

with an extraordinary reunion the 31st of March and with several other media interventions, the President and Vice President of the National Service of Civil Protection and disaster specialists of the National Commission for Forecasting and Preventing Major Risks, reassured local communities on the non-dangerousness of the frequent and quite intense seismic swarms of those days: as a consequence, great part of L'Aquila population stopped adopting basic safety measures and, the night of April 6th, decided to not evacuate its buildings, drammatically succumbing under a magnitude 5.9 earthquake.

Very dissimilarly, in Japan and the US, monitoring systems were qualitative limited and imprecise before the respective Kobe and Northridge earthquakes; the consistent death tolls of these two natural disasters, incited both the countries to undertake substantial investments to improve safety maps, monitoring stations, communication facilities and early warnign routines (RMS, 2005). As a result, tropical cyclones are constantly monitored and announced with opportune anticipation through TV, radios and social media; also, earthquake alerts are sent to the population, even by notifications on mobile phones, few seconds before the arrival of the strong ground motions, allowing for the adoption of key safety measures[28].

STRATEGIC GOAL 3:

SPREAD UP THE EXISTENT KNOWLEDGE AND NURTURE SCIENTIFIC STUDIES ON DISASTERS

Capturing, interpreting and modelling risk data is crucial activity in disaster research (Bresch et al., 2011). A country that finances disaster research allows for the evolution of the current knowledge on natural hazards and develops innovative technologies for reducing disaster risk. Italian, Japanese and American practionners are all engaged in in-depth research projects, with single or multiple-hazard perspectives, at national and international levels. Government financing for disaster research varies substantially from country to country and year to year, depending on the economic cycle that the country is facing, the administrative priorities and public opinion pressures for disaster risk reduction. However, on the whole, disaster research is almost equally advanced and prolific in all the three countries (United Nations, 2013).

[28] In 2011, Japanese were informed of the high probability of a strong magnitude earthquake in the northeastern regions; moreover, the Tohoku earthquake was announced to the interested communities 15 seconds before its arrival (Hoshiba et al., 2011).

Quite differntly, the diffusion of the existent disaster knowledge to young generations is non-uniform. As a matter of fact, in Japan, a culture of safety is built by teaching disaster risk subjects in primary, secondary schools and universities (Pham, 2013). In contrast, in Italy and the US, there are no national official requirements for building a culture of disaster awareness at school and only few educational institutions teach about disasters, by their own initiative (D'Angelo, 2012; Schothorst, 2012).

STRATEGIC GOAL 4:

LOWER DISASTER RISK FACTORS

Reducing disaster risk when preparing to natural phenomena requires the implementation of a fourth class of activities, as in the Hyogo Framework for Action. Managing environmental resources, regulating social and economic behaviours, planning land use and enforcing building codes, all belong to this category.

Once again, the three countries, i.e. Italy, Japan and the US, had national regulations for reducing disasters underlying risk factors since the adoption of their National Emergency Management Disciplines[29]. Nonetheless, until the 1990s, more or less in all the analyzed countries, the building infrastructure was old and devoid of retrofitting: the 1994 Northridge (California) earthquake damaged 114,000 buildings that were not quake-resistant, althouth the 1989 Loma Prieta (California) earthquake had already shown the importance of physical resilience; in 1994, in Piedmont (Italy), several rivers flooded affecting 38 cities and completely destroying 2,000 residences (Luino, 1999); and finally in 1995, in Kobe (Japan) 100,000 buildings were totally destroyed and 86.6 % of total deaths occurred under collapsed buildings (Kunii, Akagi, & Kita, 1995). Because of the mentioned devastations, Japan started a prudent urban development, investing in the most advanced quake-resistant technologies while simultaneously prompting the adoption of retrofitting measures for older buildings (Tierney & Goltz, 1997); as a result, the magnitude 9.0 earthquake that shook the Tohoku region (Japan), in 2011, did not cause much physical damage, and it was more the unexpectedly violent tsunami that provoked most of the destruction (Imamura & Anawat, 2012).

Radically different is the pattern followed by Italy, where, still in 2011, 10,700,000 and 2,808,013 buildings are respectively under high seismic and

hydrological risk (ANCE / CRESME, 2012). Moreover, the widespread building abusivism together with the numerous historical non-seismic proof buildings make Italy very vulnerable to natural hazards. In fact, the moderate magnitude 5.9 (L'Aquila 6th April 2009), 6.0 (Emilia 20th May 2012) and 5.8 (Emilia 29th May 2012) recent earthquakes destroyed a lot of historical buildings, industrial facilities, residential buildings, student dormitories, schools and hospitals.

Controversial is, to conclude, the situation of the US. Efficient building codes are adopted and enforced in each member State, but sometimes they do not perform as expected (FEMA, 2011b). Even if the *New Orleans Scenario* was listed among the worse potential disasters threating the US (Steiger & Steiger, 2006), little was done to protect the city from extreme natural events and, in 2005, Hurricane Katrina became the costliest natural disaster in history[30]. From then, additional safety measures were adopted throughout the US and economic incentives were offered for subscriptions of insurance policies and building retrofitting. In 2007, in New York, for example, 132 initiatives were organized within the PlaNYC municipal plan against natural hazards and climate change threats, significantly reducing the physical damages caused by violent hurricanes[31].

STRATEGIC GOAL 5:

ENHANCE COMMUNITY PREPAREDNESS AT LOCAL AND NATIONAL LEVELS

Coping successfully with natural phenomena in the moment they occurr, finally requires the awareness, active involvement and preparation of the whole national community, as well as a clear and well defined plan of action with which everyone is familiar (United Nations, 2005).

In the 1990s, to a certain extent, the three countries all failed to involve the population in the planning phase and, indeed, no evacuation was performed in Italy before the 1994 Piedmiont flooding nor proper safety measures were adopted by local communities when the Kobe and the Northridge earthquakes occurred. Subsequently, the situation evolved in Japan and the US, where the communities exposed to natural hazards started to be trained to adopt safe behaviours on occasion of earthquakes, volcanic eruptions, tsunamis, tropical cyclones, flooding,

[29] 1961 in Japan, 1988 in the US and 1992 in Italy.

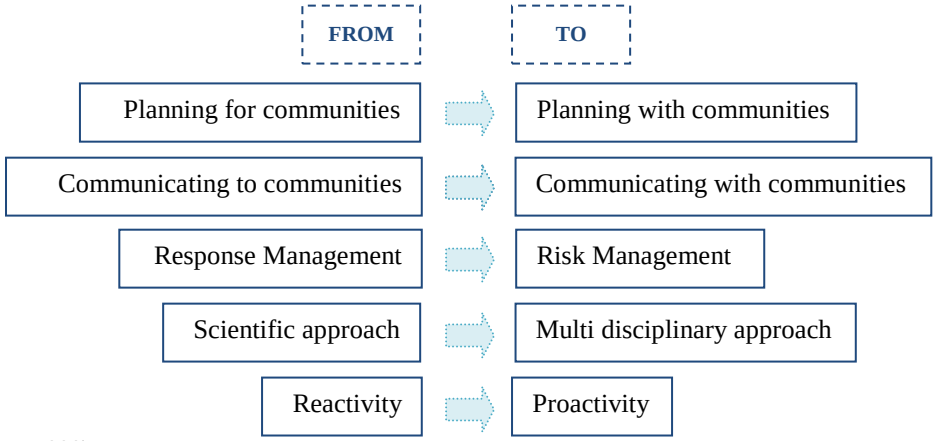
[30] After the 2011 Tohoku earthquake in Japan, it turned to be the second costliest natural disaster on record (Kajitani, Chang, & Tatano, 2013).

[31] It is calculated that, in New York, Sandy destroyed only 281 buildings over the total 76,000 (Furman Center, 2013).

landslides and extreme temperatures. In Italy, community involvement also significantly improved since 1994; however, as already illustrated when discussing strategic goal 2, political and personal interests, corrupted dynamics and superficial behaviors misalign emergency managers and local population, as it happened for L'Aquila earthquake, with avoidable disastrous consequences.

At the present time, Italy, Japan and the US are all evolving towards a community centered disaster planning (*Figure 17*), innovatively making use of the Internet and its social media to prepare, instruct, inform, coordinate and connect with the involved stakeholders (e.g. Twitter is increasingly used to give informations on what is needed by the time disasters occur).

Figure 17 - Shift in disaster planning activities



(Salter, 1998)

Evaluation of disaster management

Table 2 - Application of Quarantelli's criteria

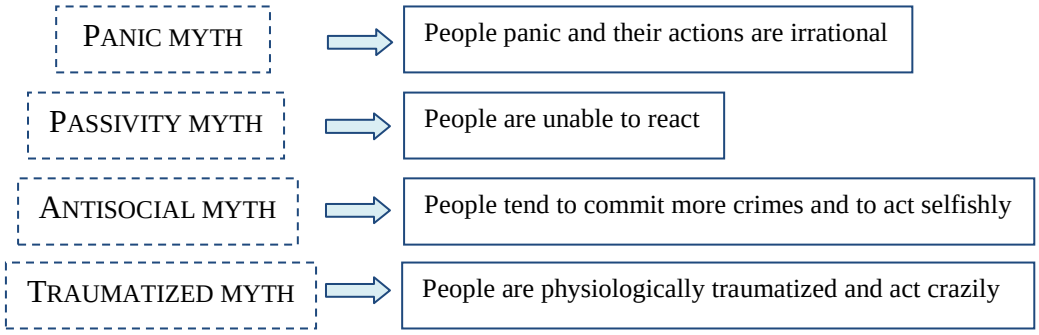
DISASTERS: \ CRITERIA:	1	2	3	4	5	6	7	8	9	10
Piedmont	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes
L'Aquila	Yes	Yes	Yes	Yes	Partial	Partial	Yes	Yes	Yes	Yes
Emilia	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kobe	No	No	No	No	No	No	No	No	No	Yes
Tohoku	Yes	Yes	Yes	Partial	Partial	Yes	Yes	Yes	Partial	Yes
Kumamoto	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Northridge	Yes	Yes	Yes	Yes	Yes	Yes	Partial	Partial	Yes	Yes
Katrina	No	No	No	No	No	No	No	No	No	Yes
Sandy	Yes	Yes	Yes	Yes	Yes	Partial	Yes	Yes	Yes	Yes

Original table created by the author

Planning activities are crucial for a community to be ready to cope with disasters. However it is through the concrete actions adopted when a natural phenomenon actually takes place, that deaths and destruction can be limited. Communities should be aware that, no matter how good their planning was and how safe their anti-hazard measures are, natural phenomena will still cause deaths, physical harm, damage and disruption (Tierney & Goltz, 1997). Good management can significantly contribute to limit those damages and avoid major disasters.

Quarantelli (1997) provides a framework to judge how good the community response to a disaster was. A general consideration, that is applicable to all the analyzed events, is that the widespread expectations of people behaving chaotically, selfishly and irrationally (Wenger, Faupel, & James, 1985) are contradicted; the panic, passivity, antisocial and traumatised myths (*Figure 18*), assuming that people react bad to natural disasters, are denied by the evidence of what communities actually did right after the examined events. For example, in the 24 hours following the Northridge earthquake, only 73 people were arrested in Los Angeles, against the average of 550 arrests per day typical of that times (Quarantelly, 1995); similarly, after the Kobe earthquake massive volunteering efforts were organized by neighboring communties, even though Japanese culture is strongly inward oriented.

Figure 18 – Popular disaster myths



(Quarantelli, 1993)

Therefore, point of departure of this second part of analysis is the assumption that human reaction, in all the cases considered, was rational, energetic, cooperative and lucid. Moreover, as by the time the events occurred a national Discipline for Emergency Management was enforced in all the countries, Quarantelli's 10^{th} criterion, requiring a well functioning Emergency Operation Center, is satisfied in all cases. Right after the declaration of Emergency, proclaimed by the President – in the United States - and by the Prime Minister - in Italy and Japan - national Emergency Operation Centers are activated to analyze what happened in the impacted regions, sending both general and case specific helps. Excluding the Kobe Earthquake, Hurricane Katrina and the Piedmont Flooding, during which even assessing initial generic needs was complicated by communication breakdowns and the scarcity of personnel on site, all the other events were caracterized by an adequate initial discernment of general and case-specific demands and basic generic needs were timely satisfied (debris removal, rescue activities and anti-looting campaigns were started, shelters and tent camps were established, medical assistance and food relief were provided).

In the context of this analysis, it is worth to notice how both Kobe Earthquake and Hurricane Katrina are singular cases for the way they were managed, resulting in almost total managerial failures, according to Quarantelli's criteria. The failures arose in two unjustifiably unprepared areas: the Kansai region, where Kobe is located, had ignored the earthquake hazard, regardless of its numerous fault zones, and it had rather invested in preventing other more frequent natural phenomena - namely tropical cyclones, landslides and strong winds; likewise New Orleans, where Katrina produced the most damage, was not prepared to react to a tropical cyclone as intense as Katrina was, even though scientists had repeteadly warned

on the possibility of a *big one*[32] and they had frequently expressed their concern for the population's high exposure to tropical cyclones (Kates, Colten, Laska, & Leathermen, 2006). As a consequence, when strong natural phenomena finally occurred, both the Japanese and the American emergency administrations in Kobe and New Orleans, respectively, were greatly inefficient: emergency organizations were impacted themselves and couldn't exercise proper action nor delegate their tasks; communication breakdowns impeded the mobilitation of personnel and resources from neighboring cities; and even though volunteers and other extraordinary resources arrived on site, they were not efficiently used to satisfy the population needs because a well organized leadership was absent. The negative consequences arising from the bad managerial attitudes adopted in Kobe and New Orleans, however, spurred both Japan and the US to improve the deficiencies of their emergency systems. It has to be noticed that both Japan and the United States already had well organized emergency systems, with the only fault of being tailored to smaller scale events. Evidence of the countries' already good emergency management systems are, for example, the strong earthquakes that had been efficiently managed before Kobe Earthquake and Hurricane Katrina. Japan had a long history of intense quakes, as, for example, the 8.2 Mw Honshu Earthquake, in 1968, or the 7.5 Mw Niigata Earthquake, in 1964, respectively causing only 47 and 26 fatalities. Also the US had been dealing with earthquakes since long times; as an example, in 1995, they suffered a 6.7 Mw mainshock in Los Angeles, principally in the Northridge neighborhood. Under the Standardized Emergency Management System (SEMS) that several Californian cities – Los Angeles included – were implementing to manage emergencies with coordination and effectiveness, the Northridge emergency had uninterrupted internal and external communications, available personnel and resources were engaged on time and external aids were called, even exceeding the community needs (and thus creating an affluence of people and goods that emergency managers didn't know how to coordinate and include in the emergency response).

The increased scope of the American and Japanese Emergency Systems are proven when, in the 2000s, the Kumamoto and Oita Flood, the Tohoku Earthquake and Hurricane Sandy hit the same nations and the adoption of

[32] The "big one" is the common name with which, in the United States, catastrophic expected events are indicated. For example, California is currently waiting for the occurrence of the big one,

practices of good management helped to limit economic damages and deaths: well-defined leadership roles and relastionships, appropriate deployement of available physical and human resources, effective inclusion of volunteers, recourse to alternative modes of communication (especially the use of crowdfunding websites and social media platforms) and organized activities of cooperation and coordination, all resulted in successful management. For example, during the 2011 Tohoku Earthquake more than 300 associations were organized and satisfactorily coordinated, with national and international volunteers acting only under the explicit conditions and for the specific tasks indicated by Japanese Emergency Managers (Carafano, 2011). Also, it has been counted that between March 9 and May 31 2011, approximately 59,000 english tweets and 1,600,000 japanese tweets have been posted all over the world concerning the Tohoku Earthquake, while between October 27 and November 1 2012, more than 20 million tweets were posted on Hurricane Sandy (Doan, Ho Vo, & Collier, 2011), giving real time information on the happenings, indications on what behaviours to adopt, what was needed and where. The profound implications and potentialities of the use of social media to manage disasters are currently debated in several academic papers (Mendoza, Poblete, & Castillo, 2010; Vieweg, Hughes, Starbird, & Palen, 2010; Gao & Goolsby, 2011; Doan, Ho Vo, & Collier, 2012), but their results go beyond the objective of this study.

A separate analysis needs to be done for the Italian cases. Quite singularly, in fact, the disaster management activities after the catastrophic Italian event of L'Aquila 2009 - especially in the light of the previously illustrated inadequate planning process - were successful and appropriate, according to Quarantelli's criteria. After a short initial bewilderment, more than 8,000 responders were sent to L'Aquila within 24 hours, 60 people were extracted alive from the rubble, temporary tents were timely erected, over 3,000 volunteers were properly managed by the National Civil Protection and the media spread out copious and precise information on the event and its evolution. The centralized and authoritative Italian *Model Augustus* organized around the National Service of the Civil Protection, appropriately managed the emergence, even though some bureaucratic issues created initial problems (i.e. people didn't know what the structure of emergency system was and who was in charge of the different tasks).

a magnitude 8 or more quake that is expected to happen within the next 30 years (Gorman, 2011).

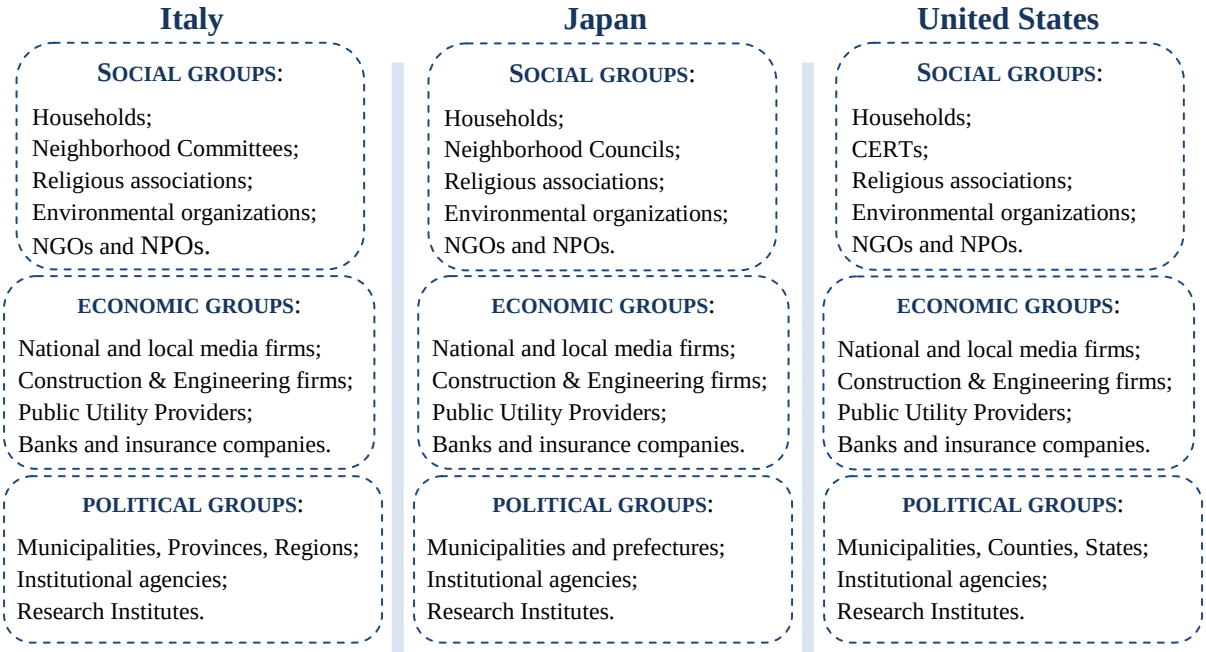
Similar success was accomplished when managing the Emilia Earthquakes, with all Quarantelli's criteria satisfied, well-timed rescue teams and resources, sufficient volunteers, widely dispersed information (also by mean of the Internet and social media), adequate coordination and the same authoritative concentration of power in the hands of the National Service of the Civil Protection. The Italian disaster management, thus, looks far better in 2012 than in the 1990s, when, during Piedmont flooding, the centralized Emergency model was problematic. After the rivers of Po, Tanaro, Belba and Bormida overflowed, in fact, communication with outsiders and within local organizations was interrupted and mobilizing personnel and resources was a fiasco. However in Italy, in 2012, remains, and even worsen, the slowness of reconstruction works, with extremely negative consequences for the impacted communities: ghost cities are created (e.g. L'Aquila city center is still uninhabited). In point of fact, the destroyed production facilities are often rebuilt in foreign countries, where bureaucracy does not slow down business action and costs are lower (Morici, 2013), with immense economic losses for the local regions already shatterd by disasters. Governmental financial support tarry to arrive and temporary accommodations are turned into permanent as, for example, after four years since the disaster happened, in L'Aquila reconstruction works are still in progress and, after one year since the quake, in Emilia, 235 people are still living in schools, gyms, police stations and hotels (Matteucci, 2013).

Stakeholder approach

Applying Freeman's definition of stakeholder (1996), an emergency management stakeholder is anyone who can affect or be affected by the decisions relative to the processes of disaster planning and management, taken by emergency managers and policimakers (Lindell, Prater, & Perry, 2006).

In the past, only restricted parts of the Italian, Japanese and American populations were allowed to contribute to the development of national policies, through their right of vote. Since the countries' Universal Suffrage[33], however, all Italian, Japanese and American citizens are recognized the right to vote, within the limits established by the law (e.g. minimum voting age, condition of mental health etc.): all citizens are thus considered stakeholders of the Nation, affecting and affected by the political course of actions decided by elected or designated officials. Moreover, in Italy, Japan and the US, emergency management policies result from the national process of policy-making and, as a consequence, all citizens directly or indirectly affect and are affected by them. All citizens are emergency management stakeholders and, in this section, their attributes, interests and roles of action are analyzed; policymakers and emergency managers occupy a central position in the analysis, as in Italy, Japan and the US they are entitled of emergency management formulation and implementation.

Figure 19 – Stakeholders in emergency management



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[33] In chronological order, in 1945, Japan extended the universal manhood suffrage to women; in Italy, the Universal adult Suffrage was introduced with the Constitution of 1946; and finally, in the US, the General adult Suffrage was fully enforced with the Voting Rights Act, in 1965.

As in *Figure 19*, emergency management stakeholders can be grouped in three categories: social, economic and political groups (Lindell, Prater, & Perry, 2006).

SOCIAL GROUPS: By definition, a social group is made of a limited number of individuals regularly interacting with each other (Forsyth, 2006). In communities, *households* are the basic units of production and consumption (Hirth, 2009); likewise, the primary social unit involved in emergency management is the household: as basic emergency management stakeholders, Italian, Japanese and American households decide to live in risk prone regions, take protective measure to reduce their exposure to risk (e.g. they build according to the established local building codes, retrofit their houses, insure properties and valuables, are informed on desirable emergency behaviors, evacuate when requested etc.), react to natural disasters and eventually experience economic and social losses. All households affect and are affected by disaster management, through the taxes they pay and the political representatives they elect; only some, however, directly experience natural disasters and suffer the major part of their destructiveness. Households' behaviors are number one driver in determining the impact of disasters, but for governments it is difficult to control them as they depend on the choices of multiple, independent individuals.

In a higher level of social aggregation, some Italian, Japanese and American cities organize *neighborhood groups* for disaster preparedness and response. Within this stakeholder groups, some examples are the Italian Neighborhood Committees, the Japanese Neighborhood Councils and the American Community Emergency Response Teams (CERTs), formed by groups of neighboring households to increase their disaster preparedness and eventually coordinate their actions when disasters occur.

Important players in emergency management are *environmental organizations*, primarily engaged in activities of prevention and reconstruction, both at national and international levels[34]. Organized environmentalists have significant lobbying power towards Governments, as a result of their contributions to disaster

[34] Examples of famous international environmental organizations are the World Wildlife Fund (WWF), Greenpeace, the Global Environmental Facility (GEF), the World Nature Organization (WNO) and the World Watch Institute. At national levels, renowned environmental associations are like the National Italian Trust and Legambiente, in Italy; the Japan Environmental Association (JEA) and the Nature Conservation Society of Japan, in Japan; and Sierra Leone and Environment America, in the United States.

prevention and reconstruction; however, as they are numerous and independent, it is very difficult - although advantageous - to integrate their actions within the governmental disaster planning and management processes.

Finally, social emergency management stakeholders are also religious groups, NPOs and NGOs. The Salvation Army, Catholic, Jewish, Muslim, Lutheran, Adventist, Methodist, Hindu and many other *religious associations* deploy their human and physical resources especially after disasters occur, directly helping their communities or funding international disaster relief projects. Additionally, disaster relief is supported by international *NGOs* and *NPOs*[35] and country specific NGOs and NPOs[36]; these organizations not only work with their usual members, but also coordinate and include within their activities the unexpected national and international volunteering offers, emerging when disasters happen.

ECONOMIC GROUPS: Economic groups are entities producing, buying and/or selling goods and/or services (Cambridge Dictionary, 2013). Comparably to households, business owners - or managers - are central economic actors; in fact, they take the decision to establish their economic activity in risk prone areas, invest in protective measures to reduce their vulnerability to natural hazards (e.g. respect the enforced building codes, retrofit their facilities, insure business properties and assets, periodically practice disaster drills, adopt contingency plans etc.), respond to disasters and eventually suffer economic and social losses. All businesses in Italy, Japan and the US are involved in disaster management through the taxes they pay, but only some are directly damaged by natural disasters. However, when major disasters strike, the economic consequences can affect entire regions or even the whole national economy[37]. Controlling the disaster preparedness of the myriad of small, medium and large enterprises is a challenging task for governments, exacerbated by the typical business resistance to restrictions on its decision making freedom.

[35] Among the most active: the International Federation of Red Cross, Save the Children, Amnesty International, Global Giving, Doctors Without Borders, the International Rescue Committee and the International Medical Corps.

[36] Some examples: AGIRE, Fondazione Francesca Rava and Fondazione ANDI, in Italy, JEN, Second Harvest and Terra People Association, in Japan; the National Organization for Victim Assistance (NOVA), AmeriCares and Rebuilding Together, in the US.

Important business actors in emergency management are media companies, construction firms, engineering firms, public service providers and financial institutions - first and foremost insurance companies and banks. National and local *media*, considered their high penetrations in Italy, Japan and the US[38], are very important means not only to inform and alert citizens right before and after disaster occurrences - with hard news - but also to continually educate them - with soft news. Likewise, *construction* and *engineering firms* are significant business actors in emergency management: within the scope of their activity, they are ultimately responsible for the quality of the constructions they realize, implemented retrofitting measures and safety assessments. Clearly central economic stakeholders are also *public utility providers* - both of private or public ownership - providing cities with their everyday needs of water, gas, electricity, communication services, transportation etc.; when disasters occur, public utilities need to be reestablished as rapidly as possible for secondary losses to be minimized. Finally, the role of *financial institutions* is equally central in emergency management, as they can cover natural disaster losses and simultaneously increase physical resilience. Specifically, banks and insurance companies can take the risk of losses coming from natural disaster by selling insurance policies, catastrophe bonds, micro insurances and other risk transfer instruments. Moreover, when selling disaster risk coverage, insurers and bankers reward disaster preparedness (e.g. the properties to insure are priced differently according to their age, material quality, condition etc.). All in all, when disasters happen, financial institutions lower economic losses and quicken the recovery process: being disaster risk transfer mechanisms limitedly diffused in Italy, Japan and the US[39], it would be profitable to enhance their penetration, especially in risk prone regions.

POLITICAL GROUPS: Political groups of emergency management stakeholders are those governmental constituencies - other than the central government - somehow

[37] Before 1995, Kobe had the sixth busiest port worldwide. After the quake, in spite of the heavy investments in reconstruction, the port did not gain back its international competitiveness and, by 2010, was at the 47th place of the same list (United Nations, 2013).

[38] For example, it is estimated that 95.4% of Italian (ISTAT, 2009), 95% of Japanese (Asami, 2010), 96.7% (Stelter, 2011) of American households own at least one television.

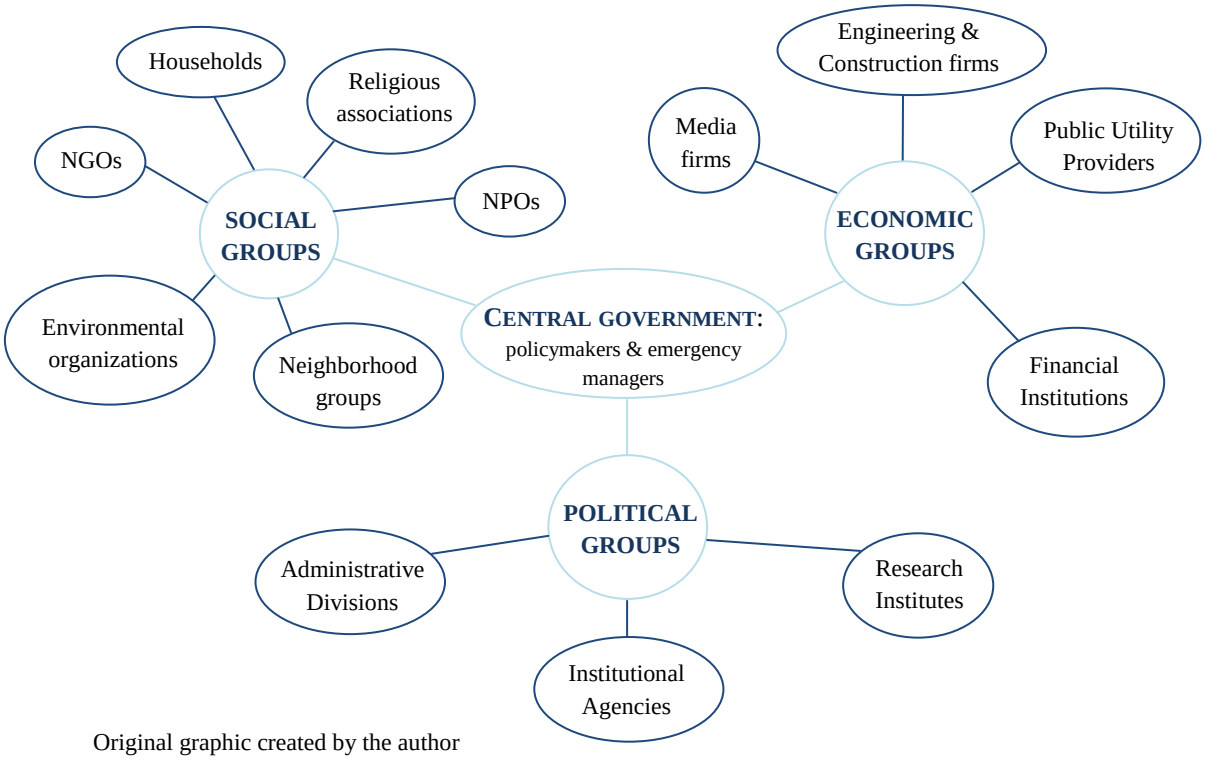
[39] As an example, earthquake coverage for commercial properties is equal to 0.18% of GDP in Italy, 0.06% in Japan and 0.44% in California (Veysey, 2012).

involved in disaster planning and management activities. Within this category, relevant actors are the *administrative levels*[40] to whom the central government delegates part of its authorities. Each administration has its role in emergency management (Appendices D,E and F) and it is supported by various agencies. The Italian, Japanese and American Public Health Care System, Firefighters, Police Forces and Coastal Guards are amongst the key national *agencies* affected by and affecting disaster management[41]; they are involved immediately after disasters and charged of debris removal, food provision, medication distribution, unsafe structure demolition, city cleanup etc. Finally, are also political emergency management stakeholders the national *research institutes* - single-hazard or multi-hazard focused - where seismologists, volcanologists, meteorologists, sociologists, anthropologists, psychologists, physicians, economists, engineers, architects, geographers, medics and statisticians conduct their studies and monitor the national exposition to natural hazards. These research centres are affected by governmental emergency management decisions, as they generally are exclusively financed by central governments - whether they are independent or not; moreover, they also affect governments through their direct linkages with emergency managers and politicians, given the essentiality of their expertise to perform and improve disaster mitigation, preparedness, response and recovery activities.

[40] Regions, Provinces and Municipalities, in Italy; Prefectures and Municipalities, in Japan; States, Counties and Municipalities in the US.

[41] Supporting the recovery processes, in Italy protagonists are the Italian Fire Brigade, the Armed and Police Forces, the National Forestry Commission, the Italian Heath Service and the National Mountain Rescue and Speleological Corps; in Japan, central institutional agencies are the National Police Agency, the Japanese Fire Department, the Japan Coast Guard, the Self-Defence Forces and the Medical Assistance Teams; and finally, in the US wide support is primarily provided by the Police Service, Fire Corps, the US Coast Guard Auxiliary and the Medical Reserve Corps.

Figure 20 – Emergency Management: Stakeholders map



Original graphic created by the author

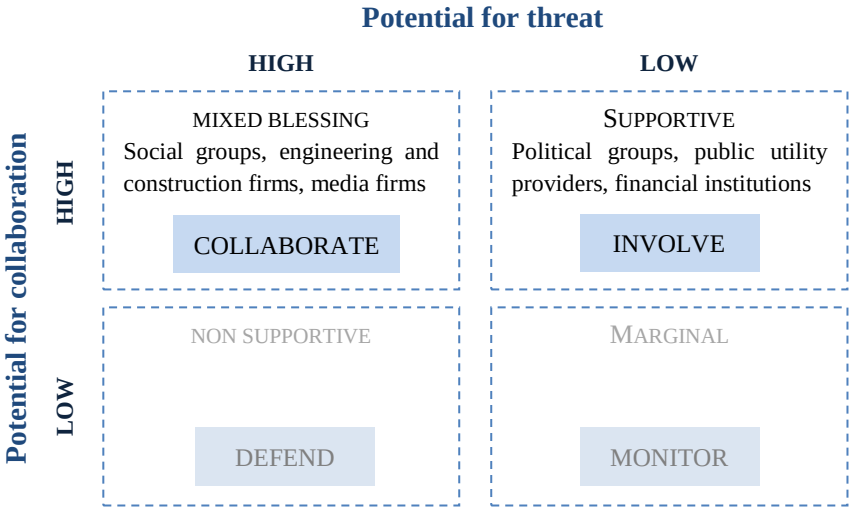
When applying Savage et al.'s (1991) framework to classify stakeholders and subsequently define the appropriate strategies to approach them, with reference to governments and their emergency management activities, a singular result is produced: none of the above mentioned actors is identifiable as "non supportive" nor "marginal" (*Figure 21*). This outcome is produced by the fact that natural disasters are potentially devastating to any subject living in a country: it is in the common interest to be protected against them. Collaboration is, then, the best solution for the communities as a whole and it is potentially achievable with any citizens' group. This, however, does not mean that no one is likely to assume opportunistic or deleterious behaviors: there will be actors disregarding governmental recommendations and collaborative efforts, rather attempting to increase their personal wealth (e.g. construction firms using lower quality materials comparing to what they declare, NPOs pocketing the money granted for reconstruction activities, administrative divisions not enforcing the rules in vigor in exchange for money etc.). Therefore, governments are in charge of monitoring all citizens and promoting the worthiness of disaster preparedness while also enforcing national disaster disciplines.

High potential for collaboration and high potential for threat is what characterizes all social groups, engineering, construction firms and media companies: their

interests to collaborate with the government for what concern emergency management is high, as they can be safer (households), improve their reputation (NPOs, NGOs, engineering and construction firms, media companies) and pursue their objectives (the humanitarian objectives typical of religious associations and the goal defending the environment distinctive of environmental organizations); however, their potential for threat is also consistently high, as they all have incentives to act according to their exclusive economic benefit, in a myopic and amoral perspective of risk undervaluation.

Differently, political groups, public utility providers and financial institutions exhibit high potential for collaboration and low potential for threat: collaboration with central government is within their mission (administrative divisions and public utility providers serve the public interest) or highly convenient for information sharing (financial institutions could know better a population profile, more appropriately model financial instruments and more efficiently monitor their clients, if supported by governmental information); moreover the potential for threat is low as there are low economic incentives for them to misbehave and strictly enforced controls on their activities (political groups, public utility providers and financial institutions are all stringently controlled by the Law).

Figure 21 – Application of Savage et al.'s (1991) framework



Original graphic created by the author

According to the model (*Figure 21*), it is advisable for governments to collaborate with mixed blessing stakeholders (social groups, engineering and construction firms and media companies), while involving supportive stakeholders (political groups, public utility providers and financial institutions) in the processes of policy formulation and implementation. Confirming the predictions of the above

dynamic model of stakeholder analysis, the examined Italian, Japanese and American cases show an evolution of national governments towards collaborative and involving strategies in emergency stakeholder management. In particular, after the 1995 Kobe earthquake, advanced collaborations and involvements have been started in Japan and successful results have been achieved by establishing formal platforms for stakeholder participation in disaster management policies (Maki, Tamura, & Hayashi, 2010). Following the Japanese example and in the wake of the achieved satisfying results, also the US are directly involving their stakeholders, in particular through public/private partnerships within the Conference of Mayors and the Emergency Preparedness center of the National Governor Association. Finally, Italy is only recently considering collaborations with its emergency management stakeholders, achieved within the United Conference State-Regions and the United Conference State-Cities, where topics of common interest are discussed between representatives of the central government and administrative divisions.

However, in all the three countries still too many stakeholders are left in marginal positions (e.g. in Italy, Japan and the US insurance companies need to be supported and promoted by central governments to a greater extent than now; the media could be used more to increase population awareness and preparedness to natural threats; the scientific community need to be better tied to governments for its alerts to be properly considered etc.). Ideally governments should classify their emergency management stakeholders and decide whether to collaborate with or directly involve them in the processes of policy formulation and implementation: by applying managerial principles to public management settings, improved efficiency in the disaster management practices could be achieved.

Conclusion

Summary of research findings

In summary, the research performed has answered the research questions as follow:

1. **HOW DO COUNTRIES PREPARE FOR AND COPE WITH NATURAL DISASTERS?**

Over the last fifty years, Italy, Japan and the US have invested more or less effectively human and physical resources to shape and improve their disaster management abilities. In 1961, Japan adopted the Disaster Countermeasures Basic Act, an extensive and strategic legal framework to prepare against natural disasters. Similarly, the establishment of a national discipline for disaster management occurred in the United States, in 1988, with the introduction of the Stafford Disaster Relief and Emergency Assistance Act, while lastly, in Italy, it was in 1992 that the National Civil Protection System was enforced. Since the introduction of the mentioned National Laws, with a highly centralized approach - as in Italy and Japan - or a decentralized system - as in the US - the three countries started planning and implementing disaster management measures, gradually improving over time, especially after deficiencies in the systems were emerging. Moreover, constantly conducting disaster research and accordingly updating their disaster disciplines (e.g. introducing new building codes, promoting new disasters proof retrofitting etc.), a body of supplementary laws has been built in Italy, Japan and the US for an integrated 360-degree multi hazard approach towards disaster mitigation, preparedness, response and recovery.

The mere existence of National regulations, however, has not proven to be sufficient itself: negligence in enforcing the established disciplines, especially in Italy and in the US, has resulted in poor disaster management activities (e.g. widespread building abusiveness in L'Aquila or imperfect levees and floodwalls design in New Orleans both resulted in disastrous events). Finally, as Japanese nuclear disaster of Fukushima demonstrates, not all the hazards have been included in national plans and linkages between natural forces and manmade systems need to be further enhanced.

2. **WHY NATURAL PHENOMENA OF EQUAL MAGNITUDE LEAD TO DIFFERENT LEVELS OF DEVASTATION ACROSS COUNTRIES?**

The capacity to respond to extreme natural events of similar intensities is highly dependent on the planning and managerial abilities of each country. When preparing for disasters, Italy, Japan and the US differently satisfy Hyogo

requirements: in order, Japan is the best prepared, followed by the US and Italy. In particular, raising community awareness and improving physical resilience is where Italy first, and the US following, should invest the most. Otherwise, when disasters occur, the three countries all have well functioning managing processes, according to Quarantelli's 10 criteria for good disaster management.

3. WHO ARE THE EMERGENCY MANAGEMENT STAKEHOLDERS? HOW SHOULD THEY BE MANAGED?

The Italian, Japanese and American emergency stakeholders groups can be distinguished into social, economic and political. Moreover, according to their potential for collaboration and threat, governments should ideally collaborate or directly involve them in their policy formulation. In particular, Japan and the US are the most advanced in terms of stakeholder participation and since the 1990s they have been successfully structuring formal platforms for stakeholder engagement, overcoming the initial intrinsic issues of coordination. Quite differently, Italy is only recently starting to involve some of its stakeholders when formulating and implementing disaster management policies: improved systems to monitor and cooperate with them need to be implemented.

4. HOW CAN NATIONS SUCCESSFULLY MANAGE NATURAL PHENOMENA, REDUCING THEIR RISK OF INCURRING IN MAJOR DISASTERS?

The widespread acceptance of Hyogo requirements and the overwhelming consensus in Literature on Quarantelli's ten criteria for good disaster management suggest the applicability of these principles to formulate and implement successful disaster risk reduction measures. Where the countries do not satisfy Hyogo and Quarantelli's criteria and stakeholder management is problematic, there is space for improvements and more investments should be done. The ideal model for disaster management will invest in mitigation and preparedness measures, in order to reduce the community losses to a minimum and speed up the reconstruction phase. The specific measures to adopt, however, significantly rely on country-specific factors and their definition goes out the scope of this thesis.

5. WHAT LESSONS CAN BE LEARNT FROM THE ANALYZED CASES? TO WHAT EXTENT CAN THEY BE GENERALIZED BEYOND THE RESEARCH SAMPLE?

Several lessons can be drawn from this research. First, rules are not enough. Beginning in the second half of the 19th century, each analyzed country has introduced national legal frameworks for managing natural disasters. Failures to withstand natural events gradually brought to the introduction of better measures of prevention and response, but their enforcements have been proved to be critical

for the policies to produce results. Inappropriate, superficial and deficient law enforcement results in poor disaster management.

Second, scientia potential est: knowledge is power (Hobbes, 1991). Expanding existent knowledge on natural disasters by involving different professionals – i.e. geologists, geographers, sociologists, physicians, statisticians, psychologists, economists, politicians, engineers, doctors, insurers and so on – on national and international research projects, is vital for each country to further reduce its disaster risk. National and international studies, in fact, can produce innovations in terms of new technologies, better planning systems and improved managerial approaches that could be adopted by each country or at supranational levels. Producing knowledge on disasters, however, is more effective if it is matched with education curricula and awareness campaigns that could spread a culture of disaster avoidance at all community levels.

Third, conflicting interests coexist in communities: no man is an island (Merton, 2005). When facing high-impact low-probability events, people usually underestimate their exposure to risk and tend to consider the occurrence of devastating phenomena highly unlikely, even if they live in disaster prone regions. Moreover, driven by economic logics of saving money, they build unsafe infrastructure (private residences, schools, hospitals, student dormitories etc.) and protection systems (levees, floodwalls, seawalls etc.), they accept low safety standards and they regret their behaviours only when fatalities occur. In disaster management, several interests are in mutual conflict and need to be managed by governmental authorities: construction firms willing to minimize their costs, social infrastructure asking for the highest security standards, financial institutions covering the risk of natural phenomena, company business investing resources in disaster prone regions, mass media trying to attract the most audience to follow their news, local administrations coordinating all the involved actors and imposing regulations and so on. Managing disasters successfully means coordinating all the involved actors, converging their interests towards the establishment of a resilient society.

Fourth, nature and technology are increasingly intertwined. Natural phenomena can trigger technological failures as well as human interventions can worsen natural events. Managing the interrelations between human and natural forces is essential to avoid mixed natural and technological unprecedented disasters of unknown effects and extent. All countries should separately consider the

technological and natural risks they are exposed to and address their interrelatedness with appropriate measures.

Finally, all communities should improve their ability to withstand extreme natural events, according to their resources and institutional capacities. Nevertheless, the results produced by this research seem to be applicable only to countries having disaster profiles and social, economic, political and cultural features similar to the Italian, Japanese and American ones. In particular, the frameworks used to evaluate disaster management are explicitly formulated to address the needs of developed countries. Different recommendations, not discussed in this research, are to be addressed to developing and underdeveloped countries.

Appendices

Appendix A: Italian selected disasters

Piedmont flooding: 1994

In the Piedmont region, between the 5th and 6th of November 1994, the Po River overflew together with some of its major tributaries (Tanaro, Belbo, Covetta and Bovina), affecting 38 cities and completely flooding the cities of Alba, Asti and Alessandria .

DEATHS: 68
HOMELESS: 10.300
AFFECTED: 7.000
TOTAL DAMAGE: US$ 9.3 billion

Alessandria after the flood
(Caneva, 2011)

L'Aquila Earthquake: 2009

On April the 6th 2009, a magnitude 5,9 earthquake shook L'Aquila and some neighbouring cities (Onna and Paganica in particular). The centre of L'Aquila had the most damages, with medieval monuments, thousand residences, schools, a student dormitory and the regional hospital severely damaged.

DEATHS: 295
HOMELESS: 55.000
INJURED: 1.000
TOTAL DAMAGE: US$ 2.5 billion

L'Aquila Prefecture destroyed by the quake
(Rizzo, 2012)

Emilia Earthquakes: 2012

In 2012, the provinces of Emilia, Ferrara, Modena, Mantova e Bologna were hit by a 5.9 Mw and a 5.8 Mw earthquakes, respectively the 20th and 29th of May. The quakes shook a region rich of industrial districts, where fashion-clothing, automation-mechanics and agro-alimentary Made in Italy products are realized.

DEATHS: 24
HOMELESS: 14.000
INJURED: 400
TOTAL DAMAGE: US$ 15.8 billion

The half collapsed clock tower in Finale Emilia
(La Repubblica, 2012)

Appendix B: Japanese selected disasters

Kobe Earthquake: 1995

A 6.9 Mw earthquake struck Japan, causing thousands of deaths and severely damaging more than 200.000 buildings. The so-called Great Hanshin Earthquake hit the industrialized Hansin Region (predominantly the cities of Kobe and Osaka) and destroyed 85% of the local social infrastructure - especially schools and hospitals.

DEATHS: 5.297
HOMELESS: 251.301
INJURED: 34.531
TOTAL DAMAGE: US$ 100 billion

An highways collapsed in Nishinomiya, between Osaka and Kobe (Warner, 2011)

Tohoku Earthquake: 2011

On March 11th, 2011, a 9 Mw earthquake and subsequent tsunami waves struck the east coast of Honshu. The highest damages and fatalities were registered in Iwate, Miyagi and Fukushima. Moreover at Fukushima Daiichi nuclear plant, a level 7 nuclear accident (same level of the Chernobyl disaster of 1986) was triggered by the strong tsunami waves.

DEATHS: 19.848
HOMELESS: n.a.
INJURED: 6.065
TOTAL DAMAGE: US$ 210 billion

Tsunami waves in Miyako City (SFDEM, 2012)

Kumamoto and Oita Floods: 2012

In July 2012 torrential rains fell over the Japanese prefectures of Kumamoto and Oita, causing several floods and mudslides. The victims were all elderly people, who didn't manage to evacuate before the floodwater swept away their buildings.

DEATHS: 30
HOMELESS: n.a.
AFFECTED: 48.135
TOTAL DAMAGE: US$ 1.4 billion

A road covered of mud and wood in Aso - Kumamoto Prefecture (Denver Post, 2012)

Appendix C: American selected disasters

Northridge Earthquake: 1994

On 17 January 1994, a 6.7 Mw earthquake severely shook the Northridge and Sherman Oaks neighbourhoods of Los Angeles. More than 40.000 buildings and 10 highway bridges were damaged, with the most destructions registered in the Northridge District, where several high technology industries were located.

DEATHS: 60
HOMELESS: 20.000
INJURED: 7.000
TOTAL DAMAGE: US$ 30 billion

The California State Route (SR 14) fallen over the Golden State Freeway (I 5)
(Los Angeles Times, 2012)

Hurricane Katrina: 2005

With a maximum wind speed of 170 Mph, Hurricane Katrina developed on August 23 and reached South Florida on August 25. Alabama, Florida, Louisiana and Mississippi were impacted the most and overall 352.930 buildings were completely destroyed. The Hurricane is the costliest natural disaster of US, especially because of the great devastations produced in New Orleans by the collapse of the city's levees.

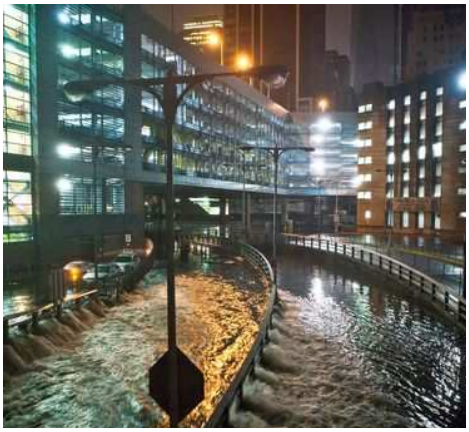
DEATHS: 1.833
HOMELESS: 700.000
AFFECTED: 500.000
TOTAL DAMAGE: US$ 125 billion

New Orleans flooded by Hurricane Katrina
(Shearer, 2010)

Hurricane Sandy: 2012

By the end of October 2012, Hurricane Sandy impacted Connecticut, New York and New Jersey coastlines with maximum wind speed of 75 mph, accompanied by heavy rain falls. The damages produced by the storm surges and waves, classify Sandy as the second costliest natural disaster experienced by the U.S, after Katrina.

DEATHS: 54
HOMELESS: 14.000
AFFECTED: 77.000
TOTAL DAMAGE: US$ 50 billion



Hurricane Sandy effects in Cary Tunnel, New York (Rizzo, 2012)

Appendix D: Italian Emergency Management system and actors

Physical Territory

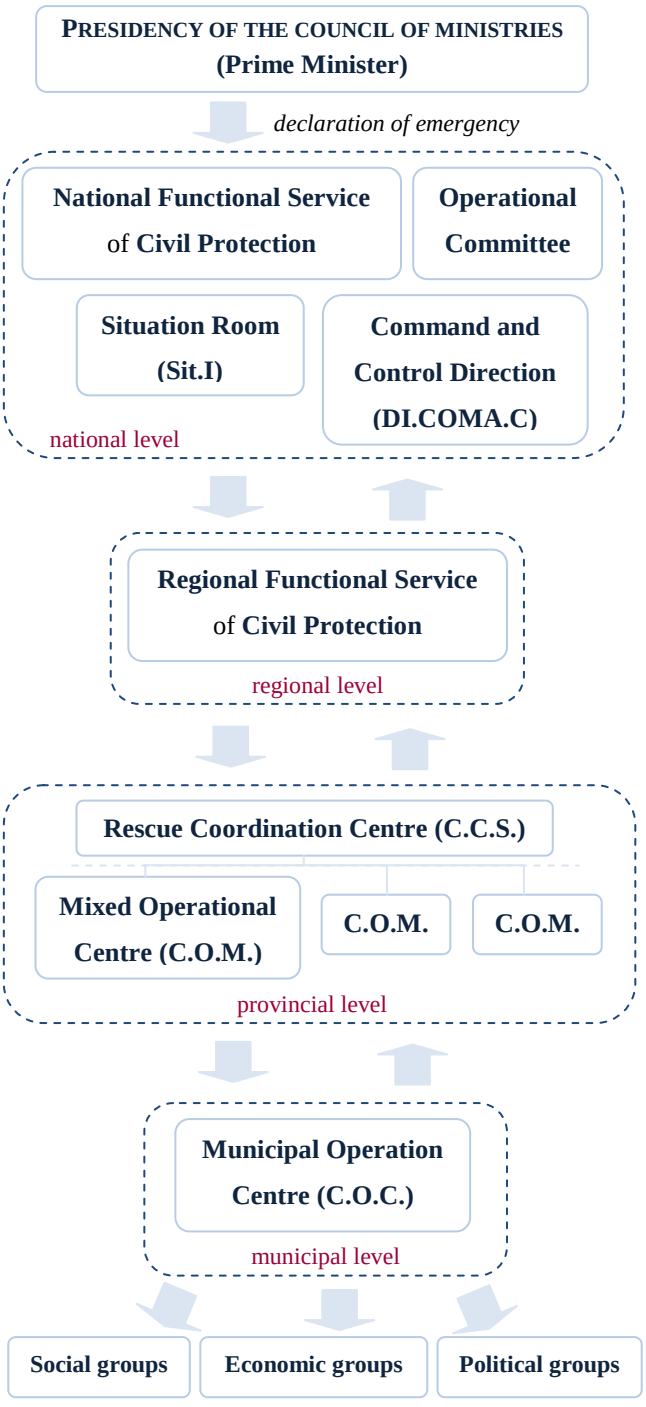
Area: 301,340 km^2
Plains: 23,2%
Hills: 41,6%
Mountains: 35,2%
Volcanoes: 29 (10 actives)

Society

Population (2013): 61,482,297 (68% urban)
Density: 206 inhabitants/km^2
Government: Parliamentary Republic
HDI: 0,881 (i.e. very high human development)
Administrative division: 20 regions, ca 8100 municipalities

Disaster Management Organization Chart

Augustus Method



As defined by Act 225 of February 24, 1992, the Italian National Service of Civil Protection is the operative arm of the *President of the Council of Ministries* and it works through national, regional, provincial and municipal divisions. When the state of emergency is declared by the *Prime Minister*, at a national level, the *Operational Committee* and the *Command and Control Direction* are reunited to coordinate emergency activities, while the *Situation Room* is kept active 24 hours a day, as usual, to monitor and control other national risks. *Regional Functional Services* get national funds and transfer them to the representatives of provincial operational structures (Forest Corps, Police Forces etc.) - organized in *Rescue Coordination Centers* (CCSs). In turn, CCSs are divided in groups of geographically proximate operational structures - called *Mixed Operational Centers* - and dispense the necessary resources to the Mayors of the impacted communities - organized in *Municipal Operation Centers*. Ergo, local and national efforts are combined in a multi hierarchical and distinctly centralized Emergency System.

Original graphic created by the author based on Act 225, February 24 1992 and on European Union Vademecum (2013)

Appendix E: Japanese Emergency Management system and actors

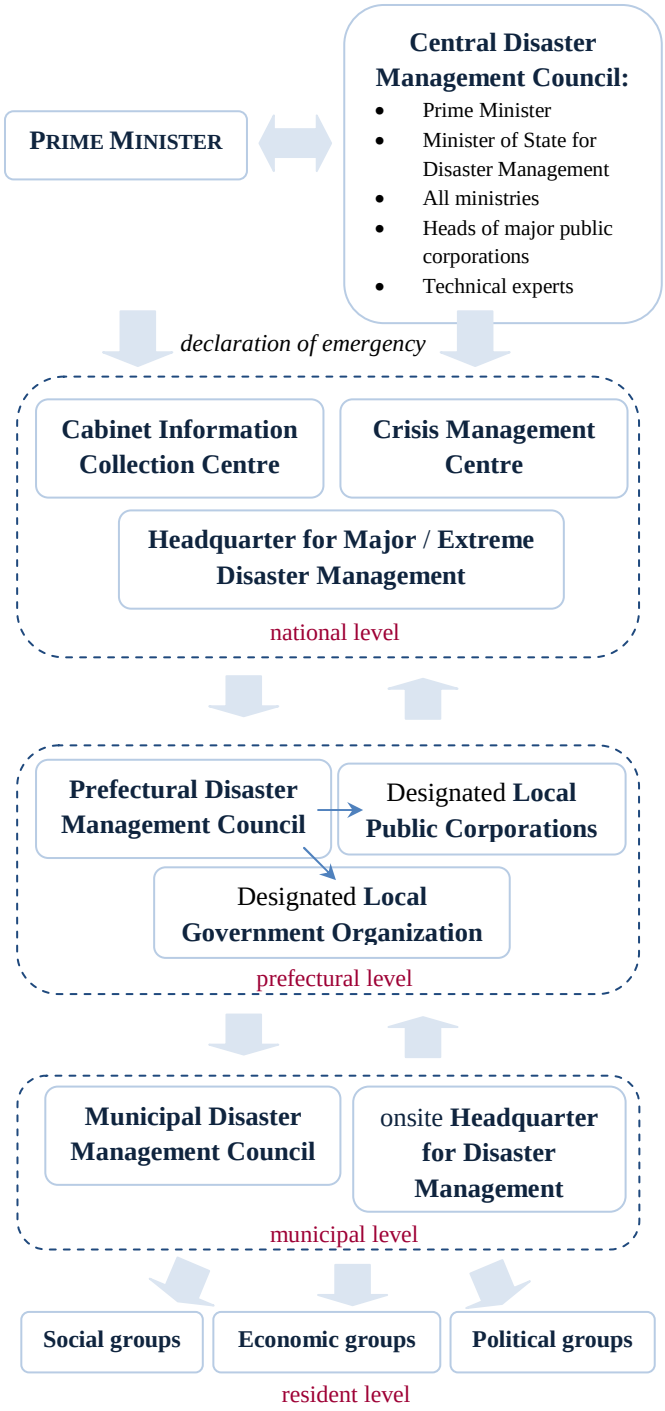
Physical Territory

Area: 377,915 km^2
Plains and hills: 28%
Mountains: 72%
Volcanoes: ca 200
(110 active)

Society

Population (2013): 127,253,075 (67% urban)
Density: 351 inhabitants/km^2
Government: Constitutional Monarchy with a Parliamentary Government
HDI: 0,912 (i.e. very high human development)
Administrative division: 47 prefectures,1.820 municipalities

Disaster Management Organization Chart



The Disaster Countermeasures Basic Act (1961) establishes a Disaster Response Mechanism having the *Prime Minister* and the *Central Disaster Management Council* at its head. When disasters are beyond local capabilities, the state of emergency is proclaimed by the *Prime Minister*, after consulting the *Central Disaster Management Council*. Concurrently, the *Crisis Management Centre* is set up to monitor the disaster situation; the *Cabinet Information Collection Centre* is used 24/24 hours - as usual - to keep track of other national risks; and the *Headquarter for Major* (or *Extreme*) *Disaster Management* is instituted to define and implement necessary response actions. The governors of the wounded prefectures - organized in the *Prefectural Disaster Management Council* - activate a support system of *Public Corporations* and *Government Organizations* (Police Agency, Coast Guard, Fire Agency etc.) and, by means of the *Municipal Disaster Management Councils*, the needed resources are provided to the affected communities.

Japanese Emergency System results highly centralized and multi hierarchical.

Original graphic created by the author based on Act 223, November 15, 1961 and on Disaster Management Brochure (2011)

Appendix F: American Emergency Management system and actors

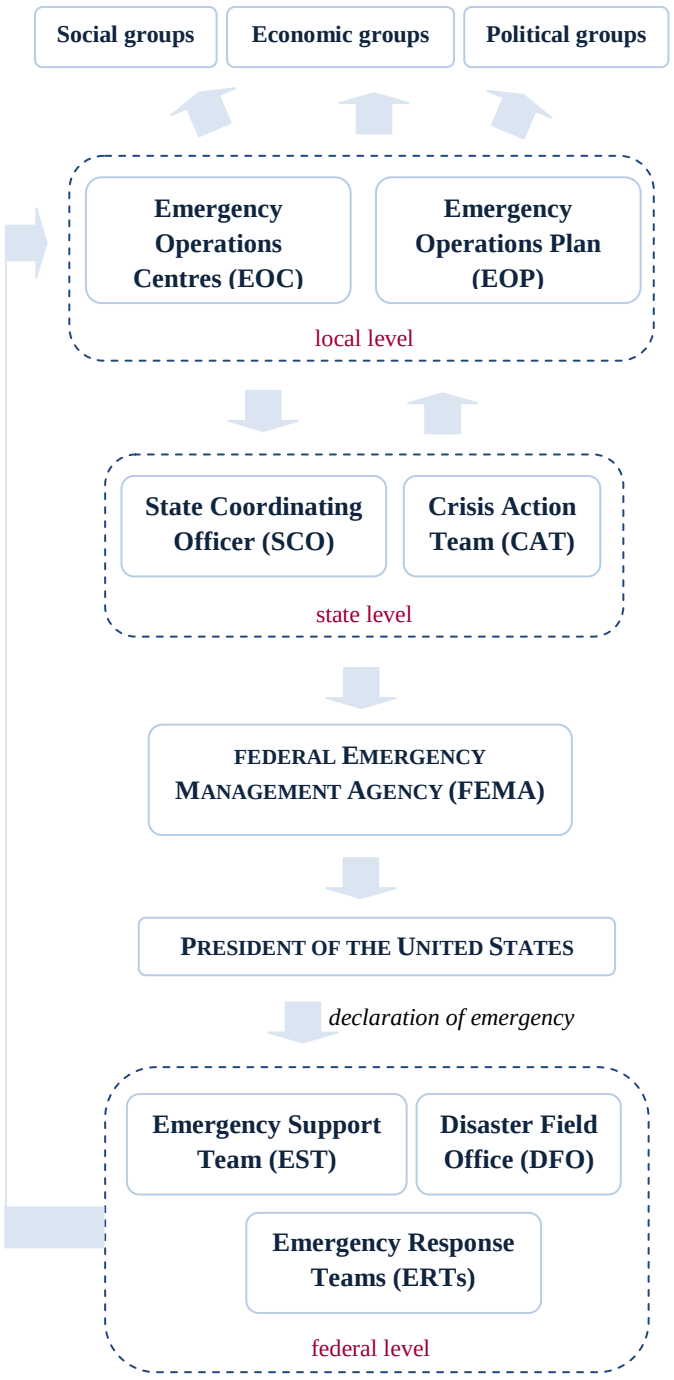
Physical Territory

Area: 9,826,675 km^2
Plains and hills: n.a.
Mountains: n.a.
Volcanoes: 241
(ca 170 active)

Society

Population (2013): 316,668,567 (82% urban)
Density: 34 inhabitants/km^2
Government: Federal Republic
HDI: 0,937 (i.e. very high human development)
Administrative division: 50 States and 1 District, 19.492 municipalities

Disaster Management Organization Chart



In 1988, with the Stafford Disaster Relief Act the Emergency System of United States was shaped. According to it, before or after a disaster occurrence, in order to perform emergency response activities, local authorities are in charge of organizing *Emergency Operation Centers* (EOC) and *Operation Plans* (EOP). If local capabilities are insufficient to cope with the disaster, State - and eventually Federal - resources are required. Through *FEMA* offices and after evaluating the extent of local needs by means of a *Preliminary Damage Assessment* (PDA), *State governors* can ask support from the Federal Government. If Federal assistance is denied, State and local authorities should autonomously deal with the disaster; otherwise, 12 *Emergency Response Teams* (Mass Care, Transport, Communication etc.), an *Emergency Support team* (EST) in Washington and an on-site *Disaster Field Office* (DFO) are established to coordinate federal assistance and provide the impacted communities with the needed resources.

The resulting system is highly bureaucratic (Mener, 2007), with a strong fiscal and political decentralization.

Original graphic created by the author based on Public Law 93-288, 1988, and Roles of Government analysis (1998)

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