Natural Hazards and Disaster Risk Reduction Policies

Loredana Antronico – Fausto Marincioni
Editors

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Cover: A woman shovels mud from her driveway in the aftermath of the October 2010 debris flow that affected the Province of Vibo Valentia (Calabria, southern Italy).

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Preface

JC Gaillard[1]

Disaster studies is mostly an Anglophone business. It is dominated by researchers publishing in English and circulating ideas framed from a western cultural perspective. This hegemony has contributed to stereotyped understandings of disaster risk and of what should be done to reduce this risk as well as how to respond to disasters. Perspectives that do not fit Anglo-Saxon ontologies (in their diversities) have largely been marginalised and voices from outside this realm have struggled to emerge.

Of course, there have been some noticeable exceptions. Back in the early 1970s, French Anthropologists have influenced the emergence of the so-called vulnerability paradigm (Comité d'Information Sahel, 1975; Copans, 1975) while, two decades later, members of La Red have contributed to the affirmation of the same ideas much beyond their Latin American base (e.g. Maskrey , 1993; Lavell and Franco, 1996). These initiatives have nonetheless been isolated and creative hotspots of disaster scholarships have long formed a patchy landscape of unconnected dots kept apart by ethnolinguistic differences. In consequence, many of these hotspots of disaster scholarship have long remained unknown to most researchers, policy makers and practitioners.

This is fortunately changing. Firstly, there is the rapid emergence of East and South Asian scholars followed by researchers from the Middle East and Africa whose increasing academic production is contributing to more balanced views. Such trend is also progressively expanding to other countries where there has been a long tradition of research on disasters but hitherto only accessible to those who master local languages. Indeed, efforts of language translation, while respecting and showing cultural differences, are on the rise. For example, a number of books in English have recently been edited by Francophone (Revet and Langumier, 2015; Vinet, 2017), Italophone (Forino *et al.*, 2018) and Lusophone (Marchezini *et al.*, 2018) scholars.

The present volume by Loredana Antronico and Fausto Marincioni, although in English, contributes to further breaking these cultural silos. It features the work of an array of Italian researchers from different social science backgrounds. It also includes contributions from Spain, Portugal,

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Mexico and India, thus participating in a much welcome multi-cultural dialogue on issues around disaster risk and disaster risk reduction.

These fresh perspectives cover multiple dimensions of disaster risk, henceforth providing a wide panorama of current research initiatives in Italy and beyond. These range from the root causes of people's vulnerability and risk perception, to information, preparedness, risk reduction, emergency management, recovery as well as broader issues around governance. These topics are addressed from both empirical and theoretical perspectives, thus providing an array of diverse and unique views to inform how we comprehend disaster risk.

The case study of Mt Etna in Sicily is particularly interesting from the viewpoint of academic geopolitics. This volcano is obviously very well-known and has stirred much interest beyond the borders of Italy. In fact, most key references on local risk, from a social science perspective, available to non-Italian speakers have been written by Anglophone scholars rather than locals (e.g. Chester *et al.*, 1999, 2008; Dibben, 2008). It is therefore refreshing and welcome to be able to here read a chapter written by an Italian researcher who is actually based in the very city of Catania (Cannizzaro, this volume).

In a nutshell, this book is a must read for all academics desirous of expanding their academic horizon. It is an easy read with short and punchy chapters all providing a unique view on a particular issue of broader relevance. It is ultimately a key step towards connecting the dots of disaster studies beyond stereotypes and from culturally diverse scholarships.

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Introduction

Loredana Antronico[1], Fausto Marincioni[2]

Natural hazard is a term widely used by scientists, authorities and practitioners to indicate extreme environmental processes that may produce damaging impacts on exposed territorial system. A large number of human communities have settled in areas where extreme processes such as landslides, earthquakes, hurricanes, tsunamis, floods, volcanic eruptions or droughts, occur recurrently causing casualties and widespread economic and environmental losses. Although considerable progress has been made in clarifying the causes and the processes related to natural hazards, further efforts are required to reduce disaster risk; e.g. reducing people's exposure and vulnerability. As a matter of fact, recent scientific data show an increase in disasters, which cannot only be attributed to an increased frequency of extreme physical phenomena (e.g. climate change), but often determined by economic, social, cultural, institutional and political factors. Consequently, promoting disaster risk reduction means activating a series of actions, strategies or policies that involve, at different scales, various social actors, including policy makers, professional and members of the academic community. In particular, it is necessary to share the challenge among citizens and institutions, public and private sectors to: a) reduce the vulnerability and exposure to hazards of people and infrastructures, b) promote sustainable land and environmental management, and c) improve preparedness and early warning to extreme events; etc.

The purpose of this Book is to document a number of case studies from different regions of the World pursuing disaster risk reduction through preparedness, mitigation, emergency response, and recovery activities. The volume contains 14 chapters divided into three sections: 1) disaster risk perception, 2) disaster planning and management, and 3) disaster mitigation and preparedness. The first section, Disaster risk perception, includes five essays. Cruz-Bello and Alfie-Cohen present two case studies in Mexico where the population was directly involved in risk assessment. For this study two different participatory methodologies were applied and their effects reported. Authors also describe participatory processes (workshops)

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through which the local communities have been empowered to develop strategies to mitigate vulnerabilities (strategies the feasibility of which were directly evaluated by the local Civil Protection authority). The experiments proved how participatory methodologies could help to raise awareness about the delicate human-environment relationship. Salami, von Meding and Giggins adopt the lens of political ecology to study flood risk and vulnerability in the traditional urban settlement of Bere, within the Ibadan Metropolis in Nigeria. Their research highlights the social construction of vulnerability, as the inhabitants most at risk were also those with higher exposure and susceptibility, given their socio-economic characteristics. Consequently, the authors encourage a more comprehensive approach to risk mitigation, moving beyond structural strategies, and considering various activities to strengthen awareness, preparedness and planning at the community level. The volcanic archipelago of the Azores is the case studied by Rego, Pereira and Pacheco. The question addressed in this essay concerns risk perception, and in particular, how local communities negotiate risks and benefits of living near a volcano. Finding shows that local communities are aware, more than expected, of the actual risks, yet it seems that they tend to neglect such risk in the face of the advantages provided by such unique landscape. These benefits includes a strong sense of belonging and connectedness within the community, and specific economic activities developed around and on the volcano. Also the case studied by Cannizzaro concerns a volcano, Mount Etna in Sicily, Italy. Here too, the author tackles the apparent irrationality of acknowledging, and yet seemingly dismiss, the tangible risk posed by living in direct contact with such a natural threat. It emerges that the strong feeling of belonging to that specific place develops a fatalistic attitude on the part of the local community; residents accept that Etna volcano can be both a source of life and economic prosperity as well as death and destruction. Lugeri and Farabollini shed light on the long-standing neglect of human accountability in the course of events that lead to disasters. Underlining human involvement in the creation of disasters, authors suggest participative and educative processes to promote sounder land use and human-environment interaction.

The second section, entitled Disaster Planning and Management, includes four essays. Gugg analyzes the Vesuvius emergency plan for Naples, Italy. Indeed, the very existence of such emergency management tool, besides acknowledging the tangible volcanic hazard, serves also the purpose of helping local communities to clarify their exposure and vulnerability and how prepare for the next eruption. In addition, the Vesuvius emergency plan is a great opportunity to build a dialogue among the various stakeholders broadening the number of individuals and groups involved in the emergency

planning process. Lastly, the author highlights the need to construct a shared vision for the future use of the Vesuvius hinterland. Gatto, Balducci and Marincioni address the inclusion of people with disabilities, access and functional needs in disaster planning and management. The authors solicit a new approach to directly involve such individuals, as well as their families, since the decision-making processes. Certainly, they acknowledge the need of a strong political engagement to foster and achieve such an inclusive emergency management approach. Annesi, Rizzo and Scamporrino focus on the physical, social and institutional components of a city. Their work concerns the recovery processes following an earthquake. Three Italian case studies are analyzed: Fucino area, Belice valley, and L'Aquila. Beside discussing the lessons derived from past mistakes, the authors recommend the Italian "National Strategy for Inner Areas" as an effective tool for seismic risk reduction. Appiotti, Bertin and Musco also discuss the recovery processes after an earthquake in the Municipality of Cascia in central Italy. The project provides insights on how fruitful a public and private collaboration can be in actively involving the local communities. At the same time, this essay discusses possible trade-offs between bottom-up solutions proposed by the citizens, and top-down processes coming from established institutions.

The third section, entitled Disaster Mitigation and Preparedness, includes five chapters. The study carried out by Fassoulas et al. focuses on a UNESCO program called Global Geoparks. The authors suggest taking advantage of the sought links between that geological heritage and all other natural, cultural and intangible legacy of sites to induce environmental education for both locals and tourists. This would also help meeting international agreements such as the Sendai Framework for Disaster Risk Reduction. The stated goal of Cadierno Gutierrez and Losada Gómez is to question the use of the term "natural disaster" in common narratives. Their research is rooted in the very definition of risks and disasters as social constructions. From this perspective, natural hazards are seen as natural features of the environment, towards which humans are required to become resilient. The authors also discuss the role of mass media in impacting individual and collective behavior, boosting or undermining adaptive capacity. Cerase too discusses disaster communication, considering how this social function could be used to delivery timely and comprehensive information to advice the choice of life-saving actions. The author also discusses the implementation of several strategies to reach members of the community. The work of Grimalt and Geli focuses on the island of Mallorca, discussing dry-stone walls as traditional means of flood mitigation. While such structures used to provide protection and foster

agricultural development, they are currently losing their importance (and function) due to the recent expansion of tertiary activities and cutback in farming. The authors suggest that these dry walls should be restores also for their cultural-heritage value substantiating the distinctive human-environment relation that shaped the island landscape. The work of Kumar draws from the paradigm shift of disasters from acts of God to acts of humans, showing how disaster response measures evolved over time from resistance to resilience to extreme events. The Author reports how in India disaster management begun by focusing on the specific risk of famine to subsequently evolve into a more comprehensive approach aimed at enhancing the overall resilience of local communities.

These above-mentioned essays, constituting the book chapters, contribute to the current scientific debate on disaster ecology, exploring strategies and ability of local communities to adjust to hazard and disasters. Common thread among the different case studies is the need for Homo sapiens to define its rights and responsibilities in environmental dynamics, including extreme events and disasters. In the end, the choice of how to deal with hazard, vulnerability and disasters, highlights the ethical nature of disaster risk reduction; control of nature or adaptation to its cycles?

Section I

Disaster Risk Perception

1. Environmental perceptions: participatory methodologies for the assessment of Social Vulnerability to floods in two communities in Mexico

Gustavo Manuel Cruz-Bello[1], Miriam Alfie Cohen[2]

Abstract

This chapter introduces two participatory methodologies in order to obtain environmental perceptions and assess the vulnerability and adaptation strategies in two localities prone to floods due to cyclones and heavy storms in Mexico. The first methodology corresponds to a modification of the one proposed by the National Commission of Protected Areas in Mexico and the Deutsche Gessellschaft fur Internationale Zusammenarbeit (GIZ) that helps to collect community perceptions about climate change. The second one is a participatory mapping approach that helped to collaboratively map out affected households, measures taken by the community to reduce disturbances and the proposed actions to be taken in the future to reduce their vulnerability. The case studies correspond to two communities, one located in the northwest of Mexico and the other located to the southeast of the country. Experts of "Protección Civil", the agency in charge of disaster risk management, reviewed the results of both participatory methodologies implemented through workshops. All the results were given back to both communities. When combined, the products of the participatory methodologies enabled the population to discuss, propose activities and negotiate with the three levels of governmental authorities in charge of risk management and vulnerability reduction to be able to handle extreme hydro-meteorological events in a better fashion.

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Keywords: Environmental perception, climate change, semi-participatory GIS, floods, vulnerability reduction.

1. Introduction

The study of the relationship between society and nature has been approached from various disciplines and theoretical movements. This reciprocal relationship implies the way in which human beings have transformed nature, but also how the latter influences and determines humanity's way of life. The analysis can include points of view from disciplines like biology, ecology, physics, chemistry, and the social sciences. As a result of the failure to achieve agreements on emission reductions since the Copenhagen Climate Summit in 2009 (COP 15), social sciences have focused on the study of the environment, as a new approach to explain the influence of human actions on climate change, and understand the social dimensions of human responses to climate variability (Heyd, 2010). It is about studying the relationships between human society and the environment that surrounds it. Social sciences have tried to integrate an approach to understand the perception that individuals have in relation to their environment and the actions they take in consequence (Ramos *et al*., 2011). As climate change has become a growing threat, efforts to understand more precisely how the climate is changing, as well as the impacts of these changes on natural and social systems have multiplied. The search for mitigation and adaptation solutions of a technological, social, economic and environmental nature has also increased. Therefore, from the social sciences perspective, individual and institutional responses have received special attention. The nodal point is to try to comprehend the processes of interaction between the society and their environment (Oltra *et al*., 2009).

In the context of the current trends in social sciences, it is essential and relevant to talk about the communities' perceptions about climate change, because attitudes towards climate variability, mitigation and adaptation might have a significant influence on the development and success of political programs, as well as on individual actions related to the preservation of the environment. Comprehend the public's engagement in climate change policy have become a subject of interest in social sciences, as well as within public authorities and private organizations (Oltra *et al.*, 2009). The main issue is understanding how the climate variability has permeated and transformed community lives, their economic activities, their social relationships and their interaction with the environment (Martinez-

Alier, 2006). A new environmental culture, values and behaviors can be addressed through a systematic study of the so-called social perceptions. As Lefebvre (1991) pointed out, the relationship between human beings and their environment is a reflection of their environmental perceptions.

In this chapter, we present two different, but complementary participatory methodologies applied in two communities of Mexico for the assessment of social vulnerability to climate change, understanding this as the people´s potential for loss (Cutter, 2006). In this context, we tried to understand how communities use their knowledge about the climate variability and the implications in their territories and activities in the adaptation and vulnerability reduction processes.

First, the perceptions-based methodology focuses on individual and collective knowledge and is concerned about climate variability and climate change. We tried to understand the ways in which each community values its environment and the actions they have taken on the matter. Several authors, including Berkes *et al*. (2000), Heyd (2011) and Vander Molen (2011) state that perceptions attribute qualitative characteristics to environmental assets through references stemming from specific cultural and ideological systems, constructed and reconstructed by the social group; this in turn, allows to generate evidence about conservation practices in their territory.

The second one is a participatory mapping approach for knowledge co-production where environmental perceptions, in a spatial context, are obtained to engage the community in the decision-making process of risk management and vulnerability reduction.

The assessment of vulnerability at the local level allows for greater understanding of the impacts of climate change in specific contexts. At the community level, there is recognition that the planning and implementation of adaptation strategies are intimately linked with culture, social values, risk perception and local characteristics. That recognition can improve decision-making, socio-cultural contexts and community expectations. Local cultures would deal differently with climate change and this may have an influence in concrete practices (Soares and García, 2014).

Therefore, local and traditional knowledge systems, practices and perceptions are important sources of information to define improved adaptation strategies (IPCC, 2007). We appreciate community involvement towards self-management and adaptation as the key to reduce vulnerability to climate change. According to Van Aalst *et al*. (2008), the bottom-up approach has the advantage of using actual observation of current climate impacts and the way communities respond. In this research, the concept of “community-based adaptation” is core. It can be defined as "a guided

process by communities based on their priorities, needs, knowledge and ability to empower people to plan and cope with the impacts of climate change " (SEMARNAT, 2012: 34).

1.1. Environmental perception

Perceptions are part of the process linked to environmental education where consciousness plays an important role (Borroto *et al.*, 2011). Therefore, perceptions are conditions, attitudes and sensitivities that influence the actions and regulations that human beings build on their environment. Perceptions reflect the consciousness of human beings about objects or phenomena of the environment that surrounds them, where sensations play a privileged role.

When a group is elicited to express their perceptions on environmental problems, it is essential to understand their environmental vision, their responsibility toward the surroundings, their attitude and the decisions they make when dealing with the various difficulties they face, as well as the opportunities of changing the environmental-cultural education that they may have. Perceptions are useful in exploring how people are exposed to climate change impacts and in what ways these affect their wellbeing. In this scenario, research on the various levels of knowledge and perceptions of climate dynamics and climate change, has been increasing in the last ten years around the world (specially in Latin America), as well as the acknowledgement of the knowledge base, beliefs and practices of the local communities. These factors contribute not only to fill the gaps in scientific information, but also to prepare the way in the design of mitigation and adaptation measures to the changing climate that are feasible from their cultural point of view (Correa, 2011).

In addition to the aforementioned, perceptions are measurements or estimates of the state the environment holds. It is an intersubjective evaluation of these conditions that includes a personal assessment of the quality of the environment, based on environmental factors to which human systems attribute certain significant values including economic, social, aesthetic and ethical aspects (Gallopin, 1986).

Perception are opinions, beliefs, values and norms to preserve lifestyles with the possibility of establishing agreements and commitments (Dietz *et al*., 2003). Recreating environmental perceptions allows incorporating those ideas on the local planning, protected areas administration, risk management, vulnerability reduction and social empowerment (Adger, 2003; Berkhout *et al*., 2004).

A balanced relationship between society and nature allows for the establishment of bonds of equity, justice and solidarity; as well as an increase to the quality of life of communities that require natural resources to ensure their material and cultural survival (Bertoni and López, 2010).

The sociocultural dimension is part of the qualitative change in the dynamic relationship between the society and nature (Guimaraes, 2001). It needs to be included in local environmental planning and management, since inhabitants know their territory and have adapted to the evolving climate conditions to prevent risks and mitigate vulnerability. Collecting local knowledge, (collective understanding rooted by generations on the cultural and territorial heritage -Martinez-Alier, 2006) can give light on the practices related to the cultural use of nature. In the words of Leff (2004), the practice of a new environmental rationality requires integrating the evaluation of ecological conditions of sustainability with the meanings of nature constructed from local knowledge and culture.

Moreover, sociologists such as Luhmann (1995) established how perceptions are able to build a space-time relationship based on linguistic signs. Perception acts as a filter between social systems and the external world. By means of perception, we can focus and understand time and space. Consciousness of spatiality is an impression of proximity with the world. "The perception is to put a foundation brick in the architecture upon which the construction of reality is built" (Lewkow, 2014: 36).

Psychology has also tried to establish links between a high quality of life and a healthy environment. Thus, Baldi and García (2005) highlighted how the World Health Organization establishes that the quality of life is the result of the relationship of individuals and communities with the biotic and abiotic elements of the environment. Moreover, PAHO (2013) has declared that there is an intrinsic relationship between health and the environment and that more than 30% of diseases can be attributed to the latter.

Therefore, environmental perception is a relationship of construction or destruction with the environment, a novel, complex, surprising and, sometimes, incongruous individual and collective process. For authors like Cisneros (2010), the struggle is not against nature but rather for nature where environmental education becomes a key element to improve environmental behavior.

We can summarize that the environmental perceptions are understood as the way in which individuals appreciate and value their environment, and can drive important changes for its conservation and transformation. In Mexico, environmental perceptions have been mainly studied in communities in natural protected areas. These studies emphasize citizen participation as the central component to increase the adaptive capacity to

deal and recover from the impacts of severe climatic events. This capacity is explained by socioeconomic conditions at the household level, but it might be reduced by the lack of health facilities, communication, social networks or deficiency in institutional programs (CONANP-GIZ, 2014). However, as Fernández (2008) refers Mexican environmental policy mainly reflects the perceptions, visions and interests of decision-makers rather than those of the local population.

Given this situation, our interest was to study the environmental perceptions of two Mexican communities recurrently impacted by hydro-meteorological phenomena (cyclones, heavy storm and floods). We also wanted to study the degree of vulnerability of those societies related to climate variability and the processes of local adaptation they have achieved. We used two participatory methodologies where the population shared their visions, values, judgments and suggestions, to face environmental and climate change.

We were interested in distinguishing how environmental perceptions are different ways of seeing "reality", how distinct communities deal with diverse situations and in what way they use their local knowledge to face climate change and how they put together their adaptation forms; and develop spaces of dialogue with local authorities to generate public policies aware of climate change. In addition, we were interested in knowing direct experiences (information given by the participants), evaluations and explanations from the communities that would allow us to find timely answers against climate risks posed by hurricanes or floods (Heathcote, 1980; Whyte, 1985).

2. Case Studies

The case studies correspond to two communities susceptible to floods caused by cyclones and storms. One located in the northwest of Mexico, Chametla, which is a suburb of La Paz city (the capital of Baja California Sur State). It is a costal settlement with an average altitude of 4 m, developed between 1990 and 2000. Its population comprises 2,178 inhabitants living in 696 households (INEGI, 2013). According to the Mexican National Centre on Disaster Prevention (Jiménez *et al*., 2012) this community is under high flood risk due to the presence of streams. There have been reports that at least every two years a hydro-meteorological phenomenon affects the region (Martínez-Gutiérrez and Maye, 2004). The other case study, Progreso, is located in the southeast of Mexico, in the state of Yucatan. It is a coastal city with an average altitude of 2 m and it is an

old settlement created in 1856. It has a population of 37,369 inhabitants with 10,090 households (INEGI, 2013). It is under the constant occurrence of cyclones, strong winds, storms and floods.

3. Methodology

To assess the social vulnerability to floods in Chametla and Progreso we decided to implement participatory methodologies, to gather the environmental perceptions of social actors that had been affected by floods and in some cases had experienced disaster situations. The participatory methodologies were conducted in two phases. The first one entailed establishing contact with the community through the local authorities in charge of the environment and risk management, as well as with academics of local higher education institutions. In the first visit, we got in touch with the community leaders, to know and analyze the locality and to talk about the project objectives and scope. Once the authorities and the community leaders agreed to support the project, we started the second phase and established a date to carry on the participatory workshop concerning environmental perception. A participatory workshop was done in each community; it included the environmental perceptions and the participatory mapping exercises. Results of these workshops were refined and delivered to the community and local authorities in a second workshop.

To have an adequate participation, our workshop attendees were volunteers. Since Chametla is a relatively small community, the invitation was opened to all its members through the placement of announcements in convenience stores and by direct invitation in some houses by a group of students of a local university (Universidad Autónoma de Baja California Sur) who helped with the project. Despite the ample invitation, we had the participation of only nine people who worked in a single group in the workshop (there were six women and three men; six were professional in different fields, one student and two housewives; their ages ranged between 21 and 60 years old; one of them was the neighborhood leader). In the case of Progreso, the research team and the personnel of the municipal risk management agency delimited the areas with most flood problems. Then the municipal personnel took the invitation to people who lived in different parts of the delimited working area to participate in the workshops. In this case, we had the participation of 15 people (eight women and seven men; four construction workers, three students; one fisherman, three housewives and four government employees; their ages ranged between 23 and 58 years old). People were divided in two groups; those who lived in the east side

and those who lived in the west, so two working groups were created of seven and eight people. Chametla workshops were carried on in November 2017 and January 2018 while the Progreso workshops took place in February and May 2018.

3.1. Community perceptions

The second visit consisted in putting into practice a four-hour workshop and conducting semi-structured interviews with key players. We used a reduced and modified version of the approach used by the National Commission of Protected Natural Areas based on the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), which was used to analyze social vulnerability to climate impacts in protected natural areas of Mexico (CONANP-GIZ, 2014).

The methodological approach applied in this research was based and adapted from the vulnerability analysis used in the "Tool for the Analysis of Social Vulnerability to Climate Impacts at a Local Scale in Natural Protected Areas", which is based on the theory of complex systems, ecosystem-based adaptation and vulnerability analysis founded on response margins (sensitivity analysis). This tool identifies five dimensions of vulnerability (DiV) defined from the interrelationships between life strategies of communities and terrestrial ecosystems in a context of climatic change (life strategies, wellness, adaptive capacity of people and households, adaptive community capacity and governance).

DiV 1: Life Strategies

- Social and ecological characteristics of the community
- Life strategies for different social groups within the community (gender, age, socioeconomic status, ethnicity)
- Important climatic impacts for the community
- Changes on life strategies due to climatic impacts or climatic change trends

DiV 2: Wellness

- Local criteria and welfare categories
- Households that correspond to these categories
- Vulnerable households or households with less capacity to adapt

DiV 3: Adaptive capability of people and households

- Access to resources to adapt, according to the social groups of the community
- Level of control of social groups over resources and livelihoods

DiV 4: Adaptive community capability

- Norms, practices and institutions of the community having an influence in vulnerability and collective adaptation capability

DiV 5: Governance

- Capabilities and responsibilities of the political actors and organizations linked to processes of vulnerability and adaptive capacity

The information was systematized and synthesized by the members of the research team, maintaining criteria on gender, age and spatial location of the families. The analysis took into consideration local climate impacts, risks and vulnerabilities based on the DiV approach. The research team complemented the synthesis on the environmental community perception and their adaptation needs. The analysis of social vulnerability and the adaptation process was performed under the concepts of interdisciplinary and complex systems.

We applied the methodological proposal of (Ulrichs *et al.*, 2015) to gather the adaptation measures from the perceptions, experiences and needs of the inhabitants and their families, through the environmental perception workshops. We were interested in the family and community knowledge regarding ecosystems and biodiversity, and the adaptation measures they use to reduce their vulnerability.

In this identification, the DiV provide information about the causes of vulnerability and strategies for adaptation, considering: 1) the sensitivity of community groups to climate impacts or food security, and 2) adaptive capability or local barriers to adaptation (social, political or environmental), as the basis to define an adaptation measure. Finally, adaptation measures were discussed within the research team and the community to define those that are appropriate, defining their advantages and consequences.

One of the key points of the analysis was to adapt this methodology to our case studies that can be considered peri-urban areas (understood as multifunctional transition zones around the cities with a mixture of land uses and high and rapid transformations (Avila, 2001; Duran, 2005), and that have had an emergency due to cyclones, heavy rains and floods. Thus, the analysis of vulnerability to climate change of the communities was performed considering these five dimensions of vulnerability: life strategies; wellness; adaptive capability of people and households; community and collective adaptive capability; governance. With the information obtained it was possible to describe the social, cultural and environmental perception about the climate change of the inhabitants; the way they conceive the risks associated with this phenomenon, their vulnerability and the means to face it, as well as their adaptation strategies and practices.

The participatory perceptions workshops were conducted through four phases:

Phase 1: Identification of risks and threats (meeting facilitation)

- Identification of risks and threats (cause and effect) due to frequent climate effects on the community
- List of hazards and their impacts to understand their seasonality (January to December)

Phase 2: Identification of areas and populations at risk

- Identification of areas with degraded forest lands, rivers, flood zones, mudslides or landslides
- Location of social groups that inhabit risk areas

Phase 3: Productive activities and risks

- Identification of impacts on productive activities in the community (season, gender, place)
- Identification of the level of impact in a specific month, percentage of change and persistence, limits of tolerance

Phase 4: Adaptation mechanisms

- Enumeration of the mechanisms of adaptation to situations of risk that affect families or the community, their relationship with productive activity and limits of tolerance
- Enumeration of the support mechanisms that families and the community receive (institutions, programs, social and family networks).

3.2. Participatory mapping

In order to gather information to support vulnerability reduction and risk management to face extreme hydro-meteorological events exacerbated by climate changes and to involve the community in the decision-making processes, we implemented a participatory mapping exercise in Chametla and Progreso. This exercise complements the information collected in the social perception workshops.

The participatory mapping exercises allowed collecting of firsthand-community information about major impact zones, refuges and evacuation routes in case of emergency. Additionally, we obtained a list of steps already taken and those that need to be carried out, individually or collectively by the community inhabitants to reduce their vulnerability (Canevari-Luzardo *et al.*, 2015; Arapostathis *et al.*, 2018).

In the end, the information was given back to the community through a workshop. This information would empower the population, providing elements for discussion and negotiation with the authorities or non-

governmental agencies that support risk management and vulnerability reduction actions to face extreme hydro-meteorological events. Besides, the map generation process represents a mechanism that allows society engagement in the decision-making process since it is an easily understood approach that facilitates the coordination with the authorities through the communication of local knowledge (Hung and Chen, 2013).

This is of utmost importance since it is a way to close the gap between society and risk management authorities. In addition, it facilitates community appropriation of measures proposed by the authorities since they are taking into account their perceptions. Additionally, this exercise allowed the workshops participants to be conscious of their spatial knowledge about their community, their exposure and vulnerability and the damage of hydro-meteorological hazards.

After the perception workshops, the participatory mapping approach was conducted through a pair of workshops in each community. In the first workshop, local knowledge was gathered and in the second one, the results were presented and validated. For the first one we used a satellite image, printed in a poster size, from Google Earth (Google Earth©, Image© 2017 Digital Globe). In addition, we employed some tools including photographs of emblematic sites from each study area to which we assigned an identifier linked to a location. In addition, we prepared markers and labels of various colors to identify different territory elements to be located by the workshops participants. These elements were previously included in a list and comprised refuges, evacuation routes, households of participants, hospitals, meeting points as well as places where adaptation activities have been carried out and those proposed to be done to reduce the vulnerability to floods. We started the first workshops for both case studies with the presentation of the projects' objective and scope; the request for consent to use the information in scientific products, and emphasizing the commitment of the research team to conduct a second workshop to present the results.

The first mapping activity was to create a confidence map. In Chametla, all participants showed deep knowledge about their community and its flood problems. In Progreso, people in the two groups agreed that they knew very well the East and West zones respectively, and almost all knew the whole study area. Spatial knowledge of their localities was gathered in both communities in the following exercise. Participants were asked to locate emblematic sites (depicted in photographs) and their houses in the printed satellite images. Discussion in this exercise among the participants was very enriching to the spatial knowledge since they not only locate their houses and the places in the photographs, but also other reference sites such as schools, churches, streets, parks, etc.

Once the confidence map was generated, we located elements related to flood vulnerability reduction. First, they were asked to identify sites that regularly get flooded even with minor rains, and then they located the zones that only get flooded with extreme hydro-meteorological events. As a next step, we asked the participants to list and spatially locate actions that they perform in an individual or collaborative way, as well as those carried on by the government to reduce the vulnerability and adapt to the floods. They were also asked to list and locate in the territory those activities they considered should be implemented to be less vulnerable to floods. Once they identified the activities they usually do and those they propose to be carried out, they were asked to locate the refuges, hospitals, meeting sites, evacuation routes established by them or by the local authorities.

At the end of the mapping activity, each group appointed a person to present their results; this presentation and the discussion that followed allowed for refinement of the final map of the first workshop. This was more significant in the case of Progreso, where the mapping work was made in two groups (east and west), since people working in one side of the city contributed to the other side and vice versa. This was possible since people in one side said they also know the other side. As a closing to the workshops, we asked the participants to describe for what purposes they could use the map and with whom they would use it. A technician then transferred the information collected in the printed satellite images during the workshops to a digital format using the geographical information system ArcGIS 10.1.

The resulting maps of the first workshops were presented to the municipal risk management experts to get their comments about the community perception; these comments were then presented back to the community in the second workshops. In these same workshops, we delivered the final map and the perception reports to the community.

4. Results

Combined, the two products of the participatory methodologies (community perceptions report and the participatory map) gave elements to the inhabitants for discussion purposes, proposal of activities and negotiation with governmental authorities of the three levels in charge of risk management and vulnerability reduction to face extreme hydro-meteorological events.

4.1. Community perceptions workshop

Participants' perceptions of our workshops in Chametla and Progreso exhibited the community's knowledge on climate variability and climate change. They mentioned an increase in temperatures and episodes of prolonged rains and increase in the presence of cyclones. People attending the workshops detailed the months of the year that are most affected by climate change. People have adapted to these new situations by using local knowhow, for example, raising the sidewalks or building walls to deviate the water flow, and reported that these actions have contributed to reduce catastrophes.

Climate change has affected their economic activities and adapting to these circumstances was one of the most important concerns in both communities. They reported changes on primary activities and consequently, they have switched to informal commerce or to the services sector to survive. Peri-urban areas are so relevant for the urban areas, because they provide climate regulation and food supplies, contributing substantially to their resilience.

Another perception reported had to do with the effects of climate change on health. Vector diseases have been increasing and today the risk in both communities is noteworthy. New diseases have developed because of changes in the ecosystems. Massive fumigations by municipalities, prevention campaigns and sanitation of streets and ponds are key actions to avoid diseases such as Zika or dengue.

Both communities perceive that the most vulnerable people are those living in poverty conditions, precarious housing and with jobs linked to climatic conditions. As several authors have shown, economic and social vulnerability plays a key role in a catastrophe. It is essential to mention that a robust social organization allows facing risk with more possibilities to prevent losses and to get better daily life conditions. In this sense, in both communities, people exhibited family and neighborhood solidarity in the face of disaster and adherence to traditional ways of making decisions. Strengthening environmental governance can generate a robust, constant and permanent organization that reduces social vulnerability to risk.

4.2. Participatory mapping

In Chametla the workshop participants identified those activities developed by the community to cope with floods, among them enabling areas for drainage and raking of streets to eliminate dragged material. This

last activity is conducted by the community inhabitants as well as by the municipal government. Among the activities proposed to reduce their vulnerability to floods, the most widely mentioned was street paving to allow for public transportation that could be used to escape flooded areas that are prone to remain under water for weeks. Another proposed activity was the installation of drainage pipes below the new road, which blocks the flow of the runoff water to the sea (Fig. 1).

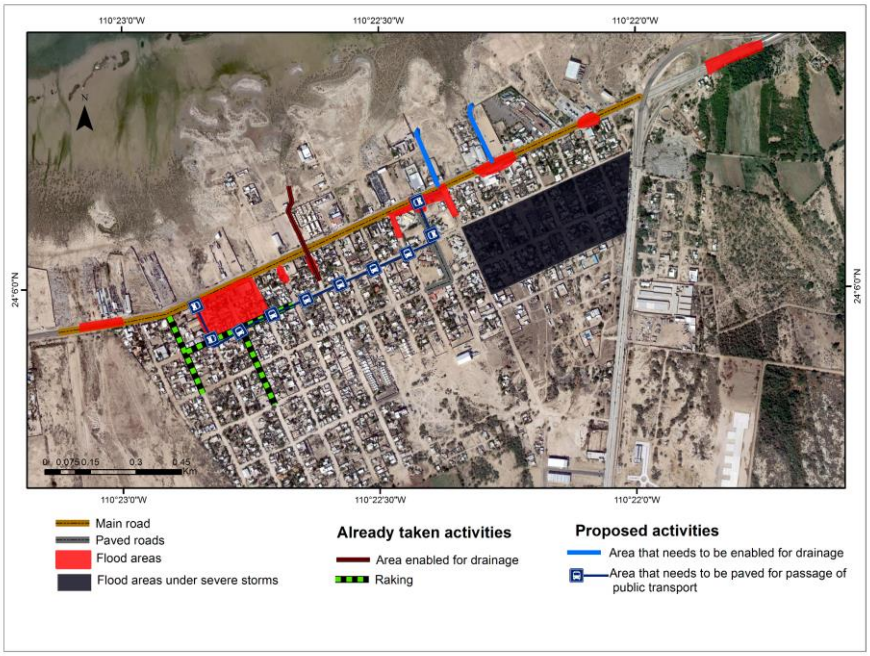

Figure 1 – *Edited participatory map for Chametla.*

In this community, the inhabitants told that the generated map could have two main uses: first, as a tool to facilitate the cooperation to select and conduct activities to reduce the vulnerability in front of floods; second, to ask for help from the authorities to carry out the activities proposed in the workshops as reported by Cruz-Bello *et al*. (2018).

In the case of Progreso, the activities were mainly related to the cleaning of streets, the construction of drainage pipelines (mainly near the lagoon), an artificial reef for the protection of the beach and the construction of drain pits (the city lacks of a drainage system based on pipelines). Among the proposed activities are the maintenance of the drainage pits, better cleaning of the streets prone to flooding, the installation of cameras and the construction of a fence to the side of the lagoon to prevent and discourage

people from throwing garbage that causes the clogging of the water drainage pits. Additionally, they suggested the installation of a wire fence to prevent crocodiles from entering the city from the adjacent lagoon during flood season and building sidewalks to avoid stagnant water (Fig. 2).

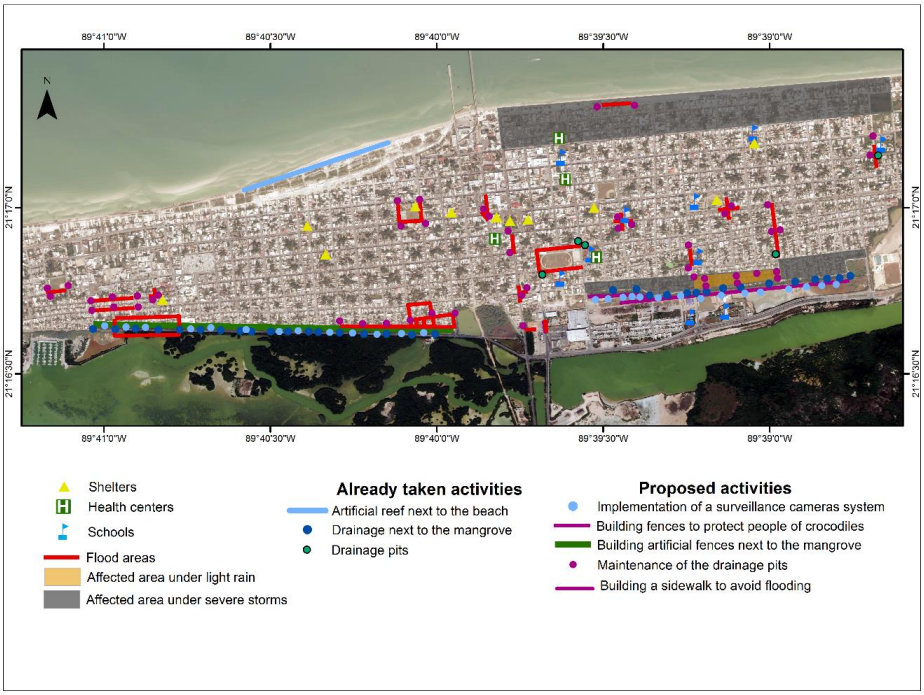

Figure 2 – *Edited participatory map for Progreso.*

5. Final remarks

With the perception method, we created a framework in which the community becomes aware of the climatic variability and the changes produced by the global warming. It is important to highlight that for some participants in our workshops it was the first approach to identifying and defining climate change and its consequences. People were able to identify, throughout the year, the seasonal changes in the weather, and the variations in the climate. Furthermore, people were able to identify the main activities conducted in the community and relate them to the climatic variability and climate change. They were able to recognize which groups and activities were the most vulnerable to floods, which behaviors and activities make

them less vulnerable. In addition, they suggested actions to mitigate risk. As with many other human activities, actions to reduce vulnerability take place in a spatial context. Hence, it was pertinent to complement the communities' perception approach with the participatory mapping method. Here people mentioned who and where are the most vulnerable, those activities they have done to reduce their vulnerability, and the special conditions where they live. This activity made the participants aware about the spatial knowledge of their community and about their vulnerability and the means to reduce it.

In this exercise both methods were executed independently, but in a future research we might combine them in an integrating exercise.

Finally, we can say that the use of these participatory methodologies for the assessment of social vulnerability to floods facilitates the integration of the communities into the decision-making process conducted by the different government levels. Local authorities knew about the workshops, they received the results and they started working with the community to improve on their suggestions. In addition, the results will allow them to have a communication and negotiation instrument that will empower them to demand government actions to reduce their vulnerability. More importantly, they have now elements for the analysis and discussion to propose and implement individual or collective actions in a systematic way in a spatial context.

Results of each workshop allowed finding the environmental perceptions of each community to face different life strategies, their capability of adaptation and possible solutions based on the opinion and participation of the attendees. Environmental perception was one of the key components to understand the dynamics of each studied community. The socio-cultural characteristics, the economic elements, the environmental and physical situations were perceived individually and allowed the community to connect with their environment, visualize it, raise awareness and understand the complex relationship between nature and society. Our results show that community environmental perceptions promote changes and transformations in the habitat and build a new relationship with the environment that surrounds them. They used their local knowledge to adapt to new situations and they started to work with local authorities thus increasing policies to face climate change and strengthen resilience.

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2. The urban political ecology of flood vulnerability in the core area of Ibadan Metropolis, Nigeria

Rafiu O. Salami[1], Jason von Meding[2], Helen Giggins[3]

Abstract

Many cities in both developing and developed countries are at risk of unequal flood risk and vulnerability. To uncover the root cause of flood risk, focusing on solutions related to physical systems alone without considering political, economic, and social aspects is unlikely to minimize effectively the level of vulnerability. This study examines the root of unequal flood vulnerability in Ibadan Metropolis (Nigeria) through urban political ecology conceptual lens. It provides a new dimension of flood vulnerability analysis, detailing how urban residents in Bere, a traditional urban settlement of Ibadan experience different levels of flood risk. The study employs participatory focus groups with households and interviews with key experts to emphasize the findings from the flood victims. The overall results provide evidence of social inequities and political marginalization. The research demonstrates how socio-political factors play a significant role in shaping the creation of uneven vulnerability to flooding. Series of structural and non-structural strategies, equity and justice in resource management are necessary to build a resilient community.

Keywords: Adaptation, African cities, Disaster Risk Reduction, Flood risks, Vulnerability, Urban Settlement.

1. Introduction

The frequency and scale of flood disasters continue to increase in recent years particularly in Africa. In 2006, disasters caused by meteorological and

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hydrological hazards alone troubled more than 102 countries resulting in 7,628 deaths, 411 million people affected and causing economic damages worth US $97 billion (EM-DAT 2016, 137). While more than one-third of global economic losses were caused by natural disasters (Hallegatte *et al.*, 2013), flooding accounts for more than 50% of all disasters recorded in 2016 (EM-DAT, 2016).

In Africa, according to Ndaruzaniye *et al.* (2010), flood and drought alone account for 80 per cent of the losses of life and also responsible for 70 per cent of economic losses in the last 30 years. In West Africa alone, around half a million people are affected by flood disasters per year (Jacobsen, Webster, and Vairavamoorthy 2012). In August 2011, Ibadan metropolis, one of the Nigerian largest cities where the study area is located, witnessed a disastrous flood event that resulted in the loss of over 100 lives and economic damages worth more than 30 billion Naira (US $83 million) (Agbola *et al.*, 2012). Most of the so-called natural disasters such as floods and droughts are triggered due to the interactions between natural and human-related factors (Pelling, 2011). Previous detailed studies that focused on flood risks and vulnerability assessment of Ibadan metropolis, as well as other African cities, are still limited (Adelekan, 2011; Nkwunonwo, Malcolm, and Brian, 2015). More importantly, in previous research, little attention has been drawn to the economic, ecological and political influence on people's vulnerability to flood risk (Westcoat, 2015; Ajibade and McBean, 2014).

Researchers have argued that poor governance and weak institutions are the major contributing factors to flood disasters rather than blaming climate change, population growth or subsistence activities of disadvantaged people (Blaikie, 1985; Watts, 2000). If serious action is not taken to tackle "the root causes of inequality, injustice, disadvantage and poverty, no amount of spending on disaster risk management will stem ever-increasing disaster losses" (Dominey-Howes *et al.*, 2016, 4). This study focuses on investigating the underlying causes of urban settlement's vulnerability to flooding risk in Bere community in Ibadan metropolitan city, Nigeria. It utilizes urban political ecology analytical lens to assess and unravel the drivers of unequal flood vulnerability in the study area.

2. Urban political ecology and flood vulnerability assessment

Most cities around the world are vulnerable to flood risk. Government leaders are continuously blaming external forces of nature as the main cause of flood risk and vulnerability, ignoring the lack of effective governance as a possible driving factor in their countries. Using an urban political ecology approach draws attention to salient questions of how some urban settlements are exposed to unequal flood vulnerability. This approach focuses on the connection between political, social, economic and ecological issues to provide solutions to contemporary environmental challenges (Bryant and Bailey, 1997; Offen, 2005; Heynen, 2014). It also examines issues concerning social and environmental justice and urban ecosystems (Keil, 2003).

According to Robbins (2012), political ecology revolves around "the complex relations between nature and society through a careful analysis of what one might call the forms of access and control over resources and their implications for environmental health and sustainable livelihoods"(Robbins 2012, 28). Specifically, an urban political ecology focuses on "an integrated and relational approach that helps untangle the interconnected economic, political, social and ecological processes that together go to form highly uneven and deeply unjust urban landscapes" (Swyngedouw and Heynen 2003, 1). In other words, an assessment of flood vulnerability through the lens of the political ecology framework would clearly unravel the underlying causes, impacts and solutions to flood risk and vulnerability compared to a conventional method of evaluation.

Lassa (2010) affirmed that the influence of political institutions and urban governance on disaster risk creation and hazards vulnerability are often overlooked by risk assessors. He asserted that nations that promote good governance and stronger institutions have a tendency to demonstrate better policies on disaster risk reduction, which in turns leads to an increase in disaster risk resilience (Lassa, 2010). Consequently, disaster risk reduction could be achieved by assessing the social, physical, political, economic, and environmental injustice that causes people and the urban environment to be vulnerable to flood risk.

3. Research Site

This study was conducted in Bere, an urban community in the core area of Ibadan metropolis, Nigeria (Fig. 1). The urban settlement is categorized as a high-density residential zone with low-quality of dwellings largely occupied by indigenous people of Ibadan (Enyinnaya Eluwa, Siong, and Abayomi, 2012). Figure 2 shows an aerial view of Bere's spatial pattern and distribution of unplanned settlement. It reflects the typical core area of traditional cities in developing countries characterized by physical deterioration of houses with poor sanitation facilities and lack of basic infrastructures.

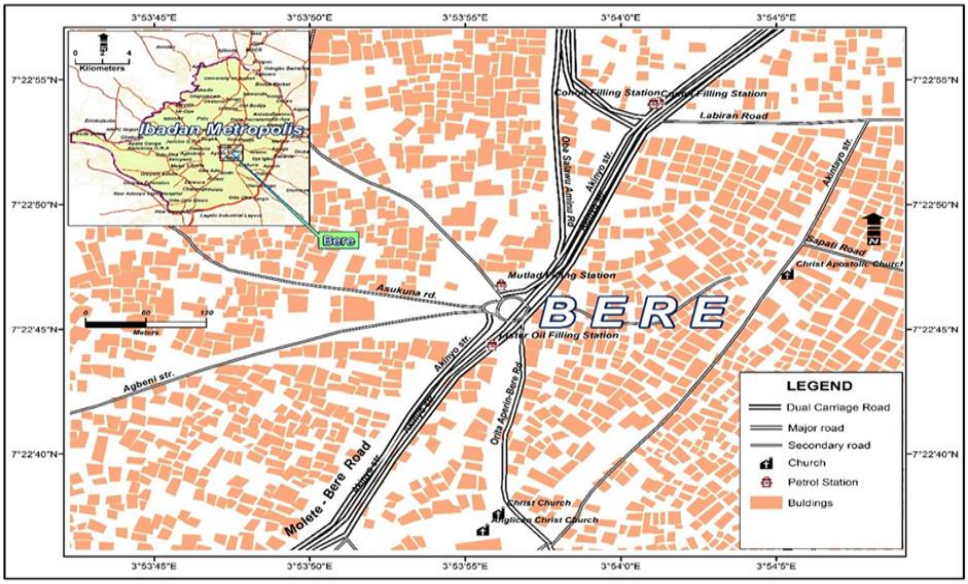

Figure 1 - *Ibadan, showing Bere community at the core of the city. Source: (Salami, 2017).*

Figure 2 - *Aerial view of Bere community's spatial distribution within the core of the city. Source: (Google Earth 7.1 2017).*

Ibadan metropolis like other traditional African cities has unique spatial development patterns (Afon and Faniran, 2013). The ancient city has three dominant settlement patterns: the traditional, transitional and post-independence sub-urban zone (Fourchard, 2003; Abel, 2007). Bere is classified under traditional core area of Ibadan where informal settlements are located as far back as the pre-colonial years. The residents are indigenous people with low-quality and deficient basic infrastructures like spacious roads and effective drainage systems (Coker *et al.*, 2008). According to Adelekan (2016), Bere urban settlement and other slums who are densely populated slums in the core area of Ibadan, are made up of approximately 26,254 housing units.

4. Research methods and analytical tools

This study utilized qualitative methods through participatory focus group discussions with residents of the study area, and in-depth semi-structured interviews with experts in the field of disaster risk management including academics, professionals and flood management agents. Combining these methods are very useful instruments that are capable of unravelling the root causes of urban vulnerability in the study area. This is as a result of using

multiple-lens of investigations to provide detailed answers to research questions (Creswell and Poth, 2017). Extensive methodologies and methods are required to capture and measure the complexities of people and urban settlements' vulnerability to flooding (Takemoto, 2011; Nasiri and Shahmohammadi-Kalalagh, 2013). Qualitative data were collected from both focus group discussions and expert interviews and analyzed sequentially to gain a deep understanding of the research enquiries. These sources of data provide useful, reliable and verifiable qualitative data that could broaden and strengthen the validity of the research outcome.

Two focus group discussions were conducted with 12 residents of the study area in Yoruba dialect by non-English speakers who were interested in sharing their flood vulnerability experience. The residents were selected by the Bere community leaders based on their relevant knowledge and previous flood experiences in the urban settlement. To consolidate the issues raised by the participants in the focus group, interviews with eleven experts including academics and practitioners in the field of disaster management were conducted in English language. All the qualitative data were audio recorded, transcribed with the permission and consent of the participants. With the aid of QSR Nvivo, thematic techniques were adopted to manage the qualitative data in the most efficient way. These procedures involved a careful identification and interpretation of textual data (Braun and Clarke, 2006).

5. Findings and Discussions

Based on the analyses of the qualitative data collected from focus group discussions and interviews, several issues concerning previous disaster experience, flood preparedness, socioeconomic status and coping capacity strategy were adequately addressed. The finding and explanation from focus group discussions and interviews are discussed below.

5.1. Focus group discussions

5.1.1. Flood experience and the frequency of occurrence

All the participants in the focus group overwhelmingly agreed that they had previous flood experience and continuously expose to flood disaster

every year particularly during the rainy season. The oldest participant in the focus group discussion affirmed that flooding is a frequent disaster in the community, but the August 2011 flood disaster affected all houses in Bere community. He reiterated that the two hours of rainfall wreak havoc on all residents in the area. It is evident that despite the residents' flood experiences in the previous years and awareness of risk, dwellers are not well-prepared for future flood risk. In line with this result, previous studies have shown that there is no significant association between risk awareness and the level of preparedness to flood disaster (Salami, 2017; Salami, Von Meding and Giggins, 2017).

5.1.2. Causes of flooding in the community

Some of the respondents alluded to residents' activities, such as blockage of natural waterways with solid wastes, encroachment on floodplains and prolong heavy rains as the major contributing factors to flooding and subsequent disaster. Others believed that the local authority failed to play their role of protecting the lives of inhabitants through the provision of infrastructures such as effective drainage system to handle overland flows during rainy season. A discussant from the focus group said, *"our drainage channels are not wide enough to contain rainwater during rainfall"*(Salami, 2017, 131). It is evident that the key issue is poor governance and lack of support by the local authority, such as provisions of effective infrastructural development to mitigate flood disaster. Despite government's critical roles at all levels to manage risk and provide preventive measures, they rarely mentioned as contributors to the consequences of disaster vulnerability, poverty and risk creation (Wisner, 2016; Lewis and Kelman, 2012).

5.1.3. Preparedness, coping and adaptive strategies for flood risk

Despite the participants' past flood experience in the community, most of them make few or no preparations for yearly flooding in the study area. While adoption of forced temporary migration during the rainy season was a means of preparation for some participants, others believe in God for protection. In the words of a respondent contribution,

"We believe in prayers, during the raining seasons, whenever we notice there is a possibility that rainfall would occur, we pray to God to protect us against disastrous rainstorms"(Salami, 2017, 132).

In previous studies on the vulnerability of wind hazards and cyclones in the study area and in coastal Bangladesh respectively, some residents relied on God for safety (Haque and Blair, 1992; Adelekan, 2012).

In case of coping and adaptive mechanism adopted, most of the participants expressed their dissatisfaction over government's response to victims of flood disasters. One of the discussants commented on behalf of the victims based on his experience:

"They continue to struggle individually to build their house back a bit by bit with our little resources. There is no help from the government. Many occupants have left their dilapidated old houses permanently. Most of the residents are petty traders and artisan. They can't afford to build their traditional houses back"(Salami, 2017, 132).

Most of the residents in Bere are low-income earners with the informal economy (Salami, 2017). With low-level of income, researchers have argued that there is a strong link between levels of flood preparedness and residents' socioeconomic characteristics (Vojinović, 2015; World Health Organization, 2002). It is evident that the profile of the household in terms of social and human capital will largely influence the coping capacity to risk and flood vulnerability.

5.1.4. Lack of government support

All the respondents affirmed that government at all levels have disappointed them in all areas of governance. One of the statutory duties of government is to protect their people. Failure of those in authority such as local government officials to provide basic amenities of life has led to a lack of trust and confidence in government. Credibility and institutional legitimacy can only be achieved through public trust (Burnett *et al*., 2008). For example, most of the interviewees reiterated several failed promises of the government concerning dredging of rivers, construction of culverts and drainages to prevent flooding during a downpour. For the government to achieve a significant improvement in building a resilient society, community-led policy implementation should be a way forward.

5.2. Interviews with experts

In order to gain further insight and validate findings from the focus group discussion on the underlying factors influencing flood vulnerability, disaster management experts were interviewed. Different relevant topics on flood vulnerability in Ibadan were discussed to elicit key information needed by the researchers.

5.2.1. Root causes of flooding and its impact

Based on the experts' point of view, frequent flood disasters recorded in the study area are due to the lack of political will by the local authority to provide preventive measures for future occurrences. One of the interviewees queried successive governments by these words:

"They (government at all levels) play politics with lives of the people. Political interference and attitudinal behaviour of the people. It took the government up to twenty years to complete channelization of Ogunpa River, and this had minimised the problem of flooding in Ibadan until the occurrence of August 2011 destructive flooding" (Salami, 2017, 137).

From another point of view, an interviewee believed that heavy rainfall, topographical characteristics such as proximity to hills, valleys and rivers play a contributory role in frequent flood experience in the study area.

5.2.2. Socioeconomic factors and flood preparedness nexus

The face-to-face interviews with experts and practitioners revealed that there is a strong relationship between the level of preparedness and the socioeconomic status of the residents of Bere community. Their perceptions of preparation for flood risk are determined by many factors such as, employment, education, income, tenure security and housing quality. In separate interviews, all the interviewees affirmed that most of the inhabitants of Bere urban settlement are low-income earners, slum dwellers with a poor living standard of life. For instance, the structural integrity of houses, construction materials and sanitary services are determinants of good housing quality (Rumbach and Shirgaokar 2017). Therefore, unhealthy conditions of housing expose its inhabitants to multiple risks (Guzmán, Schensul and Zhang, 2013). In addition, researchers such as, Brouwer *et al*.

(2007), Vojinović (2015), and Zahran *et al*. (2008) argued that a society with a high population of low-income households and lower human capital is most likely to expose to a higher degree of flood risk and lower level of flood preparedness. This implies that there is a link between the household's socioeconomic status and the degree of preparedness for flood hazards.

5.2.3. Lack of planning and development management

Professionals and researchers interviewed blamed the past governments for the lack of success in designing a sustainable master plan as the major cause of flood vulnerability. One of the academics affirmed that Ibadan metropolis "*has never had a master plan and may never have one, unfortunately...because those in authority are playing politics with lives of people."* In other words, there is no standard guiding tool for planning and development. Without a plan before physical development, urban flood vulnerability will be difficult to minimize (Arimah and Adeagbo, 2000). Another respondent reacted this way:

"We need to plan first before the development of a town or city, but in the case of Nigeria, we develop before planning. We allowed physical infrastructure to be chasing development, if we turn around the table and plan before development, things will change for the better. By injection of various principles and techniques of physical planning into development, things will change for the better. Abuja, Federal Capital Territory of Nigeria is a good example of best practices. You will be proud of the city as a resident unlike other unplanned cities or suburbs in Nigeria" (Salami, 2017, 138).

According to Baker (2012) and Ajayi *et al*. (2012), natural disasters such as floods and droughts are linked to human activities including poor drainage infrastructure, deficient refuse management and construction of shelters in flood zones. In view of these comments, there is a need for an effective and efficient urban development and planning regulations to checkmate unhealthy physical development in the metropolitan city.

6. Conclusion

This research focused on the investigation of the root causes of flood vulnerability in the core area of Ibadan metropolis, Nigeria. The study empirically assessed the flood vulnerability in Bere, an urban community

with high density and low-income residents. The research site was studied to know how physical, demographic, political, cultural factors shaped its flood vulnerability using urban political ecology framework to gain a better understanding about the drivers of urban settlement's vulnerability to flooding.

The research's findings from the focus group discussions and in-depth interviews revealed that the residents of Bere, which is a high-density urban settlement are highly vulnerable to flood risk. This research outcome was based on the dwellers' affirmation and subsequent confirmation from the interviewees concerning the government inefficiency, level of residents' exposure to flood risk, susceptibility and their status in relation to socioeconomic characteristics (such as, location, earnings, housing quality and disaster coping/adaptive capacity). It is evident from the study that flood vulnerability is socially constructed. It demonstrated that poor urban governance, politics and institutional structures contribute immensely to the production of urban vulnerability to flooding hazards in the study area in Ibadan metropolis.

It is important for all stakeholders to invest consistently on both structural and non-structural measures to achieve sustainable disaster risk management including flood preparedness, preventive measures, emergency and disaster recovery. It is also crucial for government officials to uphold equitable access to opportunities and resources, as well as to embrace social justice for all to build a resilient community. Lastly, in line with the Sendai Framework for Disaster Risk Reduction (SFDRR) requirements (UNISDR 2015), empowering local institutions to play more roles and implementing a "bottom-up" approach to community-rooted interventions will boost disaster risk reduction.

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3. People, places and volcanoes. A study on risk perception in the Azores (Portugal)

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Abstract

Volcanic vulnerable areas are often populated, despite the risk of an eruption, with severe long-term consequences. Thus, understanding risk perception is of major importance, as it can foster effective risk communication and inform interventions to reduce vulnerability and enhance resilience. Volcanic areas are often beautiful and fertile, therefore used for multiple purposes, creating the perception of benefits. The affective relationship between people and places also provides feelings of safety, belonging and connectedness. This study explores the relationship between the perceived living place benefits and the volcanic risk perception of 530 residents in the Azores, following a mixed-methods approach and using a self-completion questionnaire. Participants perceived volcanic risk as moderate, contradicting previous studies. Results point to risk devaluation. The most mentioned living place benefits were natural benefits and benefits contributing to well-being and satisfaction. No significant risk perception variations between groups of perceived benefits were found. It is assumed that the negative affect associated with an eruption conflicts with the perceived positive living place benefits, leading to minimization of cognitive dissonance and denial of volcanic hazard, reinforcing the need to foster volcanic educational efforts in the Azores.

Keywords: volcanic risk perception, living place benefits, volcanic risk devaluation, affect heuristic, cognitive dissonance.

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1. Introduction

Extreme natural events in populated areas cause death, massive destruction, material losses and social disruption, affecting the lives of entire communities or countries, sometimes for many generations. Therefore, the presence of people in natural vulnerable areas contributes to the occurrence of disasters and magnifies their impact (Alcántara-Ayala, 2002; Leonard *et al.*, 2008). Nevertheless, thousands of people live in natural vulnerable areas despite the risk they face. For example, around 500 million people live near volcanoes (Thouret, 1999), they often tend to devaluate the risk of an eruption and fail to prepare appropriately (Basolo *et al.*, 2009; Bird and Gísladóttir, 2012; Sutton and Tierney, 2006). Volcanic eruptions have short- and long-term severe consequences such as mortality of people, animals and plants, health problems related to contact with ash, destruction of buildings, roads, and water and electricity infrastructures, contamination of water, economic losses (e.g., interdiction of airspace affecting tourism), and loss of livelihoods (e.g., reduction or destruction of soil fertility used for agriculture) (Bird and Gísladóttir, 2012; Lebon, 2009).

Research on risk perception have attempted to address the underlying reasons for these risk devaluations. Findings have indicated that perception shapes the interpretation of risk messages and warnings (Haynes *et al.*, 2008) and can also influence the adoption of protective measures (Chaney *et al.*, 2013; Perry, 1990). Notwithstanding, some authors found lack of correlation or negligible correlations between risk perception and hazard adjustments (Lindell and Prater, 2000; Lindell and Whitney, 2000).

Risk perception, being a product of cognition, is a complex and dynamic process influenced by several variables and mechanisms (Lindell and Whitney, 2000), socially constructed, and permeated by bias, subjectivity and affect (Slovic, 1999). In contrast to expert, citizens risk perception seem to be majorly influenced by the qualitative characteristics of the risk, namely dread, voluntariness, familiarity, perceived personal control, perceived institutional control, artificiality of risk source, blame and distribution of risks and benefits (Renn, 2008).

Other processes, such as cognition biases and the inverse relation between the risk and the perceived benefits of living with it can also cause this devaluation. Regarding cognitive biases, the optimistic bias that is characterized by lower estimations of being affected by a hazard, comparatively to others (Solberg, Rossetto, and Joffe, 2010), and it can be present in populations living in volcanic areas. Likewise, the relationship between perceived risk and benefits of living with it is well documented in research (Finucane *et al.*, 2000; Slovic *et al.*, 1982; Slovic *et al.*, 2004). It is

assumed that if the perceived benefits are great, the perceived risk will be low, and vice-versa, and that this relation is mediated by affect. If the risk object (e.g., situation, activity) is associated with positive affect, then the risk will be downsized, and the converse is also true (Slovic *et al.*, 1982; Slovic *et al.*, 2004). Slovic *et al.* (2004), presenting the case of cigarette smokers, state that an affective heuristic, which is cognitively activated more quickly than analytic reasoning, can dominate the risk judgments, leading to little attention to or absence of conscious thoughts about the risk, ultimately resulting in risk disregard. The authors added that contact with information about health and risk often leads the cigarette smokers to weighing health risks and benefits of smoking, conducing to the desire to quit.

Particularly, volcanic risk perception also seems to be influenced by proximity to the volcano (Perry, Lindell, and Greene, 1982), hazard knowledge and experience (Gaillard and Dibben, 2008). Moreover, infrequent events tend to be underestimated in terms of probability of occurrence (Tversky and Kahneman, 1974), thus, because of the long quiescence periods of volcanic activity, volcanic risk is often disregarded (Davis *et al.*, 2005; Perry, 1990),

The present study addresses the relationship between volcanic risk perception and the perceived benefits of living in a volcanic area. The perceived benefits of living in a certain area derive from the relationship between people and the places where they live. Environmental psychology has addressed this relationship, exploring concepts such as place attachment, place identity and sense of place (Giuliani, 2003). The research indicates that people establish long-term strong affective bonds with their living environment (Giuliani, 2003; Lewicka, 2011; Hidalgo and Hernandéz, 2001) and express feelings of irreplaceability, desire for closeness, positive feelings of familiarity and security when in the place of connection and negative feelings, such as mourning, when away from that place (Fried, 2000; Giuliani, 2003). This relation includes the social bonds established within a community and the symbolism attributed to the physical characteristics of the place where these interactions occur, which represent a continuity of the social interaction, defining the barriers of group identity (Fried, 2000). Therefore, if people are emotionally bonded to a place it will be considered a source of benefits, because it promotes feelings of safety, belongingness and connectedness (Fried, 2000). Furthermore, according to Fried (2000), the permanence in a given place, chosen or imposed, implies the acceptance of the environment, in this case, acceptance of the associated risk. Our choices seem to be determined by affect. Normally there is a tendency to choose what is related to positive affect (Zajonc, 1980), but in

the case of the living place, this may be different. We assume that people are born in a place, live there and establish strong bonds with it in such a way that the choice to move is questioned because that place is seen as irreplaceable and there is a desire for closeness.

A beneficial living place can include positive social interactions, physical characteristics of the place such as an attractive landscape, and purposes of livelihood. Volcanic areas often possess these characteristics; they are beautiful locations visited by tourists, used for leisure, and for work due to their fertile soil (Davis *et al.*, 2005; Perry, 1990; Lebon, 2009). Populations use these locations to engage in social interactions and to develop activities of subsistence, favoring the perception of these places as a source of benefits (Perry, 1990; Teixeira *et al.*, 2014) and positive affect.

When studying earthquake risk perception, Armaş (2006) found that affective bonds to place could lead to devaluation or denial of risk due to the perceived security associated with the place. Studies conducted in the Azores (Dibben, 1999; Dibben and Chester, 1999), where the present study takes place, found low levels of volcanic perception among residents of Furnas village within a volcano caldera. Dibben (1999) speculated that this denial could be due to an effort to minimize the cognitive dissonance between living within a volcano and knowing that the risk of eruption is present, resulting in risk denial and reinforcement of perceived benefits of the place.

As postulated by the social psychologist Leon Festinger (1957), cognitive dissonance involves having contradictory beliefs about an issue, causing emotional stress and creating the tendency to minimize this discomfort through minimizing the conflict. Dibben and Chester (1999) report that residents in the same village mentioned the beauty of the living place as the major benefit of living in a volcanic area. Likewise, Ricci *et al.* (2013) found perceptions of beauty of the living place and cultural aspects to be the most often mentioned benefits of living in a volcanic area, supposing that the awareness of the living place benefits was greater than the perception of volcanic risk.

The authors believe that the relation between perceived living place benefits and risk perception is yet to be fully understood. Therefore, this chapter explores the relationship between the two concepts, aiming to verify if the living place benefits perceived by residents of a volcanic area are related to different levels of volcanic risk perception, explaining devaluations of risk. Considering previous studies in the Azores and elsewhere (Dibben, 1999; Dibben and Chester, 1999; Ricci *et al.*, 2013), we expected to find: (a) low volcanic risk perception, (b) mention of benefits related to natural environment and beauty of the living place, (c) significant

volcanic risk perception differences between groups of participants mentioning different perceived living place benefits.

2. Method

2.1. Location of the Study

The Azores are a Portuguese volcanic archipelago with nine islands (see Figure 1), located on a triple junction of tectonic plates in the middle of the Atlantic. It is constituted by the Mid-Atlantic Ridge, the East Azores Fracture Zone, the Gloria Fault and the Terceira Rift (see Figure 2). Due to its location, there is persistent low-magnitude seismicity of volcanic and tectonic origin (Silveira *et al.*, 2003).

After the settlement in the 15th century, approximately 28 volcanic eruptions occurred in the Azores. Of these, 13 occurred at sea (Gaspar *et al.*, 2015). The eruption of the Capelinhos volcano (Faial, 1957-58) was the most recent to affect residents, causing 11 fatalities, significant material damage (around 15 million US dollars, at 2008 values), massive social disruption, and the emigration of about 40% of the population (Coutinho *et al.*, 2010). Historical volcanic eruptions in the Azores are presented in Figure 3 (Gaspar *et al.*, 2015).

Besides the possibility of an eruption, the islands are also exposed to indirect volcano hazards, such as gas emissions, landslides, earthquakes, floods and tsunamis (Wallenstein *et al.*, 2007).

Regarding potentially active volcanic structures in the islands included in this study, S. Miguel Island has three volcanoes, Fogo, Furnas and Sete Cidades; and Terceira Island has two volcanoes, Pico Alto and Santa Bárbara, and the Fissural system of Terceira. Santa Maria Island has no potentially active volcanic structures.

To the authors' knowledge, volcanic educational efforts from official authorities are nonexistent on the archipelago.

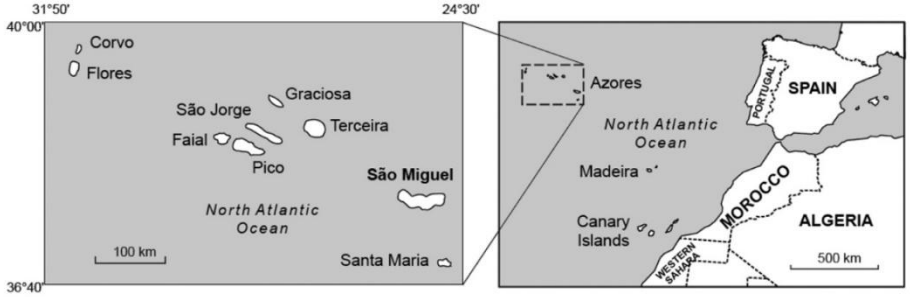

Figure 1 - *Map of Azores location. Reprinted from Wallenstein et al. (2015). Copyright [2015] by the Geological Society of London.*

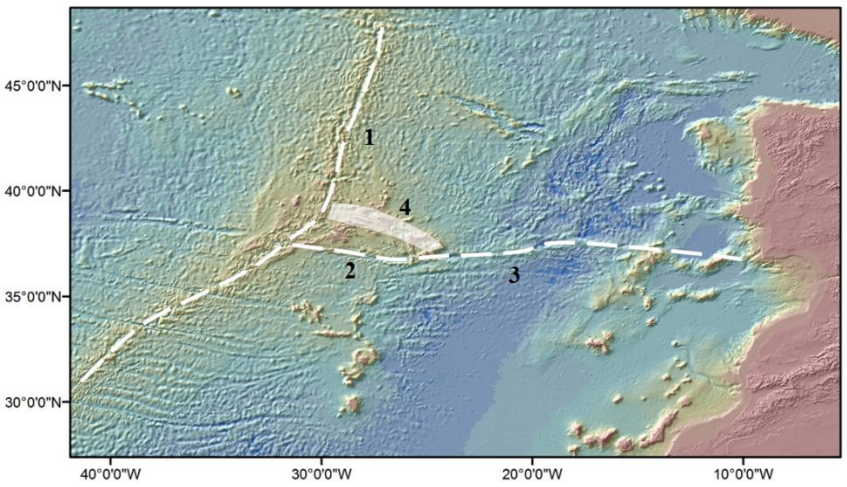

Figure 2 - *Tectonic setting of the Azores: 1, Mid-Atlantic Ridge; 2, Azores-Gibraltar Fracture Zone; 3, Gloria Fault; 4, Terceira Rift. Adapted from Carmo (2013) with permission.*

2.2. Participants

A convenience sample of residents of the archipelago was used because of time constraints and lack of funding, making it impossible to generalize results. However, this type of sample is usually used to test basic psychological mechanisms (Siegrist and Cvetkovich, 2010), which suits the exploratory purpose of this paper.

A sample of 530 residents of the Azores participated in this study, living in the Islands of S. Miguel (*n* = 481), Terceira (*n* = 44), and Santa Maria (*n* =1). Four participants did not mention their island of residence. Participants' ages ranged between 18 and 79 years (M = 36.12; *SD* = 11.600). Of these, 56.8% (*n* = 297) were male. Around 55% (*n* = 290) of participants had completed high school education, followed by 32.3% (*n* = 169) with a college education, 6.5% (*n* = 34) with a middle school education, 3.1% (*n* = 16) who completed the second year of middle level education, and 2.7% (*n* = 14) with an elementary school education.

The most mentioned municipalities of residence were Ponta Delgada (54.3%, *n* = 284), followed by Ribeira Grande (19.1%, *n* = 100), Angra do Heroísmo and Lagoa (7.1%, *n* = 37, each), Vila Franca do Campo (5.2%, *n* = 27), Povoação (3.4%, *n* = 18), Nordeste (2.5%, *n* = 13), Praia da Vitória (1.1%, *n* = 6), and Vila do Porto (0.2%, *n* = 1). On average, most respondents reported living in the municipality of residence for 18 years (*SD* = 15.516).

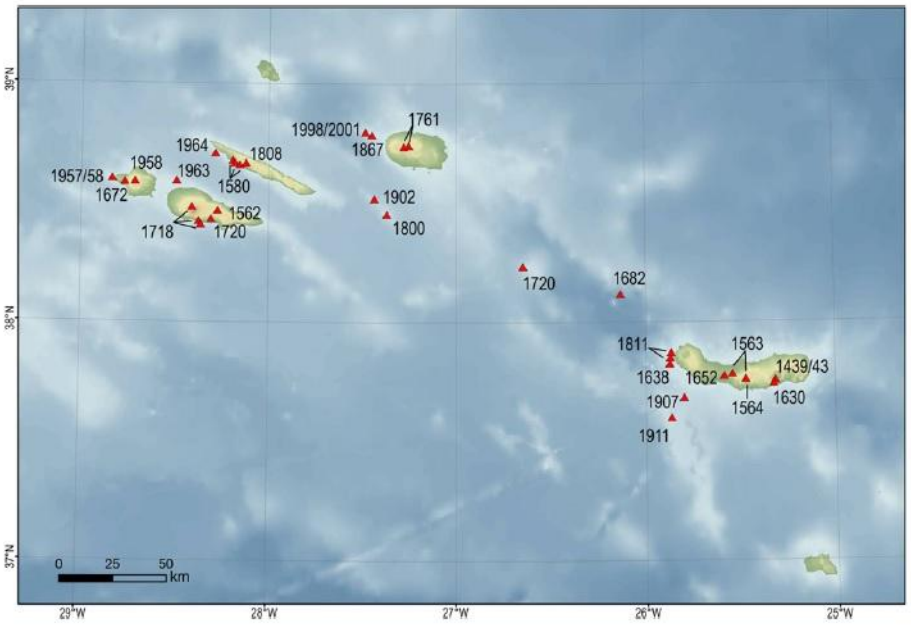

Figure 3 - *Historical volcanic eruptions in the Azores archipelago. Reprinted from Gaspar et al. (2015). Copyright [2015] by the Geological Society of London.*

2.3. Survey

This study is part of a broader research intended to explore the volcanic risk perception and associated variables of Azores residents. For this purpose, a paper-and-pencil survey was designed, consisting of nine items for sample characterization and 63 items concerning: (a) Volcanic risk perception; (b) Volcanic hazard salience; (c) Sense of community; (d) Place attachment and Place identity; (e) Coping Style, tailored to the context of volcanic events; (f) Self-efficacy beliefs regarding protection from volcanic events; (g) Volcanic hazard knowledge; (h) Knowledge of emergency planning and measures; (i) Perceived preparedness of self and entities, tailored to the context of volcanic events; (j) Trust in officials and entities, tailored to the context of volcanic events; (k) Sources of information about volcanic hazard; and (l) Evaluation of the preferred methods of receiving information about volcanic hazard. The items were based on the works of Barberi *et al.* (2008), Davis *et al.* (2005), Ricci *et al.* (2013), Hidalgo and Hernández (2001), Marante (2010), Medeiros (2013), and Pimentel (2013). The questionnaire was pretested and further adapted to ensure full understanding of the items.

To achieve the purposed chapter goals, data on Volcanic risk perception and data regarding the perceived benefits of the living place, included in the assessment of Place attachment, were analyzed.

2.4. Design and Procedures

Data was collected in 2016 and 2017 using two methods of survey distribution, namely, contact with community stakeholders for circulation to their employees and associates and delivery of questionnaires to citizens to distribute them to acquaintances. The questionnaires were returned by hand to the contact person and then handed to the researchers or sent by postal mail.

A mixed-methods approach was adopted for data analysis. Data concerning the perceived living place benefits were analyzed with the qualitative method of classical content analysis, and data on demographic variables and risk perception was subject to statistical analysis.

3. Results and Discussion

3.1. Volcanic Risk Perception

Volcanic risk perception was evaluated considering: (a) the perceived seriousness of consequences of an eruption for participants and their families, and for their place of residence, rated on a five-point Likert scale with 1 meaning 'Nothing', 2 ‘Little’, 3 ‘Somewhat’, 4 ‘Much’ and 5 'Extremely'; (b) the perceived severity of an eruption, asking participants to rate the impact of volcanic products and associated processes in the place of residence on the same five-point Likert scale; and (c) the level of anxiety about a potential eruption evaluated on a five-point Likert scale with 1 meaning ‘Without any fear or concern / absolutely not afraid or worried’, 2 ‘Slightly afraid or worried’, 3 ‘Afraid and worried’, 4 ‘Essentially afraid or worried’ and 5 ‘Extremely afraid or worried’.

Concerning the seriousness of consequences of an eruption, participants claimed that it could affect them and their family (M = 4.07, SD = 1.103) and their place of residence (M = 4.08, SD = 1.068) ‘Much’, indicating a moderately high perception of the seriousness of consequences of an eruption. These results indicate that an optimistic bias is absent. In addition, it is plausible to assume that negative affect associations with an eruption are present. They may be related to knowledge about the impact of the Capelinhos eruption (Faial, 1957-58) or eruptions in other locations.

Regarding volcanic products and processes, Earthquakes were considered the most severe because, a large percentage of participants stated they could have 'Much' impact on the place of residence (41.3%). Other volcanic products and processes such as Drainage of mud or debris (27.2%) and Tsunami/seaquake (23.2%) were also considered to have ‘Much’ impact on the place of residence, whereas Lapilli fall and ash (27.4%), Fall of blocks and bombs (28.5%), and Pyroclastic flows (27.7%) were considered to impact the place of residence only ‘Somewhat’. Lava flows (24.7%) were considered the least severe volcanic product, affecting the place of residence ‘Little’. These results indicate a low perceived severity of an eruption and could be explained by the lack of experience of participants with an eruption and by the absence of volcanic educational efforts in the archipelago, impairing the constitution of a more solid volcanic hazard knowledge, which influences risk perception (Gaillard and Dibben, 2008). Thus, volcanic hazard knowledge should be further researched in the Azores. The persistent seismic activity in the archipelago might also explain the results, justifying why most participants considered earthquakes to be the most severe process associated with volcanic activity.

The level of anxiety about a potential eruption is low, as, on average, participants reported feeling 'Slightly afraid or worried' about a potential eruption (M = 2.44, SD = 1.159). These results can have several explanations. First, the nonexistence of volcanic educational efforts in the archipelago might account for the absence of this matter in the lives and minds of the population. Second, the long quiescence periods of volcanic activity can lead participants to worry more about other day-to-day issues rather than the possibility of an eruption (Slovic *et al.*, 2004). Third, it might also be the case that the moderately high perceived seriousness of the consequences of an eruption could be related to negative affect, leading to risk denial or ignorance of the matter, which might explain why participants do not worry about this possibility, avoiding thinking about a possible eruption in the Azores, and thus minimizing cognitive dissonance (Dibben, 1999).

To conduct further analysis, the ratings of the mentioned dimensions of volcanic risk perception were summed to obtain a total score, ranging from 10 to 50 points. The total scores were interpreted considering three levels: (a) Low volcanic risk perception: one to 16 points; (b) Moderate volcanic risk perception: 17 to 33 points; and (c) High volcanic risk perception: 34 to 50 points.

On average, participants exhibit a Moderate volcanic risk perception (M = 33.65, SD = 8.041), with low perceived severity and anxiety levels about a potential eruption, and moderate perception of the seriousness of consequences.

Total scores of volcanic risk perception infirm the initial hypothesis that these would be low, contradicting previous studies in the Azores (Dibben, 1999; Dibben and Chester, 1999).

3.2. Perceived Living Place Benefits

A mixed categorical system was used to analyze the perceived living place benefits. Four categories constitute the system: (a) 'Physical features', (b) 'Social features', (c) 'Individual features', and (d) 'Absence of benefits'. The first two categories were defined *a priori*, considering research on place attachment, namely works from Giuliani (2003), Hidalgo and Hernandez (2001), Mishra *et al.* (2010), Scannell and Gifford (2010), Wynveen *et al.* (2017), and Worster and Abrams (2005). The last two categories were derived from the survey data.

To assure the reproducibility of the categorical system and to contribute to a more trustworthy analysis, two independent judges categorized the data.

Intercoder agreement was assessed using Krippendorff's alpha (Hayes and Krippendorff, 2007), indicating a strong intercoder agreement ($\alpha = .83$; Krippendorff, 2004). Table 1 presents the categorical system constructed. Participants mentioned a wide range of benefits of living in the Azores, focusing on natural benefits (including beauty of the living place) and factors related to well-being and satisfaction, confirming the initial assumption and in agreement with previous findings (Dibben and Chester, 1999; Ricci *et al.*, 2013).

Table 1 - *Categorical System: Perceived Living Place Benefits*.

Main category	*Sub-categories*	*No. of references*	*Content*
Physical features	Built environment	206	Benefits of location; proximity/short distances/travel time; references to physical characteristics of the neighborhood/village/city/archipelago/country; accesses and accessibility; and absence of traffic.
	Natural environment	759	Climate; absence of environmental problems; natural resources; characteristics of the natural environment and landscape; references to the relationship of man-natural world; geographic characteristics of the natural environment; and beauty of the living place.
Social features	Social ties	46	Characteristics/existence of people; social ties to family and community; and privacy and isolation.
	Culture and Community life	51	Mentions of the word "culture" or references related to specific cultural aspects of the Azores or sports activities; references to security; and demography.
	Economic features	65	Employment and opportunities; access to goods or services, or references to infrastructures that imply the provision of services (e.g., Schools); references to economic activities; and to economic benefits/economic level of life.
Individual Features	Well-being and satisfaction	237	Peace and quiet, quality of life, food, health, and rhythm of life.
Absence of benefits	-	2	Absence of living place benefits.
Total		1366	

3.3. Relation between Volcanic Risk Perception and Perceived Living Place Benefits

To verify if volcanic risk perception scores significantly vary with the type of perceived benefits, a Kruskall-Wallis test was applied considering the identified sub-categories. Table 2 shows the results.

Volcanic risk perception scores did not vary significantly with the type of perceived living place benefits. As mentioned, the beauty of the living place was previously found to be a major benefit of living in a volcanic area (Dibben and Chester, 1999; Ricci *et al.*, 2013). The assumption that the perceived beauty of the living place can cause variations of risk perception was verified with a Kruskall-Wallis test, indicating that volcanic risk perception scores did not vary significantly with the mention of the beauty of the living place as a benefit ($H(1) = 0.970$, $p > .05$). Although the mentioning of this benefit has been identified as a potential factor in several studies, it seems that it alone cannot account for volcanic risk perception differences.

The results indicate that the benefits of living in a volcanic area do not cause variations in volcanic risk perception scores. Although Dibben (1999) explained that the processes of cognitive dissonance minimization produced an enhancement of the perceived benefits and downsizing of volcanic risk, the minimization of the cognitive dissonance may be operating in a different way, similar to what has been explained by Slovic *et al.* (2004) in regard to cigarette smokers. Affect mediates the relationship between perceived risks and benefits (Slovic *et al.*, 1982; Slovic *et al*., 2004); thus, affect heuristics may be dominating participants' risk judgement. They recognize the seriousness of consequences of an eruption (moderately high results) because, it is plausible to assume, a volcanic eruption is often associated with negative affect, even though participants feel 'Slightly afraid or worried' (on average) and fail to recognize the severity of the event. In addition to living in a volcanic area, participants recognize that they live in a place with major natural benefits and with benefits contributing to well-being and satisfaction. Participants live in a place for about 18 years (on average), during which an eruption could occur, which they recognize could 'Much' affect them. On the other hand, they have never experienced one and live in a beautiful and peaceful location that provides good quality of life and feelings of safety, belongingness and connectedness, an irreplaceable place that creates a desire for closeness.

Two explanations of how risk is devaluated can be advanced. First, the negative affect associated with an eruption may be so strong that it conflicts with the strong positive affect of the living place. In order to minimize the strong negative affect associated with an eruption, participants may be consciously or unconsciously avoiding thinking about the risk, and consequently, not considering the disadvantages of living in a volcanic area, resulting in disregarding or even ignoring volcanic risk. Secondly, it may also be that the pros and cons analysis made by participants includes the pros of living in a place to which participants are bonded to, despite the risk, and the cons of having to move to a safer location that is not comparable or does not provide the same positive affect. In this analysis, affect prevails, and other alternatives besides living with the risk are not considered, so the risk is accepted.

These assumptions should be explored by future research on the negative affect related to volcanic eruptions and cognitive dissonance related to natural hazards. Given that volcanic educational efforts are absent in the archipelago and that, as defended by Slovic *et al.* (2004), the provision of information about the risk could lead to a conscious weighing of risks and benefits in cases where affect heuristics dominate, there is a need to develop volcanic educational efforts in the region. Hazard knowledge is also one of the variables that influence volcanic risk perception (Gaillard and Dibben, 2008), contributing to a more realistic perception and it should be further researched.

Table 2 - *Relation between Volcanic Risk Perception Scores and Perceived Living Place Benefits.*

Perceived Benefits	*Kruskall-Wallis Test*
Built environment	$H(1) = .211$ $p > .05$
Natural environment	$H(1) = .685$, $p > .05$
Social ties	$H(1) = 2.819$, $p > .05$
Culture and community life	$H(1) = 2.048$, $p > .05$
Economic features	$H(1) = .070$, $p > .05$
Well-being and satisfaction	$H(1) = .738$, $p > .05$

4. Final Remarks

This chapter's focus was to determine if there is a significant relationship between the perceived benefits of living in a volcanic area and volcanic risk perception, aiming to explain devaluations of volcanic risk.

The risk perception levels found were moderate, which was higher than initially supposed, contradicting previous studies in the Azores. However, a significant statistical difference between groups of participants with different type of perceived living place benefits and volcanic risk perception scores was not found.

Two explanations are advanced. One is that a cognitive dissonance minimization processes may be present, causing lack of thought about the risk, and consequently, risk is disregarded or even ignored. The other is that strong relations to place may influence the analysis of pros and cons of living in a volcanic area, fostering risk acceptance.

Thus, the major conclusions of this study are that the perception of benefits itself does not seem to explain volcanic risk devaluations. These devaluations seem to be related to the negative affect associated with an eruption and to positive affect related to the place, causing risk to be ignored or accepted.

The results point to the importance of conducting volcanic educational efforts in the archipelago, to exploring volcanic hazard knowledge in the Azores, and the influence of negative affect associated with an eruption in volcanic risk perception. Further research could also explore predictive, mediating and moderating variables involved in the relationship between perceived benefits and risk perception.

A convenience sample was used, limiting the generalizability of the findings, although it did serve the exploratory purpose of this paper. Therefore, the conclusions must be further explored in studies with a representative sample of the Azores population and studies on other volcanic locations.

Research on volcanic risk perception can inform risk communication and contribute to policies and practices to enhance resilience and reduce vulnerability of the population to the effects of a volcanic eruption.

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4. Geographical and historical processes of human settlements in the Etna Region. A person-place relation approach

Salvatore Cannizzaro[1]

Abstract

Etna volcano is primarily characterized by Strombolian activities, happening at the top craters or opening in mouths on the sides of the mountain, often producing temporary cones largely diffused along the slopes. There is a scientific and popular consensus about the existence of an actual but not immediate danger to people. The chapter deals with the geographical and historical process of human settlement diffusion in the Etna region over the last century and a half, considering social, cultural and economic motivations of people who voluntarily chose to live in this area, setting out a conscious coexistence with the biggest active volcano in Europe. Definitions of 'sense of place' and 'place attachment' have been assumed as cultural geography's benchmarks for the analysis. Secondary and primary data have been achieved making a placed case study, and following the procedure suggested by Grounded Theory, namely mixing sources of diverse nature and comparing with the personal knowledge and geographical experience of the author. Main results are that all people are perfectly conscious of living in a risky place; but the love their home and their landscape, which is both the landscape of family memories and an important base for economic activities. The chapter gives a positive contribution in explaining the seemingly *irrational* behavior of people living under the shadow of an active volcano.

Keywords: Etna volcano, risk, perception, person-place, topophilia.

1. Introduction: Focus and Research Questions

According to the Italian Department of Civil Protection, eruptions of the Etna volcano are primarily characterized by Strombolian activities, namely

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the effusion of lava castings and issues of ashes. These volcanic phenomena happen at top craters or the opening mouths on the sides, often producing temporary cones largely diffused along the slopes of the mountain. This kind of activity, in general, affects a limited area around the eruptive mouth and is not considered a sound danger by residents, public bodies and scientific institutions. Lava castings generally spill out at high altitude and have a low speed. Indeed, they are not an immediate danger for the safety of people (Dipartimento della Protezione Civile-Presidenza del Consiglio dei Ministri, n. d.). However, a possible big and long-lasting eruption may be considered in the hypothetical risk model of the Etna region, which has been populated ever since the very first human settlements in Sicily (Regione Siciliana, 2013). This chapter deals with the geographical and historical process of human settlement in the Etna region over the last century and a half, considering social, cultural and economic motivations of people who voluntarily chose to live in this area, setting out a conscious coexistence with the biggest active volcano in Europe.

Etna volcano is the center of its eponymous region, located in the northern-eastern section of the island of Sicily. Notwithstanding, this mountain area, notoriously characterized by enduring volcanic risk, has been the location of several small and big villages, and a centre of a vital socio-economic activity for many centuries. The choice to live in such conditions by many generations of people appears puzzling and even incomprehensible, from the positivist paradigm of location analysis perspective (Conti, 1996). Settling in a risky place is defined irrational, or *satisficing* and *optimizing*, under the bounded rationality hypothesis, which predicts the achievement of economic suboptimal equilibrium (Simon, 1993). Cultural geography stresses the hermeneutical insufficiency of the *homo economicus* model, claiming, for instance, a deeper reasoning on perception on environmental hazard, starting from the person-environment and person-place relations to the perspective of place attachment suggested by eminent cultural geographers (Altman and Low, 2012; Manzo and Devine-Wright, 2013). From a traditional position on hazard perception (Palagiano, 2005), a punctual literature review and analysis on the issue of risk perception and construction has been recently made by Italian geographers (Malatesta and Rondinone, 2011), illustrating that the individual agent may have a behavior defined as hierarchical, selfish, egalitarian and fatalist, determined by the surrounding social system (Thompson and Schwarz, 1993).

Therefore, the research focus was on residents hazard perception and conscious coexistence with the biggest, still active volcano in Europe. The subsequent research questions are defined as follows: (i) what kind of

awareness people actually have about living in a risk volcanic area; (ii) why and when they decided to live there; (iii) how they perceive the private-public relations in risk management; and, (iv) which kind of feeling they have for their living places. The research was referred to the Etna Area, as defined by the I.N.G.V., namely the Geophysics and Vulcanology Italian Institute, whose residents have to be alerted in regards to different types and levels of volcanic activity risk (Regione Siciliana, 2013). This area is quite large, encompassing 43 Municipalities, including Catania, different from the Etna region as defined by Italian geographer Alberto Di Blasi (1997), and also including some urban centers more or less far from the Etna cone, being possibly affected by the fallout of volcanic ashes. The chapter is organized as follows. Section 2 reports methodology and data collection procedures. Section 3 and 4 are dedicated to backgrounds. Section 3 reports the main geographical characteristics of the Etna region, and the population of municipalities located in the Etna area since the date of the very first official Italian Census, carried out in 1861, after the political unification of Italy. Section 4 reports a brief review of theory and literature on 'sense of place'. Section 5 describes the study's results. The final section 6 is dedicated to discussion and concluding remarks.

2. Methodology and Data Achieving Procedure

A recent study dedicated to the same topic of the present chapter (Mercatanti, 2013) signaled that relationship between people and the Etna volcano is difficult to analyze, due to its multi-dimensional nature. Hence, in order to overcome these difficulties a deep analysis of the local situation based on case study method is necessary, following suggestions of eminent scholars (Stake, 1995; Yin, 2013; Zainal, 2007). To analyze primary and secondary data, procedures suggested by Grounded Theory have been borrowed, by inspecting diverse series of sources, including scientific literature, popular narratives, and personal observation (Corbin and Strauss, 1990; Glaser and Strauss, 1967). Secondary data was gathered from preceding literature, both scientific and gray, the Internet, social media websites, and newspapers. Primary data was retrieved observing the local reality by using personal experience and geographical knowledge of the region (Anderson *et al.*, 2003). In order to validate the personal experience of the author primary data was gathered from diverse residents, living in the Etna area. For this, the author conducted a series of deep interviews with key-informants by following a specific procedure (Kvale, 2006) during the second semester of

2017. Key informants were selected following the snowball sampling method (Mack *et al*., 2005) from people who live in some of the municipalities listed in table 1.

Table 1 - *List of interviewed Key informants.*

No	*Role*	*Age*	*Place of residence*
1	Engineer	47	Nicolosi
2	Engineer	40	Zafferana Etnea
3	University employee	43	Bronte
4	Medical Doctor	56	Randazzo
5	Student	28	Maletto
6	Dealer of building materials and lava stones	68	Pedara
7	Lawyer	56	Castiglione di Sicilia
8	Student	28	Belpasso
9	Tourist guide	50	Catania
10	Tourist farm owner	48	Mascali
11	Researcher	55	Aci Castello
12	Tourist operator	49	Trecastagni

Official statistical data was extracted from diverse ISTAT (Italian National Statistics Service) sources. In contrast, these interviews illustrate the perception of residents living in such a risky-but-beloved area as the Etna region. Exploring primary and secondary data, it is possible to narrate a credible description of the actual reality, and perception of residents, giving sense, in order to deepen our understanding of person-place relations in the Mountain Etna volcanic area.

3. Background: Etna volcano and human settlements

The Sicilian regional territory includes two volcanoes, Etna and Stromboli, both with a high frequency of eruptions. Furthermore, there is an area where volcanic reactivation is possible (Vulcano island), and potentially dangerous areas such as Lipari and Panarea (Aeolian islands), and Pantelleria (located in the Channel of Sicily). Other seismically threatened areas are located in eastern Sicily: the Strait of Messina area, the Ragusa-Syracuse area, the northeast coastal chain, and, secondarily, in the whole Western Sicily (Giacomelli and Scandone, 2007).

The subsidence of the African plate under the Asian one produced an intense tectonic activity that givess origin to many volcanoes in the Aeolian archipelago and the formation of the main volcanic cone of the Etna. Sicily is

the Italian region most exposed to natural geodynamic disasters, namely to earthquakes and volcanic eruptions. It suffices to recall the earthquakes of the Val di Noto of 1693, with about 60,000 victims, and that of Messina in 1908, with about 90,000 victims, both hitting the eastern sector of the island. About the Etna volcanic eruptions, those of 1669 and 1928 should be remembered, because they devastated vast portions of the territory located on the slopes of the volcano. Over time, many eruptions threatened human settlements, not always provoking massive destruction of inhabited areas. Over centuries the volcano changed its shape, several villages have been often struck, and hundreds of eruptions have relentlessly changed patterns of the landscape, even reaching the Ionian Sea coast (Bonaccorso *et al.*, 2004; Cucuzza Silvestri, 1970; Gemmellaro, 1989; Pesaresi, 2003).

In the Etna region, the present eruptive center of the volcano is located many kilometers far away from the original one, which originated nearly fifty or sixty thousand years ago. The very first magmatic emissions were located under the sea in the area of the village of Acitrezza and the seafront of the city of Catania (Regione Siciliana, 2013). Today, all these areas are considered the most beautiful coasts of eastern Sicily for both residential and tourist purposes. The *Mungibeddu* or *'a Muntagna* (Sicilian names of Etna) did originate in the Quaternary period and it is the highest active volcano in the Eurasian plate. The Etna volcano rises more than three thousand meters above the sea level and is located between the Ionian Sea, the Alcantara and Simeto valleys, and the Catania plain. Its massif dominates all the eastern Sicily, being a very recognizable landmark (Di Blasi, 1997).

The Etna region landscape and its variety are the results of natural conditions and human activities over a long period of civilization (Cirelli and Nicosia, 2010). Local vegetation gathers a rich diversity of both natural and cultivated species. Intensive farming runs vineyards, fruit and pistachio orchards. Farming land is fragmented in small plots by a network of lanes, dry-stone walls, and terraces up to fifteen hundred meters above sea level. Beyond, land morphology becomes harsher and up to two thousand meters, there are only forests of chestnut, beech, and birch. Over this height, landscape tends to be very dry and desert, being the only wilderness for altitude in Sicily. The actual volcanic desert area is located from 2,950 to 3,370 m above sea level. The coast area shows a very different type of landscape. There are headland, capes, small gulfs, natural terraces, and narrow beaches, usually colored by alternating black of the rocks and green of vegetation. The climate is more humid in the northern side, and rains are near 600-800 mm per year in the base area, and more than 1.200 mm per year at higher altitudes (Regione Siciliana, 2013).

On 17 March 1987 the President of the Sicilian Region adopted a law decree establishing the Etna Natural Park, the very first in Sicily, with an area of fifty nine thousand hectares. Its aim is protecting a unique natural environment, and landscape, and promoting the sustainable development for local people and communities. On the 21 June 2013 UNESCO awarded Etna Mountain the title of World Heritage Site. The related area is 1,570 square kilometers, the diameter near 45 kilometers, and the base circle near 180 kilometers (*Ibidem*).

From the very first Italian National Census of population–in 1861 by ISTAT—up to present time, the whole area has much increased in resident population. Table 2 shows the variation of inhabitants in the municipalities located in the Etna area, over the long period from 1861 to 2016. Even though the whole area has increased the number of inhabitants, there are big differences among the geographical sectors of the Etna region. At large, only the northern-eastern sector of the volcanic cone faced a clear decreasing of residents, while all the others increased their inhabitants, in some cases with impressive intensity. The last right column of table 2 shows the percentage variation of inhabitants per each municipality, and the Province of Catania. Comparing municipality/province values it is possible to show the territorial areas losing or gaining residents over this period. The data has been used for drawing a thematic map (Fig. 1).

Table 2 - *Municipalities of the I.N.G.V. Etna area. Inhabitants 1861-2016. Source: processing from ISTAT (n.d.).*

	Inhabitants		
Municipality	*1861*	*2016*	*Δ%*
Aci Bonaccorsi	1,122	3,524	214.08
Aci Castello	2,016	18,674	826.29
Aci Catena	4,597	29,671	545.44
Aci S. Antonio	3,764	18,052	379.60
Acireale	30,785	52,574	70.78
Adrano	13,161	35,894	172.73
Belpasso	7,362	28,081	281.43
Biancavilla	9,388	24,040	156.07
Bronte	10,852	19,116	76.15
Calatabiano	2,711	5,258	93.95
Camporotondo Etneo	731	5,075	594.25

Table 2 – *(continued).*

Castiglione di Sicilia	5,020	3,182	-36.61
Fiumefreddo di Sicilia	1,426	9,560	570.41
Giarre	13,265	27,605	108.10
Gravina di Catania	1,373	25,615	1,765.62
Linguaglossa	8,077	5,357	-33.68
Maletto	2,597	3,841	47.90
Maniace	1,333	3,756	181.77
Mascali	3,618	14,238	293.53
Mascalucia	3,293	32,059	873.55
Milo	950	1,072	12.84
Misterbianco	6,279	49,634	690.48
Motta Sant'Anastasia	3,224	12,221	279.06
Nicolosi	2,793	7,533	169.71
Paternò	14,219	48,034	237.82
Pedara	3,346	7,533	125.13
Piedimonte Etneo	4,982	3,951	-20.69
Ragalna	982	3,963	303.56
Randazzo	7,005	10,810	54.32
Riposto	6,419	14,776	130.19
San Giovanni La Punta	1,631	23,270	1,326.73
San Gregorio di Catania	1,673	11,873	609.68
San Pietro Clarenza	998	7,915	693.08
Sant'Agata li Battiati	519	9,505	1,731.41
Sant’Alfio	1,671	1,582	-5.33
Santa Maria di Licodia	2,786	7,628	173.80
Santa Venerina	5,560	8,549	53.76
Trecastagni	3,038	10,985	261.59
Tremestieri Etneo	1,139	20,359	1,687.45
Valverde	844	7,850	830.09
Viagrande	2,894	8,672	199.65
Zafferana Etnea	3,358	9,562	184.75
City of Catania	70,608	313,396	343.85
Province of Catania	369,931	1,113.303	200.95

In order to give an immediate representation of distribution of people around the sides of Mount Etna over the period, a thematic map has been drawn (Fig. 1). The map shows grouping of municipalities according to inhabitants' percentage variation ranges as of < 0, 0-99, 100-199, 200-499, 500-999, and > 1,000. A feature immediately apparent is the clear North-South divide between the Etna slopes, or even better a diagonal Northeastern-Southwestern division. The very few villages with a negative trend of inhabitant growth are located in Castiglione di Sicilia, Linguaglossa, Piedimonte Etneo, and Sant'Alfio (see Tab. 2, and Fig. 1). In the northern sector, only the Village of Maniace shows a positive percentage increasing of inhabitants, and in general the prevalent range is that of 0-99, namely the lowest one in the whole Etna area. It is apparent that this is a geographical area with difficulties related to its distance from the city of Catania, with less transportation accessibility, higher average altitude, north-facing exposition, harsh winters, longer duration of snowy periods, and a weaker attraction for new residents.

In parallel, the South and Southeastern slopes of Mount Etna show a strong increase in inhabitants. This area encompasses municipalities whose increasing trend is included in the ranges of 200-499, 500-999, and > 1,000. In particular, municipalities closer to the plain and the city of Catania faced a paramount increasing of inhabitants, becoming integrated in a densely urbanized area. Important particularities are those of villages that faced an increasing of population of 500-999% and more than 1,000%, all of them are located close to the city of Catania. Remarkable are the features of the villages of Gravina di Catania (+1,765.62), Sant'Agata li Battiati (+1,731.41), Tremestieri Etneo (+1,687.45) and San Giovanni La Punta (+1,326.73). These villages are today an integrated part of the urbanized area surrounding Catania, whose ongoing number of inhabitants (313,396) are less than that of the 1971 Census (400,048) (ISTAT, n.d.). This data indicates many residents of Catania have preferred to 'go back' and buy houses in small villages close to their places of employment, and daily commute. Furthermore, the Ionian coast is another geographical area capable of attracting inhabitants, at the same level or even more so than the city of Catania.

It should be clear that the long wave of human settlement around the Etna slopes has been sustained by the people's preference for living *both* close to the urban area of Catania *and* the volcano. There is no evidence of any relation between the history of volcanic eruptions or earthquake and the decreasing of the population, neither in the whole Etna area nor in the few Municipalities that show a negative trend. This should be better explained by the willingness

of people to migrate towards the urban residences, away from the rural life, which is usual in all parts of Sicily and Italy (Cannizzaro and Corinto, 2014; Di Blasi, 1972; Formica, 1979).

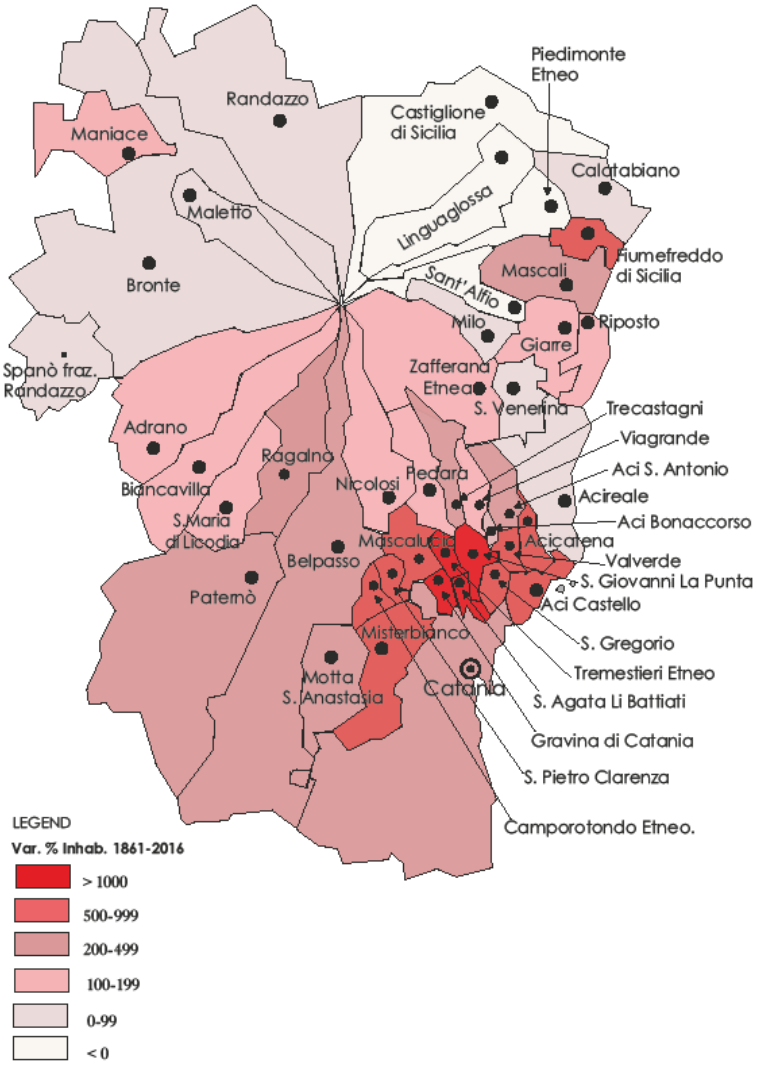

Figure 1 - *Municipalities of the I.N.G.V. Etna area. Percentage variation of inhabitants 1861-2016. Source: the author from data of table 2.*

4. Background: Sense of Place

An exhaustive literature review on the concept of sense of place and its ongoing meaning in cultural geography can be found in Altman and Low (2012). For the sake of the present work, it suffices to underline some main issues as follows. The affective relation between people and the geographical area where they live is one of the dimensions of 'sense of place' studies since its emergence in humanistic geography research. The term indicates the intimate, personal and emotional relationships between 'self' and 'place', privileging the positive affective qualities of place-attachment. It describes the senses of affection, attachment, belonging, and positive ties to a place, namely ‘love of place’, or ‘topophilia’ (Relph, 1976; Tuan, 1977). This definition is sustained by a phenomenological tradition (Casey, 1998) in which place is a meaningful, and healing, -counter to abstract, rationalistic, and not localized notions of 'space'. Critical geography approaches from the 1980s onwards put in light how such positive senses of place does produce an ‘identity’ capable of symbolically and physically excluding who is considered ‘out-of-place’ (Cresswell, 1996). Already Relph (1976) and Buttimer (1976) had emphasized that economic and cultural forces such as urbanization, industrialization, and globalization, could erode, and even occlude, supposedly authentic or original forms of place-based communities. From a different point of view, Massey (1994) designated a ‘global sense of place’, namely a conception of place as permeable, outward open, progressive, and then opposed to conservative, enclosed and unitary. Both progressive definitions of sense of place and contrasting older and narrower usages of the term, are still fertile soil for theory making, and adopting sense of place and place-attachment approaches as sound investigative methods (Feld, Basso, 1998). Such methods provide the opportunity to investigate 'in place' the nature of feelings that bond people and the landscapes of the Etna volcano, in order to better understand their ‘incomprehensible’ choice to live in such a risky place.

5. Results

Results from the analysis of primary data are that, with respect to awareness of people living in a volcanic risk area, it is very clear that residents in the Etna region consider the mountain and the volcano a sort of a ‘good-old-fellow’, -better to say a father, a grandfather, a repository of meanings, memories, and family histories, including those of many past generations who have continuously lived under the shade (and the marvelous landscape) of the volcano. People love ‘their’ volcano and narratives collected from key

informants say clearly no one has left the region due to any volcanic threats, even though they are perfectly aware of the risk.

Who left the village of Nicolosi has been urged by extreme poverty at the beginning of the 1900s and during the immediate post-WWII. They migrated to Argentina, the US, and Germany. The last eruption that actually threatened people of my village was in 1983, but after the city evacuation the flow did stop (Informant n. 1).

With respect to the question on why and when people decided to live in the Etna area, the majority of informants declared they lived there from birth, as members of families with many generations living under the shadow of the volcano. Some people left their urban place of residence, or birthplace, for family or work reasons, and even to avoid crowded Catania.

‘I am a student and was born here. My family decided to buy a house in the village of Maletto because my father was born here and my mother decided to find a job and work here’ (Informant n. 5).

'I lived in Bronte for twenty years, then while studying at the University of Catania I was a commuter until 2009. That year I decided to live in Catania for working necessity. All my preceding generation did always live in Bronte' (Informant n. 3).

‘I voluntarily chose to live in Randazzo, mainly for work purposes, as a Medical Doctor I found my job opportunity here. No one of my relatives has before lived here’ (Informant n. 4).

With respect to the question on how people perceive the private-public relations in risk management, all informants declared that the public bodies are doing a great work for assuring an effective safe of people and a functioning civil protection service. Risk and environmental education of the young are performed by public schools in a good manner. Many public initiatives and scientific meeting involve also common people in having good information about general risk, and how escaping from eruptions, and rescuing from earthquakes. Even during an ongoing event of eruption people do maintain confidence in being able to avoid major damages. The only big concern is the lack of coordinated land planning policies. People build houses without public land planning. The institution of the Etna Park gives some hope for the future better use and respect of its environment (Informant 5).

Finally, in regards to the feelings they have for their own living places, results are particularly intriguing. Feelings of loving their own houses and living places was clearly apparent during conversations between the interviewer and all the informants. No one was ever afraid of Etna; people

conducted their daily-lives with the volcano, and considered its as a family member. Even during the dangerous volcanic events, no one thought to abandon their residences, places or held any resentment towards Etna, which they consider the 'good giant'. Everything about their homes and daily-lives remind them of the precariousness of existence and material objects. If they survive Etna's wrath, they will re-start their lives, tourism and hospitality activities, all which they consider supported by the presence of Etna volcano and its unique landscapes.

Findings from primary data are consistent with those from secondary ones. It is really intriguing that informants often appreciate the 'spectacular' performances of the volcano when erupting both for direct interest and as a tourist attraction, - which is largely confirmed by news easily retrievable from digital and traditional media sources. For the sake of brevity, it suffices to reference the online Washington Post (Fig. 2) and to two tourism operators respectively local and foreign (Fig. 3 and 4).

Figure 2 - *Washington Post on Spectacular Eruptions of Etna. Source: retrieved from https://www.washingtonpost.com/world/europe/see-the-spectacular-eruption-of-mount-etna/2017/03/01/8285e3f4-fece-11e6-99b4-9e613afeb09f_gallery.html?utm_term=.cf5b6a8e7bdb, accessed on May 8th, 2018.*

Figure 3 - *Go Etna. Visit Mount Etna in Eruption. Source: https://www.go-etna.com/survey-of-an-outbreak/; last access: May 8th, 2018.*

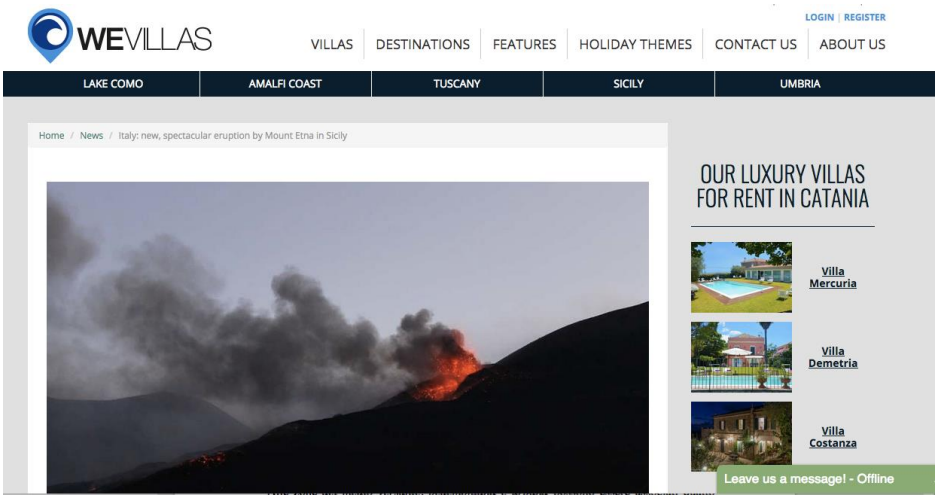

Figure 4 - *Wevillas, Our Luxury Villas for Rent in Catania. Source: https://wevillas.com/news/italy-new-spectacular-eruption-by-mount-etna-in-sicily; last access: May 9th, 2018.*

Even people having directly experienced the effects of eruptions, list the volcano as the third most serious problem in their daily lives, after the lack of a vibrant social life and consistent public services (Davis *et al.*, 2005). All the

people in Etna's shadow are perfectly aware of living in such a risky area, realizing that the next eruption is possible, but not actually dangerous. People feel that they have control over their exposure to the eruption's effects. They consider personal and collective preparedness, including that of government officials, as more than acceptable, and even high. This is attributed to community bonding that ensures sharing of same feelings and culture against nature in general and the volcano in particular. The successful government response during Etna's 2001 and 2002-2003 eruptions was considered a good benchmark for the future, enlarging the sense of safety for living in the area (*Ibidem*).

Finally, the best way of illustrating the nature of the relationship between Etna and the people living on its slopes, is found in the words of the Sicilian writer Leonardo Sciascia (2003, 1262): 'It's like a huge house cat that snores quietly; every now and then, it wakes, yawns, stretches lazily and with a swipe of its paw destroys a valley here or there, wiping out towns, vineyards, and gardens'.

6. Discussion

The adopted research method has proved effective for sourcing useful primary and secondary data to address the research questions posed in the introduction. Many popular novels tell about the coexistence between Etna and its resident human communities, often in surprising ways, which are considered superficial and not scientifically relevant. So, one of aims of the study was to compare diffused information with primary data, collected from residents and people who previously lived in the Etna area. The main objective was to find possible relations between volcanic risk and human settlement in the Etna region. The study tried avoiding interpretations of this historical human behavior as 'incomprehensible' or 'irrational'. The study discovered some original information, which contributes to a deeper knowledge of why people continue to live in Etna's shadow. Following cultural geographers' previous research on 'sense of place' and 'place attachment', the study revealed local characteristics of person-place and person-environment relations in the Etna region. People love Etna, and every day is considered a sort of benefit-risk balance. They consciously consider benefits more valuable than risks. The beauty of the landscape, possession, and maintenance of inherited family houses, living in small and comfortable villages not far from the city of Catania, and the possibility to manage

economic activities related to the presence of the volcano are actual trade-offs with the volcanic risk. Results correspond to the 'fatalist individual' archetypes as one of the four individual-social behavior models proposed by Thomson and Schwarz (1993). Still, some critical comments are necessary for better describing and interpreting the local reality. The fatalism of people who are living on the Etna's slopes, possess profound cultural roots. It could even be interpreted like a sort of intimate philosophy - which nourishes the idea that mother nature is 'unpredictable' and places 'everything is at risk'. It is apparent that, in a deeper manner, people living here consider themselves in symbiosis with the volcano. Under their narrative discourses, they are seemingly saying 'Mount Etna was my cradle, and what? It can be also my grave', and 'it is marvelous living here and possibly it would be fine dying here'. Indeed, they know well very few people have died due to the volcanic activities.

7. Conclusions

Living under the shadow of the most beautiful and the highest volcano of Europe gives people a strong sense of identity, and helps the locals in considering themselves different from the rest of the world (Cresswell, 1996), including Sicily. Etna is famous worldwide. It has a long history, and actually, a long geologic pedigree an provides the opportunity to build a strong myth around the mortal lives of its people. It is an important research topic for many researchers of diverse disciplines. It also has been featured many times in the most famous newspapers of the world. Its eruptions are spectacular and people watch them as a performing exhibition during a great night show. It has been narrated since the birth of literature and today by cinematography as well (Cirelli and Nicosia, 2010). It is 'the house cat that snores quietly' (Sciascia, 2003) which can eventually destroy my property, but it is *my cat*. Finally, it offers the opportunity to manage tourism and hospitality businesses, being a well recognizable landmark and a tourism destination that should be better exploited.

The chapter reports the findings of a case study on people, place and am active volcano. Thus, it can help us understand local situations, and localized perceptions of natural risks. It can help understand a slice of Sicilian identity, which is always fabricated by many diverse local actors and communities. Geological features of Etna volcano are extremely peculiar, and for instance, much different than those of the Vesuvio volcano, located near the city of Naples (Davis *et. al.*, 2005). Thus, results can be compared only critically

with those of other case studies placed in different volcanic areas or regions. Policymakers may consider the results of the research as a means for improving public intervention in regards to two main issues. The first is certainly the education of the young to risk management. By improving awareness of living in a place that is naturally subjected to eventual risk. The second one, is the necessity to improve tourist services and accommodations and their quality for attracting more tourists from abroad, giving them the possibility to enjoy their leisure time in a beautiful and safe place.

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5. Humankind and Risk: a difficult history

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Abstract

Talking about catastrophes in the Anthropocene Era means tackling a complex and often misunderstood topic, difficult to understand for the general public. On the other hand, a greater and more widespread attention should be given to this theme, especially in relation to natural hazards and risk. The influence of the catastrophe theory does not seem to have sufficiently permeated the interpretive field of the natural sciences, more focused on the traditional systematic approach, antithetical to the systemic and holistic one that characterizes the methodological assumptions of contemporary research on complex systems. This chapter aims to analyze the salient characteristics of the relationship between society and disasters, highlighting those elements that condition social perception of risk as well as risk management. It is important, in our opinion, to focus on the clarity of communication and, above all, on the ability in arousing public interest, to make society aware of the urgent need to change the individual/community/social behavior in a sustainable way, with the aim to prevent natural risks and mitigating their effects.

Keywords: Catastrophe, Prevention, Risk, Society, Communication.

1. Introduction

An infinitesimal variation of some parameters in a status of precarious equilibrium may lead to a huge, sudden change: the catastrophe. The word “catastrophe”, in its etymology, has no negative implications.

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What is commonly ascribed to the catastrophic event is the exceptionality, both in collective imagination and in science. The catastrophe is exceptional because it is beyond the human willingness to completely forecast/manage things, it exceeds our control. It is exceptional because the fury of the elements overwhelms anthropocentrism, undermining its solid foundation and dispersing it in nature's entropic chaos. In theoretical sciences, the concept itself of catastrophe opened a debate -a sort of revolution- touching and shaking complex problems intrinsic to the methodological "set-up" of scientific research itself. For mankind, the meaning of a catastrophe is more linked to the consequences it brings about, rather than to the ways it takes place, its causes, its "essence".

Our reflections start from some considerations on the theory of catastrophes, concerning the scientific revolution triggered by the work of René Thom (Thom, 1972, 1980), the creator of theoretical-methodological innovations whose scope has touched many different disciplines.

The scientific and technical problems related to the prediction, prevention, and management of catastrophic events will be addressed afterwards, with particular attention to the relationship between humankind and catastrophes: a dramatic aspect of the relationship between humanity and nature. In fact, the concept of risk implies the responsibility of individual/community/society as exposed to hazard. Altered perception of risk, which has its roots in anthropocentrism, is a problem that fully manifests itself when dealing with prevention. Scientific communication is therefore a key element in dealing with risk prevention.

By developing these themes, also through examples of pilot cases, this paper aims at focusing some of the most important components of the complex processes that condition social behaviors in case of natural disasters; an analysis hopefully useful in addressing natural disasters' effects.

2. Catastrophe theory

«There was an earthquake! A terrible flood! Locusts!»
(John Belushi, in "The Blues Brothers". John Landis 1980).

From Egypt's plagues prophesied by Moses, to the celebrated Jake Blues' excuses. Across science, history, myth, and cinema, the human reaction to catastrophes is aimed at inserting them into a reference system which can be managed. After all, it is nothing but the impossible attempt to make sense out of a disaster.

In order not to succumb to the threat of Mother Nature, when she becomes unkind, representation processes drive us to move away from reality, to observe it from the outside, as far as possible: with this trick, it seems we can know what is happening, how to manage it. In this way, the tragic consequences of events that could happen are exorcized.

Fear is just evoked, almost like a vector for the narration towards a final catharsis. The anguish decreases: the real threat is transposed on a border surface, between the real and the indefinite**.** However, first of all, human responsibilities are removed. Represented, but delegated to an alien figure, far from our everyday life, so keen to drag the collective imagination into an emotional current, evoking reactions as much involving as distracting, uprooted from reality.

The catastrophe goes away, losing its connotations. It is a phenomenon and reveals itself as such. Catastrophes, in a scientific and cultural sense, can still be considered - to use an active naturalistic image - as fluid, incandescent matter. Such a problem is the core of a discussion that involves several fields of study, at several levels. The term "Catastrophe" means in itself a change of some variables, gradual or continuous, such as to produce a phenomenon of great importance.

The study of these phenomena, discontinuous and divergent, is based on the study of mathematical models, that make possible a rigorous description of the nonlinear phenomena, in different fields (biology, geology, meteorology, as well as linguistics, psychology, economics). The catastrophe paradigm and the related research program (understood as a constellation of concepts, beliefs, mathematical techniques, research styles) is mainly attributed to René Thom, whose thinking (and the conspicuous amount of work) has been divulged and commented in Italy by Tito Tonietti (1983) and Umberto Curi (1988).

The «catastrophe theory» was born as a mathematical thesis of critical points; subsequently, as a theory of the description of the forms of dynamic changes (Thom, 1972, 1980). Umberto Curi (1988) defines the notion of catastrophe as a sudden change of biological or physical status that can be described linearly; in Thom's theory, in fact, discontinuity is not considered an anomaly: rather, it is made comprehensible by modeling. According to Thom (1972), such theory is not a scientific one *sensu stricto*, because it is not compatible with rigorous empirical control; rather, it tends to construct a model that is as simple and functional as possible. Thom himself defines catastrophes as "a way of life", reaffirming his own, subjective, conception of the world. Disasters are their story: telling it is essential to understand its evolution.

Catastrophes make their appearance in the scientific debate in 1972 when the text "*Stabilité structurelle et Morphogénèse. Essai d'une théorie générale des modèles*" by René Thom was published. A complex treatise, in which epistemology and mathematics are integrated. The difficulty of the text originates from the "heretical" perspective from which the author upsets the scientific disciplinary divisions and the criteria of relevance adopted by the orthodox sciences. Thom considers all the phenomena that can be observed in nature as forms that arise, interfere, conflict, die. The transformation is continuous; nevertheless, in a continuous becoming, it is necessary to identify stability of the form, concerning the perturbations, to be able to recognize the equality between two forms or to describe the transition from one form to another (Thom, 1972, 1980).

Structural stability is the basis of a sort of obligatory path, the chreod, a term conied by the biologist C. H. Waddington to explain how each evolutionary development is structured or constrained by necessary paths (Waddington, 1968), which lead to the same final result, whatever the small interfering disturbances. Scientific knowledge itself is based on structural stability, based on the repeatability of those experiments that verify those laws expressed in formulae. Structural stability does not mean laws' independence from the spatiotemporal conditions of verification (invariance of scientific theories in an s/t system). The crucial point is that the shapes have their dynamics: the breaking of the waves, the clouds that thicken or fray; "Next to the domains of stability there are cases in which small changes cause great changes": this is a catastrophe.

Thom's approach is essentially morphological: by studying the dynamics of morphogenesis, he shows how this achieves the -static- classification of the forms. To limit to a finite number of types the infinite variety of natural forms and their continuous variations is possible only by establishing "thresholds": the structural stability of forms and processes, the continuity of descriptive modalities, the four-dimensional space-time constraint size.

The point - still open - of the research program, is the typification of disasters through topological properties: places with more information, essential forms, "Gestalt". At the same time, for Thom, reality and life are more precious than any formal representation of them, and he cites Paul Valèry: "Life does not have time to wait for rigor" (Valéry, 1933; Thom, 1972). These words take us to the next step: how to deal with nature.

3. Prediction and prevention

«Progress is a very delicate thing and an ambiguous concept. It may be that a little further on, along the way, either a bridge collapsed or an abyss has been dug»
(J. Huizinga, The crisis of civilization. 1938).

The significant problem of scientists (and of the whole human condition) is the prediction of catastrophes. Knowing what is going to happen, with the highest possible precision, is the fundamental element to provide for a useful alert of the population and to implement the necessary evacuation plans, that can safeguard people and things. Salvation is based on the timeliness and appropriateness of the alarm. In any event, it seems preferable to opt for an excess of zeal, rather than incur the consequences of approximation and negligence. However, starting an evacuation plan is a complicated operation, delicate to realize: neither the authorities nor the population proves to be adequately prepared for such events. Unfortunately, the consequences of this situation are experienced in too many occasions.

Monitoring of environmental hazards seems to be an act of study and research, more useful for knowledge than for prevention. It seems that society considers hazard like a science-fiction eventuality or something that can not relate to the present, "here and now".

Beyond the technical and scientific aspects of the problem, there seems to be a profound difficulty conditioning the problematic human approach to the catastrophe. In harmony with the ever-present anthropocentrism, humanity stands outside, above nature, assuming an attitude of security and mastery or superficiality, which fully manifests itself when faced with problems related to prevention and management of disastrous events.

An ancestral misunderstanding, able to significantly influence the approach to the problem: forecasting and management vs. intervention (especially the latter) are oriented not so much on the event as a whole, but on the produced effects, with particular reference to anthropic infrastructures. Beyond the significant diversifications in the practical setting of the problem, there is a widespread and generalized tendency to separate causes and effects, in dichotomous ways. It is quite logical to understand how such a "trick" facilitates the removal of the responsibility component, direct or not, of the humankind itself in what has happened. Moreover, "it happened, by now": the urgency is in repairing the damages and (at least in declarations of intents) in working to prevent other damages that can occur in further similar circumstances. Recovery, restoration, reconstruction: man likes to build, and we can't forget the economic and corporatist interests that affect most of the

activities related to disaster management. However, the most balanced approach to the problem of catastrophes is that based on prevention, which does not separate the components, does not neglect responsibilities, which, far from devoting exclusively to forecasting plans, inserts fundamental elements and processes as consciousness, knowledge, divulgation, education (De Pascale *et al.*, 2017; Antronico *et al.*, 2017).

The scientist studies all -almost all- the possible aspects of catastrophes, through mathematical models that simulate those mechanisms and processes that determine the occurrence of a catastrophic event, its evolution, the consequent damage. So, reality often adds insult to injury: we can know what will happen, but not where, how, when. Alternatively, only partially, due to the complexity of environmental processes, and to technology limits, or, somewhere, to the differentiated availability of the same. The case of the December 26, 2004, the so-called Christmas tsunami, is tragically eloquent: the tsunami originated after the 9.1 magnitude Sumatra-Andaman Earthquake occurred off the northwest coast of Sumatra, Indonesia, causing catastrophic levels of destruction to countries around the Indian Ocean basin. The warning system managed by the US Federal Meteorological Agency, following the recording of the earthquake, issued a bulletin that excluded the risk of tsunami for the countries included in the "Tsunami warning system" in the Pacific area. Only an hour later, with fatal delay, the event was foreshadowed for the areas that were about to be affected.

Unfortunately, fourteen years later (22 Dec. 2018), a deadly tsunami, triggered by the eruption of Anak Krakatau vulcan, struck Java's western coast. No early warning systems, despite the predictability of the event, prompted by an undersea landslide that followed the eruption.

4. Catastrophes and Society

«Your home is your biggest body»
(Kahlil Gibran, The Prophet. 1923).

The consequences of natural disasters can be so dramatic to upset, even in a permanent way, the existence of individuals, communities, society hit by the event. The house, in almost all cultures, takes on an existential meaning: a set of dwellings identifies a settlement. A disaster, along with the houses, sweeps away the social and emotional reference points of individuals. Natural disasters occur with impressive frequency according to statistics; as told before, the extent of damage and loss is a function of the territory affected: geographic location, structures, and infrastructures, population density.

The so-called “survivor syndrome”, studied and defined in war veterans, also affects those who have escaped a catastrophe. Life is safe, but the consequences of the psycho-physical suffered traumas, induce emotional reactions in the subject (anger, guilt, anguish), cognitive (amnesia, disorientation), psycho-somatic (sleep disorders, exhaustion, tachycardia). Difficulties condition social relationships: the individual affected by the syndrome is unable to make sense of the experience he is living, he tends to isolate himself, to not trust others, to feel vulnerable, he can become aggressive. These are the characteristics of the phase of disillusionment, which follows the first passage through two other so-called heroic phases (in which an active reaction prevails) and “honeymoon” (in which the subject feels himself to be helped). Over time, the catastrophic event ceases its mediatic power and, after having saturated the public's attention, it no longer makes an audience. The affected populations are left alone, in taking care of reconstruction: of the self, of their own home: here occur the most painful phases of the syndrome (Lifton, 1982).

Some individual characteristics or social situations can favor, aggravate or make chronic the so-called post-traumatic stress disorders (PTSD). The subjects who have already suffered other traumas, the bearers of physical or psychological discomfort, the elderly, are more exposed and vulnerable to the syndrome. However, poverty, unemployment, ignorance are undoubtedly powerful catalysts of an internal and external destructive reaction, both individual and collective. The sense of insecurity can permanently accompany the existence of catastrophe’s victims, especially when isolation and ineffective provisional measures impede the re-establishment of a social fabric. Even rescuers, if exposed for a long time to the conditions that characterize a hit site, can suffer some similar symptoms. However, timely information on the perspectives (and difficulties) of reconstruction can avoid the aggravation of the syndrome. The PSTD fail to affect the majority of the population exposed to a catastrophic event. A not irrelevant minority - from 10 to 30% - shows lasting symptoms.

The psychological reactions to the catastrophe, the “invisible earthquake,” have not so far been the subject of specific studies, in our country, at least until the earthquake that in 1997 hit Umbria and Marche. Only after that event, some organizations for the psychology of the emergency have been present, but neither a culture of trauma nor a culture of the earthquake has yet matured (De Pascale *et al.*, 2016). The need for normality leads the population to remove or what happened and silences the consciousness that it may occur again. Despite the attempted training, which was somewhat general, it was not possible to delete or moderate this trend. The interventions concerning the mental competence carried out on the population, are often borrowed from

studies and experiences carried out outside our country and are not correlated with studies regarding the transculturality of the interventions and lack adequate scientific bibliography regarding the responses made.

The absence of a "culture of risk" is impressively evident in communication. Communicative processes should be a powerful tool in emergency situations (Farabollini *et al.*, 2014). "Communication, in fact, connects people with specific skills and common people, and only the development of a specific culture and proper education to natural disasters make it possible to avoid phenomena like the uncontrolled panic and the social amplification of risk. All effects that weigh the emergency operations down" (Lanza, 2005). Another aspect of the complex problem is in the approach between information operators and involved population. The presence, sometimes the invasion, of journalists, operators, photographers, can cause further psychological trauma in individuals already hit by dramatic experiences. Moreover, postmodern media have the dangerous power to confuse the plans of reality with those of fiction. It is not uncommon to be disconcerted in attending interviews with people involved in tragic events. The bewilderment has two faces: one of the interviewees (why expresses his pain in front of a camera? Is it helpful, is the victim aware of what he is doing?) And one of the journalists (why does he do it? media looting?). "When a journalist interviews a victim of a traumatic event, it could trigger a post-traumatic stress disorder. It is therefore essential that journalists learn about what a PTSD is and its symptoms, increasing not only his professionalism but also his humanitarianism" (Ochberg, 1996).

"Disasters are a real laboratory to experimentally assess the degree of integration, the compactness and the capacity for recovery of social systems. They are, on the sociological level, the equivalent of the experiments that are carried out in engineering to evaluate the resistance capacity of a machine subjected to extreme physical stress" (Fritz, 1961).

Some studies conducted on populations exposed to the effects of disasters have revealed that "the effectiveness and efficiency of the response to a natural disaster depend more on the readiness and functionality of first aid than on the psychological state or immediate reaction of individuals" (Quarantelli and Dynes, 1977). "Only 11% of the affected populations live in underdeveloped countries but is where 53% of the victims are registered... To avoid disasters or reduce the damage, action must be taken on the social development of populations" (Fraioli, 2005). When events occur in industrialized and rich countries, even if they cause numerous victims and very considerable damages, consequences are not permanent, progressively repaired by the national economies. In developing countries, the loss of life is 3 to 4 times higher than in industrialized countries (McGuire, 2003). A very

delicate problem is how to organize and manage relief efforts to reduce the effects of the disaster: “Today we risk the overlap between the various agencies that intervene in case of a disaster” (Cardinali *et al.*, 2010) Moreover, very often the amount of aid is not determined by the measure of need, but by the measure of loss. “Rescue operations explicitly reproduce the normal models of discrimination of pre-existing political relations. In fact, previous differences in status seem to be reaffirmed with great ease” (Fraioli, 2005).

Moreover, there are political implications: “on the wave of world compassion, states and governments, shaky for their failures, can disengage from the uncomfortable role of the accused...and assume that of the rescuer... that organizes the solidarity interventions after the disaster” (Beck, 1986).

What would happen if events of exceptional, destructive intensity struck “rich” countries? It is easy to foresee that similar disasters would have repercussions on the economies of other countries, due to the deep link to the economy, considering the “global” characteristics of the current economy.

Geological times are very different from the “human” ones. Such a difference does not exclude, however, that certain phenomena have occurred and that the triggering causes are still existing and are ready, sooner or later, to discharge their destructive energy.

5. Italian way of facing risks

“You worship fate, destiny. That is why you despise nature. Because you fear it because you want to be in its possession to blame it for every misfortune. And put your conscience in peace”
(Farinetti, The burning island, 1997).

In our country the approach to the problem of hazard and risk is mainly focused on the effects that calamities produce on the anthropic infrastructures, and given the practical limitation of the prevision skills and tools, the reaction is to exalt the anthromorphism, extending its action into misleading preventive works (of regimentation, protection, etc.) that often, more than averting risks, even enhance the devastating effects of natural events, moreover conditioning its modalities. Prevention, despite its significance, is forced towards the engineering intervention, often reaching results contrary to the aims of the intervention itself. The hydrogeological risk, for example, has been strongly influenced by the anthropic action as well as by the continuous changes in the territory. These factors increase the possibility of occurrence of disastrous phenomena, causing at the same time, an increase in

risks, due to the developing of infrastructures in those areas where such events are possible. Abandonment of mountain land, illegal building, continuous deforestation, use of agricultural techniques not environmentally friendly, the opening of loan slots, the occupation of areas of fluvial relevance, the uncontrolled extraction of fluids from the subsoil, the abusive collection of aggregates from riverbeds, the lack of maintenance of regional settings. All of these actions have certainly aggravated the instability of the Italian territory, furtherly highlighting its fragility.

Italy is a country that, due to its physiographic characteristics and its exposure to hydrogeological, seismic and volcanic risks, represents well the coexistence, sometimes the contraposition of two consciences: the one of responsibility and the one of fatalism; their comparison is more complicated due to the presence of interests, speculations, bad faith. The case of Vesuvius is exemplary: an active volcano, characterized by effusive activity and explosive activity. Although the volcano is currently quiescent, it is expected to erupt in the future. There are emergency plans that provide for the evacuation of more than two million people. What would happen if in ten, twenty, fifty years Vesuvius began to show signs of eruptive activity such as to advise the evacuation? Apart from the fact that it is not sure how much this pre-eruption activity could last - maybe months - move and settle in the rest of Italy two million people would imply an overload for the whole transport system of the Peninsula, with severe damage to the economy of the entire country. The economy would be hit in the whole of Campania region. Needless to talk about the effects of the eruption itself, easily imaginable. The reflection is open, considering that the last eruption of Vesuvius, even if not so dangerous, was in 1944.

The history of the Earth is full of natural phenomena that have influenced the climate, modified the landscapes and the shape of the surface itself. Usually, they are a continuum of events periodically occurring. Earthquakes and volcanic eruptions, and tsunamis are only the surficial manifestations of tectonic plates' movements and the internal dynamics of the planet, as well as floods, hurricanes and tornadoes are just the effects of meteorological dynamics; landslides are the response to those environmental agents that tend to modify the reliefs. It is their interference with the anthropic activities that transforms natural events into catastrophes.

What can be done to soothe, if not avoid, the harmful effects of natural phenomena? As we have seen, a valid approach to possible solutions is based on investment in knowledge and therefore in prevention, using scientific and technological achievements for the diffusion and improvement of monitoring networks, both on Earth and in space, and rigidly applying criteria for environmental protection and adequate construction. Is the current human

society available for this? One cannot but be pessimistic, given the financial resources used for armaments, wars, unnecessary infrastructures. Not to mention the difficulties in applying the Kyoto agreement on carbon dioxide emissions, rich countries trying to buy the shares of the poorest countries to continue to pollute as before. "Washington does not want the cause-effect relationship between climate change and disasters to be made explicit. If it were official, since the link between US consumption and global warming is now established, the US would be considered the main perpetrators of future disasters". "What is never found in the United States is the attribution of some responsibility to the institutional structures" (Kertzer, 1983). Not even the subsequent conference on climate change (Paris 2015) made progress in the necessary start of the reduction of greenhouse gas emissions, despite the alarm confirmed by the scientific models. The last, recent congress in Katowice (December 2018) reiterates and reinforces the provisions, thus confirming in this way the lack of effectiveness of the decisions, the insufficiency of the agreed regulation. Moreover, social inertia is surprisingly constant, not giving credit to the urgency of the problem, attributing an almost science fiction value to the consequences prefigured by the scientists (moreover the scientific community itself is not always agreeing on the interpretation of events, nor cohesive in the request for adequate interventions). In such a complex context, all that is completely certain is the fact that man's presumed supremacy over nature has never occurred, nor will it be achieved, at least soon. Too large is the strength and energy that the Earth has in itself and that humankind cannot manage.

6. Reflections, proposals, experiences

«Tis sweet, when, down the mighty main, the winds
Roll up its waste of waters, from the land
To watch another's labouring anguish far,
Not that we joyously delight that man
Should thus be smitten, but because 'tis sweet
To mark what evils we ourselves be spared»;
(Tito Lucrezio Caro, *De Rerum Natura*)

Alike two thousand years ago, society still uses an evocative tool to deal with disasters, to evoke and exorcize them: the representation. Representing a dramatic event, telling it, favors the distance between events and people. The potential victims of catastrophes become spectators, observing the

spectacle in a safe position. The mechanism of every strategy of representation is advantageous: anguishes and obsessions are avoided.

Living in Anthropocene, living the postmodernity: a plethora of technological tools and sources offer everyone around the world the possibility of participating in social dynamics, a resulting side effect of which is an extreme superficiality and fragmentation of knowledge (Lugeri and Farabollini, 2015).

The traditional scientific communication has not produced remarkable effects as a tool for prevention until now, in our as well as in others countries: this should make us reflect: there is a gap to be filled, a lack of connection between the world of research and that of information. The different cognitive needs (or the various phases of the same need) suggest new strategies and procedural logic in the interaction between scientists and society. It is necessary to follow a scientific and cultural approach that integrally considers all social and environmental components, including public participation and education. The youngest generation is the focus of a desirable and necessary dynamics for change; they are a starting place for a new active approach to science and its applications, a catalyst for the process of engagement of the "*facies sociale*" of adults, leaders and people responsible for the current state of affairs, yet far too often deprived of future prospects and conditioned by the obsession of the "here and now".

We strongly believe, following years of experience first in teaching, then in research and finally in scientific communication, that it is necessary to build a bridge between diverse realities and between diverse communicative codes. Appealing to themes that best embrace the collective imagination, is therefore profoundly motivated as it facilitates phenomena of identification and engagement. It responds to the need to arouse curiosity and vision, which lead to the planning and realisation of a polyhedral objective thanks to teamwork.

The following projects, realised in an experimental way in Italy, have been successfully realized thanks to a synergy between the Camerino University and the Geological Survey of Italy-ISPRA. The main topics are:

- The geological characterization of landscape in movies and fictions, based on the use of the filmic communication in order to make the territory comprehensible to the society. In the episodes of the famous TV series "Il Commissario Montalbano" filmed in Sicily, the natural and cultural landscapes, giving a fascinating scenery to the films, represent a meaning in the representation of history (Lugeri *et al.*, 2015).

- The "GeoloGiro" and the "GiROSAuro" (a cartoon created for the youngest audiences) for the popularization of the scientific knowledge, explaining the geological setting of the landscapes crossed by the cycling race

"Giro d'Italia". The morphology of the territory becomes a key component in the race context: if explained by the geologist, can offer to the public a new point of view of the landscapes, linking scientific information to the agonistic valence of the stage. The Giro d'Italia has welcomed the presence of the geologist, thanks to a dedicated space during the TV live transmission of the race (Lugeri *et al.*, 2018).

On our opinion, the most sensitive point in the scientific communication is how to organize the information in a strategic way, referring to targets and messages, in order to better communicate the contents to the audience. Being that landscape is also an object of human perceptions, the result of the interaction of many natural and cultural components, and the expression of the geo-environmental processes as well, it could become a "medium" to communicate the Earth Sciences to the whole society.

For humankind, a catastrophe is always the result of the interaction between natural factors and human action. In all cases, the event arises in complex situations where concomitant causes determine effects of unpredictable scale.

"There are not even purely natural disasters. Human action - or non-action - is always involved in them. The coral reefs that protected from flooding are shattered by the construction industry to make them raw material, the mangrove forests are indecently deforested, the alarm systems are not installed, the sea level rises due to climate change, the promised paradises Mass tourism is staged close to the coast, so the tsunami turns into a murderous wave", writes Ulrich Beck, after the tsunami of December 26, 2004, that has violently brought to the attention of everyone the terrible potential resulting from an altered relationship between man and environment. Most of the tragic circumstances are often almost meticulously developed by man for his own "non-knowledge, perhaps not being able to know; still worse: the non-knowledge without awareness" (Beck, 2005).

Considering oneself to be an integral part of the environment in which one lives, awareness represents an essential goal, reachable through the integration of knowledge and conscience: a necessary process for social survival: In this sense, a proper communication, aimed at making risk comprehensible, is a tool for public health management.

Today, more than ever, a new approach to raising awareness on the territory is necessary, the first step for starting good behaviors, essential in avoiding risks as well as in mitigating their effects.

A correct cultural approach to the problem of risk management, requires a multidisciplinary methodological approach, useful for guiding decision-making guidelines and management activities to achieve delicate balances but

progressively more stable, aiming at reaching a development that is sustainable for the social /environmental ecosystem.

Each type of risk management can and must make use of risk assessment, based on interpretative models (Marincioni, Fraboni, 2012).

In parallel, a new dialogue window has to be opened up between scientists and society: a dialogue that must articulate on a common code, suitable to overcome those misunderstandings often due to inconsistencies in communication with devastating effects. The need for effective social protection is a priority: such an aim can be reached only by sharing information and knowledge: information must be assimilated by individual/community/society, in order to become conscious knowledge.

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Section II

Disaster Planning and Management

6. Anthropology of the Vesuvius Emergency Plan: history, perspectives and limits of a dispositive for volcanic risk government

Giovanni Gugg[1]

Abstract

The goal of this chapter is to discuss the case of the Vesuvius Emergency Plan: this is the only risk prevention tool existing for the Neapolitan volcano. In 1995, Italian Civil Protection presented the long-awaited "National Emergency Plan" that organized the area into "zones" of danger (red, yellow and blue). This certification of the territory as "at risk" had a double effect. On one hand, it contributed changing the relationship with the places, as for the red zone that from area of building expansion became a non-building land; on the other hand, it modified the sense attributed to time: the catastrophe is no longer a hypothetical eventuality but, to some extent, has been officially announced. In 2001, the Emergency Plan was updated and the time slot needed to forecast an eruption was reduced from two to one week. Subsequently, in 2013, the red zone perimeter together with the twinning between its 24 municipalities and other regions of Italy were redefined. The main limit of the Plan is that, being only inspired by an emergency logic, it lacks any ecological approach that would guarantee a better risk reduction. Conversely, a planning of the future emergency, as well as the current management of the territory, should be the results of a constant listening process, the meeting points of a complex, heterogeneous and multi-vocal reality; planning, in other words, should be meant as a strategy able to learn from events and no longer as a pre-established program, aimed at anticipating all the moves.

Keywords: Debate, Disaster, Emergency, Preparedness, Risk.

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1. Introduction

In 1632, the year following the strongest and most destructive eruption of the Vesuvius in the last millennium, the viceroy of Naples, Emmanuele Fonseca, on behalf of King Philip IV had an epigraph placed at the Granatello, the port area of the city of Portici. The large plaque, considered "the first document of civil protection in history" (De Pascalis, 2007), recalls the catastrophic effects of the volcano, inviting the population to not rely on the mountain, but to always be ready to flee[2]. In reference to this inscription, the historian of volcanology Antonio Nazzaro coined the expression "Granatello paradox" (Nazzaro, 2001) to describe the attitude of the residents who *know*, yet *do not know* the dangerousness of the territory where they live; who *see* and, at the same time, *do not see* the risk. Nazzaro refers to that "irrational attitude between panic and repression" to assert that "the warning made by the Neapolitan sovereign has never been duly considered" (Nazzaro, 2001, p. 101). This apparently rigid and irrational behaviour of the Vesuvian population is rather multifaceted and more understandable when viewed ethnographically because it refers to a complex relationship that the inhabitants have established with the places where they live (Gugg, 2018). However, with regard to the epigraph, some questions arise, such as: For whom does the term "posterity" refer to in the

[2] The text of the epigraph is in Latin: "Posteri, Posteri! / Vestra res agitvr dies facem praefert diei nvdivs perendino / advortite / Vicies ab satv solis in fabvlatvr historia arsit Vesaevvs immani semper clade haesitantivm ne posthac incertos occvpet moneo vtervm gerit mons hic bitvmine alvmine ferro svlphvre avro argento nitro aqvarvm fontibvs gravem / serivs ocyvs ignescet pelagoq inflvente pariet sed ante partvrit concvtitvr concvtitq solvm fvmigat corsvcat flammigerat / qvatit aerem / horrendvm immvgit boat tonat arcet finibvs accolas emica dvm licet / Iam iam enititvr ervmpit mixtvm igne lacvm evomit praecipiti rvit ille lapsv seramq fvgam praevertit si corripit actvm est periisti / Ann Sal MDCXXXI XVI KAL JAN / Philippo IV rege Emmanvele Fonseca et Zvnica Comite Montis regii pro rege / Repetita svperiorvm temporvm calamitate svbsidiisq calamitatis hvmanivs qvo mvnificentivs formidatvs servavit spretvs oppressit incavtos et avidos qvibvs lar et svppellex vita potior tvm tv si sapis avdi clamantem lapidem sperne larem sperne sarcinvlas mora nvlla fvge / Antonio Svares Messia Marchione Vici Praefecto Viarvm".
The translation to English is as follows: "The light passes from one day to another / and time progresses. / Listen. / Twenty times, it is said, burnt Vesuvius. / Always with great ruin for the uncertain. / to prevent you from being surprised in the future/ I remind you that this mountain contains bitumen and alum / iron, sulphur, gold, silver and nitro / and sources of water. / Sooner or later, when the sea breaks in, it will erupt / But first it inflates/ and then shakes/shakes the ground/ Corrupted vapor ignites/ and shakes the air, / moans horribly/shakes and drives away what is in its vicinity/ Do not linger and run away /know that it is strengthening now, erupting, invading a lake/vomiting fire / it collapses and falls down, and he who flees is fleeing in vain / it kills and buries what it meets on its way".

text? For the population as a whole or for administrators? Who are the carved words for? In short, can the inhabitants be blamed for ignoring for centuries a warning written in Latin? So, today, who should carry about those words more than anyone else?

The way one responds to these questions reveals what kind of interpretation is given to the concept of resilience (a valuable critical reading on this concept is provided by Benadusi, 2014): either as a condition of "nature" or as a "historical" result. If the first option refers to an *a priori*, that is, to the idea of an innate resilience and, therefore, to an essentialization of communities, of their vulnerability and their ability to cope with it; the second option is an *a posteriori* because it focuses on a resilience understood as a process, then as a synergy of several elements that influence each other (Djament-Tran *et al.*, 2012). The difference is not negligible because it involves completely different emergency management methods.

Furthermore, a second theoretical knot at the base of this reflection is to be considered: the emergency action – which is to be caused by a sudden and unpredictable event and which requires an urgent intervention (Calhoun, 2010), in order to guarantee a response in conformity with a common sense of humanity – it overcomes the bases of law, creating a form of arbitrary sovereignty, without any mediation, and creating a "state of exception" (Agamben, 2003). This means that the emergency often has "paternalistic" tones (Castorina, Roccheggiani, 2015, p. 12) which entail the exception to individual liberties and the acceptance of a welfare system managed only by external ones, with the risk that emergency becomes an "anti-political machine" (Ferguson, 1990).

Given these premises, in the following pages, I will analyze the main volcanic risk prevention tools related to Vesuvius area that Italian institutions – scientific, techno-engineering and politico-administrative – have elaborated and promulgated over the last decades: the Emergency Plan, whose first draft was elaborated in 1995 and to which the 2016 Evacuation Plan had to be added.

2. Institutionalization of risk

In Italy, the need for non-improvised emergency plans and adequate response structures emerged between the 1970s and the early 1980s. In fact, for a period of about 13 years, Italy, and in particular the area of Naples has been affected by various natural disasters with tragic consequences for the population. In the spring of 1970, the first bradyseism emergency of

Pozzuoli led the Ministry of the Interior to order the urgent evacuation of Rione Terra (receiving violent protests from the local population); in 1976, the earthquake struck Friuli, causing about 1,000 deaths and 100 thousand displaced persons; on November 23, 1980, the notorious Irpinia earthquake caused 2,700 victims and severe damage over a vast area that also included the city of Naples and its surroundings; on October 7, 1983 a second episode of bradyseism imposed a new evacuation of the city of Pozzuoli. What made these episodes particularly dramatic was the strong impact they had on urban populations residing in densely populated cities. With a series of laws promulgated in 1970 (No. 996, "Standard Rules for Relief and Assistance to populations in case of Disasters"), in 1982 (No. 187, "For the establishment of the Ministry for the Coordination of Civil Protection") and in 1992 (No. 225, "Establishment of the National Civil Protection Service"), the National Civil Protection Organization was set up for predicting and preventing the various risk assumptions, helping disaster victims and for doing any other necessary and non-transferable activities to overcome the emergency (Article 3, Law 225/1992). In particular, the Civil Protection was established as a national coordinating body in the case of Vesuvian eruptions or, more generally, in the case of "natural disasters, or disasters connected with human activity which, given the emergency and considering their intensity and scope, must be faced with extraordinary means and powers to be used during limited and predefined periods of time" (Article 2, Law 225/1992).

In this context, the 1992 law established a "Great Risks Commission[3]" composed of technicians or scientists, and designed to act as a link between Civil Protection and the scientific community and to provide opinions and indications of a technical-scientific nature aimed at "improving the ability to evaluate, predict and prevent the various risks[4]".

At the same time, during the same years, emergency plans for volcanic areas started to be elaborated. In particular, with regard to the geographic area covered by this paper, after the 1983 bradyseism emergency in Pozzuoli, in 1986, the then director of the Vesuvius Observatory, Giuseppe Luongo, underlined the need for an urgent elaboration of an evacuation plan of the Vesuvian area in case of eruption and submitted a report to the

[3] The Commission is divided into five areas of intervention, namely, seismic risk, volcanic risk, meteo-hydrogeological, hydraulic and landslide risk, chemical, nuclear, industrial and transportation risk, and environmental risk and forest fire. Each sector is represented by a referent and is composed of representatives of the centres of competence and other experts. Accessed on May 10, 2018 at: http://www.protezionecivile.gov.it

[4] On the website of the Civil Protection: http://www.protezionecivile.gov.it (accessed on May 9, 2018).

Prefecture of Naples (Ongarello, 2009). Between 1991 and 1993 the guidelines for risk assessment were drawn up in order to start drafting a National Emergency Plan, which was publicly presented on September 25, 1995. The National Emergency Plan for Vesuvius Area (NEPVA) received an initial update in 2001, reducing the amount of time needed to predict the eruption from two to one week while a second adjustment was expected in 2013 when a new red zone boundary was delineated; finally, a third key moment was in 2016 with the presentation of the Evacuation Plan.

The Emergency Plan and the Evacuation one should not be confused: the first one is a document that identifies the areas at risk (*red, yellow* and *blue* areas, based on the emergency and the effects of an eruption) thanks to the eruptive scenario considered more likely by scientists, or by researchers from the Vesuvius Observatory, which is the Neapolitan headquarters of the National Institute of Geophysics and Volcanology; the second one is the organization in stages of the transfer of the population to the regions of Italy twinned with the municipalities of the *red* zone. Municipal Emergency Plans which identify the collection points and the evacuation routes in accordance with to the two previous Plans are more detailed.

The creation of this system involves the establishment of a series of hierarchies and rules which, with the approval and authority of a scientific assumption, induces a real "institutionalization of risk". That is, a set of standardized form of action and behaviour connected to a complex and interdependent set of rules and roles. In case of emergency, after consultation with the "Great Risks Commission" located in Rome, the Government issues the evacuation order and entrusts the Civil Protection with the direction and coordination of operations. During this first emergency phase the local administrators (the mayors, first of all), assisted by rescuers and supported by the police, play the role of supporters of the various activities but remain outside the management of the events. In other words, the organization of the Plan implies that risk management is outsourced; the central political and scientific operative structures are the ones that will have to decide who, how and when to evacuate, leaving the inhabitants out of the decisions.

3. Times and space of the emergency

The set of precepts and behaviour that citizens are required to follow in the event of an alarm depends strictly both on the place where they are located and on the emergency phase since the institutionalization of the risk and the implementation of the Emergency and Evacuation Plans as

"dispositifs of government" (Revet – Langumier, 2013) and "non-human social actors" (Latour, 2005, Benadusi, 2011), produce a regulated space and time whose scope and influence into everyday practice need to be understood now.

In terms of time, the two Plans identify four levels of alert, which correspond to the same number of regulations. The basic level corresponds to the absence of alterations with respect to the reference parameters and the precursor phenomena. During this time, which in fact, corresponds to the quiescent phase of the volcano, the competent authorities and scientific institutions are mainly concerned with the prevention and planning of the future emergency and with the promotion of training and information initiatives on the eruption risk among the population. The presence of significant variations in the physico-chemical parameters of Vesuvius should be reported by the Vesuvius Observatory to the Great Risks Commission and this can induce the latter to declare the beginning of a phase of attention (for example, the Phlegraean Fields have been in this state since 2012). This level corresponds to a low risk of eruption (which does not necessarily degenerate into a phase of greater danger), however, for precautionary purposes, the mayors of the affected municipalities are supported for an eventual beginning of their own logistic organization and for the dissemination of information to the population. The confirmation and reinforcement of anomalies in the control parameters leads to the transition to the early warning phase in which the control of the operations goes at national level; and the state of emergency is officially declared with the appointment of a Delegate Commissioner, the convening of the Civil Protection and on-site placement of law enforcement agencies and rescuers. The procedure provides that a resident with his/her own independent accommodation can move away from the area at highest risk, joining it with his/her own means; the evacuation of hospitals and similar facilities, and measures to protect cultural heritage are carried out. In the event that the precursor phenomena continue to accentuate, this should lead to the *alert phase* during which experts are almost certain that an eruption will occur within a few weeks. This implies the complete evacuation of the population of the area at maximum risk and the establishment on the territory of the Civil Protection operational centres that coordinate the activities at the local level. The scheduled time for the displacement of the population (at least 500,000, divided into 24 municipalities) is 72 hours. They are grouped according to the municipality they belong to and displaced, by means of public or private vehicles, to areas of Campania identified in the basic level as areas not at risk in order to be subsequently transferred to an Italian region twinned according to the Emergency Plan. After ensuring evacuation

in the area at maximum risk, rescuers are directed to areas that may be affected by the fall of ash and lapilli to evacuate them.

Unlike the temporal scan of the emergent emergency, which is currently being deferred and unknown, the regulation of the space produced by the Vesuvian emergency plan already shows its effects on the practices and representations of the inhabitants. On the basis of the historical observations regarding the eruptive behaviour of Vesuvius and considering the relation based on the "product between the probability of occurrence of a particular volcanic phenomenon and the relative damage it is able to cause" (Rapolla *et al.*, 2003, p. 47), scientists have identified different degrees of risk within a large area around the volcano. The Emergency Plan implemented these indications dividing the territory into "hazardous zones", including the *red* zone, the *yellow* zone and the *blue* zone. In the planning of 1995 the area of greatest risk covered 18 municipalities and followed a perimeter coinciding with the municipal boundaries, but this was modified in 2013, when, referring to a volcanological study of Lucia Gurioli *et al.* (2010), a "black line" was drawn, that is, the maximum delimitation within which the most destructive phenomena of a future eruption could fall, which is almost circular and touches 24 municipalities. However, since this perimeter no longer follows the administrative boundaries of the municipal territories concerned, several problematic questions not easy to solved have arisen; the main one being whether the risk prevention constraints (for example: the regulations restricting the right use soil for building construction) apply to the entire municipal area or only to that portion within the "black line" (and, in turn, this means identifying exactly the cadastral parcels that fall into it). Uncertainty deriving from the new *red* zone boundaries has already triggered controversies and appeals to administrative courts, as in the case of the municipality of Boscoreale to which the Campania Regional Administrative Curt granted[5] in 2014 the exit of the *red* zone because its territory was only marginally touched by the "Gurioli line"; this led, since then, to consider problems related to the "new *red* zone" as negotiable and not strictly scientific. Another important novelty of the new *red* zone is that, contrary to the previous one, it now also affects the municipalities of Naples such as the eastern districts of Barra, San Giovanni a Teduccio and Ponticelli.

[5] Editorial, 2014, "Vesuvio, il Tar dà ragione a Boscoreale: si 'stringe' la Zona Rossa 1. Via a costruzioni e restyling", *Il Fatto Vesuviano*, May 12: https://www.ilfattovesuviano.it/2014/05/vesuvio-tar-ragione-boscoreale-si-stringe-zona-rossa-1-via-costruzioni-restyling/ (url accessed on May 20, 2018).

The *red zone* is the closest to the crater, the area that could be invaded by pyroclastic flows, mudslides, lava and other volcanic products. This is the most dangerous area, inhabited by about half a million people, in which the effects foreseen in the other two areas (*yellow* and *blue*) can also occur, and it is the focus of most of the public debates and policy initiatives related to the Vesuvian risk.

The *yellow zone* corresponds to the area where ashes and lapilli could fall; they are dangerous for breathing, for their accumulation on the roofs, and for the collapse of the buildings[6]. This is a large region corresponding to 63 municipalities (in addition to the three Neapolitan neighbourhoods) of the provinces of Naples, Avellino, Benevento and Salerno. In the Plan, it is specified that according to the scenario of 1631, only 10% of the *yellow zone* will be effectively affected by the falling of *particles*, suffering damage, but it is impossible to know in advance exactly where this will happen because it is not possible to predict in which direction the wind will move the eruptive cloud. For this reason, this area is further divided into 16 sectors, identified on the basis of the probability that the wind will blow towards them. From the analysis of the historical data – but the season of the year during which the eruption will occur given the direction of the winds and their intensity[7] will be determinant –, it is more likely that the municipalities at the east of the Vesuvius, towards the internal areas of Campania, will be affected by the phenomenon. Overall, the *yellow zone* is currently inhabited by over one million people.

The *blue zone,* finally, includes 14 municipalities of the basin of Nola, to the north-east of the volcano, on a surface of 100 sq. km. Like the previous one, this area will also be evacuated during an event because of the risk of floods caused by the ash dragged by the rain which always follows an eruption.

Furthermore, the delimitation of the space and the temporal scan foreseen by the previously exposed planning correspond to a strong bureaucratisation of the operations, which is substantiated by the appearance of a large number of subjects framed within a hierarchical logic of division of roles.

From the appointment of the Delegate Commissioner to the Emergency and from the establishment of the Emergency Coordination Centre, the overall organization requires the activation of the Mixed Operations Centres

[6] In fact, one of the main causes of death during the last vesuvian eruptions is precisely the collapse of the roofs because of ash load that fell as a result of the eruption. The limit value of this load is 300 kg / sq. m.

[7] Rolandi, G., 2009, report in the conference *Rischi e Risorse in aree vulcaniche. Vesuvio ed Etna montagne di fuoco*, Naples, April 27, available in streaming on "Radio Radicale": www.radioradicale.it (accessed on May 10, 2018).

in the territory in charge of local coordination of actions, the support of law enforcement agencies and rescuers "who deploy in the territory according to pre-established plans[8]", the installation of various Advanced Medical Posts (PMAs), the intervention of Volcano Expert Team (VET), Foreigners Assistance and Support Team (FAST), Group of Interministerial work for the protection and prevention of Cultural Heritage from natural hazards (GLABEC) and numerous other structures, from the Fire Department to the Red Cross, to individual volunteers. All these structures converge on the Unified Regional Operational Room of the Campania Region (SORU) and, above all, on the DICOMAC, the Command and Control Department.

All this was presented by the Campania Region and the Civil Protection Department on October 12, 2016 when Vincenzo De Luca and Fabrizio Curcio, governor and director, respectively, met the press to illustrate the "Vesuvius Evacuation Plan" (Lucarelli, 2016). Strictly speaking, the evacuation phase should take place in two stages: the first one is spontaneous (during the *pre-alert* level) and the second one is mandatory (during the *alert* level). Expected two decades ago, the document[9] deals with how to evacuate the *red zone* according to a three-stage plan**:** *Removal* (from one's own home to the 'waiting areas', indicated in the Civil Protection Plan of each municipality, and then to the 'meeting areas' outside the area of greatest risk; this operation is done by the Campania Region), *transfer* (from 'meeting areas' to 'first reception points', according to the modalities prepared by the individual host regions); *reception* (from 'first reception points' to 'reception facilities'). A mechanism that induces certain behaviours along specific routes has been set up, as evidenced from the Major Emergency Simulation Exercise[10] (MESIMEX) carried out in October 2006 on a sample of about 2000 inhabitants of the *red zone*. The simulation, proposed in 2004 by the Campania Region for a loan from the European Union is so far the largest and most important among the few exercises carried out, most often by individual municipalities (Somma Vesuviana in 1999, Portici in 2001[11], Pollena Trocchia in 2004 and 2011).

[8] On the website of the Civil Protection: http://www.protezionecivile.gov.it (accessed on May 9, 2018).

[9] The Vesuvius plan: the planning of the removal and transfer of the population of Vesuvian red zone is available on the website of the Campania Region: http://www.regione.campania.it/assets/documents/regioni-ppaa-tavolo-transferimento-12-10-2016-rev-3.pdf (accessed on June 4, 2018).

[10] Exercise "Mesimex" (October 22, 2006), in "Section in Depth", website of the Civil Protection Department: http://www.protezionecivile.gov.it (accessed May 12, 2018).

[11] The municipality of Portici carried out a particularly complex exercise of 4 days, as envisaged by a vademecum published by Savarese and Sallusto (2001).

4. The *red zone* and the incentives for "population uprooting"

Far from being a neutral tool (Crampton – Krygier, 2005), the risk map is a "powerful vector of social, institutional and political norms" (Gralepois 2011, p. 122) and as such, it always oscillates between being the result of negotiation and becoming the scene of a controversy. The *red Vesuvian area*, both for its location which attests the vulnerability of places to non-expert observers, and for the attention it has in the Plan, is in fact, the main subject of public debates and of legislative measures regarding the volcanic risk of the area.

In the basic *alert* level, the urban regulations for the Vesuvian area essentially follow a logic of containing the number of inhabitants. It should be noted, however, that although the *yellow* and *blue* zones are also likely to be affected by the effects of the eruption, there is an explicit prohibition on building only in the *red* zone. With the regional law n. 21 of 2003, in fact, "the increase in building for residential purposes was forbidden" (Article 2) in the municipalities of the *red zone* with the aim of blocking the growth in the number of residents by limiting the number of new habitable buildings. Moreover, it should be noted that more than half of the municipalities in the *red zone* are also municipalities of the Vesuvius National Park. This situation, in addition to reinforcing restriction on construction, has imposed the obligation to move outside the boundaries of the Park activities considered to be of high environmental impact, such as numerous quarries or small fireworks factories.

All these measures have given rise, since their promulgation, to even violent reactions, whose vehemence has not diminished over the years: in 2011 the municipalities of Sant'Anastasia and Somma Vesuviana organized a conference entitled "Proposal for the modification of the perimeter of the *red zone*" which advocated for the introduction of an 'orange' zone with the possibility of construction, which would have alleviated the weight of the limits imposed by law (Roman, 2011). The mayor of Sant'Anastasia, in the spring of 2012, defined the red zone as a "scientifically refutable fraud" and the law no. 21 a "criminal act that destroyed the economy of our territories" (neAnastasis, 2012). The building industry is considered to be the main economic driver of the area, so criticisms of the absolute prohibition to build in the *red zone* have led to the approval of a first amendment to the law no. 21 with the provision no. 1 of January 5, 2011, which grants the possibility of a restructuring. With the law approved in March 2012, the prohibition was limited to new constructions for residential purposes, but further

building areas in the *red zone* have been put forward in the Bill on the landscape, which is still under discussion at the Regional Council of Campania (Geremicca, 2012).

The project called "VesuVia", approved in 2003 by the Campania Region, is even more explicit in its desire to alleviate the demographic pressure in the Vesuvian area. The initial objective was to promote the uprooting of the population living in this area by offering economic incentives (up to 30 thousand euros) for residents so that they could buy their own homes in safer areas and "realise the common and often unrealizable dream of becoming a homeowner"[12]. In doing so, the project hoped to "decongest" the *red zone* over a period of about 20 years by removing at least 100 thousand people. "VesuVia" also aimed at the reconversion of vacant buildings into tourist reception facilities with the aim of creating an "opportunity for recycling and territorial development, or recovery and revalorisation of the extraordinary cultural (Pompeii / Ercolano, Stabia / Oplonti, vesuvian villas, Bourbon sites, historical centres) and natural (Vesuvius National Park, an area entirely bound by the laws on the landscape) heritage of Vesuvius"[13].

Although refinanced twice, even with EU funds, the project has failed and is now abandoned. Three years after the beginning of the program, the decompression impact of the area was just 0.13% of the total population. Only 3,276 applications for funding were submitted, only 236 of which were considered admissible and in good standing from the point of view of the required documentation. These results did not improve significantly even after the publication of a second call.

Possible causes of the failure included the extremely restrictive conditions of participation and limitation of eligibility only to tenants with an income of less than 25 thousand euros per year and residing in the *red zone* for at least 5 years. The provision, moreover, did not provide compensation to the owners for the loss of the tenant, did not have the means to prevent the houses left vacant to be rented again and therefore, to limit the "turn-over" among the tenants. A factor no less important is attributable, finally, to the lack of involvement of the mayors and local communities in the development and promotion of the project. While on the one hand they were sceptical about supporting a program aimed at reducing

[12] *La scelta possibile. Guida alle opportunità del progetto regionale Vesuvia per i cittadini della zona a più alto rischio vulcanico*, by the Urban Planning Department of the Campania Region, Naples, 2003, p. 24.

[13] Explanatory sheet of the "VesuVia" project, published on the website of the Public Administration Forum: http://archive.forumpa.it/forumpa2005/regionando/cdrom/home/progetto/107.html (accessed on May 10, 2018).

the number of inhabitants of their municipality, on the other hand nothing was done by the organization of "VesuVia" to locate the interventions in a rational and targeted manner, concentrating them on very high risk areas and, thus, increasing the credibility and visibility of the project.

5. Criticism of the Emergency Plan

The most recurrent objection to the Vesuvian Emergency Plan regards the underlying scientific assumptions. The Plan is designed to respond to an eruption of strong intensity, similar to that of 1631, however, according to the eruptive history of the Neapolitan volcano, this event is not among the most powerful ones, instead, the famous Pompeii eruption of 79 AD emitted much more energy and was much more destructive, and the most devastating being the eruption known as "of Avellino" about 15,000 years ago. This means, according to Mastrolorenzo and his colleagues, that the possibility of a future plinian eruption, much more violent than that of 1631, remains largely open (Mastrolorenzo *et al.*, 2006), therefore, notes Santoianni, "reducing the whole planning of the emergency to a single arbitrary eruptive hypothesis, cutting out [other scenarios] is a wrong methodology" (Santoianni, 2007, paragraph 61). In particular, in the case of a major eruption, the effects of the explosion would be devastating even in the city of Naples, with the need for an Emergency Plan able to save up to 3 million inhabitants. From a technical point of view, the Plan is therefore considered extremely limited as it does not provide any countermeasure in the eventuality in which the eruption does not correspond to that of the envisaged scenario (Belli - Pica Ciamarra, 2003).

Even if the eruption was actually subplinian, from a practical point of view, a thorny point remains regarding the strategy used for evacuating the *red zone*. For the early warning and early warning phases, the 2016 Plan foresees a spontaneous displacement of the residents (according to the data of the Civil Protection it could involve half of the population, so about 350 thousand people who would use their own means), then an obligatory relocation with means made available by the institutions (it would cover the remaining 350 thousand residents, to be displaced in 72 hours). In both cases, it is an undifferentiated and mass displacement of the inhabitants regardless of what early warning experts call "rationalization of removal" (Santoianni, 2007, paragraph 61), that is, the optimal evacuation should take place in stages, starting from the disabled or hospitalized patients, up to the elderly of the hospices, children with (at least) mothers and, only if necessary, the rest of the population left in place. This choice would allow,

among other things, a greater usability of the escape routes and a better control of the outflow. It should also be noted that, to date, no census has been carried out to know the exact number of people potentially involved, that is, how many people live in the territory within the so-called "Gurioli line", or within the *red zone*.

To make the evacuation operations even more complex, there is a lack of information to the citizens who in many cases know little or nothing about the ratio of the Emergency Plan and the actions envisaged in the Evacuation Plan. The knowledge of the rules of conduct to be kept in case of proclaimed alert remains limited even among the local administrators themselves and, with the appropriate exceptions, among the members of the scientific community. The issue was raised by the volcanologists Solana, Kilburn and Rolandi who published in 2008 the results of a questionnaire administered between 2002 and 2003 to administrators of the municipalities of the *red zone* in order to evaluate how the threat of Vesuvius was "perceived" by local leaders and how much they were "aware" of this risk. The survey showed that they had an inadequate knowledge about how to react in an emergency: "80% of the authorities believe they have at least a sufficient understanding of the volcanic behaviour and 75% believe that they should not have difficulty for understanding scientific ideas and specialist terminologies. [However,] once the questionnaires were completed, an informal conversation with the authorities revealed a much lower level of awareness than the one suggested by the written answers" (Solana *et al.*, 2008, p. 312).

It is the very logic of the Emergency and Evacuation Plans, finally, to be criticized by other experts. According to fluodynamic engineer Flavio Dobran, the current planning, dealing solely with the emergency, aims at a control strategy without taking care of the "design and building" of a "safe and prosperous" environment for Vesuvians (Dobran, 2006, p. 26). The objection is radical: the only escape strategy from the volcano gives nothing more than "the illusion of security through its promoters who simply spread the news that everything is kept 'under control'" (Dobran, 2006, p. 27). The "great challenge", continues Dobran, is therefore that "the people living around the volcano acquire the awareness of the environment in which they live and participate in the solution of this difficult situation" (Dobran, 2006, p. 24).

Thanks to ethnographic observation, the perception of geological risk may depend on various factors, such as its media representation, the perceived solidity of urban buildings, the credibility of institutional commitment (Gugg, 2019). This appears of particular interest, since, contrary to any (pre) judgment on the supposed "immobility" of those who

live around the Mount Vesuvius, locally, the public debate about the risk is constant and without any doubt much more frequent than one can imagine from the outside. There are proposals and discussions (in local conferences and on certain digital channels) that concern both the methods of evacuation of the population, and the places and times of the transfer, as an alternative to evacuation in other Italian regions. In the first case, the former Fire Brigade operator Vincenzo Savarese invites us to consider motorways as a first aid place and not to exclude ships as a means of removal, at least during the early warning phase (Savarese, 2015). In the second case, instead, the former philosophy professor Girolamo Vajatica, whose idea was supported by Neapolitan intellectuals such as Gerardo Marotta and Raffaele La Capria (2007), considers a "slow and regular flow of the Vesuvian population from its living areas towards a safer and relatively close area is possible" (Teodonno, 2010): a real new city to be built in the Caserta between the river Volturno and the Regi Lagni. A similar proposal comes from the Confindustria of Caserta which has imagined to evacuate Vesuvius by sorting the population in several areas of Campania and thus rebalancing the strong demographic disproportion that the region has between Naples and the inner provinces (Teodonno, 2011).

The "Eco-Neapolis" by the architect and urban planner Aldo Loris Rossi is antecedent to these hypotheses (a first version dates back to 1988), but far more complex and, above all, not motivated by reasons exclusively attributable to risk but rather to principles of sustainability and "redistribution of urban weight". Rossi imagines the *ager campanus* as the "green barycentre of the 'Grande Napoli'", a new metropolis that, pursuing "the pacification between the ecosphere and the technosphere", conquers the role of "Bridge between the European megalopolis and the Mediterranean megalopolis" (Rossi, 2014, pp. 260-302).

6. Conclusions

Since 1995, planning the Vesuvian emergency future, certifying the territory as "at risk", has led to a change both in the relationship between the residents with the territory, and in the relationship they have with time. On the one hand, in fact, during that same year the National Park of Vesuvius which has a smaller perimeter than the *red zone* was created, but it constitutes in some way a concentric circle in which the use of space is more regulated compared to the past. On the other hand, the "future catastrophe" changed: it is no longer a hypothetical eventuality but, to some extent, it is officially announced. In other words, the scenarios of the future have

conditioned the present of the last two decades: they produced norms, established rules of conduct, determined relationships; they become a reality (Gugg, 2015). However, during this long period, it has also been found that the only logical emergence was not only a constraint on the possibility of a collective "conversion" (ecological, sustainable, environmentally-friendly, forward-looking) regarding the relationship with the places which constitutes even an obstacle because it seems to have stopped the development of different methods and alternative points of view. If better organizing the eventuality of an escape in case of an alert is unquestionable, what is lacking is the awareness (first at the institutional level) that risk is a historical product. It is only this awareness that would mitigate and reduce the exposure and the vulnerability of the area. As noted by Sandrine Revet and Julien Langumier, this means going beyond the notion of "risk culture", that is, overcoming the need to be constantly prepared for a disaster, according to a true myth, that of security (Revet – Langumier, 2013); therefore, it means grasping the political value of the theme, that is, the need to realize a reconciliation with the ecosystem, a shared planning of the emergency, a participatory management of the territory, a dialogue between the institutions and the population that fosters exchange, experiences, involvement (Gugg, 2017).

In addition to the essentially technical level of evacuation for a future Vesuvian emergency, at least three other plans to be built – as it is said in the context of risk management – in "peacetime" should be considered. In the meantime, a reflection on what Escobar (2005), Sachs (2010) and others have defined as "post-development", a sort of critical tool for rethinking and relocation should be done. This invites to consider development as a historical phenomenon emerging after World War II, as an expression of modernity and capitalism, therefore with its excesses and hazards.

Secondly, we should start a dialogue - daily and continuous - with the population: assuming that it is well-founded and feasible, the Evacuation Plan has some chance of success only if it is known and shared, that is, if it is re-elaborated together with those who are directly involved, the residents; otherwise it will be – as it is currently the case – not only ignored, but rejected.

Finally, it would be appropriate to start a territorial governance that promotes participation and subsidiarity: the associative and voluntary sector in the Neapolitan province is quite varied, widespread and active, and even now, many of them already take care of the territory (Gugg, 2018). This, however, happens outside the institutions, in small communities of purpose that represent enormous resources of active citizenship, whole pieces of society that should be involved and put in a network. If we do not want to

slip into the illusion of making an Evacuation Plan seemingly feasible to save hundreds of thousands of people in a few hours, so if we do not want to rely on some form of "insurance of dangerous mass" (Ciccozzi, 2013) that takes away the awareness (Revet, 2013) and lowers the attention (Baker, 2018), it is time to start considering "common goods" as well as the intangibles, such as collective security, not only for a vision of the future, but for a more urgent need of the present.

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7. Inclusive Disaster Planning. Evidences from municipal case studies in the Marche Region, Italy

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Abstract

According to academic and practical studies, there is a significant lack in the application of the Human Rights-Based Approach to disability in local disaster planning. This chapter discusses the main results of the study conducted by the Università Politecnica delle Marche to investigate at which extent municipal civil protection authorities are trying to include persons with disabilities in the emergency planning process. The main results of the study revealed that, despite municipal emergency planners recognize the importance to include persons with disabilities and their needs in the local emergency strategies and plans, there are still many challenges to face in order to implement an inclusive approach, such as (1) collecting data on the specific needs of persons with disabilities and allocating human resources devoted to the collection and updating of those data; (2) establishing systematic and continuous collaborations amongst relevant stakeholders on disability-related issues in emergency; (3) building and disseminating an inclusive approach to local disaster planning actively involving persons with disabilities; (4) implementing existing strategies and building new knowledge on accessible evacuation, communication and accommodation. Relevant evidences from this study were considered for the development of regional guidelines for municipal administrations to support them removing those barriers that prevent the implementation of an inclusive approach to disaster planning.

Keywords*:* Disability, Inclusive Approach, Disaster Planning.

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1. Background

The World Health Organization (WHO) estimates that more than one billion people worldwide live with a disability, representing about 15 per cent of the world population (WHO, 2011). Throughout history, there has been an evolution in thinking of disability, as demonstrated by the paradigm shift from the medical model to the social model of disability, recently integrated by the Human Rights-Based Approach (HRBA), adopted by the United Nations Convention on the Rights of Persons with Disabilities (UN CRPD) in 2006. Persons with disabilities are defined by the CRPD as individuals *"who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society on an equal basis with others"* (UN General Assembly, 2006). According to Klasing (2011), the HRBA moves from considering persons with disabilities as objects of medical and social assistance, towards viewing those persons as individuals with rights and capable of actively participating to regular societal activities. According to this approach, disability is not an attribute of the person (WHO, 2011) but, rather, is a concept that includes a wide variety of personal conditions. Societies tend to exclude people with disabilities by not including their needs and opinions in policies and programs, therefore the role of institutions and organizations is significant to avoid situations of further discrimination and exclusion. Recent events have brought worldwide attention on the fact that the elderly (Elmore and Brown, 2007; Jenkins et al., 2007) and persons with disabilities (Harris, 2004) are among the most vulnerable persons affected by disasters. Those persons, during disasters, are disproportionately affected because of their physical, mental, intellectual or sensory impairments (Ito, 2014). This is the case, for example, of elderly individuals drowned in their wheelchairs and beds inside St. Rita's Nursing Home during Hurricane Katrina in 2005 (Stough and Kang, 2015). Reinhardt *et al*. (2011) stressed that, according to emergency management statistics, in case of disasters, persons with disabilities tend to die in far higher percentages of the population than persons without disabilities. Article 11 of the UN CRPD specifically addresses the rights of persons with disabilities in situations of risk and humanitarian emergencies and mandates that States Parties undertake *"all necessary measures, including those taken through international cooperation, to ensure the protection and safety of persons with disabilities in situations of risk, including situations of armed conflict, humanitarian emergencies and the occurrence of natural disasters"* (UN General Assembly, 2006). The relevance of the HRBA to disaster management has been recognized worldwide and many local,

national and international initiatives addressing disability-related issues during disasters increased the opportunities for communities, countries and groups of nations to learn and increase knowledge, and to enhance the application of this knowledge in dealing with the catastrophic consequences of disasters on the safety of persons with disabilities (Rouhban, 2014). Since only few studies have explored the possibility of involving persons with disabilities and their families in disaster planning, a risk exists that those persons might be excluded by current local emergency planning strategies (Rowland *et al*., 2007). Therefore, investigating the level of inclusion of persons with disabilities in local disaster preparedness and promoting disability-inclusive strategies should be priority activities for all those involved in Disaster Risk Reduction.

2. Mainstreaming Disability into Disaster Risk Reduction

Persons with disabilities have to face unique challenges during emergencies and disasters. According to Mitchell and Karr (2014) the needs of those with disabilities are often excluded from emergency relief, recovery and rebuilding programs, and they have less access to resources and help in refugee camps and in post-disaster environments. Van Willigen *et al*. (2002) discovered that, in the aftermath of Hurricane Floyd in 1999, many persons with disabilities tried to respond to warnings but they did not receive any support during the evacuation efforts. After the Indian Ocean tsunami of 2004 persons with disabilities had less access to life-saving aids (Crock *et al.*, 2014), and also the earthquake and tsunami in Japan in 2011 has confirmed that persons with disabilities are often left behind during evacuation phases (Quigley, 2006) due to poor preparation or inaccessible evacuation facilities and transport systems (Crock *et al.*, 2014). Such inequalities have been revealed, as never before, by Hurricane Katrina in 2005, which terribly affected the most vulnerable population due to inadequate or nonexistent evacuation plans (White House, 2006). Roth (2014), the Senior Advisor and Director of the Office of Disability Integration and Coordination (ODIC) of the Federal Emergency Management Agency (FEMA), explained that, during the 2011 terrorist attack in the United States and Hurricane Katrina in 2005, the needs of persons with disabilities were considered special leading to separate planning strategies and stressed the importance to treat the needs of those persons as pivotal elements to plan for the whole community. According to Smith et *al.* (2012), both published and grey literature have focused on the issue of *"disability-related inequalities during disasters".* Njelesani *et al.*

(2012), for example, investigated some disaster management initiatives of the 2010 Haiti Earthquake and the 2005 Hurricane Katrina from a human rights perspective. The authors reported that, during those catastrophic events, the coordination activities between disaster response organizations and associations of persons with disabilities were lacking, highlighting the poor involvement of those persons, their families and representatives in the disaster planning meetings. Furthermore, the National Organization on Disability (2009) revealed that, in some cases, communication and information programmes did not include alternative accessible formats and therefore, persons with hearing impairments were not able to use phones to contact their relatives nor those with visual impairments were able to access printed documents. The International Federation of Red Cross and Red Crescent Societies (2007) and Handicap International (2010) suggested that the main reasons of those repeated discriminations are related to the negative attitude of considering disability as a specialized field separated from the whole community. Another issue is that most of the scientific literature on emergency and disability-related issues tends to discuss standardized emergency preparedness policies and practices (Smith and Notaro, 2009), rather than how to include persons with disabilities in the decision-making process, and also Hoffman (2008) confirmed that very few emergency plans have addressed the needs of those persons. According to Barrios (2014), an inclusive approach should (1) increase community awareness of the importance of involving persons with disabilities in disaster planning; (2) encourage those persons and their families to participate in disaster planning meetings; (3) collect detailed information on persons with disabilities living in the community in order to understand their specific needs and develop tailored inclusive solutions. This last action may require using census data (in compliance with privacy laws) to be used in case of emergency to adequately rescue and assist persons with disabilities, but also during the emergency planning process. Municipalities should closely collaborate with long-term care facilities and should have an updated list of the residents of such facilities to be used by rescue teams in emergency. Another pivotal element of inclusive disaster planning is training emergency managers and rescue teams on disability-related issues. Rowland et *al.* (2007) investigated the emergency staff training programs of three urban and three rural locations in northeast Kansas. The study revealed that local emergency management agencies were not supported by any emergency preparedness policies, guidelines or procedures specifically designed to rescue persons with physical disabilities and, moreover, there was a consistent lack of data on those persons in their areas. Furthermore, the authors stressed the key role of simulation exercises to test the plan,

highlight aspects to be improved and raise awareness of commonly overlooked issues. According to Alexander and Sagramola (2014), more attention has to be paid to municipal emergency planning processes because all emergency plans are local in their implementation and outcomes. Municipal governments are central to the question of inclusive emergency planning because they have a direct connection with local communities, business, industries and services, and are thus responsible for the coordination of rescue and response activities (Alexander, 2016). Experiences of many European countries revealed that there is a level of uncertainty in municipal governments on how to approach and deal with disability-related issues during disasters (European Association of Service Providers for Persons with Disabilities, 2014), therefore a strong political commitment is needed to develop national or regional policies and guidelines as instruments to support the implementation of a disability-inclusive disaster planning. It will be strategic, then, to identify which organizations have the responsibility to develop policies in favour of persons with disabilities and to regularly monitor the effectiveness and the level of implementation of such policies (Alexander, 2002). It is also strongly recommended to reinforce the level of cooperation among civil protection authorities and organisations of persons with disabilities. This may represent a strategic solution to connect public administrations with civil society (Alexander and Sagramola, 2014). Alexander (2016) also stated that planning for emergencies is a never-ending cycle in which there are constantly improvements to be made. Thus, if the emergency plan can be considered a flexible instrument that can be regularly integrated and updated to include the specific needs of persons with disabilities, the delay on local implementation of disability-inclusive strategies is due to other critical issues, such as limited budget or personnel and resources in short supply (Alexander, 2016). These are the typical cases in which, very often, the needs of persons with disabilities are left behind instead of thinking that the whole community will benefit from an emergency plan that include and involve persons with disabilities and that such inclusive strategies will help building healthy families and stronger societies.

3. Including persons with disabilities in disaster planning: from international policies to national good practices

The importance of including the needs of persons with disabilities in Disaster Risk Reduction (DRR) has been recognized by several international agreements and treaties, such as the Convention on the Rights of Persons

with Disabilities (2006) and the Verona Charter on the Rescue of Persons with Disabilities (2007) that laid out the foundations for ensuring the protection and assistance of persons with disabilities in case of disasters. In the framework of ongoing discussions on the post-2015 UN development agenda, United Nations entities are making significant efforts to guarantee the inclusion of disability perspective in the global development agenda (Ito, 2014). Disability-related issues have been included also in the 2015 UN World Conference on Disaster Risk Reduction (WCDRR) in Sendai, Japan, as result of a long process, which was developed through the 1994 WCDRR in Yokohama, Japan and the 2005 WCDRR in Hyogo, Japan. Many pivotal issues, such as universal design principles and accessible technologies and communications strategies, have been included in the Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR). As stated by Stough and Kang (2015), *"the inclusion of disability issue in the Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR) firmly establishes people with disabilities and their advocacy organizations as legitimate stakeholders in the design and implementation of international disaster risk reduction policies"*.

With regard to the European commitment, in 2006, Council of Europe adopted the Disability Action Plan 2006-2015. The plan aimed to support Member States in reinforcing anti-discrimination measures and ensuring equal opportunities to persons with disabilities. At the end of 2010, the European Union, which ratified the CRPD in January 2011, defined the European Disability Strategy (2010-2020) as the main instrument to support the EU's implementation of the UNCRPD. This strategy was committed to introduce the principles of the Convention within the external actions and to raise awareness of the needs of people with disabilities in the field of emergency and humanitarian aid (European Commission, 2010). In 2014 the Council of Europe, after consultation with all relevant institutions and civil societies, defined a set of guidelines to support and promote the inclusion of people with disabilities in disaster management. In 2015, the European Council adopted the Council Conclusions on disability-inclusive disaster management, which specified the actions that the Member States and the European Commission must implement to ensure the inclusion of the needs of persons with disabilities in disaster management (Council of Europe, 2006).

Italy is among the first signatories of the UN CRPD and the first to adopt the Disability Action Plan as a successful result of an interactive and continuous cooperation among organizations of persons with disabilities, governments, academic institutions and other stakeholders. In Italy there are many legal and technical documents addressing the needs of persons of

disabilities in disaster management. One of those is the document entitled "Aid to disabled persons: indications for emergencies management", issued by the Italian Ministry of Internal Affairs, and elaborated by the Department of Fire Brigade, Public Safety and Civil Defense. Here, many recommendations are provided on how to deal with different types of disabilities during disaster planning including some good practices to better assist and support those persons. Also the Italian standardized model for disaster planning and management, the so-called "Augustus Method" (regulated by the Law n. 255/92 - not in force anymore and replaced by Legislative Decree n. 1/2018), states that *"particular attention shall be paid to people with reduced mobility: elderly people, disabled, children"*. The Ministerial Decree of March 10, 1998 provides a description of the forms of assistance available for persons with disabilities in case of fire and, moreover, stresses the obligation to consider the specific needs of those persons in the early design of fire prevention measures and in evacuation procedures of the workplaces (Office of the High Commissioner on Human Rights, n.d.). The Circular Letter n. 4 of March 1st, 2002 addresses the "Guidelines for the evaluation of fire prevention measures in workplaces with disabled workers", which include (1) involving people with disabilities in the process of risk assessment; (2) reaching adequate security standards for all; (3) elaborating security plans for disabled workers avoiding separated plans but rather including their needs in the existing emergency plans (Office of the High Commissioner on Human Rights, n.d.). Since 2004, the Italian National Department of Civil Protection promoted and conducted several initiatives on disability-related issues in situations of emergency in collaboration with the Social Cooperative "Europe Consulting Onlus" with the aim of (1) collecting relevant data on persons with disabilities and mapping their needs as prevention activities; (2) sharing good practices with voluntary associations, organizations of persons with disabilities, rescue teams etc., on how to develop inclusive and innovative ICT-based strategies for emergency alert and rescue; (3) organizing practical exercises such as those in Basilicata Region in 2012 and in Piemonte Region in 2016 which directly involved persons with disabilities. Furthermore, at regional level, many projects have been developed to reinforce the collaboration amongst civil protection authorities to enhance the ability of communities to deal with disability-related issues and to promote the inclusion of persons with disabilities in local disaster planning.

4. Major challenges and concerns related to the implementation of disability - inclusive approach to municipal disaster planning

In 2015, within the framework of a doctoral research, the Università Politecnica delle Marche (hereafter UNIVPM) conducted a study in three Italian municipalities of the Marche Region to investigate at which extent they are trying to include those persons in the emergency planning process. For the specific purpose of the study, persons with disabilities were not included in the survey but further studies should be conducted to investigate their point of view on such issues and to understand their willing to participate in local disaster planning. Thus, the sample population of participants was limited to the three municipal emergency planners and each interview lasted about 1 hour. There was a minimal risk to all participants as the study sought self-reported knowledge that was not deemed sensitive in nature and posed no threat to the participants. The participation in the study was voluntary and without compensation. Participants might refuse to answer any specific questions raised during the interviews without giving a reason or explanation for doing so, and without any effect on the relationship with UNIVPM or the other researchers involved. The interviews have been audiotaped. The voice files and transcripts from the interviews have been archived at the UNIVPM on a secured server and used for educational or research purposes only.

In-person structured interviews were conducted to collect information for the qualitative content analysis and to respond to the following main research questions:

1. Does your municipality include tailored strategies aimed to identify and map persons with disabilities who may need specific assistance in emergency?
2. Does your municipality collaborate with local first responders, representatives of social services (public and private), the Regional Disability Advisory Council, disabled people's voluntary associations to prepare and update the emergency plan?
3. Did your municipality involve persons with disabilities and their families in the emergency preparedness process?
4. Does your municipal emergency plan include specific considerations on communication, evacuation and transportation strategies for persons with disabilities in case of emergency?

The information extracted from the transcribed interview texts have been organized and summarized in the following categories:

1. Availability of data and resources for mapping persons with disabilities;
2. Collaboration amongst relevant stakeholders on disability-related issues in emergency;
3. Inclusion of persons with disabilities into disaster planning process;
4. Considerations on inclusive evacuation, communication and accommodation strategies.

The main results of the study, presented and discussed in the next 4 subsections, confirmed the complexity of disability-related issues in emergency and highlighted major concerns and challenges that local civil protection authorities need to face in developing strategies to support persons with disabilities during the emergency preparedness process.

4.1. Availability of data and resources for mapping persons with disabilities

None of the participants reported including systematic data on people with disabilities in the emergency plan, even though they had access to those data (without violating the Italian Personal Data Protection Code - Legislative Decree n. 196/2003), owned by the Social Services of the municipalities and the Local Health Authorities. All participants reported that the data was available in print version and there was a lack of human resources within the municipality devoted to the creation of a database containing information on citizens with disabilities, such as address (for their rapid localization), type of disability (to ensure adequate assistance and rescue), specific needs (to provide tailored services in emergency). This may confirm that the delay on local implementation of disability-inclusive strategies is often due to critical issues, such as limited budget or personnel and resources in short supply (Alexander, 2016). However, all participants were fully aware of the importance of collecting and updating such a database *"as it will represent an inventory of special needs and the location of people who may be in need of assistance"* (Alexander and Sagramola, 2014) and will provide further information to understand their specific needs and develop tailored inclusive solutions (Barrios, 2004). All participants claimed the need of a strong political commitment to assign stable resources devoted to this specific task within public administrations.

This may entail the creation of specific offices/services within municipalities and regional authorities to run programmes for protecting people with disabilities, representing their needs in emergency and including them in the disaster planning process.

4.2. Collaboration amongst relevant stakeholders on disability-related issues in emergency

All participants reported a liaison with the Regional or Disability Advisory Council (established by the Regional Law n. 18/96) but it was not clear at which extent they discussed disability-related issues in emergency or which specific topics emerged from those discussions.

All participants reported that they have identified residential care facilities in their territories (nursing homes, assisted living facilities, etc.) but, they all reported some gaps in the collaboration with them, especially with those in peripheral areas. More in detail, two participants reported that few practical exercises were conducted, also because it is challenging to involve residents of those facilities in the evacuation drills. However, also according to Rowland *et al.* (2007), those few experiences were considered strategic to highlight some critical issues and aspects to be improved, such as problems with transportations of residents due to a critical viability in the historical center of one municipality. Another issue emerged from the three interviews was the availability of adequate facilities, terms of accessibility and compliance with safety standards, where to accommodate the residents. Furthermore, one participant explained that he asked residential care facilities to share their emergency plans, since they might contain precious information for first responders on how to rescue and assist their residents, but only few of them replied to those request. Concerning the collaboration with voluntary associations, one participant reported that, during a flood event in 2006, the local Red Cross volunteers went door to door to ask persons with disabilities specific information on their needs, guided by the Social Services of the municipality which knew where those persons lived in the community. However, this was an extemporary solution adopted in emergency and not a systematic approach or a planned strategy included in written collaboration agreements, thus revealing the absence of a continuous collaboration and cooperation between social services of the municipality and external voluntary associations.

4.3. Inclusion of persons with disabilities into disaster planning process

None of the participants reported the development of specific strategies to involve persons with disabilities and their families in the emergency planning process, confirming that very few emergency plans address the needs of those persons (Hoffman, 2008). More in detail, one participant recognized the value of their participation in the decision-making processes and the urgency of finding solutions, developing programmes and allocating resources to build a systematic approach to this issue. The other two participants revealed some uncertainties on the concrete possibility of including them in such activities. In fact, in their opinion, those persons and their families have not enough time available to face these issues and they can feel uncomfortable when they are invited to participate in practical exercises where evacuation procedures are needed to test the municipal emergency plan. As further explained by the two participants, establishing a trust relationship with those persons and their families is challenging and, in this regard, they stressed the key role played by the Social Services and the voluntary organizations to sensitize those persons on the relevance of their participation in the disaster planning process. In this regard, introducing a new cluster (or a dedicated group on disability issues) within the local emergency operation centers could be a practical solution. This new cluster will be able to organize, for example, disability-tailored rescue services, stimulating the continuous dialogue and sharing good practices among the Civil Protection authorities and all relevant stakeholders in this field.

All participants revealed that persons with disabilities living at home (with their families/caregivers or, worse, completely alone) are of major concern compared to the residents of long-term care facilities. In fact, in case of emergency, the staff of such facilities are prepared and trained to assist and rescue those persons, thus revealing a certain level of trust in the ability of such facilities to act in emergency to protect the residents. All participants asked for the establishment of public-private pre- and post-emergency partnership/networks able to develop innovative solutions and approaches to ensure adequate assistance in emergency also to those persons with disabilities living at homes.

4.4 Considerations on inclusive evacuation, communication and accommodation strategies

Only one participant reported that the emergency plan included specific considerations on personalized evacuation procedures and techniques for

persons with disabilities. In general, some uncertainties emerged from all participating emergency planners on the ability of the civil protection teams to assist persons with different type of disabilities (e.g. physical, cognitive and sensory disabilities) during rescue and evacuation operations. All participants suggested that first responders did not receive additional training or guidance to learn more on how to communicate with those who are blind, deaf, hard of hearing, or who speak languages other than Italian.

Concerning alert systems and communication strategies, only two participants specified which local associations were responsible for alerting persons with disabilities in case of emergency. However, few details were provided on how these associations ensure effective and inclusive communication. All participants provided a digital version of their emergency plan on their official web sites, however, none of those plans were available in alternative formats (e.g., braille, large print, audio and/or video), thus they were not accessible for those persons with hearing and vision impairments, low literacy or cognitive processing difficulties, and who do not understand the local language. These results confirmed that, in some cases, communication and information programmes do not include alternative accessible formats (National Organization on Disability, 2009).

Concerning issues related to local accommodation strategies, none of the participants widely explained if the emergency areas, evacuation camps and reception facilities were selected considering Universal Design principles and regulations included in the Legislative Decree n. 236/89 and the Decree of the President of Italian Republic 503/96. Furthermore, none of the participants specified, in the plan, specific accommodation services such as accessible showers, specific dietary requirements, refrigerated storage of medicines, and accessible transports.

These results revealed a high level of uncertainty in municipal administrations on how to approach and deal with disability-related issues during disasters, confirming what explained by the European Association of Service Providers for Persons with Disabilities (2014) and, highlighted the need for strong political commitment to give further impetus for the development of national and regional policies and guidelines as instruments to support the implementation of a disability-inclusive approach to emergency planning.

5. Conclusions and Recommendations

The implementation of a Human-Rights Based Approach in local disaster planning is, undoubtedly, a long and impervious process, which requires

considerable efforts from governments, policy makers, civil societies and all relevant stakeholders in the field of Disaster Risk Reduction. The main issue is to start moving away from considering only the impairments when assessing a person's ability to participate in societal activities. Member States of the European Union developed good strategies to implement the recommendations of the UN Convention on the Rights of Persons with Disabilities, but a lot of work is still ahead to put in practice the human rights principles.

The dialogue on the specific needs of persons with disabilities in emergency should be reinforced and promoted by local authorities, investigating the needs of those persons, also collecting specific data and information, and sensitizing those persons and their families on the importance of their participation and involvement in public meetings, training programmes and practical exercises, organized by civil protection authorities. Furthermore, since many responsibilities related to disaster planning and management have been delegated to the municipal level, actual transfer of financial and human resources should be ensured to strengthen local capacities. Decentralization is a challenge for both national and local authorities, which should be met with adequate legislation but also with the needed support to comply.

Further research should investigate the opportunities provided by innovative ICT-based strategies for developing networks of civil protection authorities, public administrations, civil society organizations, directors of residential care facilities, voluntary associations and other relevant stakeholders. Such ICT-based international, national and local networks should be interdisciplinary, participatory, and accessible environments where sharing best practices as well as to increase knowledge and expertise on the field of inclusive disaster planning.

Further research is needed to understand how integrate specific measures for the evacuation, transportation and accommodation for people with disabilities into local disaster planning. Specific innovative training sessions and practical exercises should be developed to reinforce existing expertise and building new knowledge on how to assist and rescue persons with disabilities (e.g. innovative approaches, technologies and methods, etc.).

At local level, governments and communities can best engage with each other and work together for the successful implementation of the Human Rights-Based Approach to disability into local disaster planning. Key elements for such implementation are strong political commitment, sensitive and aware communities, innovative but realistic inclusive strategies, adequate resources allocated at local level and strong collaborations

amongst relevant stakeholders in the field of inclusive disaster risk reduction.

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8. Post-disaster dynamics in inner areas. An Italian hypothesis for transition management

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Abstract

The city can be defined as a balanced relation among *polis*, *civitas* and *urbs* (Salzano, 1998). Disasters impact this balance. Undermining the link between the components as well as the component themselves, the disaster can lead a city to the death, especially if the balance is already damaged (Edgington, 2010), at the same time it can represent the opportunity for changing the development trajectory of the territory (May and Williams, 2012). The catalyst effect of a disaster, and in particular of an earthquake, emerges more evident in inner areas where generally there are ongoing negative demographic and socio-economic trends (Barca, 2014).

With this premise, the chapter proposes an overview of Italian reconstruction processes from the post-war period until today with the main aim of highlighting the dynamics of disaster governance and community organization, which are often less visible in the ordinary circumstances.

The approach to reconstruction used seems not to be able to stem these phenomena and to reverse trends in order to "revitalize" the territories.

The chapter aims to show the possible application of a flexible tool, such as the Transition Management approach, to the issue of post-disaster management in inner areas.

Basing our study on transition management theories and (Rotmans *et al.*, 2001; Bosch and Rotmans, 2008) disaster and post-disaster literature, the research uses the window of opportunity concept to connect the concepts of development trajectory, transition, trajectory break and trajectory reshape. Finally, the aims of the research are explained under the light of the ultimate goal of contributing to resilience-building vocation of the National Strategy (Barca *et al*., 2013).

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Using a multiple case study approach, three different earthquake events will be analysed and reasons of the occurred (if occurred) urban-death in inner area will be outlined.

The work will try to connect the issue of disaster-management and inner-areas, and it will propose to improve the post-disaster phase thanks to the exploitation of an existing planning tool with the aim to start a conscious recovery by optimizing efforts, data and time.

Looking at the failure factors of three recovery processes the authors will propose the adoption of an existing National strategy (SNAI) as actant for the planning of inner and earthquake-impacted areas.

Keywords: Inner areas, Transition management, earthquake.

1. Introduction

Cities are a perfect balance among three components: *civitas, urbs, polis* (Salzano, 1998). The presence and the interrelation between those three components are the *conditio sine qua non* for a settlement to be defined as a city. The physical aspect, the *urbs*, as well as the community with its social implication, the *civitas*, and the governing body with their exclusive balance represent the unique conceivable idea of city. The pluri-secular overlap of uses, spaces, functions that have created an ingenious and conscious civilization represent the city (Norberg-Schulz, 1979). These literature assumptions help us to understand the strong relation between *urbs* and *civitas* and why the theme of city with its new physical and social evolution is under the spotlight of the academic debate. The third component, the *polis*, has finally the role to manage all the changes, relations and uses of the city, with *a super partes* approach and in coherence with the community needs and rules. The mutual interaction among the components determines the vitality of the city. This perspective set the framework for the case study analysis carried out in the second section. Basing our research on the assumption that the balance of the city components is the life of the city itself, the paper will analyse the reasons of city abandonment after a calamitous event, such as an earthquake, and try to outline a possible recovery strategy.

A disaster represents a shock of the *urbs-civitas-polis* asset and represents a break of it. A hazard can be defined as the (still) unexpressed damage that an event can produce toward a community through the interruption of regular activities, the destruction of buildings and

infrastructures and through the physical damage against the population (Smith, 2003).

A disaster can hit one, two or all of the three city components, leading to the death of the city. From a different perspective, disasters can also be portrayed as an opportunity for the city to take a different path of development. Although the existence of post-disaster policy windows has been pointed out (May and Williams, 1986), "several conditions can be identified in which policy windows might more likely lead to effective policy changes" (Solecki and Michaels, 1994). Furthermore, in a long term perspective, the earthquake plays the role of a catalyst of changes and it appears able to accelerate the ongoing demographic and socio-economic trends (Edgington, 2010; Scamporrino 2013). In a certain way, it represents the opposite phenomenon compared to the change of path expected with the post-disaster window of opportunity. In the last decades, the academic literature has showed the need to deal with the post disaster management using a different approach, framed in a long term strategy, suggested also by the shift from the term reconstruction to post-disaster regeneration (Scamporrino, 2013). The main outcome of this shift is a different perspective: reconstruction implies the restoration of the previous functioning system, eventually improved, unlike the regeneration and/or the transition which admit the possibility of a different future asset. Both of them need to be supported by a long term vision; but while regeneration found its sap into endogenous resources, transition is based on the management itself that steer the process. The concept of "window of opportunity" is still effective when inscribed in the larger framework of the transition management. In that case the long term vision should be already defined when the disaster happens because "a transition can be accelerated by one-time events, such as a war or large accident or a crisis but not be caused by such events" (Kemp *et al*., 2003). Framing the research in Eddington's and Scamporrino's theories about "path dependency" of the reconstruction, in the final part the chapter tries to identify in the Transition Management application a possible strategy for the management of post-disaster recovery in inner areas.

2. Literature framework. Transition management and seismic inner areas

Transition Management (TM) is a flexible approach formulated to direct towards a shared idea of scenario by exploiting available resources (Loorbach and Rotmans, 2009).

From the first applications in the Dutch context, aimed at understanding and managing social changes (Rotmans *et al.*, 2001, Bosch and Rotmans, 2008), to the successive experiments, TM have seen its application in other field of study, such as climate change (Roorda *et al.*, 2014; Wittimayer *et al.*, 2014), the run-up to sustainability (Kemp and Loorbach, 2003) or in the management of public policies (Rotmans *et al.*, 2001).

The exploration of the local context, named Integrated System Analysis (Loorbach, 2007), the exploration of local actors (Actor Analysis), in terms of their role, their potentials or the identification of the power dynamics playing by them on the territory (in conditions of stable equilibrium) are the bases by which the TM defines short-term actions to implement in a medium-long term perspective (Rotmans, 1998).

Near the ISA (Integrated System Analysis) and the AA (Actor Analysis), the Transition Arena and (TA) represents the central tool of TM to meet local actors and develop shared and coordinated plans with them.

The idea to adopt TM as tool to support risk and disaster management at national scale has a number of advantages and it has not yet been exploited. Post-disaster policies are sometimes characterized by improvisation and by priorities that temporary tend to neglect historical, cultural, architectural and urban heritage. The need of defining a strategy for the regional development before the disaster for a better recovery management may sound paradoxical, but it could make sense for those areas, such as the inner areas, where the necessity to act with a preventive approach both for the presence of hazard and presence of negative trends is clear (Strategia Aree Interne, 2015).

Inner areas, as well as seismic areas, have been addressed by a number of strategies and theories without consistent successful results. The literature in particular, defines "inner" those areas significantly far from those centers that offer essential services, such as education, health and mobility. Moreover, inner areas appear to be characterized by high availability of natural resources and demographic, as well as economic, negative trends (Barca *et al.*, 2014).

According to IFEL (2015) the Italian distribution of inner areas finds a special density at the Appennine areas, that is the national area most exposed to seismic risk. The SNAI, as well as other studies (IFEL, 2015; Dematteis, 2013) for Italian inner areas, does not take in consideration also the seismic nature of those context.

In this multilevel complex context, the characteristics that make TM an eligible tool for inner areas management, in term of prevention, are the versatility and its process-oriented nature. In fact it is usable in different

contexts and for different purpose, moreover it is possible to have the same shared process to achieve different purposes and strategies.

The three level of policy making analysed by Kemp and Loorbach (2003), such as tactics, strategies and operational, have different time of implementation and in this sense, TM is able to respect times and objectives (short and long-time objectives) powered by policy-maker choices. Preparedness planning is not typical of urban planning policy in Italy. More often the overlapping of un-coherent plans and goals and the increased number of actors involved in the emergency phase set the perfect ground for speculative actions. TM in this sense is able to embrace the circular-course nature of monitoring systems, made of a continuous auditing and redefinition of the trajectory, that should characterize planning or re-planning processes.

The TM approach is totally in contrast with the classical approach that define a-priori, generally 50 years long, planning path without considering the contextual changes. The idea to have a set of possible scenarios that define the expected, or desirable, trajectory or result without having a fixed path, represents the innovative and advantageous characteristic of TM.

Finally, the opportunity to adopt TM approach at different scales, without the need to have new different agencies for its applicability, represents a reduction costs benefit.

All the above mentioned characteristics make TM a strategic tool to achieve all those peculiarities that characterize Italian territory, such as morphological heterogeneity and the political, as well as, administrative fragmentation.

3. Analysis of case studies. Three examples of disaster recovery failure

Taking evidences from three case studies, the chapter analyzes how three main factors, such as the nature of the disaster, the previous trends and the reconstruction management, can damage in different ways the relation among civitas, urbs and polis and how the loss of the mutual interaction between these components can lead the city to coma or death. In the following section the analysis and the interpretation of Fucino earthquake, 1915, Belice earthquake, 1968, and finally L'Aquila earthquake, 2009 will be chronologically reported (Table 1).

3.1. The entity of the tragedy: the Fucino earthquake

The impact of the seismic activity of the 1915 in central Italy has been analysed among the abandoned areas due to the nature of the disaster. On January 15, 1915, at 6.53 (G.M.T.) an earthquake occurred (no foreshocks reported and 4 year of aftershocks) near Avezzano with a magnitude of 7 points on the Richter scale. Speaking of the intensity of the event as a cause of abandonment (voluntary or not) it is important to pay attention on the detected level of destruction. The seismic event had a maximum intensity of XI on the Mercalli scale. In the case of Fucino, the "quantitative" impact of the first shock was measured in: 21 settlements totally destroyed, 30.519 victims, 5 provinces damaged and 41 landslips (Itala Publishing Co., New York s.d., 1915). According to Oddone (1915) the geological localization of destroyed settlements has caused local amplification of the seismic motion. The alert launched too late (12 hours later), the impossibility of reaching some places and an abundant snowfall completed this tragic event. Analysing the impact, the Government decided to apply two different post-disaster policies: reconstruction for historical and/or partially damaged settlements and a delocalization policy for irrecoverable settlements. The second choice, based on the law 445/1908, was driven by the necessity to reduce the risk of future seismic events and by the awareness of being unable to guarantee a sufficient number of task force on the territory in the reconstruction phase. In both cases the affected population has undergone a long period of "temporary dislocation" in 21.000 "shacks" with a consequential breakdown of the social fabric and with an interruption of productive activities. To have an idea about the "temporary dislocation" is sufficient to observe that most of the centres were rebuilt around the second half of the 30s (15 years later).

A long period analysis shows three different scenarios as results of the two post-disaster policies:

1) Recovered settlements: it is the case of Avezzano and other settlements/cities of which the strategic role for the territory could not be removed without leading to a total social implosion of the area.

2) Repopulated settlements: those settlements, initially destined to the dislocation, that have been rebuilt and repopulated owing to the strong will of the survived community. Sometimes the repopulation has been occurred later also for those settlement that had already had a reconstruction of a twin "new town".

3) Definitively abandoned settlements: those settlements that were strongly both physically and socially impacted.

The delocalization choice has led to a duplication of each destroyed settlement. Actually in the affected area about each municipal unit was characterized by the presence of two distinct settlements of which one is totally abandoned. The new "town", or more precisely "settlement" has generally been rebuilt more downstream and it was characterized by a geometrical structure, lack of identity and out-migration trends.

By observing the evolution of the Fucino context, it is thus possible to state how in an initial state of demographic stability, the magnitude of the damage and the dislocations choice have heavily influenced the future of the whole affected area. The magnitude of the disaster has almost irretrievably impacted the territorial balance and each of the elements that characterize the nature of each urban centre. The physical structure, the *urbs*, of urban settlements was reduced to a collapse of rubble and the whole territorial pattern appeared totally flaked. The community suffered the loss of a quarter of the inhabitants with a consequential break of social ties and of the *civitas* structure. Finally, the historical context with the imminent war have led to the absence of a governmental structure that could guide the affected territories. In the long run, post-disaster management choices have led to the breakdown of territorial ties (socialism, landscape-productive structure, ...) and left urban (old and new) corpses on the territory. Despite the disastrous premises, the Fucino area has begun an unexpected process of rebirth. The strong linkage of the territory with the old urban centres has in recent years exerted a magnetism capable of initiating a new process of spontaneous repopulation of abandoned settlement. The *urbs-civitas-polis* balance does not seem totally lost. The territory is still in transition and the observation of trends suggests that the new town are destined for emptying in favour (partly) of the old centres. The territory was able to initiate a process of spontaneous rebirth by repopulating areas that were destined for dislocation. This specific phenomenon is the confirmation of the strength of the original bond man-place. On the other hand, the inability of new centres to re-create the original social magnetism has been caused both by the lengthening of reconstruction times (over 15 years) and by a dislocation that did not take into account the study of the *urbs-civitas-polis* balance.

3.2. Previous trends: the case of Belice Valley

The Belice earthquake, occurred in 1968, has often been studied as the first disaster managed by the new Republican regime, as a consequence, in most of the scientific literature the focus has been more on the management

process then on the context. After a series of foreshocks, a strong shock of 6.5 on the Richter scale occurred during the night of 14/15 January producing an impact of X of Mercalli scale[4] (Ambraseys, 2009). The south west Sicily was damaged for an area of 6.200 Km2. The most damaged area is identifiable in 12 municipalities of the Belice Valley. The earthquake caused 400 victims, about 97,000 homeless and 100.000 people with a heavily damage house (Scamporrino, 2013). The 60% of the resident population was displaced. In the first post-disaster phase, the Government introduced a set of special tools for displaced families and temporary settlements. In particular, a series of benefit was established, such as relief for the population-suspension of payment of taxes, moratorium on debts and bills of exchange, suspension of lease payments, etc. Temporary settlements (prefabricated house units) were located in areas not always adjacent to the damaged original site (i.e. Gibellina), in view of the future territorial reorganization proposed by the central State (Chubb, 2002). The recovery process, based on the dislocation of old settlements combined with the creation of a new industrial economy, appears an utopian development model laid down into a detached context. The Belice Valley was originally characterized by an agricultural vocation and its territorial structure was still based on the original medieval asset with sumptuous villages and a road structure intended for the agricultural use. The traditional way of running the activities made the area underdeveloped compared to the rest of the country, but also backward in comparison with the other part of the Sicily region. While analysing previous demographic trend, an area characterized by a significant out-migration, in particular of the young male population, emerged (Carta, 2009), which represents the most important phenomenon to be taken into account to understand the death of this territory. The trend has been accelerated in the first post-disaster phase. About 12.000 people moved to the north of Italy where a part of the population had already moved in previous years for work reason. In addition, the promotion of migration to northern Italy and abroad through monetary incentives, clearly expressed the government's desire to not initiate a reconstruction and repopulation process. The ownership structure, marked by few big ownerships and the vast majority of the agriculture workers who didn't own their land, in addition to the negative trends, set up the elements of the vulnerability that led to the reconstruction failure. The government strategy gave the final blow to this fragile context. Look at the actual Belice Valley, it is possible to see in a glance what we could define the parody of a reconstruction: the

[4] Mercalli scale (in) is a 12-point ordinal scale and it evaluates the impact of the earthquake especially on human and human-made structures (Mercalli, 1902).

old city has been concreted over (as a land art work performed by A. Burri) while the dream of a new city with its new economy never took off. In this perspective, the case of Belice represents the clearest example of the role of previous demographic and economic trends in the rupture of the city balance. Referring at the past demographic trends, it is clear how the negative phenomena already strongly present in the territory were only further stimulated by the catastrophe. The entity of the event, a reconstruction too slow (40 years) and far from the will to recreate a liveable urban environment have just completed a downwards trajectory already in place.

3.3. The role of the management process: the case of L'Aquila

L'Aquila earthquake, embodies the rupture of the city, operated firstly by the disaster itself, but also by the reconstruction process. Although an earthquake swarm was going on since December 2008, the shock of magnitude 6,3 occurred at 3:32 a.m. on the 6th of April 2009 caught the city literally sleeping: unprepared and off guard. The effects have been devastating: 308 victims and 1.600 injured (Chiarabba *et al.*, 2009). During the emergency phase more than 67.500 inhabitants have been assisted and 27.850 of which were displaced in shelter or private accommodation. The disaster involved also the physical destruction of the settlements: Onna has almost completely ruined down, while in L'Aquila the most affected area was the entire historic city centre and the monumental heritage. At the end of July, the municipalities officially affected by the event were 577. Considering the whole area hit by the earthquake, almost 50% of the built environment has been declared safe, among the public buildings even more. The polarization characterizes both the demographic and the economic structure of the region. In the last century the area carried out the transition from an agricultural economy and polycentric urban structure first towards an unsuccessful industrial development and then toward the development of the tertiary sector. Some of the villages in the last decades tried to develop a tourism industry alongside the traditional agricultural practice. Despite the positive or stationery trends, the demographic and economic assets were to a small extent place-related, the population balance took advantage from the University student inflow as well as the economic trend. The earthquake shock unveiled the weakness of the relation between part of the *civitas*, and the related economy, and the *urbs.* Compared to other earthquake occurred in the last century, in the case of L'Aquila the scale of the disaster and the previous demographic and economic trends that set the ground for the

reconstruction process were less severe. The choices, made for the emergency management, showed the will to create a new approach disregarding the good practices of the previous experiences. The first radical choice was to nominate the head of Protezione Civile as special commissioner for the reconstruction, undermining the established practice of giving the office to the president or a councillor of the regional government. The strategy of giving the full authority to a representative member of the central government left to the local authorities the role of the audience. The second main feature of the new approach was to shorten the transition of the inhabitants from the emergency shelter first, to the temporary housing unit (MAP: moduli abitativi provvisori) then to the recovered home place. The government made the decision to skip the temporary accommodation building new permanent settlements. The project C.A.S.E cannot be defined as an urban intervention as it takes into account only the housing function, nevertheless its impact on the territory has been indiscriminate. The outcome of this choice is a distortion of the urban patterns, with the "planned sprawl" of the new-towns and the abandon of the historic settlements. The third aspect of the reconstruction process is a non-choice represented by the lack of dispositions for the reconstruction of L'Aquila city centre, the words "historic city centre" are completely missing in the special laws (Di Ludovico *et al.*, 2017). If the disaster itself represent a direct shock for the single element of the city: the *civitas*, the *urbs* and the *polis*, this three driven of the reconstruction management led to the loss of the city balance threatening the links among the components in different ways. The first choice, abandoning the multilevel governance, broke apart the trust relationship between *civitas* and *polis*; taking over the regional and urban planning from the local authorities. Neglecting the restoration of the historic city centre meant to attack the real foundation of the local identity, not only the identity of the city inhabitants but of the entire region, weakening the relationship between *civitas* and *urbs*. While the second choice undermined the link between *polis* and *urbs.* In fact C.A.S.E project, essential choice in the post-disaster context, has been implemented ignoring pre-existing rules and pre-earthquake planning tool. After several years, the inconsistency of the solution with respect to the development strategies and the criticality, in terms of territorial planning, clearly emerged.

With these premises, it is necessary to highlight that the implemented radical transformation was carried out and wanted by supra-local actor who responded with definitive actions to temporary problems related to a transition-state of the city. Citizens, as well as local actors, have been excluded from the decision making process and have been considered passive observers of the change of their own places.

Table 1 – *Summary table of compared cases.*

	Fucino earthquake	*Belice earthquake*	*L'Aquila earthquake*
Period	1915	1968	2008
Context	Inner Appennine area Demographic stability (ISTAT)	Inner area Out-migration flows Agricultural vocation (Carta, 2009)	Inner Appennine area Positive or stationery trends (ISTAT)
Magnitude	7 - Richter scale XI - Mercalli scale (Oddone, 1915)	6.5 - Richter scale X - Mercalli scale (Ambraseys, 2009)	6.3 - Richter scale IX-X - Mercalli scale (Chiarabba *et al.*, 2009)
Damage	30519 victims 21 totally destroyed settlements (Itala Publishing Co., New York s.d., 1915)	400 victims 97.000 homeless 100.000 people with heavily damaged house (Scamporrino, 2013)	308 victims 27850 displaced 577 affected municipalities
Contextual factors	Abundant snowfall First world war (Oddone, 1915)	Negative socio-demographic trends (Carta, 2009)	Transition phase from agricultural to urban society
Policy	Temporary dislocation	Settlement dislocation Incentives for migration (Chubb, 2002)	Temporary settlements (Di Ludovico *et al.*, 2017)
Long-term impact	Repopulation (ongoing) of original sites	Abandoned territory	Sprawled community and sprawled settlements (Di Ludovico *et al.*, 2017)

4. Discussion. TM as disaster management strategy in Italian inner areas

Looking at post-disaster strategies applied in Italy from the first world war until today, and their effect in a long term perspective, it is clear how

the Central State has not yet found a replicable solution in damaged territories. Methods, techniques as well as tools of national procedures have not been implemented in order to prevent or manage a disaster and its effects (Nimis, 2009). Several post-disaster choices, that have been supported in order to answer to multilayer crisis and needs, have led to negative medium-long term impact. Moreover, those post-disaster choices have not taken in consideration the "inner" nature of these areas. On the contrary, TM can ensure a systemic approach based on the shared planning meetings (TA), the inclusion of all the local actor (AA) and takes in consideration both the pre-disaster context and the future strategy of evolution. Context and previous trends are central in TM as well as they are significant indicator for the planning, and the monitoring, of inner areas.

In this sense, looking at analysed case studies, the application of the TM would have allowed to take into account the previous demographic trend of Belice Valley, as well as its agricultural vocation, or the nature of *inner area* of central Italy settlements.

These cases, and in particular the correspondence between the exposition to seismic risk and the belonging to *inner area* context, show the presence of synergies and conflicts between long-term development strategies (typical of Inner Areas Strategy: SNAI) and measures related to emergency management.

Emerged conflicts about competences, school reorganization, regulation of land use and temporary accommodations, could be managed and reduced thanks to a pre-disaster strategy based on existing resources, problems and institutions.

In the Italian context, the post-disaster phase could be managed through the TM approach. TA could represent, in this sense, the tool to curb the risk of an exogenous governance through the involvement of local actors that will have the same weight of superordinate local actors, such as politician, technicians, representatives of superordinate bodies.

At the same time, the re-frame of those tactical and operational actions necessary during an emergency situation in a transition process can be the way to give a long term perspective to the reconstruction process.

The flexibility of TM approach is the characteristic that mainly makes TM ideal for an Italian application. Nevertheless, the analysis carried out allowed us to identify also some critical issues and challenges that the diversity of context inevitably entails. The limits of this study and of this hypothesis are related to the replicability of an approach whose success may have been influenced by the specificity of the Dutch context, in which it was tested. In particular, replicability issue could be related the political and geographical peculiarities.

About the political context, the debate on the relationship between the Dutch polder-model and TM (Kemp, Loorbach, 2003; Meadowcroft, 2007; Kemp *et al.*, 2007) does not allow to settle the question about the synergy or antagonism of different approaches, but allows to detect a close correlation between the two. The prevailing continuity in the political lines both on a national and on a local scale has favoured and made more effective the experimental applications of the method.

In relation to geographical peculiarities of the Dutch context, the TM application has been facilitated by exclusive Dutch characteristics such as the short extension of the National territory and the substantial morphological homogeneity. In this sense, the Italian context is characterized by a strong morphological heterogeneity and a pronounced cultural diversity.

An additional doubt about the TM replicability in Italy, is related to identification of a political framework in which the TM approach could be framed.

The identification of an institution able to promote the coordination of TM with ordinary planning needs to start from a review of existing planning bodies and their implications in relation to the different scale of application, competences and ability to dispose necessary resources.

The adoption of TM by local authority or municipality has the advantage of being able to rely on a strong relation with the territory, its knowledge and it will be reinforced by the thrust in local institutions and by the involvement of population. Moreover, the municipality has the right to follow all the planning process from the approval of the land use until the project.

In this sense, it is also reasonable to think that the municipality can not manage the disaster impact on the territorial structure alone. The scarcity of economic resources as well as the lack of external founds (European, state, regional, …) and of adequate technical skills would make the management of the TM process too complex for a municipality.

The idea to propose the Provincial authority as promoter of TM process, risks to find difficulties in term of administrative competences. In the same way, the Metropolitan City and the Unions of Municipalities offer optimal characteristics for the application and promotion of TM but, to date, they suffer from the same uncertainty of province authority.

Although not covering the entire national territory and being in a second level entity mostly limited to management, the Mountain Community offers the advantage of being recognized by the population that clearly perceives its limits and can rely on consolidated relationships between municipalities and administrators within a defined territorial unit. Finally, the Mountain

Community is a specialized administrative body, which deals today with the management of specific topics and services of the municipalities that are part of it, and for this reason it is not an integral part of the planning chain. If it will be proposed as promoter a transition process, it would be necessary to strengthen and broaden its competences.

The Regional body has a territorial extension often comparable to that of some European nations and has the resources, the skills and the competences to be able to successfully support the adoption of TM and it can play the role of coordination and promotion of TM in areas at risk. The civil protection with its dimensionless nature could be proposed as technical support body on issues related to the disaster (both as prevention and as reconstruction), but certainly can not act in tandem with a local actor or with competent local authorities in urban planning and planning such as the Region.

In this sense the Regional body should be the local responsible of TM application within the SNAI objective. This solution could ensure the respect of local needs and local peculiarities.

5. Conclusion

Starting with this assumption that the survival of a territory depends on the vitality of all of its components, the paper analysed the case of Fucino, Belice Valley and L'Aquila earthquakes and tried to identify the adopted process of recovery and their failure reason. This study has several outputs and sometimes they appeared strictly correlated one to each-other. Following a chronological approach, firstly we analyzed the case of Fucino (1915). Characterized by a demographic stability in a critical political period for the whole Country, the Fucino area has been impacted in an irreversible way. The entity of the disaster and dislocation choice have completely disrupted the territory. In addition, the inability to re-create the *urbs* spirit has led on the territory a lot of new and old urban corpses. The case of Belice Valley (1968), has led us to the conclusion that not all the reconstructions are necessary. By deeply analysing the territorial profile, it was indeed clear that the strong earthquake had just the capacity to accelerate an emigration process already active. The activated reconstruction process appears unable to reanimate an area already in a phase of coma.

The last case, L'Aquila (2009), put under the spotlight the issue of a poor management of the recovery process. The choice to nominate a (external) special commissioner for the reconstruction with a full authority had the

effect to leaving to local authorities the role of the audience. Furthermore, the "temporary" housing unit had further damaged (and it is still damaging) the *civitas* side. The interpretation of the city, defined as a balanced relation among *polis, civitas* and *urbs* should be extend to a broader context to understand the nature of the territory and of its polycentric structure. The survival of a territory depends on the vitality of all of its components, the failure of a single city/settlement has the power to material impact the whole system. The sample used for this analyses is made up of settlements located into what the National Strategy for Inner Areas (SNAI) define an inner region. The overlap of these two issue, such as the exposition to the seismic risk and the marginality, adds another level of complexity in planning the recovery process. According to the 2° objective of UN Plan of Action on DRR for Resilience (2013-15), the solution for an effective recovery process could be find, in the Italian context, in the SNAI. The SNAI team has the mandate to work on the study and the sustainable management of inner areas in Italy, that cover almost the ⅗ of the whole National territory. SNAI, in this sense, represents a strategic program for a kind of development based on multi-stakeholder national and local governance system and with a strong institutional capacity-building efforts. The exploitation of SNAI during a recovery phase can maximize the use of resources and of territorial knowledge, can reduce the recovery time and design a "customizable" and effective long-term plan for the full recovery of the impacted areas. Due to the fact that the largest part of the strategies for the pilot areas have been approved, the TM could be included in those areas that are still in a planning/programming phase. The inclusion of TM as tool to design a long-term perspective and its monitoring in time could be the base of a second phase of SNAI program.

The scientific debate on disaster and urban settlements is mainly focused on reconstruction models, while a second branch is focused on approaches and processes of reconstruction. Our aim is to contribute to the second debate proposing a new approach based on three emerged evidences:

1. The need to read the city as a living being keeping alive the interaction among its components.
2. The necessity to develop different approaches and strategies for different territorial contexts. Starting from the difference between demographic and socio-economic trends, geomorphological shapes, metropolitan/urban/inner areas, since accessibility is intimately correlated both to the development path and to the emergency and risk management.

3. The awareness that a reconstruction process need to start from a clear framework on development trajectory, such as previous socio-demographic trends or long-term development strategies.

The assumptions take us to consider Inner Areas Strategy as a perfect ground to develop a prevention culture both from the technical-constructive and from the operational-procedural point of view. In conclusion, a process based on (1) a clear and detailed knowledge of the region profile (2) a long term vision for the region development that draw the direction for the reconstruction path (3) an inter-municipal governance and cooperation, can find a ground floor on the SNAI. Thanks to the organization of permanent panel discussion (TA), the SNAI give us the opportunity to not have a duplication of agencies, public bodies or research or the addition of external actant during the disaster-recovery-phase. The strategy, based on a socioeconomic approach, is lacking in term of spatial sensibility, central aspect for the disaster management and in maintaining the regional and territorial structure (ISA). The original balance of *urbs-polis-civitas* of a whole region covers indeed a central role in the post-disaster management and in particular in the recovery process. The long-term vision, potentially given by the SNAI, is the only way to give to the disaster-affected region an effective development trajectory. In some cases, "the third way" could be an assisted deconstruction. According to the analysis of previous trends and of the level of previous abandonment, the assisted deconstruction could find a place in the SNAI as a process of territorial reorganisation, shifting from a negative post-disaster side effect to a non-emergency management phase. In the proposed approach the disaster is read not only as a phenomenon /trend accelerator, but also as a strategy accelerator. It appears as a real window of opportunity to catalyze the implementation of a long-term vision.

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9. Increasing social and physical resilience to disaster through post-disaster planning: the case of Cascia Municipality

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Abstract

The recovery after a disaster is a critical phase but it must be considered an unmissable opportunity to foster the social and physical resilience of impacted territories. As a matter of fact, recovery is considered as a/the phase during which the development of a disaster risk reduction awareness could be easily achieved through the identification of strategic sub-goals such as the inclusion of the concepts of adaptation and resilience to hazards. In this sense, post-disaster planning will become a tool of an inter-scalar disaster governance strongly connected with the ordinary governance of territories. Secondly, recovery is an essential moment in which awareness of land management, prevention and preparedness to hazards can be introduced to pursue territorial and social sustainable development. Thirdly, recovery requires a strong institutional coordination across sectors and level of administration that should result in supporting public/public and public/private innovative and useful collaborations. The present paper analyzes the case study of Cascia's recovery and post-disaster planning. The Municipality of Cascia, central Italy, was hit by the 2016-2017 earthquake sequence that caused many damages and economic losses in an already isolated territory. In 2017, Cascia has signed an agreement with the Iuav University of Venice for the development of a plan for the area's long-term recovery. The project, currently ongoing, aims to be a first significant example of public/public free collaboration in Italy. The main goal of the project is to offer a comprehensive and integrated vision of the Cascia's post disaster planning process, which can be replicated in other situations. In order to strengthen the current and future resilience of the area, Community-based approach, population preparedness and development of adaptive capacity, which will be discussed in detail in this paper are imperative within the whole process identified.

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1. Introduction

Moe *et al.* (2007, pp 787) define a disaster as ‘‘a situation which overwhelms local capacity to manage it, necessitating a request to the national and international level for external assistance’’. Disaster is derived from Greek meaning, ‘bad star’ (Konoorayar, 2006) and are classified in various ways. Independently from the disaster typology, a disaster management cycle has been developed by researchers and operators to illustrate disasters’ main phases. The disaster management cycle illustrates the ongoing process by which governments, businesses and civil society plan for and reduce the impact of disasters, react during and immediately following a disaster and take steps to recover after a disaster occurred (Alexander, 2002). The disaster management is used to define standard and organized efforts for reducing harm to life, property and environment due to disaster in different and consequential time steps (Coppola, 2011). In this cyclic framework, for example, hazard mitigation that occurs after a disaster is still hazard mitigation in preparation for another disaster further in the future, as well as the recovery phase is already a phase in which awareness of land management, prevention and preparedness can be introduced and addressed. The Sendai Framework of Disaster Risk Reduction 2015-2030 (Unisdr.org, 2015) underlined that disasters are critical opportunities to “Build Back Better” including through integrating disaster risk reduction into development measures, making nations and communities resilient to disasters. It strongly suggests that the recovery phase give the opportunity to develop capacities that will reduce disaster risk in the short, medium and long term and will improve physical and social resilience (Archer and Boonyabancha, 2010).

Considering these elements, the role of urban planners is central in many disaster management phases, and, especially, in providing a wire that connects all the different phases, offering tools and competences to reach multiple goals and to introduce additional targets/topics and approaches.

Furthermore, planners can apply the concept of multi-objective management, in which hazard mitigation, adaptation management and sustainable development are made to coincide with the policy objectives of other stakeholders in the community (Schwab *et al.*, 2003). Furthermore, recovery is the phase in which the plans for post-disaster rehabilitation, developed in “peacetime” can be implemented, often using extraordinary

channels. An essential purpose of a post-disaster recovery plan is to provide vision that serves as a beacon for decision makers and some frameworks within which decisions will be taken (Cfr. Ivi). Decisions taken in the heat of the emergency period following a disaster influence the opportunities to re-build a safer, adaptable and resilient community in the future (Hopkins, 2001).

The paper illustrates the case study of Cascia Municipality, central Italy, hit by an earthquake of magnitude 6.5 in October 2016 and then in January 2017, which is currently in the middle of a post-disaster planning and recovery phase.

Cascia is a town of 3.000 inhabitants situated in the center of Italy, 80 km on South-East from Perugia and 200 km on North-East from Roma (see Fig 1). Cascia has a medieval architectural plant, developed on a system of 40 little villages on some hills. The city has been interested by an important economical evolution around Santa Rita devotional tourism between 1920 and 2000, that still before the earthquake used to attract in town 1'000'000 of tourists per year (Istat.it, 2016). This development has also broken the traditional plant with some suburban neighborhoods of bad quality 5-6 floor buildings, the most affected by the seism, and with an "archistar" intervention that disrupted the relation between center and valley. Also the earthquake has accelerated the crisis of this tourism model, suggesting the need of an offer differentiation. Moreover, Cascia is trying to face these landscape and economic themes, that, coming from long before the earthquake, are already urgent to be faced. Because of the Italian law on public servant number dimensioning, the Municipality is unable to face this huge intervention by itself, and need a big support in terms of knowhow and site-specific research. Therefore, Cascia Municipality is an example of an innovative process of public and public collaboration.

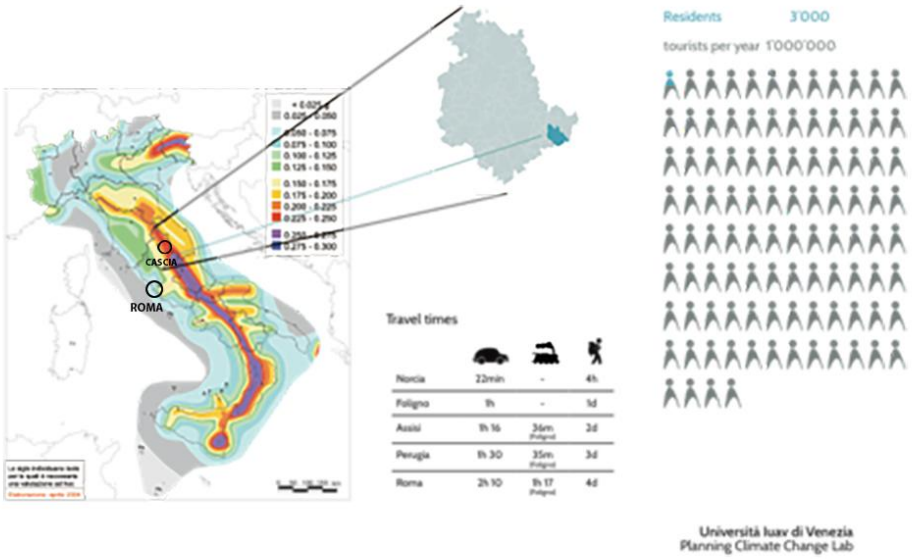

Figure 1 - *Cascia Municipality localization, travel times and tourists-residents' ratio. (Data: INGV, 2008, Google, 2017, Istat, 2017).*

2. An occasion for resiliency in post-disaster recovery

The disaster management process follows specific steps usually described according to the component of a cycle: (i) mitigation and prevention; (ii) preparation; (iii) response; and (iv) recovery (Alexander, 2002)

In the present paper, the authors, in accordance with Blaikie *et al.* (1994), Coppola (2011) and March *et al.* (2017) decided to refer to "recovery" phase of the disaster cycle as the process of rebuilding, repairing or reconstructing and returning a system to a functional state. The recovery phase complete the disaster cycle and aims at restoring affected communities to less vulnerable state (Alexander, 1999). It is not a static point or a single moment in time but is an extended process that includes the damages reparation and the restoration of community essential services creating. At the same time, this phase offers new opportunities for future development aligned with the principles of "sustainable development" and "Build Back Better" (Aldrich, 2012; Lindell, 2013; Unisdr.org, 2015) to

avoid or reduce future disaster risk. At social level, and in terms of social capital, the recovery phase involves different actors that must be re-bounded in order to re-create the social connections needed to support identified actions and measures (Aldrich, 2012). The Recovery Phase (RP) can be subdivided in two different stages: rehabilitation and reconstruction. As reported in UNISDR terminology (Unisdr, 2016), rehabilitation is defined as the phase of restoration of basic services and facilities for the functioning of a community or a society affected by a disaster. Reconstruction, instead, is defined as the medium and long term rebuilding and sustainable restoration of resilient critical infrastructures, services, housing, facilities and livelihoods required for the full functioning of a community or a society affected by a disaster (Unisdr, 2016). Being part of the same main phase of the process, also the reconstruction must follow the Sendai Framework principles of sustainable development and Build Back Better.

The RP, and especially reconstruction, would be more effective and less onerous if it is well planned. However, planning needs to be holistic. As a matter of fact, as express in the above definitions, it is not merely a question of replacing damaging buildings stock and infrastructure, but also one of rehabilitating communities, ensuring equity and access to resources and reducing community vulnerability to existing hazard (Alexander, 2004; Berke and Campanella, 2006). The concept of applying a holistically view in the disaster management phases is strongly supported also by UNISDR Sendai Framework, especially in the recovery phase:

"*Recovery needs to be viewed holistically - as part of a continuum, inseparable from preparedness, response, mitigation and sustainable development. Moreover, recovery must be approached in a cyclical nature wherein actions to strengthen resilience are taken both before and after disaster occur - rather than a linear approach that limits recovery action to the aftermath of an event*" (Unisdr.org, 2017).

Indeed, as also expressed by March *et al.* (2017), disasters offer the opportunity to reconsider and improve upon a settlement's characteristics. Furthermore, as a policy objective, mitigation and resilience should be pursued both during the pre-disaster period and programmed during the recovery phase and reconstruction periods (Schwab *et al.*, 2003; Berke and Campanella, 2006). To increase the resilience of an urban area in a disaster context means to enhance its ability to reduce losses, in terms of life and properties, as well to create a greater sense of place among residents, a stronger and more diverse economy and more economically integrated and diverse population (Vale and Campanella, 2005; Berke and Campanella, 2006). Alexander (2004) reported some historical examples in which sustainable disaster mitigation solutions have been incorporated into

recovery and especial reconstruction programs, while Berke *et al.* (2014), by reviewing 87 disaster plans in the US found that the plans weakly consider the achievement of long-term resilience as a leading element of the recovery plan. However, to achieve these objectives of risk reduction and sustainable development in an effective way, communities should plan reconstruction before disaster strikes to tackle it when it occurs: this is called "pre-disaster recovery planning" (Alexander, 2004; Berke and Campanella, 2006). Using these planning instruments, the introduction and implementation of measures and actions for increasing the resilience to disasters become the connection element between the pre and post planning process and the disaster management and recovery phases (Lindell, 2013). In this way, post-disaster planning can become, also, a tool of an inter-scalar disaster governance that is strongly connected with the ordinary governance of territories. Taking advantage from local effect could be an important occasion of redefinition of safe and dangerous mapping of an injured area. Doing this obviously means to focus on a post-disaster recovery not just as reconstruction, but, overall, as occasion of rethink a territory. (Cfr. De Marchi and Colten, 2009; Medd and Marvin, 2005, pp. 43-46).

As reported by Tierney (2012) "*disaster governance consists of the interrelated sets of norms, organizational and institutional actors, and practices (spanning pre-disaster, trans-disaster and post-disaster periods) that are designed to reduce the impacts and losses associated with disasters…*". Good governance emphasizes local participation and power for the achievement of the strategic goals identified before and after a disaster. A bottom-up approach in the identification of the recovery strategic lines and in the application of local actions and measures is essential for achieving long-term goals and social support (Cfr. Blakely, 2007, 2012; Frisch, 2009).

In addition, the strong institutional coordination across sectors and level of administration needed to pursue recovery multi-objectives could result in supporting public/public and public/private innovative and useful collaborations.

2.1. Chronicle of a multidimensional earthquake

Between August 2016 and January 2017, four earthquakes of magnitude between 5.4 and 6.5 hit central Italy, determining a decidedly new phenomenon of emergence even for a country so familiar with seismic events. The phenomenon is peculiar for the considerable size of the crater area, including 131 municipalities distributed in 4 different regions: Lazio,

Umbria, Marche and Abruzzo (Gruppo di Lavoro INGV, 2016). Furthermore, it could be considered a unique emergent phenomenon that developed around four single events, different in intensity, position and period. One of the small town hit by the seismic sequence started in August 2016 is the city of Cascia.

Cascia, a small medieval city of the Val di Nera, developed around a system of villages and hamlets with a history and a representative structure of the image of the country, of its culture, of its beauty, and, at the same time, of today's difficulties for areas like this (see Fig. 2, 3). Despite the aspects related to Santa Rita pilgrimages and agri-food touristic potential, services and reception are the most important economic sectors of the city. On October 30th, 2016 an earthquake of 6.5 degrees Richter, the strongest in Italy since 1980, hit the area of central Italy, with effects perceptible to hundreds of kilometers away.

Figure 2 - *Effects of earthquake on historical city.*

Figure 3 - *Effects of earthquake on XX century city.*

After this main event, until February 2017 Cascia has been hit by violent earthquakes on several occasions, becoming part of the phenomenon called "Earthquake in Central Italy" and reporting serious damages by these phenomena. The 30 October 2016 earthquake rendered roads, houses, shops and the hospital unusable, in some cases for different months, in others until today, highlighting a need of a strong reconstruction intervention to overcome the large damages reported. Moreover, the urgency of an intervention for Cascia is connected to his role of center of gravity for different municipalities of the area, being the only one hospital center in 70 km and *fulcrum* of the economic and social activities of a large district. Cascia represents an example of the urban dynamic of central Italy small municipalities, that, despite being in a position of geographical isolation and,

in a sense of urban backwardness, aims at developing economically by preserving its peculiar characteristics. As reported in the ISTAT Database, Cascia is subjected by a progressive depopulation trend, in part coherent with the national demographic trends, and partially due to its geographical location that make accessibility and economic/social development difficult goals to reach. This phenomenon of abandonment of the area, together with its religious importance due to the presence of one of the most visited sanctuary in Italy, makes the area extremely interesting from a geographic-planning point of view.

The seismic sequence that is interesting Cascia's urban and surrounding area, and that is causing important damages on physical and social dimensions, is adding a new important goal for the area: increasing resiliency to future events by exploiting the window of opportunity offered by the happened "disaster". For this reason, in October 2017, one year after the main destructive earthquake, the Municipality of Cascia has recognized the importance of collaborating with an external institution to benefit from its expertise in terms of post-disaster reconstruction planning. As reported in the previous paragraph, the reconstruction phase is a complex process that involves many spheres of actions and that need trans-scalar knowledge and competences.

The present paper aims at offering an integrated vision of the Cascia's post-disaster planning process by identifying the most important elements and steps of the whole process. Moreover, the paper will highlight the importance of redefining collaboration relations and governance definition, in order of turn around the historical bureaucratic and economical limits of this territory (Luhmann N., 2005; Paba, 2010, pp. 108-109). The post-disaster planning process that is under definition, will be based on the awareness that a community-based approach is imperative to strength the current and future resilience of the area and to offer new lines of economic development. Additionally, a discussion about the importance of the sharing of knowledge and competences in post-disaster planning as main elements to increase social resilience of territories will be presented. The Cascia's post-disaster and future development planning process will be structured looking at three main dimensions: social, physical and of governance.

3. University role in post-disaster recovery as bottom-up action support

First of all, reconstructing Cascia means providing the community with innovative ideas and perspectives oriented to rethink its shape and its

attractiveness in the near future, bringing together economic, social and physical interventions. Secondly, the Cascia's citizens and administration propensity to act and actively manage the emergency and post-emergency phases should be strongly considered as a replicable approach also during the following recovery steps. In fact, the safety of Cascia, and the possibility of saving it from abandonment, has been possible thanks to the tenacity and self-organization of the population, which played a role as first rescuer of itself, providing work and resources for return to their autonomy. Taking care of Cascia reconstruction means over all giving scientific and communicative support to an active self-promoting citizenship that has engaged itself in emergency management. Supporting Cascia regeneration means providing this community with innovative ideas and perspectives, through which rethink its form and its attractiveness in the near future.

The collaboration between Iuav University and Cascia Municipality started from a voluntary initiative of some Iuav researchers in emergency management in supporting the city's recovery phase. Cascia's local administration and Iuav research staff decided to catch the important opportunity of applying an innovative approach in recovery phase after a real disaster.

The work has been organized starting from three main field trips, thought as occasions to recognize and define the peculiarities of Cascia's catastrophe, the tools needed to be activated in short time and to describe the local and regional governance to be involved. This preliminary phase ended in July 2018 and a second phase started in September 2018 and will end in December 2019. At time of writing, the work is at the beginning of the second phase.

In this second phase a scholar experience workshop of three weeks is going to be organized aiming at: (i) analysing dynamics, strengths, weakness and opportunities of the area; (ii) constructing a vision and some specific objectives for the area including resilience and sustainability features; (iii) proposing some design hypothesis and interventions as based of discussion with local citizens; (iv) undertaking a first moment of discussion with local population.

Indeed, in accordance with "Urban Vulnerability and Good Governance" (Lewis and Mioch, 2005), the works plan will be organized considering an active involvement of private and public sectors in all the recovery sub-phases. The involvement of public and private local sectors, as well as representative of local demography is supported by the Lewis and Mioch (Ivi, p. 51) statement: "The equation of rights and responsibilities is particularly important in disaster risk reduction; people have a right to feel

protected in their communities, yet equally they need to be aware of their shared responsibility to protect themselves".

Therefore, two permanent participation groups will be created for the entire duration of the 2-years process. The first one, aims at being representative of the local productive sectors, will be composed of farmers, restaurateurs and hoteliers and the artisans of the valley. The second will bring together the presidents of the Cascia's fractions, representing the most complete and complex form of this territory. A permanent space will be identified and selected to be a physical place of discussion about the evolution of the recovery process. In this step, Iuav responsibility will be to organize these groups, to focus them on a clear step based program, avoiding to feel university role as super decisor, but to act as a partner in the game. To do this, the Stanley (2017) consideration's will be kept in mind: "A further challenge for planning is how to effectively combine vertical governance or decision making from the bottom up with decision making from the top down, in order to integrate local citizens participation with broader, strategic planning goals".

The local intervention will start in October 2018, with the supervision of a research team directed by Prof. Edward Blakely, in a ten-days residence experience in Cascia. This experience will let start the groups activity, and aim at producing the program and the goal expected by the group work. After that the direction of the groups will be let in hand of the local administration, in connection with Iuav team to discuss the evolution of the project and the respect of the goals.

The ambition of this methodology is to improve a real shared new culture of Cascia recovery phase, trying to delete the main reconstruction errors of the past times and, especially, to take advantage of the real opportunity that the "disaster" is offering to this territory of reconstructing its identity in a resilient and sustainable way.

Cascia recovery, and regeneration, will be organized around three superimposed levels and objectives: Re-Bulding Re-Storing Re-Brending. First of all, to develop the XXI century urban and surrounding area of Cascia rethinking the outskirts of the city center, and transforming an expansion of low aesthetic and residential quality, strongly damaged by the earthquake, into the access avenue of the Municipality is mandatory. Secondly, the project will try to redesign the relationship and mobility between the villages and the village at the bottom of the valley. Thirdly, the promotion of a diffused hotel receptive model and the establishment of some high quality agri-food production disciplinary, organized around a high-level coordinated communication will be pursued. Finally, planning for

safety and resilience, with attention to seismicity and climate change will be addressed.

The application of this approach, fully embraced by the local administration, is discounting the predictable perplexity of the administratively superior level (Region). The bureaucratic top-down structure is right now normally asking for the respect of a vertical command and control line in regeneration planning and developing, defending a supposed know how inside this structure. (Cfr. Crozier, 1978, pp. 61; Lindell, Meier, 1994, p. 222) One of the most relevant problem in the realization of the project will probably be the active involvement of local bodies on one side, and, on the other, to convince regional administration that is mandatory to "dispel the myth of hierarchical control", (Comfort, 2007, p. 190) keeping them to consider recovery as "a participative process of hermeneutical recognize and of community building" (Bertin, 2018, p. 134). This will an occasion of win-win collaboration between different agency in public administration and citizens. Moreover, the project would be coherent with the four priorities for disaster risk reduction actions stated in the Sendai Framework:

(i) Understanding disaster risk – by implement a studying phase on the area to better understand the present hazards and potential impacts;

(ii) Strengthening disaster risk governance to manage disaster risk – by actively involving local administration, stakeholders and the community in the whole planning process;

(iii) Investing in disaster risk reduction for resilience – by informing and involving productive and financial sector in the post-disaster planning process to increase physical, social and economic resilience;

(iv) Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction – by considering that prevention and protection must be pillars also of the reconstruction phase as well as physical and social resilience.

The project's structure, the actors involved and the principles guiding the post-disaster recovery and planning phase in Cascia will consider these priorities for action in each project's phase.

4. Conclusions

The paper describes the implementation of a post-disaster recovery process in the Municipality of Cascia based on the active collaboration among different types of public entities. The process, currently on-going, is

demonstrating a significant potential in taking efficiently advantage of the window of opportunity offered by the October 2016 and January 2017 seismic events. A structured and programmed participation of the Iuav University institution is offering an essential support in the recovery process, especially in marginalized and hardly accessible areas such as the one of Cascia. The knowledge and competence on post-disaster and adaptive planning, participation, economic evaluation and monitoring, offered voluntarily by the University institution, as well its scientific and institutional network, is becoming completely accessible to the small municipality under discussion. At the same time, the described area is offering the opportunity to the research to carry out parallel studies on post-disaster recovery plans and on a real social/physical reconstruction process, especially focusing the attention on the emerging bottlenecks from the integration between community-based and institutional-based processes.

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Section III

Disaster Mitigation and Preparedness

10. UNESCO Global Geoparks: living laboratories to mitigate natural induced disasters and strengthen communities' resilience

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Abstract

UNESCO Global Geoparks (UGGps) are forming a network of 140 territories all over the globe (GGN), that are located in various geographical settings that may be partly or entirely exposed to various natural hazards and extreme weather events. In recent years, natural hazards have already caused extensive damage to several UGGps. In addition, climate change seems to affect both occurrence and intensity of various hydro-meteorological hazards. In order to have a better understanding of the exposure of UGGps to natural hazards, and their activities to mitigate risks the GGN and UNESCO's Section on Earth Sciences and Geo-Hazards Risk Reduction team undertook in 2015 a thematic survey. Analyses of the data revealed the high risk that UGGps are facing, the important role of training and awareness raising actions, as well as of the existence and implementation of adequate risk management plans. Many UGGps in Asia and Europe have already set as top priority the reduction of naturally induced disasters and the protection of citizens and infrastructure, having implemented certain projects and developed concrete infrastructure and activities to raise awareness and mitigate risks. Existing knowledge of indigenous communities help UGGps to develop practices and initiatives to overpass crises and become more resilient. Hereby we present thus the results of the UNESCO and GGN

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survey in UGGps, as well as examples and good practices developed so far among the various geoparks.

Keywords: Global Geoparks, Natural Hazards, risk mitigation, geo-hazards, resilience.

1. Introduction

Natural hazards and Climate Change induced impacts are considered as the most serious threats for modern societies (WB, 2012; IPCC, 2014). Natural hazards vary in scale, time and magnitude and may modify, suddenly or in long term, earth's relief or atmospheric composition resulting often into serious losses, damages to or changes in the environment, human infrastructure and health both directly or indirectly.

Natural hazards are classified in three main groups in respect to their origin (UNISDR, 2004; WB, 2010). *Hydrometeorological* hazards are related with processes or phenomena taking place in the atmosphere and are subdivided in hydrological, meteorological and climatological hazards; *geophysical* or geo-hazards are those originating from solid earth; and *biological* hazards are those processes of organic origin or those conveyed by biological vectors.

Earthquakes and tsunamis may be considered as the most disastrous phenomena in terms of magnitude and scale, especially in those cases where they affect vulnerable infrastructure and assets. Those disasters primarily affect developing countries and result frequently in hundreds of thousands of deaths (UNISDR, 2009). Some of the most devastating disasters of the past decades took place in the Asian-Pacific region, such as the extreme earthquakes in China (2008) and in Nepal (2015) and the tsunamis of Sumatra (2004) and Tohoku region of Japan (2011). They resulted in the death and displacement of hundreds of thousands of people and caused huge socio-economic losses to the society (CRED, 2014). Similar smaller scale disasters took place in Europe and Latin America too (CRED, 2014). Wildfires or forest fires are occurring frequently in Mediterranean countries and have caused hundreds of deaths and the loss of millions of hectares of forest or scrubland in California and Australia. Extreme tropical cyclones and tornadoes struck the Caribbean, USA, Mexico and eastern coasts of Asia (i.e. Haiyan, Philippines 2014) affecting large areas and causing billions in damages and losses. During the first two decades of the 21st century, many areas of Europe and Asia faced the worst floods of the century.

It has been observed that poor people are disproportionally exposed to natural disasters (Hessel *et al.*, 2018) and that more than 90% of the deaths related to disasters from natural hazards occur in developing countries. Although the number of disasters increases and more people are affected, there are less people dying than in the past (WB, 2012). Middle- and high-income countries face greater proportional economic burden of damage than poorer countries (WB, 2012). Modern development trends and related social attitudes have led to a mass movement of populations from rural areas to urban ones leading to a high concentration of humans in big cities, increasing also their vulnerability to hazards. Associated modification of landscape and environment, deforestation, land degradation, soil erosion and resources over-exploitation near urban settings increase further the vulnerability of people and increase their disaster risk.

In addition, experience has documented that the response mechanisms after a disaster are never enough to cope with its effects (UNISDR, 2009). It is thus of extreme importance to focus our efforts in identifying and understanding the various hazards we are facing as societies, to minimize our vulnerability and increase our resilience. Accumulated social knowledge, scientific research and detailed studies can help us to understand better, how natural phenomena may become damaging and thus identify the hazards we may face. Societies should be robust to avoid damage and losses when a disaster strikes, sufficiently flexible to adapt to changes, have an integrated approach to allow consistent and fast decision making processes and have enough resources to respond sufficiently fast in case of a shock (Plodinec, 2009). Knowledge of available methodologies, technologies, best practices and available or potential resources is one way to prepare and make our societies more resilient to disaster risk.

2. The UNESCO Global Geoparks (UGGPs)

The UNESCO Global Geoparks (UGGps) are territories aiming to protect natural and cultural environment and support sustainable development through education, conservation and geotourism. In 2015 UNESCO Member States of UNESCO ratified the creation of a new label, the UNESCO Global Geoparks, during the 38th General Conference of the Organisation. This expresses governmental recognition of the importance of managing outstanding geological sites and landscapes in a holistic manner. At present 140 territories spread in 38 countries have been designated as UGGps.

Geopark Networks were established in 2000 in Europe and represent rural territories which include an important geological heritage, wealthy natural and cultural environment, clearly defined boundaries and a large surface area where a sustainable territorial strategy is implemented aiming to sustainable development (Zouros and Martini, 2003). Since 2004 the Geoparks have been transformed to the Global Geoparks Network (GGN). Its main task is to communicate the memories of the Earth to as many people as possible, contributing to a better future for humanity and our planet (Martini and Pages, 1994).

This is achieved through the assessment and conservation of their geological and natural heritage and the development of educational and geotouristic activities (Fassoulas *et al.*, 2011) that contribute to local sustainable development. In addition, UGGps are bodies that are constantly in contact with ordinary people, i.e. pupils, inhabitants, visitors, and are the most suitable dissemination and education tools to share policies, skills and behaviors, as well as to build life attitudes (Zouros and Martini, 2003).

UGGps are located in various geographical settings, mostly in rural areas, and their territories may be partly or entirely exposed to various natural hazards and extreme weather events. In recent years, natural hazards, both geological (such as earthquakes, volcanic eruptions, landslides and tsunamis) and hydro-meteorological (such as floods, droughts and avalanches), have already caused extensive damage to several UGGps. In addition, climate change seems to affect both occurrence and intensity of various hydro-meteorological hazards. For instance, Japanese and Icelandic UGGps have been affected by multiple hazards, including earthquakes sometimes followed by tsunamis, as well as volcanic eruptions that damaged infrastructure and natural environment. Different types of landslides occur frequently on the slopes in mountainous areas damaging access roads and tourist paths. Many sites face a high flooding risk, as revealed by heavy floods in the past decade in Slovenia, Italy, Vietnam and many other regions.

3. Need for Action

The impact of disasters due to natural hazards is widespread in all aspects of social and economic life of modern societies and will increase further because of climate change (Forzieri *et al.*, 2017). This increasing magnitude of hazards and vulnerability and increasing frequency of disaster occurrence, activated multilateral organizations, scientific institutions and countries to act in order to prevent and minimize the effects of disasters and build more

resilient communities. In 2005 the global community set in place the Hyogo Framework for Action 2005-2015 (HFA), signed by 168 governments and international organizations (UNISDR, 2007).

Following up the HFA, in 2015 the Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR) decided by UN (UNISDR, 2015). The framework calls for collaboration at all levels (from local to international) in education, knowledge and technology transfer, in order to build resilient communities that will be better prepared, more equipped and skilled to prevent disasters and better organized to recover in a better way and sooner than in the past. It further requests Member States to monitor the impact disasters have on the educational, environmental and cultural sectors.

The Global Geoparks Network is now spread in all continents and is growing fast (Figure 1). UGGps are mainly located in rural areas meaning that in most cases a lack of skilled staff and of necessary structural and non-structural means to better design and respond in case of a disaster, occur. In addition, because UGGps are bottom up initiatives, they have built strong relationships with local communities, being thus able to communicate better with them, transfer knowledge, skills and attitudes and educate a great range of citizens than others (Zouros and Martini, 2003).

Being sensitized on Disaster Risk Reduction and joining the Global effort undertaken after the Tohoku 2011 disaster, the GGN adapted in 2012 the "Shimabara declaration" (EGN, 2012). In the 5th Global Geoparks International Conference held in Unzen UNESCO Global Geopark, 593 delegates from 31 countries affirmed their strong commitment to contribute in mitigating the risks from Natural Disasters through the Declaration. The congress was organized just one year after the devastating Tohoku Earthquake and tsunami that stroke the whole Japan and Pacific area. The "Shimabara Declaration" foresees that: 1. The Geoparks should utilize the experience of local communities and of the destruction that occurred as a tool for the education in geo-hazard prone areas of the Earth; 2. Geoparks recognize that education about our dynamic planet is the most effective way to help our local communities to coexist in accordance with our risky nature; 3. Similarly, Geoparks should educate on climate change and should strive to become known for a best practice approach to utilizing renewable energy and employing the best standards of "green-tourism"; 4. Geoparks should contribute in the sustainable use and need for natural resources, promoting also respect of the environment and the integrity of landscape; 5. Geoparks should conserve and utilize geological heritage by linking various bodies engaged in governing and conservation of geoheritage, building high quality facilities and providing high quality education programs to increase public

awareness; 6 Geoparks should establish collaboration with all territorial organizations, bodies and communities to achieve a real sustainable development through geoconservation, education, tourism and management.; 7. Networking, exchange of knowledge, practices and staff is necessary to promote, raise and maintain the high values of tangible and intangible heritage, and to recognize geodiversity as a key element for sustainable development of Geoparks; and 8. Geoparks in collaboration with UNESCO and Member States should improve collaboration to establish Geoparks as territories of ideas and real sustainable development, respectful of local traditions and desires that could enable a future development of an official UGGps initiative.

The Global Geoparks Network has thus a great potential to play an important role in the achievement of the Sendai Framework for Disaster Risk Reduction targets but most crucially, to support their communities to better cope in case of a disaster, contributing in raising of awareness and building resilient communities.

Figure 1 - *The Interactive map of Global Geoparks Network* (http://www.staridasgeography.com/world-Geoparks/ after Staridas & Fassoulas, 2015).

4. Natural Risks in UNESCO Global Geoparks

4.1. Disaster record in UGGps

In Europe, many UGGps exist in very hazardous areas within respect to earthquakes and volcanism, like those in Greece, Italy, France, Portugal and Iceland. Historically, Psiloritis, Lesvos, Sitia and Helmos -Vouraikos UGGps in Greece were repeatedly affected by very strong earthquakes, which for the

case of Psiloritis reached 8.3 magnitude in Richter scale. In 1867 a strong earthquake devastated the town of Mytilene and several other villages of Lesvos. In 1920 a strong earthquake of 6.5R magnitude but also very high intensity affected the Apuan Alps UGGp in Tuscany Italy causing many victims and damages. In 1909 a strong earthquake happened in France with its epicenter located in the area of Luberon UNESCO Global Geopark, affecting also the nearby Haute Provence UNESCO Global Geopark, which resulted in several hundreds of deaths and an important economic cost. Many UGGps are also located near, or even established around active volcanoes as is the case of Azores and El Hierro, but also the Sicilian UGGps,the Cilento Vallo di Diano and Alburni in Italy. In 2010 the eruption of Eyjafjallajökull volcano in the Katla UNESCO Global Geopark of Iceland blocked for many hours the global air-traffic.

Several other UGGps located in central Europe are also facing a high flooding risk. This has been revealed during the past decade, when heavy floods occurred in Germany, Austria, Poland, Czech Republic, France and in the Balkans. In addition, other UGGps like the Chablais in France, CillentoValo di Diano and Alburni, Apuan Alps, Sesia Val Grande and Beigua in Italy and Swabian Alb in Germany experienced significant landslides in past that damaged infrastructure and the natural environment. The landslide of Hirschkopf in Swabian Alb UNESCO Global Geopark was declared as National Geotope of Germany, to stress the importance of mitigating the natural risks in future (Figure 2). In the Asia-Pacific region, severe disasters have been occurred in the past with several of them affecting strongly some UGGps. Hazards in that area are both of geophysical but also of hydro-meteorological origin, resulting in devastating earthquakes and tsunamis, big volcanic eruptions, as well as strong monsoonal cyclones and heavy storms. Japan is probably the country that is facing the most damaging hazards from all countries participating in the GGN, if considering the very recent Tohoku 2011 earthquake and tsunami. Many national UGGps have experienced in past and are still experiencing every year big volcanic eruptions, strong earthquakes, typhoons, as well as, their accompanying tsunami and landslide phenomena (like the 2013 landslide at Izu-Oshima National Geopark). Like their European counterparts the majority of the nine Japanese UGGps face a number of natural hazards with a great disaster risk. San'In Kaigan UGGp faced a very strong earthquake (7.3 R) in 1927 which devastated several towns, destroyed much of the existing infrastructure and resulted in many deaths. Another UGGp from Japan, Unzen Volcanic Area, is an outstanding case of the GGN that has been repeatedly affected by various disasters. In 1791 a cluster of earthquakes triggered by volcanic activity

resulted in a devastating tsunami that killed about 15.000 people. Volcanic activity occurred again in 1990 lasting for four years, killing many people and changing forever the landscape and nature in the Unzen area. China is also a country that in past and in very recent times, has suffered a lot from very damaging disasters such as floods, earthquakes, volcanism, typhoons and landslides (Figure 3a). The most striking case of recent times may be considered the 8.0 magnitude in Richter scale earthquake that happened at Sichuan territory on 12 May 2008, resulting in more than 35,000 deaths, considerable destruction of infrastructure mainly due to the landslides, and river bed changes. The earthquake affected the Xingwen UGGp but also the area of Qingchuan Earthquake Relic National Geopark of China that was especially established as a memorial to the devastating 2008 disaster (Wang & Tian, 2013). A very heavy flooding took place in Fangshan UGGp in 2012 affecting many of their geo-spot areas like the Shidu, Yesampo, Baishishan, and Shangfangshan, where almost all infrastructures were destroyed.

Figure 2 - *A signpost in Swabian Alb UGGp to notify the importance of Hirschkopf landslide in national level.*

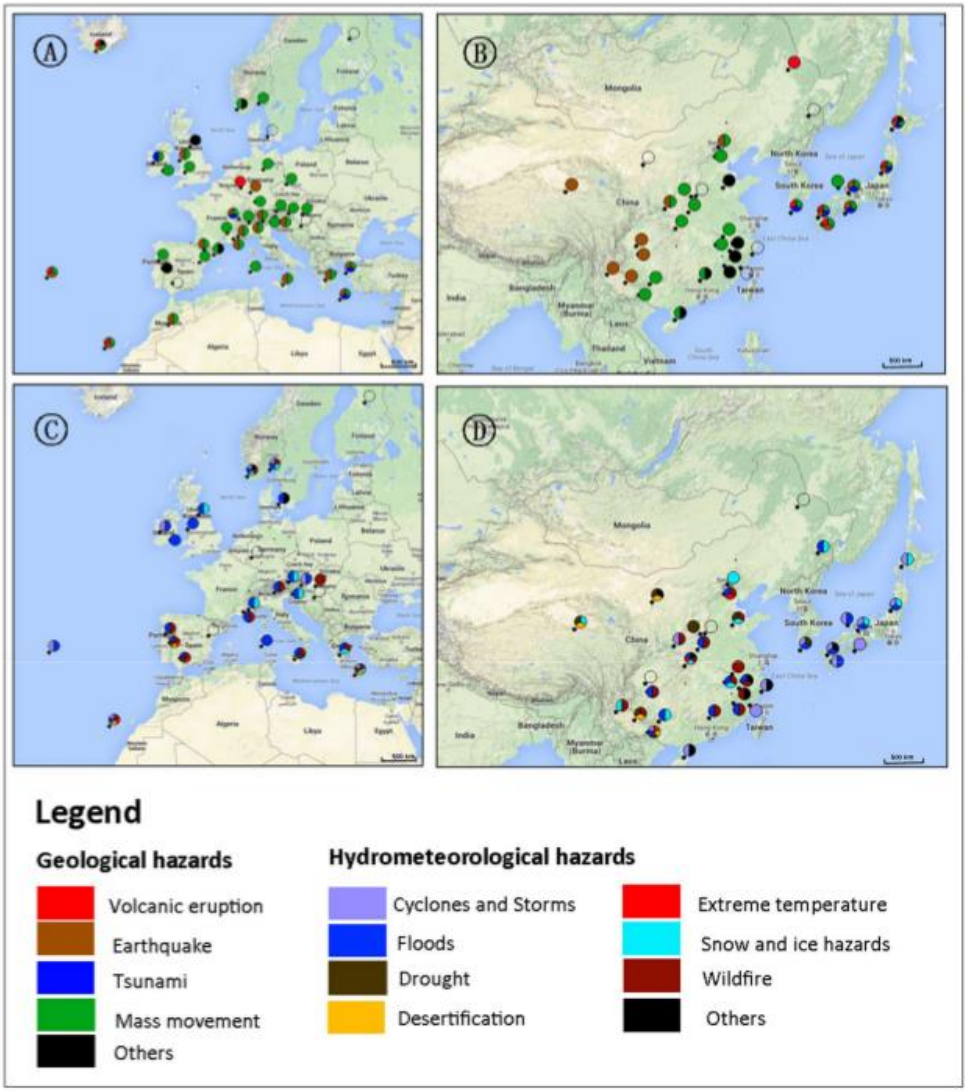

Figure 3 - *Distribution of natural hazards at Global Geoparks according site managers: geological hazards in Europe (A) and Asia (B), hydrometeorological hazards in Europe (C) and Asia (D).*

4.2. Assessing risk in UGGps

UGGps are thus facing high potential disaster risk due to their geophysical and hydro-meteorological hazards but this risk has not been studied and analysed in detail yet. A joined activity was developed by the Section on Earth Sciences and Geo-Hazards Risk Reduction of UNESCO and the

UNESCO Global Geopark Secretariat aiming to identify, catalogue and analyse the natural hazards and associated disaster risk in each UNESCO Global Geopark.

A survey questionnaire was developed in 2014 by the Section on Earth Sciences and Geo-Hazards Risk Reduction of UNESCO and shared with all UGGps by the UNESCO Global Geopark Secretariat. This on-line survey was composed of opened and closed questions (available at https://en.unesco.org/drr-sites/survey) and aimed to identify UGGps that are exposed and are vulnerable to natural hazards, as well as to obtain an overview of good management practices and awareness raising activities in UGGps. To date, 81 site managers of UGGps have responded to the questionnaire, 43 belonging to the European Geoparks Network (EGN) including M'Goon from North Africa, 35 to Asian-Pacific (APGN) and 3 to the American Networks (Fig. 3). About 73% of the UGGps replied, 66% of the EGN, 75% of the American, and 83% of the APGN (Dierickx *et al.*, 2016).

According to the questionnaire analysis, all UGGps are expected to face at least one natural hazard (Figure 4). Geophysical hazards that are perceived to be present in most UGGps are mass movements (reported in 70% of the UGGps), followed by earthquakes (39%) and volcanic eruptions (12.5%) and tsunamis (12.5%). Other types of geophysical hazards (like ash flows, lightings etc.) have been also reported in 15% of the survey responses. The hydro-meteorological hazards, the presence of cyclones, floods, droughts, desertification, extreme temperatures, snow and ice, wildfires and others were also examined. From those types of phenomena, floods are occurring in the 65% of the UGGps, followed by wildfires (46%), snow and ice (36%) and cyclones/storms (31%). These results are in line with a similar research conducted on other UNESCO designated sites network – World Heritage sites program (Pavlova *et al.*, 2017). Results showed that not less than 46% of world heritage properties are exposed to at least one of the four main geological hazards.

In the majority of UGGps the infrastructure is exposed to the hazards (Figure 4). It is interesting to notice that in some cases, these hazards resulted in damaging both structural and non-structural elements of the UGGps, affecting existing infrastructure like trails, paths, signing system etc., and in some cases also human health and well-being (Figure 5a). There is more relative exposure of the UGGps' infrastructure to geophysical hazards, compared to hydro-meteorological hazards. When the UNESCO Global Geopark has a risk on volcanic eruptions, in most cases the infrastructure is exposed as well; the same can also be observed for the case of tsunamis, while

less exposure in infrastructure is reported for earthquakes and mass movements.

The survey questionnaire requested also information for UNESCO Global Geopark's activities related to the preparedness, adaptation and recovery in case of natural disasters that can be used to identify the level of resilience of each UGGp (Manfredi *et al.*, 2014). According to the questionnaire analysis just 35 out of 81 UGGps appear to have developed strategies and actions to mitigate disaster risks in their territory. Although according to site managers responses for most of UGGps natural hazards are important issues to deal with, only 19 (23%) of sites have conducted risk assessment studies on their territory and 26 (32%) have incorporated a hazard and risk prevention analysis in their UGGp management plan. In addition, in 28 UGGps (34%) various educational activities with respect to natural hazards are provided and in 23 UGGps (33%) awareness raising activities are undertaken annually. Finally, it appears that most UGGps would like to develop training activities for their staff and visitors (83%) and, share good practices (34%), but only a surprising 20% (only 7 UGGps form the 81 participated in the survey), has already developed cooperation with other UGGps in this regard.

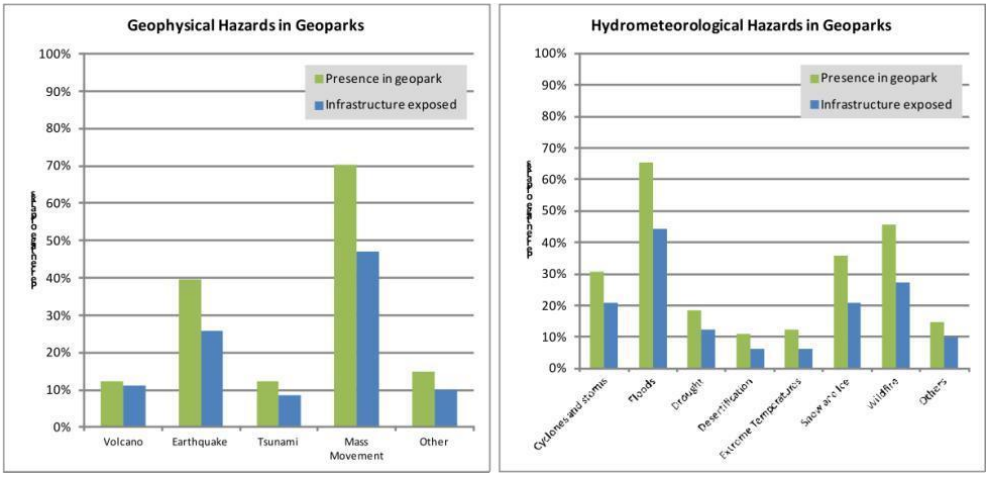

Figure 4 - *Statistical Analysis of Natural Risks in UGGps.*

5. What can UGGps do? Examples of Raising Awareness and Risk Mitigation for Natural Hazards

The UGGps are dedicated to implement the "Shimabara declaration", and already many UGGps are working to achieving those targets that focusing on safety, education and training, networking and collaboration. Various

examples demonstrating how UGGps adapt and implement the Sendai Framework for Disaster Risk Reduction and how those contribute to achieving the Sustainable Development Goals can be found.

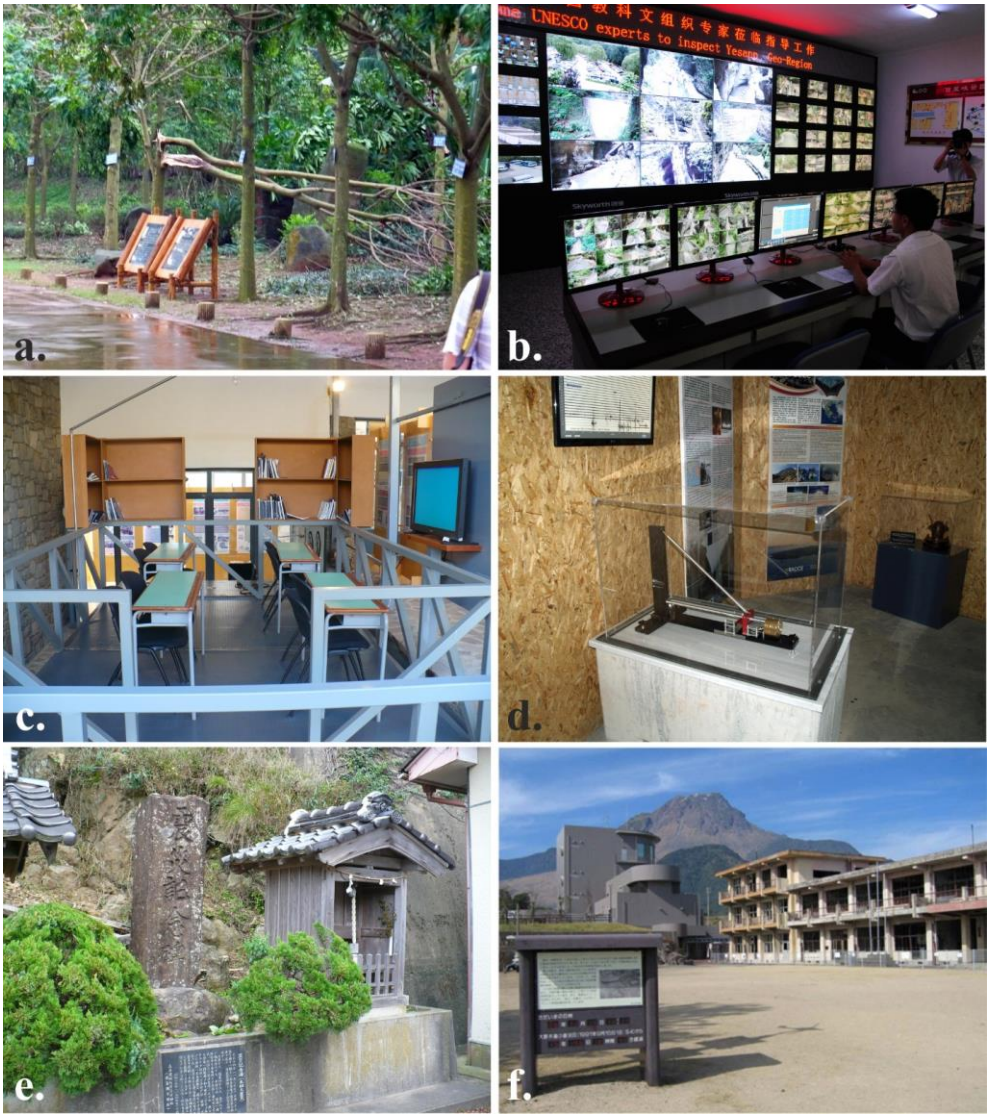

Figure 5 - *a. Damages by the summer 2010 typhoon in infrastructure of Zhan Jiang geospot area in Leiqiong UGGp in China; b. The Yesampo monitoring center at Fangshan UGGp in China; c. The earthquake simulator at Lesvos Petrified Forest museum in Lesvos UGGp Greece; d. The educational seismograph in Natural History Museum of Crete in Psiloritis UGGp in Greece; e. Memorial statue for the 1927 earthquake in Kinosaki area of San'In Kaigan UGGp in Japan; f. The Ohnokoba primary school destroyed in 1991 by pyroclastic flows of Unzen volcano, now preserved as statue in Unzen UGGp in Japan.*

5.1. Safety

Based on the replies of the 81 UGGps to the UNESCO's questionnaire (Dierickx *et al.*, 2016) and their annual activity reports many UGGps appear to be very active in achieving the "Shimabara Declaration" goals and developing a more resilient community on their territory. UGGps contribute to enhanced prevention and preparedness by ensuring the safety, security and the protection of their staff, visitors and also established infrastructure.

For example, several Japan UGGps cooperate on the operation of Early Warning Systems for earthquakes, volcanic eruptions and tsunamis that have been established. The Aso UGGp in Japan is hosting a 24 hour monitoring system for Nakadake crater measuring fluctuation, tectonic movements, heat, etc. Similarly, in Europe the El Hiero UGGp is also operating a 24 hour monitoring system of volcanic activity through a geophysical and geochemistry network.

In China more and more UGGps are installing centralized monitoring systems of visitor's flow, which enables a more accurate analysis of the exposure to different geohazards. Fangshan UGGp established a monitoring system of visitors' traffic and flooding risk in certain geosites and spot areas and has constructed shelters and escape routes in several cases (Figure 5b). Ningde and Yandangshan UGGp installed about 180 and 90 electronic surveillance detectors to control and protect the key geoheritage sites, roads, tourist centers, squares, and risk prone areas in the UGGp. Shilin UGGp created a Data Management Center which is responsible for daily monitoring the park through a quick-bird video monitoring system, whereas the Wudalianchi UGGp is operating since 1988 the Earthquake and Volcano Monitoring Center.

Some UGGps have already conducted risk analyses for their geosites and infrastructure and have moreover undertaken and engaged in their Action and Management plans to undertake measures to secure visitors' safety, infrastructure armor and staff capacity to act in case of an emergency. Examples of these are the Katla's UGGp Risk Assessment for Geosites or the Unzen Action Plan for volcanic danger. Similarly, Evacuation Plans have been prepared in few cases (Lesvos Museum for Petrified Forest; Funiushan and Muroto UGGps' Annual Prevention and Mitigation plans; Sierra Norte, Andalusia Emergency Plan for Flooding, etc.). Psiloritis UGGp in Greece participated through its partner the Natural History Museum of Crete (NHMC) in a European project titled "PATCH" that created guidelines and tools to contact Emergency Plans for museums and the cultural heritage in

case of a disaster, available in several languages at project's website (http://www.montesca.it/patch/index.asp).

5.2. Education and Training

The majority (56 out of 81 responses) of UGGps implement training and educational activities on a constant and annual basis. Examples of these are training staff on risk occurring in the UGGps, on the preparedness and response measures, as well as on the implementation of the existing Emergency and Evacuation plans, providing them with skills and capacities to support visitors needs in case of an emergency. For these purposes, UGGps are collaborating with experts, university and local Civil Protection authorities.

The main target group are however the visitors and the general public and for them a great variety of activities and initiatives are provided. Special Museum Exhibitions focused on geohazards and associated disasters have been created in many UGGps. This is the case for Lesvos Petrified Forest Museum, the Natural History Museum of Crete in Greece, the Wudalianchi Science Hall in China, the Aso Volcano Museum, the exhibition for earthquakes and volcanoes in the Fossa Magna Museum of Itoigawa UGGp and Mt. Unzen Disaster Memorial Hall (Volcano Museum) in Japan. In addition, under various occasions other UGGps develop or participate in temporary exhibitions like the "Seismotour" that was hosted in Luberon and Haute Provence UGGp in the memory of the 1909 France earthquake.

Special installations and displays do exist in several UGGps to demonstrate to their visitors simulations of natural phenomena. Lesvos Petrified Forest Museum and Natural History Museum of Crete in Greece host modern earthquake simulators that can perform real earthquakes and provide information on the preparedness and prevention measures (Figure 5c). Seismographs are installed in several museums and exhibitions, some connected also to national monitoring networks like in Japan and Greece, and others for educational purposes (Figure 5d). Marble Arch Caves UGGp in Ireland as well as the partner of Psiloritis UGGp (NHMC) display educational seismographs that can record global earthquakes providing their data to the global seismological community through the IRIS's (Incorporated Research Institutions for Seismology) "Seismographs in Schools" project (http://www.iris.edu/hq/ssn/events).

Many UGGps develop and implement educational activities for their visitors and inhabitants, as well as specialized programs targeted at schools,

families, and disabled people. These activities are undertaken at museums, visitors' and educational centers and at special georoutes or geosites and can be found at UGGp's webpages. Apuan Alps UGGp, twenty years after the 1996 catastrophic flood, launched the "Rains & Ruins" project as a best practice to warn the local communities about the natural hazards and risks of the future using the memory of past disasters. The project, which is still in progress, included an educational exhibition hosted at the Geopark Visitor Centre in Seravezza, together with the related catalogue printed in 2017 (Bartelletti *et al.*, 2017; Figure 6a). Several lessons at primary and secondary schools have been performed to share as much as possible the teaching of how past disasters boost scientific and community cooperation to prevent such events in the future. Furthermore, collateral photographic exhibitions and movies on the flood memory have been set up in the "red zone" of the 1996 flood. Sesia val Grande UGGp develop educational initiatives devoted to extreme alpine environment, snow and avalanches at the "Istituto Angelo Mosso", an alpine Science Center at 2900 m asl in the Western Alps. The interpretation center is also an active scientific laboratory for monitoring the alpine environment and global changes within the international L-TER network (https://lternet.edu/).

Muroto and Unzen UGGps in Japan organize summer schools focusing on natural hazards in partnership with Universities and local institutions, whereas Aso UGGp is holding annual workshops for knowledge sharing on volcanoes addressed to the broader public. Initiatives that adapt the "Shimabara declaration" goals to encompass existing knowledge of local people in story telling experiences have been developed in Itoigawa UGGp of Japan. There locals are engaged in the interpretation of many of the geosites within the UGGp stricken by disasters and their influence on people's lives during geotours and other educational activities; the same approach is also used at Muroto UGGp. Furthermore, Toya-Usu Volcano UGGp trains and certifies local residents as "Volcano Meister" who are expected to work as educators, local leaders for disaster mitigation and also tour guides. They also organize educational program as well as tours that show the characteristics of the volcano.

In 2011, three European UGGps, the Psiloritis through NHMC, the Lesvos and the Haute Provence, implemented with other European territories a project titled "RACCE: Raising earthquake awareness and coping with children's emotions", funded by the European Civil Protection financial instrument. The project resulted in various outcomes like exhibitions, training activities and the creation of several educational and dissemination tools in five languages (Figure 6b). The products are addressed to children aged 5-13,

as well as to teachers and families and can be downloaded free from project's website (http://racce.nhmc.uoc.gr). The RACCE project was promoted by the EU through its presentation at the Civil Protection Forums of 2012 and 2014, was also presented at the Kinosaki 2013 International Academic Conference for "Natural Disaster and Regional Resources in Geoparks" held in San'In Kaigan UGGp (Fassoulas, 2013), whereas parts of the Educational material is also hosted at the Prevention-web platform of UNISDR.

Another project funded by the EU Civil Protection instrument related to UGGps is the EVANDE (http://www.evande.eu), which focused on e-training of volunteers and Civil Protection operators. The project is still under implementation by two European UGGps, Psiloritis and Beigua, and the active engagement of all European UGGps is foreseen during the training and dissemination activities (Fassoulas and Burlando, 2015) in order to establish local networks of experienced volunteers.

Many UGGps, especially in Japan, are preserving past disaster remnants and land effects as memorials to the people affected and use them for educational and awareness raising activities, trips and educational projects. In San'In Kaigan UGGp several memorial statutes and stone monuments occur in many areas that have been devastated by the 1927 earthquake, like in Kinosaki and nearby villages (Figure 5e). The same stands also in Unzen UGGp for the two catastrophes of 1791 in Shimabara and 1991 in Unzen (Figure 5f; Nakada, 2014). In China the Sichuan 2008 great earthquake was the reason for the creation of the Qingchuan Earthquake Relic National Geopark where fault traces, ruptures and other structures related to the generation and the impact of the earthquake are preserved and used for geoeducation (Wang and Tian, 2013).

UGGps often take the opportunity to benefit from global campaigns to promote further their activities on natural risk mitigation. The International Day for Disaster Reduction (IDDR) celebrated by UN on the 13th of October is a good chance for a large number of UGGps to organize activities for raising awareness on natural hazards and better inform people (Figure 6c-f.). Similarly, the majority of Chinese UGGps take benefit of the International Earth Day celebration (April 22) and of the Safety Awareness Month (June). Finally, various drills are performed in most UGGps due to national regulations related to evacuation plan implementation for earthquakes, fires, flooding etc.

The vast majority of UGGps have produced several kinds of publications, posters, booklets and info panels explaining the natural disaster risk and associated geohazards of their territories. Hazard maps, evacuation plans, shelters and accumulation areas are also printed and shared to all locals and

visitors of the UGGps. Ultimately, all UGGps support and enhance scientific research activities in their territories or even participate directly in research projects to identify, analyze and assess the natural disaster risk they are facing, like the participation of Lesvos Petrified Forest in several projects related to earthquake risk.

Figure 6 - *a. Rain and Ruins, an educational project for landslides and floods by Alpi Apuan UGGp in Italy; b. The Museum Kit of RACCE project travelling to Santorini volcano by Psiloritis UGGp in Greece; c. Implementing training activities at schools during IDDR on 13 October 2017 at Lesvos UGGp Greece; d. Public talk on risk mitigation during the celebration of 13th October at Azores UGGp in Portugal; e. Training activities at Cilento Vallo di Diano and Alburni UGGp in Italy in collaboration with Prof. S. Nakata from Japan Geoparks Network; f. Presentation of school projects for the celebration of IDDR on 13 October 2018 at Psiloritis UGGp in Greece.*

5.3. Networking and Collaboration

Initially there are only 13 UGGps that declared their cooperation with other Geoparks or UNESCO affiliated sites on natural hazard prevention and mitigation. Following the comments that were provided, it appeared that 28 UGGps would like to share their practices on natural hazard prevention with the Global Geoparks Network. Other 59 site managers from UGGps have confirmed their interest to be trained or organize a workshop at their UGGps on the thematic of natural hazard prevention and mitigation.

In many European and Japanese UGGps the managing authorities are closely collaborating with local, regional and state Civil Protection authorities to develop hazard maps, evacuation plans and drills, organize seminars and training activities and to produce various publications. Furthermore, Japanese UGGps are engaged in the development of national and local, early warning systems for tsunamis and volcanic eruptions and are part of the alerting mechanism in their territories. In addition, many UGGps have installed in collaboration with local authorities signs, marks and guiding directions in case of a tsunami. Similarly, in Europe different UGGps are participating in regional and national emergency and evacuation drills, as well as the adaptation and application of regional Civil Protection Plans.

In 2016 the GGN decided to create a special working group that will be focused in risk mitigation mainly against nature induced disasters. The GEOHAZARDS group was founded in 2017 to design, coordinate, implement and monitor activities related to risk assessments, raising awareness, training and capacity building, as well as collaboration against nature and climate change induced disasters. In EGN a similar working group was also established to coordinate activities at regional level, and APGN is planning to set a similar working group too. The working group developed in 2018 a 4-years action plan that is currently under implementation, organized two thematic sessions during the 2017 and 2018 International UGGp Conferences at Azores and Adamello-Brenta UGGps respectively, as well as coordinated the celebration of the IDDR on 13th October 2017 with the participation of the vast majority of UGGps (Figure 6 c-f.).

The “Shimabara Declaration” has created the obligation to all UGGps to collaborate and work on a global scale to mitigate the disaster risks of natural hazards under common activities and collaborations with international organization such UNESCO’s Section on Earth Sciences and Geo-Hazards Risk Reduction, as well as the tools of UNISDR. At present, the Section has revised the questionnaire for the survey on Natural Hazards in UNESCO

designated sites, asking managers of these sites to participate in the common action.

6. Conclusions

The Global community was shocked by the devastating destructions that came as a result of the 2004 Sumatra as well as the 2011 Tohoku earthquakes and subsequent tsunamis in the Asia-Pacific region. The effects of these catastrophes were so extensive and universal that forced all engaged parties in Civil Protection and Risk Reduction to intensify their efforts and contributed along with other initiatives, to the formulation of the Sendai Framework of Action. The impact of these disasters was exaggerated due to oblivion on such hazards, the lack of knowledge and the improper preparedness.

UNESCO Global Geoparks use existing scientific and indigenous knowledge to develop educational products and training activities, to produce publications and dissemination tools, to develop common projects and to organize events and workshops to raise awareness and sensitize their inhabitants for natural risks. The more vulnerable of those appear to be better prepared, more organized and more active in minimizing the disaster effects. They have strengthened and armored their infrastructures and facilities, secured their visiting areas and services, are continuously monitoring and evaluating risks, and are simultaneously offering and promoting awareness and educative activities.

Nevertheless, UGGps are initiatives benefiting from their extraordinary geological heritage including structures and remnants of geological processes of the past and very recent, that can be considered as memorials of disasters. Having at the core of their existence the conservation of natural heritage and the education of public, UGGps could be key players in achieving the aims of the Sendai Framework for Disaster Risk Reduction. The geological memories dating back to 4.6 billion years of earth's history are the capital of UGGps to exploit and utilize for the mitigation of disaster risks and for promoting the development of better and resilient communities. The latter statement is very clearly demonstrated by the moto of EGN "4.6 billion years of Earth history to serve our future".

The "Shimabara Declaration" has set the basic concept and framework for the active participation of UGGps into the global effort for Disaster Risk Reduction. Human capital of local and indigenous people that offer long-lasting experience dealing with disasters can be further incorporated in

educational activities for younger generations, decision makers and planners. It can also be used for developing training seminars for staff and visitors and could be part of geotouristic products like geotours, story-telling, and site interpretation. Modern technology offers many tools for monitoring hazards and provides early warning services alerting or alarming in case of an emergency. Adaptation or use of these tools in risky areas can increase further visitors' and staff's safety and support local authorities and communities in implementation of Civil Protection Plans.

A topic of ultimate importance for intervention in UGGps could be Climate Change impacts that can affect all geoparks regardless their nature, location or geological origin (O'Brien, 2006). Hydro-meteorological hazards are expected to intensify their impact in the future in every corner of our planet, with coastal areas to be more vulnerable due to the expected global sea level raise. UGGps are ideal institutions that are well positioned to increase preparedness and adaptation of citizens by appropriate training and educative activities, exhibitions and displays at their visitors and info centers, as well as awareness raising campaigns.

The most challenging and promising topics however are networking and collaboration among the increasing community of UGGps. Many territories carry a huge amount of knowledge, practices and experiences that can be exchanged with each other. Based on this capital, UGGps can develop further common activities, projects and synergies to support local communities in getting more prepared for the forthcoming hazards, in coping with the expected impacts and in becoming more resilient and able to recover soon and on the best way from a disaster. This is now formulated by the establishment of the GEOHAZARDs working group and the implementation of a 4 years Action Plan by all UGGps. In addition, as UGGps receive a great number of children and schools, they can play a crucial role in building a resilient consciousness and environmentally friendly attitudes for the future generations that could ensure a safer planet and wiser use of natural resources.

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11. Information instead of fatalism: a proposal of a strategy to inform on disasters

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Abstract

During the summer-fall of 2017 numerous disasters occurred. This period stood out for concentrating a large number of tragic episodes such as hurricanes Harvey, Irma and José, the earthquake in Mexico City or the major fires in Spain or California. Each time most of mainstream mass media regularly repeated the popular linguistic formulae that refer to these phenomena as "natural disasters". However, even if it is usual to find this formula, the adjective "natural" is far from correct in regard to a series of motivations this work tries to lie on the table. All this in order to clarify and simplify the terminology to be used for the information from generalist mass media.

The main objectives are related to understand that employing the term disaster means to talk about risk and to realise that the real conditions that favor the occurrence of a catastrophe are not "natural", but "human". Another key point is to keep digging for the concept of risk, so that it can be understood both in probabilistic terms and as a social construction. The last goal refers to the need to prevent fatalist behaviors and to focus on lowering vulnerabilities and fostering people's inherent capacities.

Keywords: mass-media, hazards, vulnerability, information, disaster

1. Introduction

The term *natural disaster* is often used as a colloquial formulae to refer to the occurrence of an earthquake, a tsunami, a hurricane, flood or fire (Sánchez *et al.*, 2014). To the term "disaster", then, it is commonly added

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et al., 2014). To the term “disaster”, then, it is commonly added the adjective "natural" to emphasize the type of threat associated to the development of the catastrophe, as if it were intrinsic to nature itself. This is done repeating the linguistic formulas that are popularly spread, without correctly knowing the whole and true meaning of the term.

That is why we wonder in this paper, what a disaster is and why it would not be right to talk about ‘Natural disasters’.

2. Disaster, risk and threat

Although the abundance of terms about these concepts becomes overwhelming, there must be a place for a series of basic principles to understand the complicated relationship between environment and the human being. Firstly, it should be noted that this relationship is not symmetric, as environment has not the ability and consciousness to react as it does not think, unlike human beings. Thus, understanding that environment comprises different natural processes in different scales becomes crucial to figure out how the human behavior takes the so-called ‘disasters’ as positive or negative experiences.

Taking into account the definition of the United Nations Office for the Reduction of Disaster Risk (UNISDR, 2009), a disaster would be *an interruption in the operation of a society that causes human losses and material, economic and social impacts that exceed the capacity of the affected society to deal with the situation by means of the use of their own resources.* In other words, a disturbance that affects the normal functioning of the society, which in many cases is attributed to environmental reasons.

As Colombian specialists Gustavo Wilches-Chaux (1989) and Omar Darío Cardona (1993) indicate, the caused changes, which tend to occur suddenly, develop transformations that are difficult to deal with, due to the lack of flexibility or adaptability of the affected social system. In the same terms, the concept of disaster is also defined as the materialization of risk in a certain space where people and goods are in danger. So, the concept of risk arises as a crucial term when defining what a disaster is and therefore, why it is not natural (Cardona, 1993).

The aforementioned UNISDR also points to the meaning of risk as the combination of the frequency of the occurrence of a negative event for the human being with its negative consequences in regard of lives, health, means of sustenance, goods and services, and how this negative effects could happen in a particular society. Regarding that matter, speaking of frequency is not trivial, as it indicates the repetition of the occurrence of a phenomenon that

involves danger. Therefore, knowing where frequency of negative events is higher and how this affects places where more people are in danger due to potential hazards, allows for arguing in favour of anthropogenic responsibility; thus, from this perspective, speaking of Natural disasters would not be correct.

Going further and indicating not only to disasters but to their triggering factors, a new concept emerges that also takes part of the meaning of risk: the threat. Threat can be defined as a phenomenon, substance, human activity or dangerous condition that can cause death, injury or other damage or impacts to health, property, economy or the environment, among others. It was considered until recent times as the physical-natural element that triggered the disaster. For Cardona (1993), the concept still shows a technocratic approach to the knowledge of threats, without paying attention to the fact that, in many cases, the real conditions that favor occurrence of catastrophes are not natural elements.

We are talking then about the physical and social vulnerability, that is, all those characteristics and circumstances of a system that make it susceptible to the harmful effects of a threat.

As an example, when a building located in the alluvial plain of a river is damaged due to a flood, the real condition of the disaster is not the flood itself, but the exposure of the house to such phenomenon. When a landslide occurs on a destabilized hillside where a slum is located, although the trigger can be an intense precipitation, the real cause is the precariousness of the settlement and its associated social vulnerability. Such a social vulnerability, in addition, is also translated into the lack of economic resources and its subsequent marginalization; moreover, it is totally influenced by the implementation of hypothetical political solutions that starts funding a correct risk management (UNISDR, 2009).

In spite of all the aforementioned aspects, it is equally important to point out that these conditions can be reduced when facing a disaster, as having a threat generates knowledge and awareness of anticipation. Therefore mitigating becomes very possible to avoid damages before the catastrophe as well as offering solutions.

For instance, Harvey and Irma Hurricanes have caused disasters in the Caribbean, but as this region is often affected by such phenomena, they are not extraordinary for populations. Then, in regard to the learning and adaptation, their occurrence has allowed the implementation of large measures of evacuation, mainly in Cuba and Florida. On the other hand, in poorer countries like Antigua-Barbuda or Haiti, the lack of resources for the implementation of evacuation measures did not permit to alleviate the damages.

3. Disasters are not natural

According to geographer Allan Lavell (2005), giving an accurate and correct definition of the term disaster goes beyond its own semantic approach, as it constitutes a key point for providing an appropriate background. For this reason, the first step towards a correct conceptualization evolves into the affirmation that disasters are an eminently social fact.

In 1993 the Social Studies Network on Disaster Prevention in Latin America (La Red) published the report 'Disasters are not natural', in which it was argued that in order to manage a possible catastrophe it was necessary to disprove a series of misinterpretations, such as thinking that disasters are a consequence of uncontrollable natural, or even supernatural forces.

As the main approach to the term disaster continues considering them as extraordinary phenomena away from any relationship between human being and nature, this attitude fosters fatalistic visions that lead to resignation, conformism and immobility. Just as the concept of risk is a social construction, a disaster is considered only when it impacts on a territory with a vulnerable social structure, generating negative repercussions in economic and environmental terms, at the same time. Therefore, if there are not such effects, it would be an event that is just part of the natural processes and cycles (for example, a hurricane in the middle of the ocean or a snow avalanche on uninhabited areas). That is why a disaster can not be defined Natural. So what happens then?

The awareness of anticipation and the flexibility of the society when facing a disaster are crucial factors to take into account when overcoming the damage generated by a catastrophe. To that effect, social resilience should be indicated as an opportunity to achieve risk reduction and community development. Indeed, the aforementioned UNISDR defines social resilience as the capacity to resist, absorb, adapt and recover from the exposition of a threat in a timely and effective manner.

Researchers like Wilson (2012) and Manyena (2014) go a little further, as they point out that resilience not only can be a simple reactive capacity of the population, but also a possible adaptation that involves constant learning of processes and responsibilities. Such an adaptation is given by means of synergies that keep society alert before disasters, planning all the necessary measures to mitigate their damages, before, during and after they happen.

On the other hand, Cardona explains that there are cultural features regarding the development level and organization that influence individual and collective perception of risk, favouring or impeding its prevention and mitigation. In similar terms, the human being tends to see risk only through

its materialization in disaster, showing a great limitation that can be overcome with education programs on risk prevention. For all these reasons, we must not forget that, beyond the probability that a specific threat arises in a system with a certain degree of vulnerability, risk is a social construction.

In addition, also the emotional facets have to be taken into account as they are necessary dimensions for integral comprehensive understanding of the territory. This is essential for understanding that natural processes, however intense they are, are not a threat per se. Indeed the real concept of a natural threat acquires meaning only when it is linked to a vulnerable and exposed community.

Therefore, it is necessary to widen the purely technocratic and physical approaches to the term "disaster" supplementing them with more in-depth studies on vulnerabilities, capabilities and opportunities of a community or a territory. To reach this point, the contribution of the social sciences becomes essential to understand that if a disaster happens it does not have a natural background, but if it were, then it would not be a disaster.

4. A glimpse of news

The mass media, together with social and cultural learnings and other communication processes, have a strong influence on risk perception. Indeed, risk perception is more shaped by communication than by the personal experiences of individuals (Renn, 2008). As Wachinger *et al.* (2013) point, developing a sense of trust in experts and authorities becomes also key to defining risk perception, so new ways of communication about adverse phenomenon are needed in order to promote a change in the perception of natural hazards, especially if such a change could stop the evaluation of natural events as the main cause of disasters.

As an example, since 1st of December 2017, the Spanish national weather agency known as Agencia Estatal de Meteorología (AEMET), together with MétéoFrance (France) and IMPA (Portugal) meteorological agencies, are naming the deepest depressions that can produce strong winds, intense precipitations and adverse coastal phenomena. Since then, several named depressions, that have received a wide and alarmist media coverage, have hit different areas of these three countries.

The initiative of naming atmospheric depressions is not new; the hurricanes that hit America every year have been given names for centuries (at the beginning, they were associated with the calendar of saints' days), and the Free University of Berlin has been baptising middle latitude depressions

and high pressure areas for ages. Nevertheless, it has been an initiative going on since 2015 in the United Kingdom and Ireland which has created a bigger interest. It has been proved that when citizens receive more detailed information about a low pressure area or about any type of recommendations, they pay more attention to the hazard, achieving a better identification of the phenomenon, then a more effective risk communication happens (AEMET, 2017). Moreover, it should be pointed out that considering the objective of giving less importance to hazards because of an excessive alarmism by the mass media, the three weather agencies decided naming just those depressions that have a bigger potential to cause harm on people and their goods.

Nevertheless, agencies not always agree about the perception of risk after naming atmospheric depressions. Caribbean Hurricanes like Leslie, which have recently hit Portugal, can also reach this part of Europe every once in a while, and it seems that an even warmer Atlantic Ocean will foster the arrival of more Hurricanes in the next years (New Scientist, 2017). This situation adds new variables to the risk equation which need to be properly communicated, but this has not been the case in Spain, where some media have overwhelmed citizens with incorrect and sometimes exaggerated information. In addition, the Spanish and Portuguese weather agencies where not well coordinated; while Portugal activated the red alert for the northern part of the country (La Vanguardia, 2018), which shares borders with the Spanish region of Galicia, Spanish AEMET agency did not do the same for Galicia, thus showing the importance of good coordination between these important risk communicators.

Said that, it is interesting to underline again that people pay a bigger attention to a hazard when they can actually identify it in a more direct way, in this case through a human name; that is, when it is understood that what causes harm has human features.

Another similar example regarding the responsibility of the media on risk perception has happened in the Great Rift Valley. In this area due to heavy rainfalls, sediments were removed leaving uncovered one of the faults. Last April 2018, the mass media talked about the development of a crack (so defined by the media) in the Great Rift Valley. The “enormous crack” was up to 15 meters deep in some places, 20 meters across and various kilometers long, especially around the Narok region in Kenya (El Periódico, 2018). Together with the publication of news about this phenomenon, it stands out the big amount of headlines about the “crack”, the photographic reports and the number of headlines that are referred to the progressive opening of the

rifting process in Eastern Africa. Equally, it has been pointed out that probably the fault could have been uncovered when part of the lightest materials that filled it where washed up by the last floods in Kenya.

This way, it has been analyzed how the mass media distort the geological time by accelerating it when it does not fit the human scale. Moreover, the news expounded on the phenomenon by mentioning the "separation of Africa" as an imminent and astounding process, with the only purpose of attracting readers/followers to the headlines. Thus, it can be worked out that the market laws do not just influence the decision making about risk perception, they also introduce noise in the information campaigns. Because of that, and in our opinion, the media must complement the official information through good journalistic practices that contribute to clarify the general information and to reinforce trustable local knowledge.

Regarding the last point, it is also important to note that sometimes taking the necessary measures like evacuating a city are not the best answer for an emergency. When Hurricane Harvey was about to hit Houston, local and county officials decided not to follow the recommendations for massive evacuations coming from the Texas Governor. In order to avoid a bigger catastrophe originated by putting 2.3 million people on the road just a few hours before the Hurricane's arrival, they decided the best option for the residents was to shelter and stay in place, appealing to the local experience and knowledge by posting tweets like "Local leaders know best". Though quite polemic, the disaster management was successful in terms of reduction of personal damages (The Washington Post, 2017).

Another important factor is the expected hurricane risk in relation to the capacity of meteorological forecast about their strength and trajectory. In regard to this point, Florence, the first big storm of the current hurricane season in the Atlantic Ocean, was expected to be much stronger than what it really was. After reaching Category 4 in the beginning of September, Governors of North Carolina, South Carolina, Virginia, Maryland and Washington D.C. declared the state of emergency due to an imminent impact. Besides, mandatory evacuation orders were given around September 10 for the coastal communities in the Carolinas and Virginia. Apart from that, media coverage on Florence arrival was widespread, even in inappropriate and unethical manners by means of the exaggeration of its strength by a reporter of *The Weather Channel* (The Telegraph, 2018). Finally, Florence weakened and hit North Carolina on September 14 as a Category 1 hurricane, getting everyone's attention. This fact made thousands of residents decide to stay put

ignoring the mandatory evacuation. After all, many people regretted that decision when the storm flooded several rivers and their banks (The Washington Post, 2018). This matter shows how people think about lower hurricane Categories as an acceptable risk, when in fact they are exposing their lives to an unexpected threat as communication and warnings were not clear at all.

On the other hand, hurricane Michael generated a smaller risk expectation as it hit Florida, where hurricanes are more usual. Moreover, there was a sense of exhaustion and devastation after all the confusion regarding threat and Category about Florence. This helped to generate an apparently smaller sense of risk before a Category 4 hurricane that hit the northern territories of the Florida peninsula leaving at least 45 people killed around its trajectory (USA Today, 2018).

From a closer point of view, the storm sequence that affected the Eastern parts of Majorca island (Spain), and activated the local ravines that flooded Sant Llorenç des Cardassar has also been controversial. The death of 12 people because of the flood has reopened the discussion between the reliability of the forecast of a very local phenomenon and the lack of urban planning related to flood risk. Even so, data shows that the volume of flow was much bigger than expected for return periods of 100 and 500 years in a town that has coexisted with ravines from the 16th Century. Thus, the problem might not be the lack of urban planning, but the lack of a coordinated early warning system with a clear protocol designed for citizens, which contains the precise instructions about what to do during similar situations (El País, 2018).

5. Informative strategies

Just like Major and Atwood (2004) point out, the media have become the main general information source in terms of risk perception. This aspect is fundamental in order to understand the risk perception and the risk itself depending on the level of importance given by the media (Critcher, 2006). Such level of importance affects the cognitive aspects that help valuing the issues from a personal point of view. This means the humanization and the rise of a certain risk, and thus, the perception of that risk as a human answer. This feature is crucial in order to face complex risks that are not directly perceived or that have long term effects. Thus, the media have a very relevant role when it is necessary to complement the official information (Williams,

et al., 2012).

5.1. The attitude facing information

According to Sánchez *et al.* (2014), the journalistic information about disasters should not be alarmist. Anyway, the relation between distinguishing data related to unstable natural phenomena and the emotional answer that is produced when visualizing it has always been complex. In fact, it has generally been easier to find 'catastrophism' from a selfish and exaggerated perspective in relation to any hint of reality shown in a picture of a flooded city, even though the idea of a single transmission of information about disasters generating alarmism seems to be predominant (Lozano, 2009).

Either because of the attraction of pictures or generally because they have a bigger media coverage, it seems that the information about disasters awakens a bigger interest amongst the ones that deal with this kind of information. But it should be taken into account that this does not mean that the receivers correctly process the information for the creation of knowledge that can be shared. Indeed, the frequent exhibition of such pictures more probably could stop surprising the receivers. That is to say, the real possibilities of attending risks decrease due to their indifferent answer to the media saturation (Sánchez *et al.*, 2014).

For this, we should talk about the responsible role played by the media, as they foster upsetting viewpoints among the population. Actually, we are used to receiving big amounts of information related to plenty of unstable situations that may collapse our cognitive capacities, and this do not let us to process all the data in a correct way (Anderson and Woodrow, 1989).

It should also be indicated that this general confusion cannot be overcome only if people understand what is going on with abnormal phenomena, as this problem also affects to the ones that prepare and send information (journalists, news readers, editors), when they narrate what has happened in order to try to approach (rather than explain) the big public (Wilson, 2008).

On the other hand, the effect the news has on risk perception should be considered too, as in the majority of cases they just show the critical points of a disasters. This is due to the fact that the news tends to refer exclusively to the phenomena that break the human events and they focus uniquely on some of their main characteristics like latest news, novelty, truthfulness, regularity

and journalistic interest (Fontcuberta, 2003). On the contrary the generative processes of a natural phenomenon are much more complex and longer (Lozano *et al.*, 2012).

But equally, from the reporter's point of view, it must be pointed out that the less there are information about a disaster, the more there is an increasing of the journalistic interest, so that any kind of data is hot news and any sign or evidence becomes a headline. Nevertheless, once there are more complete, contrasted and reliable information as time goes by, the catastrophe starts losing interest as hot news and it will not be part of the front pages or headlines, being thus published in much less highlighted places (Sánchez *et al.*, 2014).

5.2. Towards an informative proposal

The previously indicated aspects also need a natural contextualization at present. Today, risk perception is bigger than in the past, not just because we can access to more information than before, as the media connection level is much higher, but because present societies happen to be more fragile. Then, in order to reduce such a general fragility and to reach an agreement about the information under a market regime, we propose a series of points that we believe are fundamental for the development of information about natural phenomena.

The first goal is related to emphasize that employing the term Disaster means to talk about risk. Risk is defined according to UNISDR and involves a conjugation of threats, mostly considered as the physical-natural elements that trigger the disasters, and physical and social vulnerabilities, explained as the inherent characteristics of a system that make it susceptible to receiving damage. Therefore, although it is true that these factors are designated as a dangerous condition that can cause various losses, it could be indicated that the real conditions that favor the occurrence of a catastrophe are not natural, but human. To achieve this point, mass media not only might be truthful, but also responsible of offering information in a simple way by means of communication processes. According to communication theory (McQuail, 1985), the abstract representation of risk, the information about a case, and the social construction of real events must be linked to provide an accurate and trustable source of knowledge about an specific event. In a previous study Blanchard-Boehm (1993) pointed to the validity of different and simultaneous communication strategies based in printed media. Here a

synthetic and accurate approach to inform from official sources was the most reliable way to make people understand about the importance of a warning.

Regarding the second goal, the integration of the probabilistic terms of the concept of hazard is also proposed. To achieve this, a complete understanding of the spatial and temporal frequency of the occurrence of a threat, as well as the degree of exposure and vulnerability of a community are paired. Therefore, the positivist integration of the concept from a global perspective requires that, in addition to a probability, risk must be understood as a social construction whose materialization results in disasters. This fact implies that those who receive all the information might be in good disposition to know, understand facts and share knowledge regarding natural threats. This is useful for explaining all the precedent points before reaching the disaster, in order to remodel the current social construction about natural threats. In relation to this point, and apart from the official information provided by the authorities, a further layer of information can be provided by citizens using social media as a network to gather valuable data about the development of an event in real time. As Fraustino *et al.* (2012) and Williams *et al.*, (2012) point, this fact becomes significant for people, as it can contribute to raise awareness of natural hazards by means of collaborative real-time learning about processes involved in a specific risk. Moreover this information can also be shared to scientists and authorities to develop further knowledge.

Lastly, it is necessary to understand that fatalist behaviors derived from a total separation between nature and human beings must be avoided. At the same time, assuming that the risk is a social construction contributes to abandon the idea of considering the risk as nothing else but a materialization in disasters. This aspect happens to be fundamental when focusing on vulnerabilities, and on how the communities that suffer from such vulnerabilities count on inherent capacities which can make them resilient. The impartial achievement of this goal is crucial as it becomes a key point for distinguishing information from opinion, as opinion from the mass media side is the basis of many fatalist behaviours.

6. Conclusions

This paper has tried to show how important and necessary it is to leave behind the colloquial formulas that refer to catastrophes as natural disasters. Indeed using the adjective “natural” emphasizes the type of threat people have faced at a certain moment, but it omits the real and long-term circumstances

that trigger the disaster. For these reasons, this work has partly focused on the definition of disasters and all the concepts that shape it, as well as the reasons why it is not right to talk about Natural disasters, which is completely related to the definition of the terms themselves.

When talking about disasters, the media and most of the receivers compare disasters with hazards, which are the phenomena that can cause harm to a society and their goods and that can actually have a natural origin. Nevertheless, this definition does not refer to the real meaning of a disaster, so that is why it is necessary to expand the definition.

Indeed, a risky natural phenomenon will just become a disaster with the presence of a society that is characterized by different vulnerabilities and by a lack of flexibility and adaptability that are necessary to become a resilient society. Social, economical, educational or physical vulnerabilities, as well as social capabilities like education, knowledge transmission, learning from direct or indirect experiences or the creation of strong social bonds are all inherent conditions that can ease the way a population faces a disaster. Anyways, the definitions of hazards, vulnerabilities, social resilience make it clear that risk is a social construction, and as the materialization of risks, namely the disasters, cannot therefore be natural.

Even though disasters should not be treated like extraordinary and dreadful phenomena, the media tend to talk about them in a very catastrophic way. Considering the big influence that the media can have on people's risk perception, efforts should be made in order to prevent alarmist news. These latter, indeed, can foster two types of undesirable human behaviors towards risks and consequent disasters: firstly, the most fatalistic visions that come from a total separation between human beings and nature can lead to resignation, conformism and immobility; secondly, the saturation of alarmist hot news can even provoke a loose of interest among people, thus lowering their risk perception and making them more vulnerable.

In order to guide the generalist mass media in terms of clarifying and simplifying the disaster terminology that should be used, this paper has proposed a series of goals. The most important ones refer 1) to the need to address the human origin of the real conditions that trigger a disaster; 2) to understand the concept of risk as a social construction, and 3) to prevent the fatalist attitudes that generate counter-productive behaviors.

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12. Re-assessing the role of communication in the aftermath of a disaster: case studies and lesson learned

Andrea Cerase[1]

Abstract

The scope of the chapter is to provide an interpretive hypothesis on the different functions of different media in the aftermath of a disaster, drawing upon theoretical and empirical literature and case-studies in the light of Uses and Gratification perspective. Moving from the way people engage with media and interpersonal source, the chapter addresses disaster communication in the light of both collective needs and its related social functions, considering how people actually interact with communication to cope with disasters.

A better understanding of the ways situational constraint, individual motivations, consumption patterns and communication cycles are arranged may improve our understanding of the whole disaster communication process, thus being very helpful to ground effective communication strategies, and to better understand the possible consequences of poor message shaping or use of wrong choices of channels.

The paper will also discuss complementary roles of broadcast media, interactive digital environments and interpersonal channels to inform public discourse on disaster, improving preparedness measures, giving voice to exposed communities and informing both individual and collective decision, as well as mobilizing human and collective resources to foster return to normalcy.

Keywords: Disaster communication, Media functions in disaster, Uses and gratification, Communication theory.

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1. Social functions of communication: a theoretical foundation

1.1. From structural functionalism to use and gratifications

A large body of studies on emergency / disaster communication is based on a source-oriented perspective, that looks at the whole disaster communication process in terms of actions, duties and responsibilities of who is charged on handling communication (sources), basically aimed at improving message circulation and its effectiveness on people's behaviours and attitudes, thus privileging a clear-cut fix-the-problem orientation (among others: Seeger, 2008; Heath and O'Hair, 2010; Lundgren and McMakin, 2011; Sellnow and Seeger, 2013; Lindell, 2018).

This chapter is intended to overturn the perspective, by considering the way both people and communities turn to communication (and media) to cope with disasters, to better understand what happens downstream messages, with a closer look to uses, functions and gratifications that motivate people to get and release information and to be engaged in disaster communication.

The key assumption about media role and functions in disasters derives from the assumption that "societies are more than the sum of their constituent individuals" (Durkheim, 1984). He was the first to realize that social disrupt is a fundamental feature of modern industrial societies, stemming from a chronic state of widespread lack of socially valued goals (anomie). Moving from the idea that social system has a paramount importance with respect to the individual, and tends to a state of equilibrium, resulting from an effective interaction between sub-systems (e.g. political institutions, law administration, economy, political parties and trade unions, social movements and so on), structural-functionalist theory was developed by eminent scholars such as Parsons (1951) Merton (1949a), Luhmann (1995) and, more recently, Alexander (1988).

Communication is seen as a relevant channel to convey, establish or reassert shared norms and goals, and media are held as a relevant part of the social system itself. According to Lasswell (1948), media are essential for system maintenance as they fulfil functions such as surveillance and control on the environment; linkage of the parts of society and transmission of values and social norms. Furthermore, such functions are likely to go far beyond the source's intentions, as to perform latent functions which consequences, although unintended or unrecognized, are relevant for the social system (Merton, 1949b).

Mass media are charged with complex and differentiated functions, being not confined to simply distributive maintenance of social system, that also include more complex forms of feedback control and knowledge distribution within different segments of population, thus widening gaps in knowledge and power (Donohue, Tichenor, and Olien, 1973).

Such a theory is one of the most complex and articulated theories in social science, also constituting a milestone in communication research (Bentivegna, 2005). "The general assumption is that communication works towards the integration, continuity and order of society, although mass communication also has potentially dysfunctional (disruptive or harmful) consequences." (McQuail, 2003: 68). Moving from these premises Uses and Gratifications approach (hereinafter U&G) was first theorized in early 40's, re-established and strengthened in 70's and later revamped as a promising theoretical tool to investigate emerging uses of information and communication technologies (ICTs) (Ruggiero, 2000).

U&G overturned the perspective of structuralism – functionalism and marked a pivotal turning point in communication research, thus replacing the paradigmatic question "what the media do to people" with "what people do with the media". U&G first introduced the idea of active audience, emphasizing the interaction between media and public as a voluntary and selective behaviour, thus challenging the idea of audience as a mass of passive individual receivers. Furthermore, media uses are deemed to satisfy other relevant latent functions, as keeping company or to mark the time of everyday activities (Klapper, 1960; Katz and Foulkes, 1962; Katz *et al.*, 1974).

Differently from functionalism-structuralism, U&G approach is focused on audience ability to use the media to achieve their goals and satisfy various personal and social needs as gathering information, discharge stress, share experience, and so on (Levy and Windahl, 1984). This kind of needs can be also fulfilled by family, peer groups, co-workers, through a variety of channels, and since people's attention is a scarce resource, media compete with each other to get public's attention (Katz *et al.*, 1973; Moores, 1994; McQuail, 2003). U&G is focused on the ongoing interplay between different sources, channels and subjective motivations, being therefore applied in researches about people's approach to media and communication in serious crisis (Peled and Katz, 1974).

Given the prominent attention to individuals' subjective motivations, U&G also provide a strong integration of both quantitative and qualitative methods (Ruggiero, 2000).

1.2. Media functions and gratification in disasters' context

These basic theoretical and methodological assumptions are helpful to address the multifaceted functions and roles played by communication in disasters' scenarios, according to the general hypothesis that communication is as a crucial resource both for social system and individuals because of its "regulatory" capacity, that may foster (or even hinder) disaster response capacity and, in turn, return to normalcy (Wenger and Parr, 1969; Quarantelli and Dynes, 1977; Austin et al., 2012). Audiences are deemed capable to interact both with media and other channels in different ways, thus feeding a broader, multi-layered communication process, in which media uses, institutional communication and individual gratifications are intertwined with other socially and psychologically relevant activities (Rubin, 2009).

When a disaster occurs, communication is charged with fulfilling a plurality of individual and collective needs: to get information about the event, to provide a coherent account of available information, to reassure people and to improve their self-confidence in coping with the situation, as well as to relieve stress, help people to overcome grim, sense of powerlessness and frustration, to make sense of the event and to re(connect) disrupted community ties (Peled and Katz, 1974; Houston, 2012; Lev-On, 2012).

From a psychosocial perspective one of the main functions of communication concerns the need of reducing the inherent ambiguity of situation, that represents a distinctive sign of disasters and crisis (Turner, 1978). When physical and social environment can not provide neither clues nor expert knowledge that may support in interpreting the situation, communication becomes a relevant resource to cope with disasters, as it integrates available information, helping people to face ambiguity and indeterminacy of the event. This process leans both on looking for information and on asking for consensual acceptance of the proposed definitions (Ball-Rokeach, 1973).

Such a mechanism is very relevant for disaster studies. When a disaster strikes people shall confront with novel emergent problems and the ability of providing adequate definitions of the situation is to be definitely intended as a primary goal of emergency communication, along with orienting mitigation behaviours and delivering self-efficacy messages (Lombardi, 2005: 80). People can make sense of the disaster by gathering information (about the event, support resources, actions, etc.) that will be interpreted in the light of emerging demands, including the primary need to restore sense of community (Paton and Irons, 2016).

The traditional view of disaster communication as a top-down delivery of information from an authoritative source (as agencies' officers or media) to a mass of passive individuals appears to be out-dated and inappropriate, as it provides oversimplified schemata of the process, deemed to result into an ineffective approach.

Taken by themselves, media and institutional sources alone are not enough to fulfil complex social needs, and people play an active role along all the communication process, being continuously involved in an information exchange through different channels, as to check validity, prioritize emerging issues and arrange information into a comprehensive and coherent structure. Information is not simply transmitted, as it is shared, interpreted, evaluated, decoded and loaded with different feelings, as to build both shared meanings and empathy. Disaster communication must consider that "(media) consumption represents only one of many media activities in which people engage" (Massey, 1995: 338).

The spectrum of these activities has been obviously enlarged as a consequence of the appearance and domestication of the Internet, that has ended to become as an essential part of our everyday lives. The social change triggered by ICTs, namely social media and mobile devices, has now ballooned to massive proportions, till to result in a radical and sometimes contradictory change of late modernity societies' themselves, being more globalized, more commodified, and more connected than ever (Haddon, 2011; Kaplan and Haenlein, 2012; Humphreys *et al.*, 2013; Couldry, 2014; Livingstone, 2015). Such radical changes also includes the way people approach to disasters, and ICTs are increasingly used to convey information spread early warnings and improve situational awareness also supporting dialog and organized action of citizens, volunteer, public authorities and other stakeholders (Wendling *et al.*, 2013).

The U&G approach has been successfully adopted to investigate the ways people were using the media during major crisis and disaster, as the 1973 Yom Kippur War (Peled and Katz, 1974), 1989 Loma Prieta Earthquake (Massey, 1995), the 1997 Red River Valley floods (Hindman and Coyle, 1999), the most stressful phases of the Hurricane Katrina (Macias *et al.*, 2009) and the 9/11 terrorist attacks in NY (Pew Internet and American Life Project, 2001; Morcellini, 2002; Dutta-Bergman, 2006). It basically assumes that during a disaster people would differently approach media usage within wider patterns of communication, and the ways they do it has a fundamental relevance to shape collective response, also resulting in different needs and patterns of media / interpersonal communication use.

Fraustino and his colleagues (2012) analysed social media uses during a disaster. They identified convenience, social norms, personal recommendation, need to relief stress through humour, to check in with family and friends, to self-mobilize, and fostering sense of community and emotional support as factors that motivate online communication. Anyway, major relevant uses revolve around cognitive needs such as information seeking, the will to get timely and unfiltered information and to estimate disaster magnitude. Other studies highlight the psychological benefits provided by social media, and their role in making people feeling as a part of a like-minded community, improving their ability to feel relieved (Neubaum *et al.*, 2014).

2. Communication and disasters: between continuity and disrupt

As a result from both increasing mediatisation of society, and the process of growing integration of communication and related technologies in any social activity, disasters acquired a two-fold nature: they are not only about physical events per se, as they may be dramatically amplified or attenuated by social interactions between individuals, social groups, institutions, media, government agencies and other policy-makers (Kaspersons *et al.*, 1988). By definition socio-natural disasters, together with other critical events, are caused or magnified by "wrong" human interventions on environment that enhanced the vulnerability of human beings and communities in the affected areas (Guha-Sapir *et al.*, 2014; Mela *et al.*, 2017). Disasters namely arise from the combination of a hazardous event (earthquakes, volcanic eruptions, tsunamis, hurricanes and tornadoes) and a vulnerable "built" environment. (Turner *et al.*, 2003; Birkmann, 2006).

Although disasters can be triggered by a natural event, their consequences are due to social factors such as unauthorised buildings, intensive mining, poor land use plans and building codes, which in turn result from inequality, unfair deployment of resources and distribution of power, lack of democracy in environmental policy (CRED/UNIDSR, 2015). These factors are at the basis of the increasing vulnerability of socialized environment: their consequences are everything but an "act of god" and could be therefore predicted and prevented by means of human knowledge and rational decisions (Chmutina *et al.*, 2017).

Disasters can trigger sudden and long lasting perturbations of social structure, able to pose serious threats against the physical environment and social structure, also jeopardizing the validity of social norms. Such vulnerability also depends on the way knowledge circulates and it is shared,

inasmuch risk awareness and mitigation measures are always made possible and mediated through (risk) communication, regardless the direction of flows, their purposes, and channels used to convey messages (Plough and Krimsky, 1987; Renn, 1991).

Within the proposed approach, disaster communication fulfils two main manifest and latent social functions: 1) *restoring the symbolic unity* of the physical and social environment and 2) *strengthening community networks* to enable people's capacity to self-organize and respond to disruption. Information must be seen a symbolic resource, continuously exchanged within and between communities, enabling social action and feeding feedbacks within social system (e.g. media coverage of recovery phase). This process does not only involve broadcast media, as messages flows are mediated through interpersonal networks, having a primary role in situation-setting and also fostering the creation of socially shared images of the "new" reality of the disaster.

These representations and narratives provide a general picture of the situation allowing people to understand how to act, making possible a more effective mobilization of both available material and symbolic resources, also strengthening the social ties between members of the community, thus improving the effectiveness of recovery process and facilitate the return to normalcy. In a long-term perspective, they also contribute to the creation of a social memory of disaster, deemed to be a crucial factor to explain people's attitudes toward future risks (Adger *et al.*, 2005).

Such communication function "emerges in the manner in which media frame a disaster, thereby contributing to a complex combination of public risk consciousness and disaster-related issue amplification or attenuation" (Rausch, 2014: 275). Furthermore, people interact with media and engage in communication within the framework of everyday activities. As disaster trigger a radical change in daily interactions with the media, people are likely to return from "unusual" media activity to "usual" media activity within few days (Massey, 1995).

Communication provides relevant resources to bring order into a disrupted / discontinued reality, creating sensemaking structures both of "normal" and "risky" events. Borrowing a basic assumption of cognitive and social psychology, information and meaning are not self-evident neither neutral, as they are first organized and understood within shared cognitive structures (frames) being used to make sense of experience and to provide a base for setting social situations and to inform behaviours. In view of this, the idea of sensemaking structure (Sellnow *et al.*, 2002) has a close kinship with other similar concepts from social sciences being applied in risk and disaster studies, such as mental models (Morgan *et al.*, 2002; Zaksek and

Arvai, 2004) or social representation theory (Moscovici, 1981, 1988; Breakwell, 2001; Joffe, 2003: Joffe *et al.*, 2013). These approaches have characteristics in common, as they recognize communication centrality in creating / shaping disasters' reality.

Disasters may trigger the collapse of pre-existing sensemaking structures, relationships and understandings of the event, also fostering the emergence of new ones. Hence, a prominent function of communication consists in rearranging scattered fragments from a chaotic reality within new coherent cognitive structures. Such a process is often conceptualized as "framing" and it is basically intended as "a way of giving some overall interpretation to isolated items of fact" (McQuail, 2003: 379).

Framing involves a selection of some aspects of a perceived reality and their salience / prominence, as to promote causal interpretation, moral evaluation, and/or treatment recommendation or remedy for the item described (Entman, 1993). Framing issues related to disasters are both relevant for common people, legislators and policy makers, as frames connect various sources of knowledge to inform decisions, practices and policies (Wisner *et al.*, 2012). This process involves different channels and sources at different stages and times: media, interpersonal channels and governmental / institutional sources. On the other hand, disaster communication must be seen as a mean to restore community ties. Since audience should be considered as active, individuals are deemed to play in turn a pro-active role in the whole emergency communication process, by selecting, gathering and relaying information through their interpersonal communication networks. When a disaster strike, a relevant part of the audience feels to be urged to alert relatives, friends, neighbours and significant others, in order to be ensured about others' safety and to seek for confirmation and further information about the ongoing event.

A number of studies have shown that, on the occasion of disasters or high-impact events, the importance of the media turns out to be relatively secondary with respect to interpersonal sources, in particular for warning dissemination (Drabek, 1969; Drabek and Stephenson, 1971; Perry, 2007). Research data also stress word of mouth and other interpersonal channel as first sources, also speeding-up the diffusion of the news (Greenberg, 1964; Mayer *et al.*, 1990; Greenberg, Hofschire and Lachan, 2002; Morcellini, 2002; Roger and Seidel, 2002; Kanihan and Gale, 2003). Interpersonal networks are a primary channel to spread information on hazards characteristics and evolution, and a better understanding of their functioning is needed to improve warning dissemination strategies about imminent risk (Lindell, 2018).

Both direct and technological mediated channels (Twitter, Facebook, Whatsapp) may support the diffusion of news across such networks, thus improving diffusion rates of messages, the effectiveness of operating early warning systems and the ability to collect relevant data from disaster area (Earle *et al.*, 2010; Chatfield *et al.*, 2013; Kryvasheyeu *et al.*, 2016). Furthermore, as the diffusion of portable technologies grows, direct witnesses or first information responders play a pivotal role in disseminating information about an ongoing crisis to the members of their interpersonal networks, who are also more likely to accept these messages as reliable information (Omilion-Hodges and McClain, 2016).

3. Three cases studies

To better assess the uses and functions of media in a disaster we will consider three well – known case studies: the 9/11 terrorist attacks in NY (2001), the Katrina Hurricane in Louisiana (2005) and then the Great East Japan earthquake and tsunami (2011). These three major disasters have relevant characteristics in common, fitting the scopes of this paper. All these event have clear-cut boundaries around place and time, had a relevant impact even at a global scale, triggered both relevant media coverage and on-line communication flows and were subjected to extensive research efforts from both communication and disaster scholars, including papers referable to U&G theoretical framework.

Following Simons' analysis of current definitions, a case study is aimed at addressing the complexity and uniqueness of particular project, policy, institution, program or system in "real life" through an in-depth exploration from multiple perspectives of the context, in which a single case is aimed at resuming and generalizing a larger set of similar events (Simons, 2009: 21).

The first descriptive observation is concerned on the way changes in mediascapes affected scientific methods, themes and subject matters. This concept is referred both to technological means to produce and disseminate information and to the consequences deriving from the diffusion of means themselves (Appadurai, 1996). In the described scenario, also disaster communication has been affected by such a profound socio-technological change, and researchers' attention appears to be having gradually shifted from the analysis of how traditional broadcast media are used (e.g. Massey, 1995) to the more advanced forms of digital volunteerism enabled by digital media (e.g. Starbird and Palen, 2011).

Along the last decades, as a consequences of the growing penetration of ICTs in modern societies, as well as their increasing domestication within

users' daily lives, the main focus of the U&G studies in disasters situations has slowly shifted from broadcast and printed media to social media uses, even though they still continue to be complementary information resources in the aftermath of a disaster. One of the main reasons appears to be the surprising ability of user to personalize technologies, even "re-inventing" them to fulfil new needs emerging from disaster itself. Zemp (2010) noticed that tremendous structural change occurred in media systems, thus modifying their own logic and goals. This radical change created an opportunity to better address media shortcomings and explore advanced uses of ICTs in disaster field. A study of the Pew foundation about American public on a typical day, not related to any specific event nor disasters showed that although local and national cable TV were the most important news source for over 70% of the interviewees, more than 60% were used to get news from somewhat on line source and 37% of Internet users were experienced with sharing new stories through their personal social media (Purcell *et al.*, 2010).

3.1. 9/11: a broadcast media disaster

9/11 may provide a number of insight on the way people approach breaking news about an ongoing disaster. For some aspects, 9/11 may be considered as the last broadcasted disaster, since traditional media and TV networks have been the main channel in disseminating the news and providing information, with a relatively minor impact of ICTs. Since late '60 disaster research has focused on the role of the mass media in mass emergencies. Broadcast media are still nowadays relevant, but their value as first source is often related to the particular social situation in which they are used. Albeit the role of radio in providing first information is well-recognized since first researches on flash floods in late '60s (Drabek, 1969), the 9/11 event provides a number of evidences about its prominent role in the diffusion of the news. Similar percentages of people who heard first news from the radio (roughly between 20 to 30 %) have been found in different researches respectively conducted in Southern California, Arizona, Italy and Germany (Cohen *et al.*, 2003; Roger and Seidel, 2002; Morcellini, 2002; Reuband, 2010).

Unfortunately, the 9/11 disaster also proves that a generalizable explanation about media ability to provide the first information appears to be a quite remote possibility rather than an empirical reality. Same events can, in fact, result in a very different usage of the available channel according contingent factors such as time zones and related media

consumption patterns, that may be influenced from being asleep, driving on the way to work, being at home in front of the TV set rather than staying at work (Cohen *et al.,* 2003; Roger and Seidel, 2002; Reuband, 2010). Anyway, radio is still nowadays a primary and supplemental source (Steelman *et al.,* 2015), as it is one of the more prominent channel through which at-risk populations receives vital information regarding the disaster (Andersen and Spitzberg, 2009: 217) even in the case of malfunction of other media (Perez-Lugo, 2004).

The usage of different sources may differ substantially according to the contextual situation of the receiver, thus making impossible to individuate a clear pattern of channels usage. Saying it with an old and always valid adage, a mix of channels incorporating news media is still nowadays the best strategy (Perry and Lindell, 1989). Redundancy and differentiation of channels are at once effective and indispensable to effectively spread information both in organizations and general public, also fostering extensive retransmission of messages to quickly reach a broader audience (Sutton *et al.,* 2015; Perreault *et al.,* 2014; Stephens *et al.,* 2013; Nicholls, 2012).

Evidence from other research suggests that a high exposure to media is very likely to result in negative sentiments such as anger, depression, confusion and fear. Nevertheless, the need to get a relief from the distress triggered by the initial alert along the lack of alternative viable sources push individuals to search compulsively information through the media, as to restore their images of the world and get timely information to follow the return to normalcy (Lachlan *et al.,* 2009).

In the wake of 9/11, others demonstrated that gender is likely to significantly affect source choices and perceived usefulness, displaying different pattern of media consumption on behalf of male and females. More precisely, women were found more likely to perceive television and radio usefulness with respect to males; printed media usefulness was not significantly influenced by gender, while Internet was perceived as more useful by males (Spence *et al.,* 2006).

3.2. The Katrina Hurricane

Albeit Katrina Hurricane is deemed to be a tremendous failure of Institutional Disaster Communication, it also provided a fertile field and huge amount of relevant insights for both scholars and practitioners (Cole and Fellows, 2008). In particular, the poor response capacity of both media and governmental agencies triggered an increased attention of researchers to

the way (common) people faced the collapse of communication infrastructure, thus reinventing the way traditional and digital media have been utilised. ICTs played a pivotal role: as an example, they have been successfully used to find out people and to restore connection with displaced ones within the little community of New Orleans musicians, overcoming mobile phones call failures: people quickly realized that text messaging on their phones worked, and along with e-mail, blogs and other interactive service they can get information, find out friends and co-work and restore the sense of their little, fragmented community (Shklovski *et al.*, 2010).

Burnside *et al.* (2007) found that sources of information are relevant predictors of people willingness to evacuate in case of an event, along with risk perception and previous experience of similar events. More in particular data shown that media and public officials are often the first source people seek: media effectiveness as a predictor of evacuation has not emerged immediately, but after a closer examination of data about visual images of damages. In other words, media become actually relevant only when capable to convey images that may help people to assess the seriousness of disaster consequences.

The lack of appropriate information on the self-effective measures to be undertaken in case of an event is as a critical issue in disaster communication. An analysis on 293 emergency-related news stories on 119 local television news websites shown that although almost all the selected sources provided information on disasters (96%), "mobilizing information" with directions on proper behaviors to adopt was present just in less than half of the online news stories (44%), a poor way to foster behavioral changes (Tanner *et al.*, 2009). Anthony and Sellnow (2011) investigated media usage, arguments and information sources perceived as most credible by coastal Mississippi residents hit by Hurricane Katrina. The research revealed a strong preference for local sources fostering message convergence versus those messages that generated divergence, thus resulting in a clear preference for local media sources and strong discontent for National media, held to be unethical for having reported inaccurate and sensationalistic account of death tolls and overly personalized stories. Such a research advocates for the relevance of perceived quality of information and people's need to have a fair coverage of the events they're involved in.

3.3. The Great East Japan earthquake and tsunami

The 2001 great East Japan earthquake and tsunami, along with the following Fukushima nuclear disaster have represented a major turning point in disaster communication research, once again triggering researcher attention on the way communication was approached and personalized by people, that resulted in the publication of important papers. A research team challenged the alleged clear-cut distinction of mass media and ICT roles, where the first ones broadcast verified messages and information from few sources to passive audience (one-way model), while second ones would enable users to actively create and share their own content over the Internet acting as gatekeepers within their horizontal networks. Data shown that using of both ICT and mass media is linked to some positive effects use in the post-disaster recovery, but at the same time audiences are also passively subjected to influences from different media (Cheng *et al.*, 2015).

Another study shown that the intention to share news about an ongoing event on social media is influenced by different types of gratifications, as status seeking to attain popularity among peers, and prior experience in sharing news in their social platforms (Lee and Ma, 2012).

Jung scrutinized social media uses in the aftermath the Great East Japan Earthquake, finding two major reasons to use: communicating with others and understand what was going on. Not surprisingly, although Twitter was the most important social media for almost two people on five (39,1%), Facebook was the most used platform to get in touch with friends and relatives (35,5%), whereas Twitter was most used to get information (31,3%). Jung also provided an analysis of media used to get information on the evolution of Fukushima nuclear plant accident, showing that TV was the first source (> 75%) both for social media user and non-users. The main difference concerned ICTs non-user, printed newspaper received much more attention by such non-user (42,5%) compared with user 11.9, while radio had a penetration rate of 12,5% in non user and only 1,2% for users (Jung, 2012).

In another study on three catastrophic disaster occurred in Australia, New Zealand and Japan (including the Japanese earthquake and the tsunami) authors found that social media, namely Facebook was seen as an alternative channel to engage with others after phone and power lines malfunctions, still remaining accessible through mobile phones. People used phones to post messages, sourcing information and responding to requests for help, thus resulting as a relevant resource to facilitate positive conversations, to develop trust-based relationships, and to engage with communities (Howell and Taylor, 2011).

Digital media may also provide an opportunity to express emotions and grievance for losses, facilitating the process of overcoming crisis and public trauma. After the disaster people were used to use their mobile phone (*keitai*) to help ease the pain and support new forms of mediated intimacy, also providing occasions to self-isolate to avoid suffering (Hjorth and Kim, 2011).

Different media uses were also found to be related to different levels of concerns for the disaster. A research on a sample of 1560 residents of Soma city, in the Fukushima prefecture jointly investigated media consumption and people's attitude toward the nuclear disaster. Summarizing the results of the multiple regression analysis, three main factors emerged: fear for social disruption, fear for the future and fears for radiation health. The first factor was associated with hearing radio news, the second with reading national and regional newspaper and heightened levels of fear and anxiety were related to local newspapers consumption (Sugimoto *et al.*, 2013).

4. The disaster communication cycle (a preliminary conclusion)

In the aftermath of a disaster, media channels along with ICTs and interpersonal source play different and complementary roles, performing different functions in response to arising social demands. Such social and psychological functions are differently arranged at each stage of the process and span from disseminating early warning messages to setting a public space for policy debates on mitigation measures. Social functions and individual needs appear to be mutually connected, to the extent which both they depend on shared social definitions of reality, which normative power lies in the society itself. The co-creation of shared social definition of disaster reality provides symbolic means deemed necessary to face disasters and foster a quick return to normalcy.

Levy and Windhal (1984) focused on the communication sequence, defined through three temporally ordered stages: before, during and after the media experience, providing a meaningful typology of goal-oriented uses and gratification that can be respectively chosen and obtained through the media at each stage. First, selective exposure to media results from prior experience, so that daily uses of media is likely to predetermine the channels that will be used in fulfilling primary cognitive needs. Second, during the exposure phase, meaning will emerge as a result of both collective and individual information processing, along with an assessment and a deeper understanding of available messages. Third, after the exposure, once gratifications are obtained, contents are used both as to orient purposive

action and as a "coin of exchange" to interact with others and to enhance personal influence within their social networks.

We can therefore try to identify and characterise the ongoing disasters communication cycle by splitting it into four discrete stages. Given a certain arrangement of social need and individual gratifications, people differently engage with media, ICTs and interpersonal channels at any stages, using and combining available information to build a comprehensive idea of what's going on and what's next. In addition, people also try to express their feelings, to address the relevance of the event, also with regard to the emotional / physical "closeness" of the disaster (Correa *et al.*, 2016).

Such functions are performed through different channels in different moments, as to provide new knowledge about life, conversational material and advice on how to behave in a certain social situation. Both information and entertainment contents can be helpful to relief the stress; to cope with uncertainty, indeterminacy and ambiguity and to restore a comprehensive structure of perceived reality (Atkin, 1985).

The whole cycle may be summarized in four discrete moments: 1) first information (getting the early information about the event); 2) reality check (seeking information to understand whether information is true or false and collect additional information about event's features); 3) relaying information / social interaction across individual social networks as to disseminate information or being advised through interpersonal channels (Interpersonal Network Diffusion) to and 4) frame building, by which shared definitions of the disaster are built within the feedback loops between media and public, providing the big picture of the event as to enable purposive action, to overcome ambiguity and confusion and bring order into the disrupted reality.

4.1. 9/11: broadcast media as first source

Although it should go without saying, disaster communication cycles are initially triggered by single information, reaching individuals through different channels. In the immediate aftermath of the event, people are mainly concerned to quickly receive the first information, and to get a preliminary idea about what's going on. Disasters response effectiveness, along with community resilience, lean on the ability of media and institutional sources to timely respond to information demand and to satisfy people's cognitive needs, thus minimizing the informational gap between the curve of demands arising from the public and the response curve, that

measures the amount of information made available by institutional sources (Lombardi, 2005).

Source prominence and credibility are first related to their ability to make information available in a timely manner, whatever people are doing at that moment, even if driving, working or staying at home. Hence, source selection and effectiveness depend on a pre-established pattern of media usage within the contextual situation, on the basis of channels' exposure during daily activities and slow / sudden disaster's onset.

The effectiveness of disaster communication is enhanced by message redundancy through multiple channels, since individuals have other things to do than continuously monitoring media, since they are engaged in many different collective activities in different places (Dynes, 2006). Both media and interpersonal sources are more likely to get used as first information source when available, spatially closer to the recipients and / or easy to access: early knowers might be already listening a media source or having a device at the hand (Morcellini, 2002; Rogers and Seidel, 2002; Kanihan and Gale, 2003).

Interpersonal communication may occur both through simple word-of-mouth and technologically mediated channel (phone, mobiles, web application). It is still recognized as a primary source along with broadcast media, even though people may switch to other channel once received first information. Once received the first information, whatever the first source was, people are very likely to turn to broadcast media to validate and better understand what they have just knew, also to find out more about the ongoing crisis (Greenberg, 1964; Greenberg et al., 2002; Kanihan and Gale, 2003).

The Internet and the social media triggered a radical and irreversible transformation of the whole mediascape: since their availability to an increasing number of people and Internet, social media and micro-blogging platforms are more and more likely to play a crucial role as first information sources (Greenberg *et al.*, 2002; Lindell *et al.*, 2005; Comunello *et al.*, 2016).

Unfortunately, 9/11 disaster also proves that a generalizable account of the roles of single media ability to provide the first information appears to be a quite remote possibility rather than an empirical reality. Same events can indeed result in a very different usage of the available channel according contingent factors such as time zones and related media consumption patterns, that will be obviously influenced from the activities being carried out at that time: being asleep, driving on the way to work, lying on the couch in front of the TV set rather than being at work (Cohen *et al.*, 2003; Roger and Seidel, 2002; Reuband, 2010). Anyway, radio is still nowadays a

primary and supplemental source in disaster, as it is "still one of the more prominent means through which at-risk populations receives vital information regarding the disaster" (Andersen and Spitzberg, 2009: 217). Redundancy and differentiation of channels are still at once effective and indispensable means to spread first information at best.

4.2. Information seeking: searching for a verification

Once received the first news, people are likely to collect information from any available source to satisfy their essential cognitive needs and to inform their decision about how to cope with disaster (Sorensen and Sorensen, 2007; Sutton *et al.*, 2008). Whatever was the first source, people are also likely to switch to broadcast media and ICTs to validate and better understand what they get, also finding out more about the ongoing crisis (Scanlon, 2011). The consequences of disasters may be indeed amplified by the lack of additional information on certainty, severity, and immediacy of the threat, and on possible mitigation measures to be undertaken (Jungermann *et al.*, 1996; Seeger, 2002; Lindell and Perry, 2012).

Credible sources are more likely to promote compliance to warnings, whereas messages from less credible sources tend to prompt further information seeking (Mayhorn and McLaughlin, 2014). The relevance of source's credibility and reputation results appears prominent whatever the channel is: broadcast media (Mileti and Fitzpatrick, 1992) Internet (Taylor and Perry, 2005) and social media (Westerman *et al.*, 2014).

Source credibility and trustworthiness are relevant at this stage, strictly depending on perceived consistence of messages issued. In such a sense, verification process is aimed at checking whether media and Institutional channels can confirm the event, as to reduce uncertainty through contents' comparison across different channels and sources. In the verification phase messages are more likely to be considered trustworthy when they are redundant and consistent across diverse sources and channels (Anthony and Sellnow, 2011).

The media also play an institutional role in disaster governing process, for their inherent capacity to gather and relay information and to provide a place to display information, countering the inherent fragmentation of institutional context (Miller and Goidel, 2009).

4.3. Are media and interpersonal sources complementary?

Individuals play a pro-active role in the whole emergency communication process, by selecting, gathering and relaying information through their interpersonal communication networks, disseminating messages to relatives, friends, neighbours and significant others, in order to be ensured about others' safety and to seek for further information about the ongoing event.

The will to get in touch with others satisfies the primary need to cope with the frustration from feeling powerless, as well as to give a helpful hand to others. It is not by chance that Disaster Reduction Management is nowadays attempting to fully embed both interpersonal communication and social media within their Emergency Management strategies (Veil *et al.*, 2011).

It is also believed that digital volunteers will play an increasing role in gathering, organising and making information available to improve rescuers' situational awareness and their ability to allocate scarce resources such as water, drugs, temporary shelters (Starbird and Palen, 2011), to foster and channel convergence process of citizens and information at disaster sites (Schmidt *et al.*, 2017), to draw live participative crisis maps through Facebook and Twitter, providing a similar or improved accuracy with respect to authoritative sources (Whittaker *et al*., 2015), as well as to create Virtual Operations Support Team as to monitor social media communication, engage public, and handle tasks that can be performed remotely through digital media (Denis, Hughes and Palen, 2012).

4.4. Framing the event

Media are called upon to fulfil relevant and complex symbolic functions, including gathering information, promoting social exchange, providing emotional support, evoking past experiences of similar situations and provide causal explanations of the ongoing events (Stallings, 1990; Massey 1995; Perez Lugo, 2004; Miles, Morse 2007). Disasters challenge people to face uncertainty and ambiguity: assessing their potential impact on their lives, household and properties could be very uneasy and uncomfortable, thus feeding a genuine appetite for information about the ongoing events (Miller and Goidel, 2009; Koopmans and Vliegenthart, 2010; Wein *et al.*, 2015; Correa *et al.*, 2016). To get a comprehensive idea of a disaster, the concept of frame has a primary role, as it is a "a central organizing idea or story line that provides meaning to an unfolding strip of events" (Gamson

and Modigliani, 1987: 143). Frame building is influenced by a number of communication players and media play a primary role, providing an institutional arena where relevant issues are defined as a result of a competition for publics' attention: different players contenddifferent definitions of disaster's reality, including both causal explanations and assignment of responsibilities (Hilgartner and Bosk, 1988).

Frames are likely to change as a consequence of the way such players are able to impose their definitions of reality. In the aftermath of two recent earthquake disasters occurred in Italy in 2012 and 2016, media partially changed their way to approach scientific issues, giving more room to prevention (e.g. retrofitting) with respect to the analysis of ongoing physical phenomena (seismogenic mechanisms, intensity of aftershocks or fault location), thus anticipating and addressing political decisions which would have followed the recovery phase (Cerase, 2017).

Media have a prominent role in frame building, as a consequence of their ability in disseminating messages to a vast public.

Nonetheless, framing also entails the possibility of erroneous, misleading or biased narratives, as it happened for an exaggerated coverage of both rumours and fake news, being circulated to inflate unfounded news, support conspiracy theories, "troll" others by baiting and provoking on-line, to make fun or outwit journalist, but first and foremost to blame or attack individuals or groups (minorities, scientists, government officers and so on).

These "dysfunctional" approaches to communication are very likely to occur in a disaster situation. Stories such as the alleged looting incidents, on steps being taken to prevent it, and, on how unusual was not to be preyed on by looters in the aftermath of Hurricane Katrina (Tierney et al. 2006). A similar "looting frame" has been used by Italian media after the Amatrice Earthquake of August 2016, although the news of the alleged Roma looters has been subsequently demonstrated to be unfounded (Cerase and Santoro, 2018). During the Hurricane Sandy researchers observed a proliferation of fake images of the event, including manipulated images of storm cells and sharks allegedly swimming in the inundated streets of New Jersey (Gupta *et al.*, 2013).

Italian seismologists are not immune to miscommunication: social media have played a crucial role in spreading a false prediction about an impending earthquake in Rome, later covered also by traditional media (Nostro *et al.*, 2011) and a number of gratuitous allegations about purported manipulation of magnitude data (La Longa *et al.*, 2014).

This analysis provides some relevant suggestion for communication strategist and officers to improve disaster communication usefulness and effectiveness. First, publics' needs and ways to engage with media and

communication should be put at the first place, along with evidence from research on possible uses and gratifications people expect after being engaged in disaster communication. Second, it is recommended to provide timely information through multiple channels, also considering the way and the reasons why recipients use different channel at different stage of disaster. Even though people are not expecting such messages, remind that everybody has the right to get information can save lives and properties, regardless of who is the receiver, where is staying and what is doing at that moment.

Assume that whatever the source is, people will immediately turn on media or Institutional sources to confirm first information and to make a first, temporary idea about what's next. Consider any possible limitation of channels, including communication infrastructure collapse, languages or technological issues that may prevent people to get such information.

Always keep an eye on feedbacks and information sharing and always consider the potential of social network and micro-blogging as relevant sources on the ongoing situation as well as potential threats. Consider people's need to get a comprehensive view of the event and its consequences, rather than flooding them with useless messages. Improve contents structure; prioritize messages and quality of visual information to viewers. Be always present and respond to people's need of information and clarification and become a towering presence among the voices talking about disaster.

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13. Traditional flood mitigation measures in Mallorca

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Abstract

The drainage system of Mallorca is constituted by ephemeral rivers, known as *torrents*, which are not usually running. The rainfall in the island features high-intensity episodes (of more than 100 millimeters in 24 hours), which occasionally cause *torrents* to overflow and as a consequence causes severe flooding.

The island been historically affected by flood events. Since the 15th century, 223 events have been recorded. Up to the 20th century, floods in the island affected plains with a high agricultural production. In order to reduce the vulnerability of those areas, islanders adopted a wide range of measures based on traditional engineering.

The research is intended to describe the main measures adopted by local population in order to control surface runoff. Among them, the channelization of a large part of the streambeds, the deviation of the streams and the use of *parats*, a complex system of stone walls built within river beds that diverts the flow and to avoid the flooding of the adjacent fields. In limestone areas of Mallorca, another traditional system is the *albellons*, which are artificial runoff channels that run under the soil, build with stones, which help to avoid the flooding of the fertile lands of the area. Finally, in the mountainous areas, other dry-stone structures, called *marges*, are used to create land to farm in the mountain slopes. *Marges* avoid erosion, as they have channels on the sides, where water is deviated and driven to reservoirs where it can be kept to be used later.

The research is focused on that man-made systems, how they work, where are located in the island and their evolution. These systems are currently in ways of abandonment, given the change in the economical framework from the island, which has evolved from the traditional agricultural society to a tourism-based economy. The current situation has not only meant a higher degree of urbanization but also an increase of

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human presence in flood-prone areas. The lack of maintenance of traditional dry-stone structures has a direct effect on the increase of risk of flooding.

Keywords: Mallorca, ephemeral streams, flooding, mitigation, dry-stone.

1. Introduction

The Mediterranean basin has been heavily inhabited since early historical times. The need of farmlands and the protection against natural hazards led to an intense action that modified the original landscapes. The resulting space has been described as "cultural landscapes" (Aplin, 2007; Álvarez, 2011; Minca, 2013), some recognized by the UNESCO (Unesco, 2014).

Around the Mediterranean, the use of dry-stone techniques was usual for a wide range of human activities, building and farming being the most common. The Balearic Islands constitute a unique example of a dry-stone landscape within the Mediterranean due to the extension, variety and complexity of such constructions.

The value of dry-stone techniques for flood mitigation measures is related to the importance of farming and building adjacent to flood zones. The need to gain surfaces to cultivate and to protect the crops from meteorological and hydrological events which may cause severe damages was solved with the use of stones, which were of common in areas with geological and lithological characteristics.

The need of these mitigation measures arises from the fact that the Mediterranean basin has been prone to flooding events for centuries (Barredo, 2007; Barreda-Escoda and Llasat, 2015; Barriendos and Rodrigo, 2006). While the flood causes have been extensively investigated (Gaume *et al*., 2016; Marchi *et al.*, 2010; Tarolli *et al.*, 2012), the effects of flooding in terms of societal and economical impacts are less known (Barnolas and Llasat, 2007; Barredo, 2009; Glaser *et al.*, 2010).

In this article, man-made structures for flood mitigation purposes will be presented. Their main shared feature is the use of the dry-stone system, common in the whole Mediterranean area but adapted to the specificities of Mallorca in physical, societal and economical terms.

2. Research area

The Balearic Islands archipelago (Fig. 1) is situated off the eastern coast of Spain. It is made up of five islands (Mallorca, Menorca, Eivissa,

Formentera and Cabrera) with adjacent islets. The islands' total surface area is around 5,014 km^2 and its population in 2017 was just over 1 million (IBESTAT, 2017). The islands are a well-known summer destination throughout Europe, with millions of yearly visitors. Before the expansion of touristic activities, the islands were isolated from the mainland and produced what was needed in an autarchic way of life.

In spite of the commercial development during the Late Middle Ages, agricultural activities became, from the 17th century until the second half of the 20th century, the foundation of the archipelago's economy, thus leading to an intensive use of the territory. Therefore there developed a need to control surface runoff through man-made techniques.

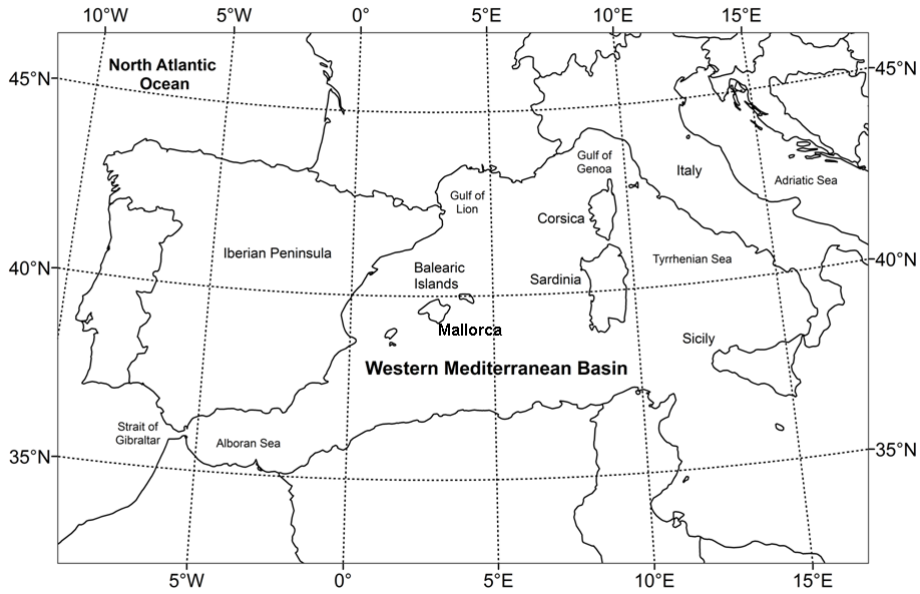

Figure 1 - *Location of the Balearic Islands in the Mediterranean basin. Source: Grimalt et al, 2013.*

The main island of the archipelago is Mallorca, with a surface of 3626 km^2. It is a relatively flat landscape, with a low land in the middle of the island (Es Pla), lying between two main mountainous areas, the Serra de Tramuntana in the north west (1445 m.a.s.l at the highest peak) and the Serres de Llevant in the southeast, with altitudes reaching 500 meters on average. The island features are completed with small hilly areas, included

in Es Pla, several alluvial plains (Palma, Inca, Sa Pobla and Campos) and a carbonate Miocene platform in the southeast (Fig. 2).

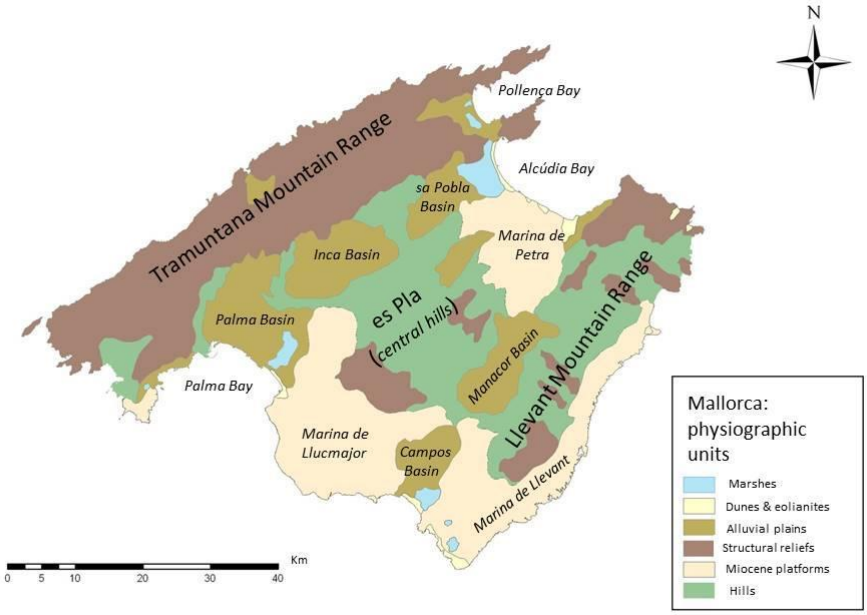

Figure 2 - *Physical features of Mallorca. Source: Author's research.*

Regarding rainfall, Mallorca is affected by intense precipitation events, linked to cyclogenic Mediterranean conditions and the geographical layout of the island. Average yearly rainfall is around 600 millimeters but with a high variability in terms of spatial and temporal distribution (Grimalt *et al.*, 2006). The northern mountains can reach averages of 1400 millimeters per year while the southern zones barely reach 400 millimeters per year. Seasonal distribution shows an autumn maximum and a summer minimum, with July being the driest month, usually without rainfall.

In Mallorca the rainfall regime is highly variable and irregular and dry years alternate with profusely wet ones. Heavy rainstorms, that can occasionally reach 400 millimeters in 24 hours, are frequent and affect mainly the mountainous area in the north of the island, as well as on the east coast.

Severe floods are characterized by extreme peaks that exceed the capacity of *torrent* channels (Grimalt *et al.*, 1990). This overflow affects

mainly alluvial plains and coastal areas, both of which register high human occupation since they host crowded touristic venues and facilities as well as the most fertile lands for farming activities.

Mallorca has a population of 861.430 inhabitants as of 2016 (IBESTAT, 2017), distributed unequally between 53 municipalities. Palma, the capital and main city of the island, hosts almost half of the inhabitants of the island (46, 77%). The economy, following the trend of the archipelago, shows an important tertiarization of the active population related to the tourism industry, with an industrial sector, mostly linked to building, and an agricultural sector that is statistically unimportant.

Historically, agriculture shaped the society and the traditional habitat of the island, changing the physical features of the land, thus creating a cultural landscape. The farming activities needed an adaptation of the land with men-made structures, to protect farmlands, obtain hydrological resources and protect the territory from meteorologically or hydrologically adverse conditions. Nowadays, the societal and economical structure and the territorial modeling are the result of the tourism growth since the second half of the 20th century (Salvà, 2008). The increase of urban population, the uncontrolled building in coastal areas and the development of new infrastructures (highways, roads, etc.,) led to an abandonment of agricultural practices and the change of the land use to residential activities in a large area of the former agricultural lands (Salvà, 1995; Binimelis and Ordinas, 2012).

3. Human measures to prevent flooding: *parets, albellons, parats, avencs and marges.*

The control of the surface runoff is accomplished by using dry-stone traditional structures. The main purpose of these structures is to avoid soil loss due to erosion, as a result of the intense precipitation. To accomplish this, the idea is to prevent surface runoff or, at least, regulate the intensity of runoff flow. The constructions can be divided between those which only have hydrological functions and those that also have farming purposes.

3.1. Walls

The simplest structure is the *paret*, a wall which forms boundaries between properties. *Parets* are built with calcareous rocks which have a plain face, the one looking to the external side of the wall, while the internal

one has irregular shapes. The rocks are held without concrete and a filling with rubble (Fig. 3). This kind of construction means that water can flow through the rock holes while sediments are retained at the wall. This kind of walling allows fields with small slopes to not overflow thus avoiding the formation of gullies and badlands.

Zoning walls can be found all over the island but they are very common in the carbonate Miocene platforms of Migjorn, Llevant and Marineta de Petra. The landscape in these regions is made by shallow soils and a karstic environment that forms a fluvial system of steep torrential canyons.

A problem with the walls is that when intense rainfall affects the area, plots are flooded and high-water levels pressure the rocks. This can lead to the collapse and the formation of flood peaks with catastrophic effects downstream. To avoid it, in places where the landscape shape allows the concentration of runoff, the walls have openings in their base, called “clavagueres”, which allow water flow through.

Figure 3 - *Wall with holes, allowing the water flow through the stones. Campos Basin, January 2017. Source: Author’s research.*

3.2. Parats

Parats are man-made structures for hydrological purposes but can be used for land cultivation. The system is made by stone walls laid out transversally in the streambed (Fig. 4). Their main purpose is to avoid runoff formation so the walls are designed to resist water pressure using big rocks at the base and rear parts. Even though they are usually of linear form, some of them can follow parabolic contours, thus offering more resistance to the flood waters (Grimalt *et al.*, 1998).

Parats appear thorough Mallorca but are common in the mid mountain areas of the eastern and western sides of the island as well as the Miocene platforms above mentioned.

Figure 4 - *Parats in Lluc (Tramuntana mountain range) during a flood event (April 2018). Source: Author's research.*

3.3. Albellons

Another technique devised to avoid flooding is to lay drains in the soil. Called *albellons*, these drains are ditches in the cultivated plots which are covered with layers of stones (Fig. 5). The stones allow the drainage of

water, thus avoiding the stagnation of flood waters after heavy precipitation episodes. The drains run to a grid of channels (above or underground), located within the plots, which divert the flow to the streams.

The *albellons* are located in two areas of Mallorca. One of them is in the clay-limestone lands at the centre of the island, which has land with low permeability and flat surfaces, where the system avoids the flooding and promotes the growth of cereals. The other one is in mountainous regions where *albellons* are used to drain water from the top of the agricultural terraces to the underground reservoirs.

Figure 5 - *Plain land flooded in Camp den Torrella (Marina de Llevant) after an extreme precipitation event (December 2016). On the right side of the road the "albelló" is draining the flooded plot. Source: Author's research.*

Finally, there are some complex drainage systems linked to regularisations of the main streams. In this particular case, the streams are found between sidewalls (levees) and the drains to allow the exit of flood waters from adjacent fields. Water runs underground into the *albellons* (also known as *eixugadors*), which run parallel to the stream, until reaching a level that allows it to flow into the main bed. An example of this system is found in the Sóller valley, in the Tramuntana mountain range.

3.4. Avencs

A characteristic of the southernmost part of Mallorca is the use of holes, dug from Miocene calcarenite soils, which present an intense karstification close to the ground. Those holes connect the surface with the karstic area and divert the runoff to underground water circulation (Fig. 6). The main purpose of the system is to avoid soil erosion or damages in cultivation due to surface runoff after heavy precipitation events.

Those *avencs* are commonly linked to an *albellons* system, which drain the water to the artificial cavities, thus performing the same function that the natural ones (Barceló *et al.*, 2012).

This technique is found mainly in the Marina de Llevant and Marina de Llucmajor, as well as in the Campos basin. The progressive abandonment and the lack of their maintenance have led to an increase in episodes of flood with damaging effects, especially from the start of the 21st century.

Figure 6 - *Avenc de Son Muletó (Marina de Llucmajor). An example of dig to force the runoff infiltration to the underground. Source: Author's research.*

3.5. Marjades

Along the steep sides of the Tramuntana mountain range, men build dry-stone systems which allowed the cultivation of the land. The terrace walls, known in the islands as *marjades*, is a system that uses stone walls to hold the land and allow the use of plots for agricultural purposes, mainly olive trees, carob trees, citrus and other fruit trees (Fig. 7). Their origin is related to the Catalan conquest during the Middle Ages, between the 13th and 14th centuries (Mas, 2017).

Aside from hosting crops and expanding farming areas, terraced walls are also aimed at regulating the water surface flow, allowing infiltration and avoiding erosion as the water flows through the stone walls to evacuation channels.

The terraces are a complex system, which combines buildings and other structures in order to upgrade their functionality (Fig. 8). For instance, the communication between terraces was provided by different kinds of paths, ladders and even mounting blocks integrated in the walls. Hydrologically speaking, a complex structure of transversal drainage channels (*relles)*, combined with underground drains and stream bed diversions using stone walls, is found in these terrace structure systems. The objective is to avoid an excess of water in the plots and divert the subsurface waters to underground reservoirs.

Figure 7 - *Terraced land in Son Bunyola, Banyalbufar, Tramuntana mountain range. Source: Author's research.*

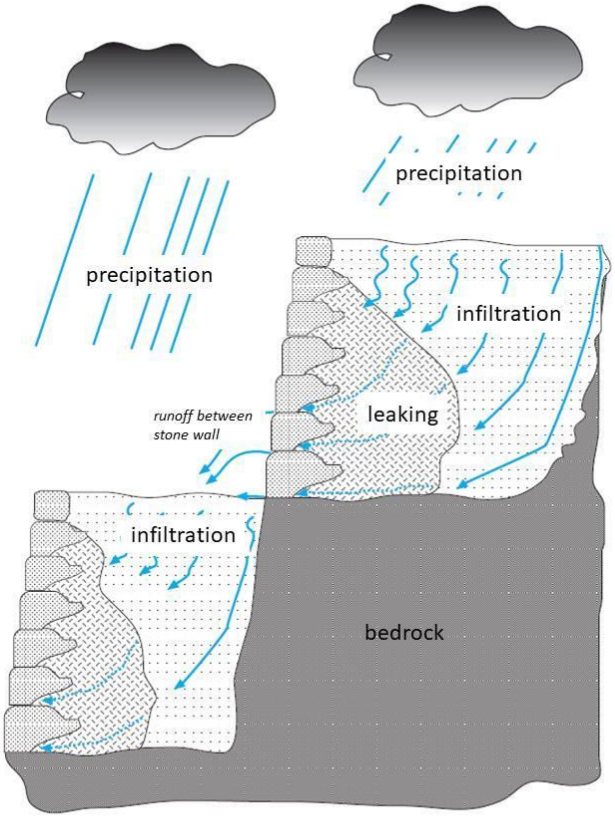

Figure 8. Simplified scheme of the runoff behaviour in a terraced wall system. Source: Author's research.

The terrace walls were built by a professional union (*margers*), who passed the knowledge from fathers to sons. There is a current promotion of this trade, with an official school funded by the *Consell Insular*, the island regional government, with the goal to train people for restoration, maintenance and construction of dry-stone structures.

The building of *marges* during centuries resulted in an extended walled surface, around 200 kilometers, which is located within altitudes ranging from 200 and 600 meters above sea level. The walls have a notable height (2 meters on average) and can be found in plots that reach up to 20% or more of the embankment. It has been calculated that the longitudinal development

of the terrace system equals to 10,000 kilometers if laid out in a straight line (Rosselló, 1997).

Another important fact about the walls is that they are used as a protection against landslides in the Tramuntana mountain range. Due to the high precipitation rates and geological trends, it is a landslide-prone area (Mateos and Azañon, 2005; Coste *et al.*, 2017) and the terraces contribute to diminish this risk.

4. Current situation

The whole extension of Mallorca is occupied by the man-made structures, which have been described previously. The extent and functionality of the systems varies in each of the natural districts of the island, and basically depends on the features of the physical environment.

The methodology used to collect data and identify the location and current situation of these structures was (1) the research of archives and historical information about the structures (2) field research in locations where such systems were identified (3) the observation of aerial photography to locate the structures and their current situations and (4) oral interviews with former builders or farmers, who have worked in the building of these runoff mitigation structures.

In Table 1, a description of the presence and the regulation capability of each system in the natural landscapes of Mallorca is included. Regarding the presence, the key is as follows: 0-absent, 1-rare, 2-barely, 3-abundant, 4-highly abundant, while for its flood prevention function, the key is: A-predominant, B-important, C-accessory, D-insignificant.

Table 1 - *Presence and functionality of traditional systems. Source: Author's research.*

Natural area	*Murs*	*Parats*	*Marjades*	*Albellons*	*Avencs*
Mountain	1C	2C	4A	2C	1C
Hills	2C	3B	2C	2C	1C
Planes	1C	1D	0	4A	1C
Miocene platform	4A	3C	1D	2C	3B

For example, in the mountainous areas, the terraces are the main element of hydrological regulation, as the table shows their presence (highly abundant) and function ability (predominant). Even so, *marjades* are usually combined with *albellons* and, sometimes, the streams are diverted using *parats*. On the other side, *murs* and *avencs* only appear sparingly and are accessories, if not insignificant in terms of use.

To date, man-made dry-stone structures suffer an abandonment process, which facilitates their degradation, as they are systems requiring periodical maintenance. The failure of that maintenance leads to the destruction of the system or its disablement as a protection tool. Abandonment is not equal over the island and depends on the type and the main use of the structures as well as their spatial locations.

The following chart shows the presence and conservation of each kind of dry-stone structures in relation to territorial uses.

Table 2 - *Current situation of the traditional systems. Source: Author's research.*

Structure	*Murs*	*Parats*	*Marjades*	*Albellons*	*Avencs*
Harmful practices					
Agricultural	3D	2D	3A	4A	1A
Public works	3C	2C	2B	3C	2C
Urbanization	3C	1C	2A	2C	1C
Abandon	3A	4A	4A	3A	3A
Preservation practices					
Maintenance	3	2	4	2	1
Restoration	3	1	4	1	1

The key is explained as follows, for the frequency of use: 1-rare, 2-barely, 3-common, 4-important, while for the effects of the use: A-

degradation (loss of function), B-nullification, C-destruction, D-no effects, E-effective use.

Besides abandonment, other degradation effects are the result of the arrival of new cultivation tools, such as heavy machinery that ploughs deeper than ancient machinery, destroying systems such as *albellons* or *marjades*. Public works are another element of impact, particularly the construction of new roads or the widening of old ones. Both instances also contribute to the damage or destruction of draining systems. Another important fact is the loss of the building culture, which leads to the use of modern restoration techniques that are not as efficient as the traditional ones (Fig. 9).

Finally, the increase of urbanization, which is related to the tourism industry in Mallorca, in coastal areas and in the outskirts of towns, has led to an occupation of former agricultural land and the destruction of protection systems, which were not useful for the new urban activities.

Figure 9 - *Collapsed dry-stone wall as a result of a lack of maintenance. Source: Author's research.*

The consequence of the degradation and abandonment process is the lack of protective measures in the event of severe rainfall. Some examples stand out in the past decades. Flooded lands in the plains are common after heavy rainfall episodes, such as the ones in December 2016 and January 2017. In both cases, the failure of the *albellons* system led to plots that remained flooded for weeks, with the waste of crops and the closure of roads as a

result. Another effect of those episodes was the flooding of the urban area of Campos as the destruction of the *avencs* system did not prevent the arrival of surface runoff into the city center.

The dry-stone walls of the Tramuntana mountain range suffered from collapses after rainfall events of high intensity, such as the March 1974 or October 1978 episodes, when kilometers of terraces were destroyed (Grimalt, 1992).

Nevertheless, when the systems were in full use and with correct maintenance, intense storms were able to collapse the system, because they were unable to cope with the amounts of falling rain and the resulting floodwaters. Impact from high water peaks, dragged materials and high erosion rates resulted in the destruction of the traditional engineering system of the affected area. One case was the 1885 event in Sóller (Tramuntana mountain range) with relevant losses of crops and land.

Another example of such catastrophic events is the September 6th 1989 storm, which affected the southern and eastern areas of Mallorca. After a fall raining event (more than 200 millimeter/24 hours records), flooded streams carried peaks of over 500 m^3/s, which destroyed walls, *parats* and filled up *avencs* with sediments. It resulted in collapsed bridges, washed away roads, public and private buildings destroyed, heavy losses in agriculture and livestock farming and fatalities (Grimalt *et al.*, 1990).

5. Conclusions

This research presents a complete study of the traditional flood mitigation measures in the island of Mallorca. The dry-stone structures are related to the Middle Ages, when they were used to develop agricultural plots thorough the island. They allowed the expansion of farming activities while protecting land and people from hydrological extremes, such as intense rainfall events, which are very common in Mallorca.

The abandonment of farming and the increase of tertiary activities in rural areas, especially since the second half of the 20th century, led to a failure to maintain those systems, which now cannot fulfill their function, as has been discussed.

Regarding the current risk reduction situation, the abandonment of the systems in the island has become an added hazard for its inhabitants. The effects to reduce disaster risks have been handed to local or regional authorities because society believes that such actions must be lead by policy-makers. In a sense, disaster risk management has forgotten those man-made structures, which sometimes are seen as remains of the past.

Obviously, if authorities do not engage in a policy to recover or develop traditional systems, the changes in the societal structure will not help to improve the situation. The abandon of the agriculture and the loss of farming tradition mean that the knowledge related to the building and maintenance of those structures is vanishing on the island of Mallorca.

The future, in terms of the flood mitigation, appears to be problematic. The probable increase of events of low or medium intensity, related to global climate change, will have an effect of an increase in flooding events, as the system is not fully working in large parts of the island. In extreme events, the presence of the man-made structures, which in the past could not cope with the impact of such episodes, will not change the outcome but, if they were preserved, they could, at least, reduce the damaging effects.

Environmental and cultural policies have recognized the important heritage of these systems. The ethnological value of the structures, seen as the result of the interaction between men and environment, has to led to a recovery of the trade and protection of the remaining structures in order to allow future generations to inherit a historical legacy, as a means and technique to protect the inhabitants of the Balearics and their lands from the dangers of flooding.

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14. Risk, hazard and disaster in India: a perspective from law and governance

Binod Kumar[1]

Abstract

Fear of disaster in the minds of human beings is as old as human civilization. The fear of disasters has given rise of many mysterious practices among human beings. By the passage of time, man realizes that mysterious practices are not enough to prevent loss in such unforeseen circumstances and they must act in advance to mitigate the loss. Consequently, a systematic approach to study the disaster started. There has been change in the approach from time to time. In ancient India, there was understanding that considered disasters as an act of God and there is limited scope for human intervention to mitigate the same, whereas modern approach to disaster is based on principle that disasters are not the killer rather human obstruction and structures kill the human beings.

Keywords: disaster, governance, India, institution and risk.

1. Introduction

'Disaster' has different meanings for different sets of people. The current meaning of disaster has been shaped by the different set of realities and is context specific. Much of the mitigation and preventive efforts in disaster policy is woven around this specific meaning given to 'disasters' in a country. Differences in perspectives as what constitutes disasters are dependent on sense of loss, which varies from one person to other (Collins, 2009, p. 11). Altering status of disaster can also be the result of politics, humanitarian aid (Middleton and O'Keefe 2001 as cited in Collins, 2009, p. 11), state ideology and reporting/under-reporting by media. The concept of disaster has undergone immense changes in India**.** It was 'disaster prevention' in the 1970s that turned into 'disaster mitigation' and 'disaster risk reduction' in 1980s and 1990s respectively. Disaster risk reduction is a broader concept, and it takes development into consideration in disaster mitigation. In current context, it is important that disaster not be looked upon as natural phenomena

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rather as a function of development. Sometimes, disaster is caused by the insufficient development of means to avoid crisis, and sometimes the aspect of development itself become the reason for crisis and ultimately leading to disaster. In this situation, tools like risk assessment, social impact assessment and environmental impact assessment have been employed by development professionals to adjudge the efficacy and impact of development on the community at large. Disaster is a function of human exposure to danger, causing social life, economic and environmental losses, and beyond the community or social concerns. Disaster does not wreak havoc in isolation rather it is combination of hazard and vulnerability. Hazard is extreme events, which have potential to harm human and non-human species whereas vulnerability signifies characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard (UNISDR, 2009, p. 9).

UNISDR defines disaster as *"A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources"* (UNISDR, 2009, p. 9). Section 2 (d) of Disaster Management Act, 2005 of India says "*disaster means a catastrophe, mishap, calamity or grave occurrence in any area, arising from natural or man-made causes, or by accident or negligence which results in substantial loss of life and human suffering or damage to, and destruction of, property, or damage to, or degradation of, environment, and is of such a nature or magnitude as to be beyond the coping capacity of the community of the affected area*".[2]

One theme that is common in every disaster is community's inability to cope up with human, material and economic loss. Another important aspect to study disaster is its causes. Traditionally, disaster has been seen and analyzed within the frame of causation hence there was concept of natural and man-made disaster. However, progress in disaster scholarship with the aid of scientific advancement invalidates the classical categorization of disaster. Moreover, causative factor to classify disaster into natural and man-made, failed to explain the inherent causes of damage and loss after disaster. Hence, no disaster is natural.

[2] Section 2(d) of Disaster Management Act, 2005.

2. Governing Risk and Vulnerability in India

The geophysical, climatic and demographic condition makes India one of the most disaster-prone countries across the globe. Sixty percent of the landmass of India is prone to earthquake and landslide of different magnitudes and 8% of its geographical area is subject to riverine and flash floods. Thirty major towns with the population of more than half a million each are located in seismic zone IV and V where the earthquake of the magnitude of six or above in the Richter scale is real time possibilities. Climatologically speaking, India is land of contradiction, where northeast India receives the highest rainfall in world; the western part Thar Desert receives scant rainfall, some areas of trans-Himalaya are coldest habitat places (Chakrabarti, 2006, p. 4). This wide variation of rainfall and climate makes India vulnerable to several hazards like drought, heat and cold wave that claims lives, flood, hailstorm, cloudburst, avalanche, livelihood and property. India is one of the most disaster-prone regions hence disaster management is vital for development of the country. It is interesting to note that nearly half the century since independence, marked by planned economic development and advancement of science and technology had not initiated any serious intervention for mitigation, preparedness and disaster response in a well-coordinated manner.

In this period, the entire focus of the government had been in disaster relief and rehabilitation. The state government response to the disaster has been in the form of office of the Relief Commissioner within the Revenue Department. At the centre, drought relief Division under Ministry of Agriculture and Cooperation was national nodal authority for disaster management. Later on, various changes have been made in the field of disaster management in Indian context. Apart from the enactment of Disaster Management Act of 2005, which has facilitated the establishment of various institutions, the subject of disaster management has been shifted from Ministry of Agriculture and Cooperation to Ministry of Home Affairs.[3] The change of nodal ministry for disaster management from Agriculture to Home Affairs laid the focus of disaster governance from relief to systematic, comprehensive and holistic approach. Accordingly, states were also advised to reconstitute their Revenue and Relief Department into a dedicated Disaster Management Department to look into every aspect of the disaster to facilitate the smooth disaster governance.

[3] Vide Cabinet Secretariat's Notification No. DOC.CD-108/2002 dated 27/02/2002 (GOI, Cabinet Secretariat's Notification No. DOC.CD-108/2002, 2002).

The development of soft law like Yokohama Strategy and Plan of Action for a Safer World, The Hyogo Framework for Action 2005-2015 and Sendai Framework for Disaster Risk Reduction 2015-2030 on disaster management at the international level and disaster events like Latur Earthquake 1993, Super Cyclone 1999, Bhuj Earthquake 2001 and Tsunami 2004 altered the focus from *ad hocism* to integrated and focused approach in disaster management.

Earlier, focus was on relief and rehabilitation approach, which changed to mitigation, preparedness, response and recovery in the process of disaster governance. The reason behind the shift was the hard realization that disasters are eating gains of developments. This policy shift was recognized in Tenth Five Year plan and it was acknowledged that traditional disaster management has the excessive focus on calamity relief under non-plan expenditure. It also acknowledges that relief alone is not sufficient to mitigate the disaster. It is necessary to make this exercise a continuing progress and development work must be sensitive to disaster risk reduction. Therefore, it is necessary to deal with the disaster from the perspective of development to reduce human, non-human and material losses. Only after integrating the current risk into the developmental plan, we can think of sustainable development and resilient community.

Based on the philosophy of sustainable development and building resilient community, holistic disaster governance is need of hour. The concept of holistic disaster governance takes cognizance of development, environment, problems of poverty and resilient structure to provide effective disaster risk reduction framework along with role of multiple stakeholders. The idea of disaster governance is based on the fact that natural hazards are inevitable however every natural hazard cannot become disaster if hazards and risks governed properly. The term “disaster governance” also recognizes the role of galaxy of organizations to tackle disaster, which includes state, market and civil society. Traditionally, disaster management has been exclusive domain of state barring few non-state actors. Nevertheless, the changed architectural arrangement of landscape of governance recognized the role of market in disaster management.

As the idea of disaster governance is still in the nascent phase and world keep learning how to govern disaster after every incident. Although, disaster cannot be fully prevented but loss by the disaster could be mitigated through appropriate governance measures. Every disaster is an opportunity to revise strategies to mitigate the loss in the future disaster. Where mega international disaster like Tsunami 2004 taught us how state need networked disaster governance in case of international and inter-provincial disaster whereas Mumbai floods taught us the lesson as how urban local governance needs to

prepare itself to the onslaught of urban floods. The national level agency: National Disaster Management Authority (NDMA) needs to prepare appropriate governance strategies along with national and state plan for disaster management. Today, a large number of technology and strategy is available across the world and it is national agencies for the disaster management, which is responsible for adapting and localizing the available strategies to facilitate disaster governance.

3. Historical Overview of Disaster Governance in India

3.1. Ancient Measures

The modern idea of classifying disasters into binary of natural and man-made owes its origin in ancient understanding. The Sanskrit the word "*nipata*", "*pidana*", "*apatti/vipatti*" and "*vyasana"*are the words, which were used to denote the disaster. The word "*vyasana"* denotes incident, which is caused by ill fate. As per archaic-understanding, disaster cause because of ill fate of human being. By the passage of time, systematic understanding of disaster started and Kautilya classified disasters into two broad categories: *Daivam* (Natural) and *Manusam* (Man-Made). *Daivam* means "divine in nature" and may be considered as parallel to the western conception of "act of God". Kautilya in his fourth book discussed eight types of "*Daivam"* or natural calamities which are: They are fire (*agni*), flood (*udaka*), epidemics (*vyadhi*), famine, (*durbhiksa*), rats (*musaka*), beasts (*vyala*), snakes (*sarpa*) and demons (*raksamsi*). In the view of Kautilya, "*daivam*" cannot be controlled or handled by human beings as he considers it as an act of divine. Kautilya describes "*manusavyasana*" as an act of misfortune however he considers role of human beings in controlling this. He talks about the role of a king in case of calamity in his state. Considering nature of the people to protect properties and life of other people and nation, Kautilya proposed punishment for the people for not serving in these situations in the *Arthasastra* (Bapat, 2014, p. 14).

In '*Arthasastra*', Kautilya has considered man-made calamities as a disaster. During the period of Kautilya, apart from war and the agitation of subjects, other man-made disasters did not exist. Hence, Kautilya dealt only with war and internal agitation. In *Vyasanadhikarikam* that deals with calamity has broadly divided calamities in two groups: (1) Internal Agitation (2) External agitation (8.2.2-3). The result of these two calamities is four threats to the nation, which are: (a) external threat supported internally (b)

internal threat supported externally (c) external threat supported externally (d) internal threats supported internally (9.5.3) (Bapat, 2014, p. 18).

The above measures to tackle disaster in ancient period suggest, *Arthasastra, which* is an old text on Indian polity provided robust framework of disaster governance.

3.2. Medieval Measures

The crisis and contingent situations were dealt with *ad hoc* approach in medieval India. Although, historians documented numerous disasters in medieval India but there has been absence of a pattern in response to it. The historical account of the disaster in medieval India is largely available for famine and epidemic. There is a dearth of literature on relief work undertaken in this period except for famine. The famines in India have been regular phenomena and Roy (2014) assumes that largely it is due to environmental and geographical factors. The administration of Muhammad bin Tughlaq under Tuhlaq dynasty did not offer relief to the starving residents during the famine in and around Delhi. The historical account suggests Peshwa Sawai Madhavrao provided relief during Deccan famine of 1791-92. The relief measures to tackle famines included the restriction on export of food grains and importing food grains to augment availability in the local market. However, evidence of relief in case of disaster is too scanty to judge the real efficacy during medieval India.

3.3. Modern Measures

3.3.1. Colonial Initiatives on Disaster Management

The systematic response to disaster started in colonial India. To deal with the recurrent problem of famines, they constituted Famine Commission 1880 to study and suggest measures to tackle famine. The Commission concluded availability of surplus food grain in India and indicated to have administrative set up to ensure availability in all regions. The Commission also suggested numerous measures, guidelines and regulations on how to respond to famines and food shortages and it came to be known as Famine Code. The Code was finally approved in 1883 during the viceroyship of Lord Ripon. It had to wait for three years, as predecessor Lord Lytton was not ready to take any initiative to solve the problem of food shortages in India. Jean Dreze studied the pre

and post-famine code situation in India and has concluded that barring few large-scale famines instances; code was effective in ensuring relief. Dreze explains these intermittent failures by four factors: "(1) Failure to declare famines (2) excessively punitive character of famine restrictions such as wages for public works (3) policy of strict non-interference with private trade (4) natural severity of food crises" (Dreze, 1991, pp. 32-33). There was the threat of famine in India due to its geographical and ecological situations, but in the post-famine code Bengal Famine of 1943 was the most devastating. The Famine Commission in 1880 underlined loss of wages to agricultural workers and artisans as substantial causes of famine in India. It also suggested the strategy to create jobs for the marginal population to tackle famine and relied on public works to engage them. The Famine Code has been updated from time to time in post independent India and subsequently renamed as "Scarcity Manuals".

The Indian Famine Commission (1880-1901) emphasized speedy relief, the provision of fodder for cattle, prompt remission and suspension of land revenues, swift loan distribution, the introduction of fodder camps, and gratuitous relief for women, children and the destitute. So, famine commissions during British period were exemplary in addressing the immediate need of the household to arrest a large number of deaths in colonial India (Ray-Bennett, 2009, p. 281). The reliefs provided under famine commission were of short term, and *ad-hoc* in nature as the perception of disaster was based on the idea of natural events. Moreover, there were little effort on the part of the government to tackle vulnerability and building capacity to the community. The funds allocated under recommendation were largely used for structural measures rather than non-structural measures such as capacity building. Besides, there was the absence of integrated approach to disaster management and treated every disaster as an isolated event.

Moreover, British administration had activity based relief departments, which used to be functional in the post-disaster scenario. The flood control through embankments and drainage was next uphill task executed by colonial powers in India. On the one hand they constructed embankment and drainage and made the rules for maintenance of the same. The regulation of 1793, Embankment Regulation (VI of 1806), regulation XI of 1829, Act XXXII of 1855, Act VI of 1873, Act II (B.C.) of 1882 were directly related to flood control in India enacted by colonial powers in India. Where British measures to tackle drought was relief centric; the flood control through embankment and drainage composed of mitigation and preparedness measures. The regulations and act related to flood control suggest the existence of robust regulatory and governance framework during British period. The architecture of disaster governance started by British continued till enactment of Disaster

Management Act, 2005. Before enactment of this act at national level, State Relief Commissioners were working under Central Relief Commissioner (GOI, 2011, p. 55).

The institutionalized response to disaster started with the establishment of revenue, agriculture and commerce department. In 1881, department of agriculture was established as a separate department on the recommendation of famine commission which was upgraded as Ministry of Agriculture in 1947.

3.3.2. Post-Colonial Initiatives on Disaster

Carrying the colonial legacy, the Ministry of Agriculture became the nodal agency to deal with disasters in India even after independence. To facilitate better governance, damage assessment and relief due to natural calamities was brought under its purview in 1969. In 1974, the issues related to loss of human life and relief for drought, scarcity or famines were transferred from department of food to department of agriculture (Kapur, 2005, p. 4551). Moreover, there has been a provision in every five-year plan under "Irrigation Command Area Development and Flood Control". Besides, relief department has also been active throughout the period to facilitate activity based disaster response (GOI, 2011, p. 55).

In this way, Department of Agriculture became nodal agency responsible for the matters relating to floods and droughts as these were directly related to agriculture. Besides flood and drought, other disasters were dealt with fragmented approach without specific pattern in governance. In the case of high casualties, all the ministries were supposed to work concertedly. The traditional awareness of disaster management was limited to the idea of relief, which was essentially a non-plan.

The modern perspective on disaster management started with establishment of National Disaster Management Division in 1994 under Ministry of Agriculture. Later on, it was rechristened as National Centre for Disaster Management in 1995. In pursuant to better coordination of relief, the subject of coordination of relief after disaster was transferred from Ministry of Agriculture to Ministry of Home Affairs[4]. However, coordination of relief measures after drought remained with Ministry of Agriculture. The constitution of a high-powered committee in 1999 ushered paradigm shift in disaster management in the country. It led a shift from relief centric measures

[4] See for details, Cabinet Secretariat's Notification No. DOC.CD-108/2002 dated 27/02/2002.

to a holistic approach in disaster management in India. Later on, National Centre for Disaster Management was converted into National Institute of Disaster Management (NIDM). The establishment of NIDM at the national level provided impetus to states to constitute disaster management centres within state institute of public administration (GOI, 2011, p. 55). Prior to this, Disaster Management Institute at Bhopal with a clear focus on industrial disasters was already functional, which was established in the wake of Bhopal gas tragedy. Recognizing the importance and gravity of the issues around disaster, 10th Five Year Plan carried an exclusive chapter on Disaster Management. In the year 2002, Disaster Management Bill was forwarded to Parliament with a view to develop legal framework for disaster management in the country.

The government attention to disaster in India came into limelight not because the number of disasters had increased or due to greater compassion towards dead and vulnerable but because of international pressure. The UN resolution "*to reduce through concerted international action… the loss of life and disruption caused by natural disasters*" was issued on 22nd Dec 1989. Besides, the decade of 1990 and 2000 was declared as "*International Decade for Natural Disaster Reduction".* The response of India has been slow on the issue of disaster despite concerns about the disaster at international level. The "*World Conference on Natural Disaster Reduction*" which took place in Yokohama in 1994 evoked immense interest towards disaster management in India (Kapur, 2005, p. 4455).

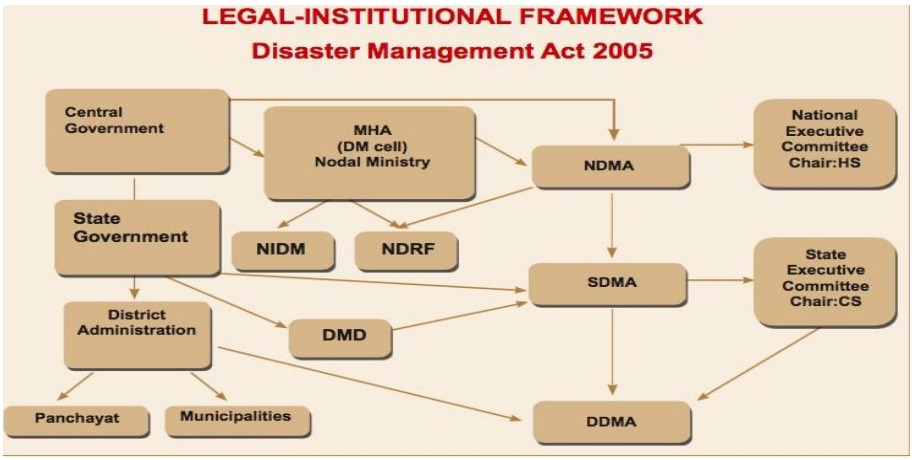

Figure 1 - *Legal And Institutional Framework Under Disaster Management Act, 2005; Source: Disaster Management in India* (GOI, 2011, p. 58).

Before enactment of specific law on disaster management by the central government in 2005, central relief commissioner was a nodal officer to coordinate relief operations through Crisis Management Group. The National Crisis Management Committee (NCMC) used to give directions to the Crisis Management Group (CMG) (Das, 2012, p. 43).

The legal framework for disaster governance in India works through the cluster of laws. Where Disaster Management Act, 2005 facilitated the establishment of institutions at national, state and district level along with financial mechanism to deal with disaster; laws like National Building Code 2005, Coastal Regulation Zone Notification, 1991 provides a firm basis to reduce risk and mitigate the impact of disasters.

Disaster Management Act, 2005 is the only act, which directly deals with disaster. The legal responses to disaster are dealt through the jungle of laws. The most explicit connection to disaster law apart from Disaster Management Act, 2005 comes in the form of environmental laws, laws relating to relief and compensation and law relating to insurance. There has been the immense potential of environmental law to reduce disaster risk (Kapur, 2005, p. 4552). There are numerous laws that have potential to reduce the disaster risk. The law germinates through causation of disaster: like industrial disasters are dealt with different set of laws, environmental and climate induced disaster are tackled through environmental laws and compensation after disaster dealt with insurance laws and the most recent and last category relates to direct legal response to the diverse disastrous occurrences and came in the form of *Disaster Management Act 2005*.

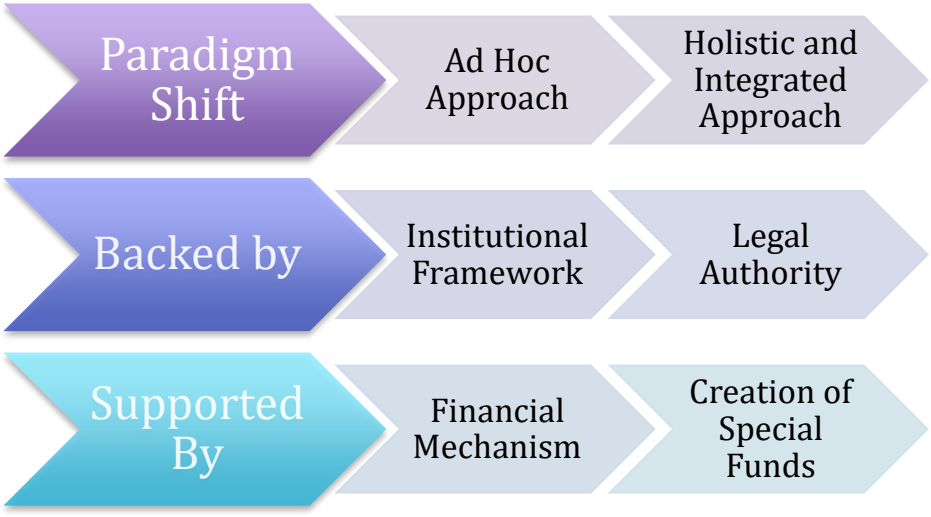

Figure 2 - *Paradigm Shift in Disaster Management in India after Disaster Management Act, 2005.*

4. Disaster relief in India

The disaster reveals a special relationship between state and its population. The state intervention in the disaster is important because people become victims of actions which they are not responsible for and have no control over the incident. Historically, it has been a duty of the state to come to rescue the people affected by the disaster. However, there has been change in the legal position of the victims of the disaster. Where they were subject to moral responsibility in earlier times, now their rights have been recognized not only under international law but also under the municipal legal system. Even after recognition of the rights of victims of disaster, there is absence of legal entitlement to the victims of disaster. Hence, state enjoys the moral duty to take care and provide relief to victims of disasters in India. The recipients of disaster relief in calamity claim their innocence and victimhood. The spontaneous relief provided by the state takes care of the local moral economy and tries not to subsidize able-bodied persons. In drought-affected areas, the state provides food for work as the relief to help victims. Therefore, disaster relief is not a constitutionally mandated right nor is recognized by law and is not justiciable in the court of law. The moral responsibility of the state is equally important in providing assistance in disaster as many times moral duties precede legal mandates of the rulebook (Chhotray, 2014, p. 218). However, there is need to make it a right based approach to reduce the chances of double victimization of victims of a disaster.

5. Politics of disaster in India

There is always a debate to declare the calamity as 'national calamity' or 'national disaster' whenever severity of disaster is high. However, there is nothing in the manual or statutes to declare a disaster as national disaster howsoever big it may be.[5] None of the disasters has been declared as national calamity/disaster till date. But it is an expression used in common parlance and whichever party occupies the position of opposition at the national level always asks the ruling party to declare a disaster as 'national calamity/disaster'. The philosophy behind the absence of such nomenclature lies in the fact that India does want to project her with a begging bowl or be

[5] http://www.dnaindia.com/india/report-dna-special-the-secret-why-no-tragedy-can-be-a-national-calamity-1858347.

seen in distress and seek the help of other countries. Declaring a disaster as 'national disaster' gives leverage to big economic powers to show their benevolence and big brotherly attitude. The architects of our Constitution and subsequently the *Disaster Management Act 2005* wanted to shield India from such external influences. Moreover, in the absence of the provision to declare a disaster as 'national disaster/calamity,' there is enough arrangement within the *Disaster Management Act*, which permits centre to finance the relief and rehabilitation efforts of the concerned state through National Disaster Response Fund (NDRF). Once the state declares the onslaught of disaster as of 'severe nature'; state qualifies to get fund from National Disaster Response Fund (NDRF) for relief and rehabilitation work. In the absence of such categorization by the central government, state government bears all the expenses under the head of relief and rehabilitation through State Disaster Response Fund, which comprises fund from the central government and state government. As a matter of fact, there is no standardization/benchmark to assess the severity of disaster in India. Oftentimes, it becomes the contested ground between central and state government when same party is not ruling the centre and state. Correspondingly, we need to put standard benchmark or parameter to provide the fund to facilitate the relief and rehabilitation efforts of the state in a proper manner.

6. Bridging Disaster and Development through Judicial Response

Disaster and development has been elaborately discussed by the Supreme Court of India in the case of *Tehri Bandh Virodhi Sangharsh Samiti and Others v State of UP*[6] and *Narmada Bachao Andolan v Union of India*[7]. In both the cases, the argument produced by court was similar and facilitated the construction of the dam. In these cases, fundamental rights of the people affected by the projects under Article 21 of the constitution were in question. Besides, petitioner also contended that construction of dams in those areas would lead to ecological disaster. However, court contended that stalling a project at such an advance stage would compromise the development of nation in the garb of ecological disaster.

Additionally, the court also added that even for major changes in the project, there have to be the compelling reasons to do so. "Through these cases court also arbitrates between human rights, national laws and regulations relating to national security and national economic development.

[6] 1992 Supp (1) SCC 44.
[7] 2000 (10) SCC 664.

The government contended that these areas have very low productivity level and in the case of Sardar Sarovar Project there is absence of actual forest as those has been depleted by the passage of time. Court also contended that displacement of person would not *per se* result in the violation of their fundamental or other rights. The real issue what has to be ensured that their rehabilitation at a new location is better off than what they were. Court accepts that project promises better assimilation of marginalized communities through their betterment and progress. Court also added, merely because there will be change is no reason to presume there will be the ecological disaster. Accepting the argument of petitioner that there will be change in the environment, the court reiterated it would be wrong to presume the construction of the large dam will result in ecological disaster" (Visvanathan, 2000, p. 4179).

In the case of *N.D. Jayal and Anr vs Union of India and Ors*[8] Supreme Court opined that the construction of dam would obviously change the environment but it is not correct to presume that dam will result into an ecological disaster. Merely because there will be a change is no reason to presume that there will an ecological disaster. The judgment of this case also underlines that adherence to the principle of sustainable development is *sine qua non* for the maintenance of symbiotic relationship between environment and development. The concept of sustainable development has to be treated as an integral part of 'right to life' under Article 21. The principle of '*inter-generational equity'* could only be ensured through compliance of principle of sustainable development.

In this backdrop, disasters imperil development at the same time development can itself create new risk. There are enough examples from the realms of development in India, which contributes to disaster risk. The rapid urbanization, growth of squatters and informal settlements in urban areas by internal migration from the countryside has made urban areas more vulnerable to disaster risk as these settlements are located somewhere in prohibited zones, steep slopes, floodplains or adjacent to hazardous industrial units. Local livelihoods are endangered by the regional impact of climate change and environmental degradation. The frequency with which India is facing natural disasters should ensure that disaster risks are at the forefront of the development program. Future disaster risk management should be integrated into the development plan to promote the concept of sustainable development. Integrated disaster risk management should run along side the development planning.

[8] 2003 Supp (3) SCR 152.

7. Conclusion

The definition and typology of disaster are based on based on existing scholarship in disaster study. There have been changes in the meaning of disaster from time to time. Where earlier disaster was seen as act of God, of late, it is being considered as an act of the state. The culpability of the state is seen in the law, as state is not able to ensure the compliance of laws. Besides, law can also regulate the creation of new risk in the process of development. Although, invulnerable development reduces the risk and save the life of the people but sometimes development itself creates risk and makes the society disaster prone. Hence, the notion of disaster has always got the attention but an approach to manage the same has been changing regularly. The institutional response to disaster governance in India started with constitution of famine commission, which continued till recently. The law and rules governing the disaster management comprise cluster of laws drawn from host of issues. However, the specific law *Disaster Management Act, 2005* paves the way for a paradigm shift in approach of disaster governance in India. It provides legal and institutional framework for disaster governance by delineating the roles and responsibilities of different stakeholders. It also aims to inculcate resilience not only to the community but also to the institutions working for disaster governance.

Despite enactment of the specific law on disaster management, there has been the issue which is yet to be resolved like standardization of assessment of loss, declaration of national disaster and reduction of arbitrariness in disbursal of funds to the state by the central government for instant disaster relief. The institutions responsible for development are remotely connected to the institutions responsible for governance of disaster. Hence, there is an imperative to bridge this divide vis-à-vis disaster governance. In order to reduce the disaster risk, institutions do not need to work only on the existing risk rather it should reduce the creation of new risk by developmental processes.

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Natural Hazards and Disaster Risk Reduction Policies collects 14 original essays, of authors from all around the World, exploring strategies and ability of local communities to adjust to natural hazard and disasters. The volume, fostering the current scientific debate on disaster ecology, muses about the need for Homo sapiens to define its rights and responsibilities in environmental dynamics, including extreme events and disasters. In the end, the reflections about how to deal with hazard, vulnerability and disasters, highlights the ethical nature of disaster risk reduction; control of nature or adaptation to its cycles?

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