Guidelines on monitoring and analysis of common rules of conduct for the Adriatic area after a disaster

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1. LESSONS LEARNED FROM 21ST CENTURY DISASTERS

1.1 GLOBAL MAJOR DISASTERS

Learning the lessons from every disaster, every time, is essential. Every time, the world can respond more effectively – drawing from past experiences and avoiding past mistakes. As extreme weather worsens, people's understanding of a disaster's scope and effect can also evolve.
In this chapter some of the major global disasters are reported with indications of disaster risks reduction measures applied.

THE TSUNAMI OF 2004

The 26 December 2004 Indian Ocean tsunami was generated by an earthquake of Magnitude around 9.0, with the epicenter off the southwest of Sumatra. The first wave of the tsunami struck the coast of Thailand, Malaysia and other countries about two hours after the earthquake[1].
The tsunami generated waves of 5-12 meters high along the west coast of southern Thailand and almost 230,000 people died, and more than 1 million were displaced[2].
The impact was so high that it was felt in Asia and Africa, miles away from the epicenter.
The global response was unprecedent, Governments, international agencies and millions of people donated to help the communities devastated by the tsunami.

The affected countries were unprepared for the disaster and the tsunami exposes the countries and community to unprecedent stress in terms of disaster management. Despite the huge amounts of funds collected, during the following years some problems started to come to light during the reconstruction phase. In 2005, local's ministries reported that there were inefficiencies in the distribution of funds, slow progress in reconstruction, allegation of corruption and coordination failures. The Prime minister of Sri Lanka in December 2005 highlighted the coordination problems noting that many Ngo lacks experience and local knowledge, and in their haste to spend moneys, disregard community needs[3].

Part of the International total funding was provided in the form of grants and loan terms over varying time periods, other amount has been offered with various conditions, in a mixture of grants and loan terms over time periods. In addition, the Rehabilitation and Reconstruction Agency, or BRR was the agency established by the Indonesian Government to lead the rehabilitation and reconstruction phases, aiming to improve auditing controls over expenditures and corruptions.
This experience teach the complexity of post-tsunami construction programs that were dogged by both slow levels of spending and by funding gaps that emerged as a consequence of construction cost escalation.[2]

The European response

On the same day of the tsunami, the Sri Lankan government made a formal request to the after few hours from the tsunami, the commission began collecting information for disseminating through the MIC (Monitoring and Information Centre - European office that monitors and responds to natural and man-made disasters worldwide) that notified all EU members' state. 12 persons took part in the EU assessment expert team with the role of intermediary between local officials and EU agencies in the region and other international organizations[4]. Priorities were the support and evacuation of EU citizens while taking care of the safety and well-being of the residents. Member states sent donations and contribution in so much large amounts that Médecins Sans Frontières, a non-governmental organization, asked to redirect funds to other global disasters[5], an examples of the prompt reply from Eu States.

CHILE EARTHQUAKE OF 2010

The magnitude 8.8 earthquake struck at 3:34 AM. The epicenter was located some 200 miles (325 km) southwest of the Chilean capital of Santiago, and the focus occurred at a depth of about 22 miles (35 km) below the surface of the Pacific Ocean. The earthquake, resulting from the rupture of a 300- to 375-mile (500- to 600-km) stretch of the fault that separates the South American Plate from the subducting Nazca Plate, was felt as far away as São Paolo, Brazil, and Buenos Aires, Argentina.[6]
According to the Ministry of Interior of Chile, the earthquake caused the death of 521 persons, with almost half of the fatalities caused by the consequential tsunami. Over 800,000 individuals were directly affected through death, injury, and displacement.
More than a third of a million buildings were damaged to varying degrees, including several cases of total collapse of major structures

.

(Twenty five survivors have been rescued from this collapsed apartment building in Concepcion, Chile. Nine bodies were recovered. Natacha Pisarenko/AP Photo)

The transportation system was dealt a crippling blow, with 830 failures registered with the Ministry of Public Works on roads in both the public and private transportation networks. Severe disruption of commerce as well as the rescue and response effort resulted from the damage to roads, embankments, and bridges.
The earthquake has resulted in failures in several geotechnical systems including embankments, port structures, bridge and building foundations and was in many cases consistent with observations from prior earthquakes.
Numerous highway and roadway embankments failed due to either liquefaction of underlying soils or due to what appears to be insufficient compaction of the embankment structure itself. Liquefaction and lateral spreading damaged a number of ports and bridges including approach abutments as well as bridge piers. Site amplification due to presence of soft soils is likely responsible for observed damage at several bridge overpasses in Santiago. On the other hand, retaining walls and underground structures including tunnels appear to have performed very well despite the long duration of shaking. It was also reported that areas where ground improvement was performed, liquefaction was prevented and building foundations performed well. Chile responded very well to the massive earthquake,

that would have devastated a less prepared community, proving that Chile is in a reasonable state of earthquake response preparedness[7]

THE GREAT EAST JAPAN EARTHQUAKE (2011)
A DISASTER INTO DISASTERS

On March 2011, an earthquake of magnitude 9.0 occurred in the Pacific Ocean off the coast of Japan's Tohoku region.
This was the first disaster that included an earthquake, a tsunami, the treat of a nuclear plant accident and a large-scale disruption of supply chains. The direct economic cost was $210 billion. As reported by the World Bank, Learning from Megadisasters, the loss of life and property could have been far greater if the countries policies and practices had been less effective. The advanced Japanese disaster management system, built during the years of coping with natural and hazards risks, have proved its worth.

Japan is governed by three-tiered administration: the national government, prefectures, and municipalities. The Head of each level takes full responsibility for that jurisdiction in a structure similar to a nation. After the lesson learned from the Great East Japan Earthquake, the extreme disaster management headquarters was established to act immediately without waiting for the receiving request from the affected areas[8]. Strategic concentration of unit supports such as the police,

firefighters and self-defense office are located on key prefectures where great damages are expected.
(Houses swallowed by a tsunami burn in Sendai after a huge earthquake struck Japan. The city bore the brunt of the waves. Photograph: AP)

Concerning medical response, the ministry of Health, Labour and Walfare has been advancing policies in disaster management in three pillars:

- Setting disaster base hospitals, located in every secondary medical zone
- Operating and training Disaster medical assistance teams (DMAT's, which consists of four members, a doctor, two nurses and a coordinator)
- Establish an Emergency Medical Information System

THE DEEPWATER HORIZONTAL OIL SPILL

The 2010's Deepwater Horizontal incident was one of the largest marine oil spills in history. The explosion of the drilling rig led to a catastrophic oil and gas outbreak at the BP operated in the Mississippi Canyon area in the Gulf of Mexico. The explosion that killed 11 people, released 3.19 million barrels of oils and gasses were released into the ocean that led the contamination of deep waters habitats. Beaches, marshes, wetland and estuaries that are important habitants for wide range of species were affected [9]. The remediation system made to limit the disaster comprehends extensive use of oil dispersing agents, in situ burning, the use of oil degrading microbes helped by local factors such as the high surface water temperature and the ocean currents. Despite laws incorporated to the public policy for preventing and facing this kind of disasters events, and despite the modern technologies and practices designed to clean up and mitigate effects of oil spills, this is remembered as the worst environmental disaster that occurred in the last 10 years, still affecting the area nowadays.

Deepwater Horizon oil spill environmental disaster, Gulf of Mexico [2010]

Economic prospects in the Gulf Coast states were dire, as the spill affected many industries upon which residents depended. More than a third of federal waters in

the Gulf were closed to fishing at the peak of the spill, due to fears of contamination. A study[10] found that fish in the Gulf of Mexico continued to show evidence of contamination by polycyclic aromatic hydrocarbons (PAHs)[11].

THE NORTH PACIFIC GARBAGE PATCH

Ocean plastic pollution has been a major environmental problem of the last decade, and it is continuously growing despite the sensibilization campaign raised during the previous years. The global annual plastic production exceeded 348 million metric tons[12] which is predicted to be higher, especially after the Covid-19 pandemic currently faced worldwide. An enormous amount makes the north pacific Garbage patch of rubbish, plastic waste that has broken down into microplastic fragments, provoking terrible effects on wildlife. The patch stretches from the California coast across the Pacific Ocean to Japan, harms ecosystems and food chains and its growing years after years[13].

2. INTERNATIONAL LEGAL FRAMEWORK

The existing international legal framework is composed of agreements and negotiations stipulated worldwide. Usually, frameworks and agreements address common objectives that have gained priority over time. The focus is to prevent and mitigate phenomena resulting from the rise of climate change, calamities events, and man-made disasters. The main frameworks of reference are presented in this section, used as a guideline to offer an international view of disaster management systems.
This section is intended to provide an overall assessment of the framework policies as well as the international regulation created to proper response natural and man-made disasters. The first analysis will give an overview of the best policies appliable during a decision-making process concerning disaster management prevention and mitigation at policy level.[1]

2.1 SENDAI FRAMEWORK FOR DISASTER REDUCTION 2015-2030

The SFDRR objective is to measure global progress in reducing disaster risk.
Endorsed by UN General Assembly following the 2015 Third UN World Conference on Disaster Risk Reduction (WCDRR).
Outlines seven global targets to be achieved by 2030:

1. Reduce global disaster
2. Reduce the number of affected people globally
3. Reduce direct economic loss in relation to GDP

4. Reduce disaster damage to critical infrastructure and disruption of basic services
5. Increase the number of countries with national and local disaster risk reduction strategies
6. Enhance international cooperation to developing countries
7. Increase the availability of and access to multi-hazard early warning systems

To help achieve the 7 targets, a set of 38 indicators recommended by an open-ended Intergovernmental expert working group were identified. The indicators measure the progess in achieving the global targets set by the Sendai Framework. The UNDRR states that "Both the SFDRR and the SDGs outcomes are a product of interconnected social and economic processes. As such, there is a lot of synergy between the two policy instruments." [14]

As highlighted by several researches (Briceño 2015; Manyena 2016; van Niekerk et al. 2020; Wisner 2020), the effectiveness of the SFDRR was questioned because of the limited impact and benefits provided by its implementation in different countries. The implementation does not address the root-cause of disaster which are highly connected with weak governance arrangements and non-risk informed development. Despite the development concept is present in the targets settled, the measurement is targeted to respond to disaster event instead of preventing the cause. [15]

2.2 Grand Bargain: Agenda for Humanity

In May 2016 representatives of 18 countries and aid international organizations (IONG) and Red Cross and Red Crescent Movement agreed on signing the Grand Bargain, 51 commitments aimed at improving the efficiency and effectiveness of international humanitarian aid. The agreement was established as one of the three recommendations of the UN Secretary General High-Level Panel on Humanitarian Financing: The agreement comprehend the following priorities: 1) reduce needs; (2) expand the resource base; and (3) establish a Grand Bargain between donors and aid organisations. DG ECHO as a signatory of the Grand Bergain is committed to the target N°2 "*More support and funding tools to local and national actors*", to help strengthening the capacity of first responders.

As reported by the authors of [16] Annual independent report 2021, progress has been reached in this 5 years. Despite the significant political, financial, and human resource investments have resulted in important returns, the goals set out were not achieved and remains priority today. Recommendations have been made such as enabling better quality funding, increase support for local responders, focusing on political strategies to inform and support solutions to make progress.

2.3 The Paris Agreement

The Paris Agreement is a legally binding international treaty on climate change adopted by 196 Parties at COP 21. Its primary goal is to limit global warming to well below 2° Celsius and to pursue the limit of 1.5° C before the end of the century. Emissions should be reduced and reach net-zero by the middle of 21st century. By establishing a long term adaptation goal within the Article 7, the agreement formalize the consensus on the urgency to shift from a state-centric view of climate to a wider global vision in which parties recognize that adaptation is a global challenge faced by all with local, subnational, national, regional, and international dimension (Article 7, par.2)[17]
Climate change is responsible of an increase in the frequency of hydrometeorological disasters such as decreased water availability, forest, and land fires. The natural disaster frequently occurring in the last years are the results of combination of complex issues caused by larger environmental, social and economic changes.[18]

2.4 Agenda 2030 - Sustainable Development Goals

SDGs are a universal set of goals, targets and indicators adopted by all United Nations Member States in 2015, which comprises 17 goals and 169 targets. 330 indicators were introduced later. Disaster risk reduction is a priority included in the SDGs 11(cities) and under the SDG9 (building resilient infrastructure). The Agenda is interlinked with the Sendai Framework, and it recognize the urgent need to reduce the risk of disasters as reported [19].
SDG indicators can play a significant role in spread how government measures progress towards disasters risk reduction. SDG3 (Heath), SDG5 (Gender disparities), SDG1 (Poverty), SDG4 (denied access to education), SDG1 and 11 (land tenure) are all addressing root cause of disasters risk, and il line with the SENDAI Framework and the Paris Agreement, make a complete resilience agenda, as building resilience require action spanning development, humanitarian, climate and disaster risk reduction areas[20].

2.5 ASEAN (Association of Southern Asian Nations)

The association, established in 1967, is seen as a founder member of Indonesia, Malaysia, the Philippines, Singapore, and Thailand. Today counts ten members of the Southern Est Asia. The association, born with the formal purpose to promote economic and social cooperation, has also been conceived as an agreement to fight against disasters and calamities for the geographic areas covered by the ASEAN countries, the most prone region to catastrophe in the world[21]. Recently, the Members have set a new roadmap based on three pillars of the ASEAN Community: Political- Security, Economic, and Socio-Cultural Community.

2.6 Tampere Convention on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations

From May 1991, experts in communication and disaster management from more than 25 countries met in Tampere, in Finland, for the conference on Disaster Communication.
The purpose was to address the urgency to improve international cooperation in communication and enhance national communication capabilities.
The conference stresses that improved flows of international information through telecommunication technologies, including satellite and broadcasting, can assist in the prediction, monitoring, and early warning necessary to prevent some of the consequences and reduce the impact of such disasters once they have occurred.
After the meeting experts agreed to sign The Tampere Declaration on Disaster communication, addressing the urgent need to coordinate and improve national and international communication capabilities to reduce loos of life and damage property and the environment as a result of natural and man-made disasters.
The Tampere Declaration called on States to take all steps to facilitate the rapid deployment and effective use of telecommunications equipment for disaster mitigation and disaster relief by reducing, and where possible, removing regulatory barriers aiming to strengthening the transborder cooperation between countries.
Space-based technologies, and satellite-based positioning technologies, such as meteorological and Earth observation satellites, communication satellites, can be an essential tools as evidenced in past practice[22].

According to the Declaration, the Convention agreed on the following key factors:

- Facilitate the widespread and rapid use of terrestrial and satellite communication facilities to predict, monitor, and respond to major disaster through the world
- Inspire national authorities to inventory available communication equipment and ensure timely access to these resources.
- Provide a mechanism within the United Nations Disaster Relief Organization for international sharing of communication resources, training of personnel.

Despite the presence of 22 European countries agreed, Italy and Croatia have not ratified the Tampere Convention.

3.The European emergency system management
DG ECHO - European Civil protection and Humanitarian Aid Operations

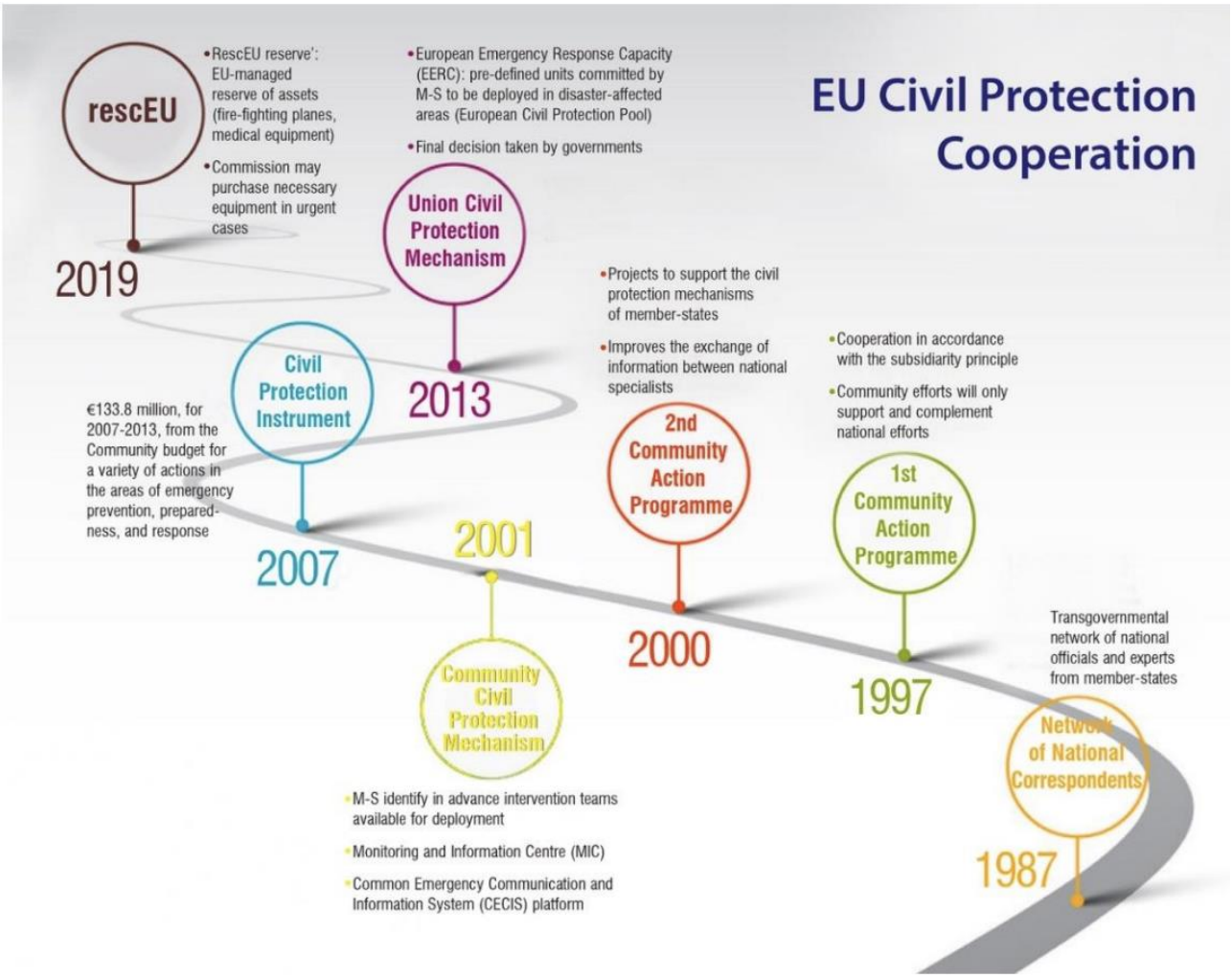
The mission of the DG ECHO[23] is to assist affected countries after a disaster of various kinds addressing human suffering by protecting vulnerable groups, providing aid relief for victims, and encouraging cooperation between the Member States following the Lisbon Treaty.
The Union Civil protection mechanism constitutes the EU response to first aid to natural and man-made disasters, thanks to the volunteers and equipment that created a reserve of resources in case of calamities.

In 1985 the European Commission established the Civil Protection Unit by engaging with civil protection in the DG environment. In 1997, after the UK and Netherlands voted against adopting an Action Programme in Civil Protection, the European Commission established a new agreement: a community action program**, "CAP,"** in the civil protection field. Despite the aid and humanitarian nature of the program, the civil protection system would encounter significant political challenges[24]. The CAP system ran from 1998 to 2004 and includes projects that sought to support the civil protection mechanisms of the member states.

In October 2001, after the 11 September attacks, the Community's **Civil Protection Mechanism** was established under the pressure of member states that stressed the need to set up a mechanism of mutual aid and use of resources among the European States. Moreover, Member states wanted to identify the intervention teams that might deploy at terse notice within 12 hours from the request of assistance. Cyprus, Malta, and Turkey signed the bilateral agreement while Central and Eastern Europe could have access to it.
The community civil protection tools can be grouped into two categories:
The community action plan that provides the legal basis for cooperative preparation activities in the EU, such as workshops, training courses, and major projects related to disaster management and Community mechanism: concerning the responsive phase of a disaster and involves all EU countries plus six non-EU members states[25]. Since its adoption, the mechanism has been employed several times, performing well in coping with diverse disasters conditions.

The Monitoring and Information office (MIC) was established to receive request of information and assistance, later replaced by the Emergency Response Coordination Centre (ERCC), and the Common Emergency Communication and Information System (CECIS) platform, created to exchange and share information on real-time[24].
In 2011, the Union Civil Protection Mechanism was launched with two major innovations: increase in budget (from €133.8 million of the 2007-2014 to €368.4 million for the 2014-2020 period) and the introduction of the European Civil Protection Pool **(ECPP),** a set of resources from participating and member states, including a pool of experts, ready for deployment to a disaster zone in short time. Nevertheless, due to its non-binding nature, State had the right to refuse to deploy those assets[24].

In 2019, the Union Civil Protection Mechanism was upgraded through the rescEU mechanism and a European reserve of resources (**the RescEU reserve**). The rescue reserve constitutes a dedicated pool reserve of assets, managed, and activated by the EU when the existing national-level assets or resources from the ECPP were insufficient or unavailable. Some states criticized the provision, motivating that EU was trespassing their competences in sovereignty.
The mechanism played a major role during the Covid-19 outbreak. In fact, the Commission created a strategic stockpile of medical equipment hosted by one or several member states, which can apply for a direct grant covering 90% of the stockpile costs[26].
Enhancing civil protection cooperation would constitute a valuable asset to a 'global Europe' and the geopolitical aspirations of the EU.



A European Civil Protection Union: Maturing out of necessity Blavoukos, Spyros; Politis-lamprou, Panos, 2022.

7. Disaster Risk Management Planning

Disaster risk assessment is a qualitative and quantitative approach to determining the nature and extent of disaster risk by analyzing potential hazards and evaluating existing conditions of exposure and vulnerability that could harm people, property, services, livelihoods, and the environment on which they depend.
Disaster risk assessments include the identification of hazards; a review of the technical characteristics of threats such as their location, intensity, frequency, and probability; the analysis of exposure and vulnerability, including the physical, social, health, environmental, and economic dimensions, and the evaluation of the

effectiveness of prevailing and alternative coping capacities concerning likely risk scenarios. Understanding that disaster risk in all its dimensions and vulnerability, capacity and exposure of persons, assets, hazards characteristic, and environment[27].

As defined by the ISO 31010 International Standard, risk is "*the combination of the consequences of an event or hazard and the associated likelihood of its occurrence.*" The risk previously identified are not an exception to this definition. The four factors that must be developed and implemented to increase disaster response capacity and reduce the consequences of these events are:
As specified by the IPCC (Intergovernamental Panel on Climate Change), the term Risk is used only when a hazardous event applies to human or ecological system

The risk management strategy is composed of three main phases:

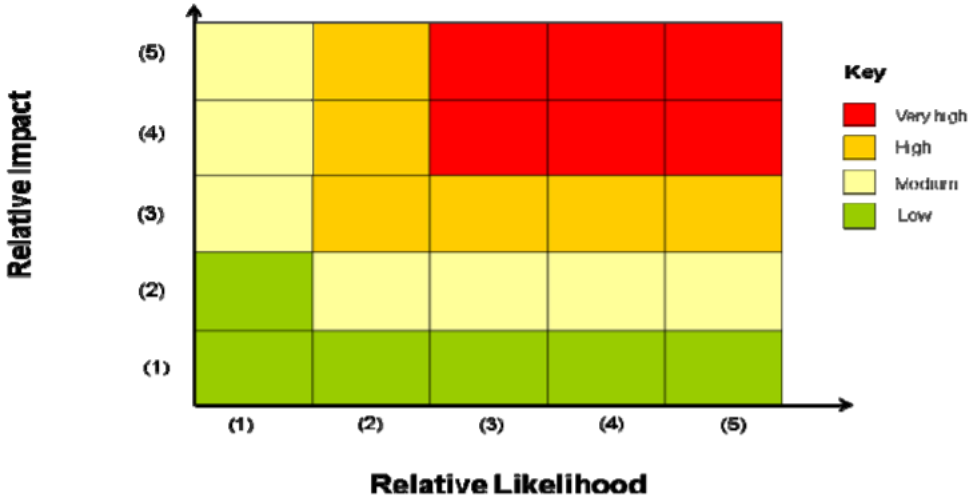
- Risk Reduction
- Preparedness;
- Response;
- Recovery.

An integrated risk assessment and analysis phase is fundamental and will permit to answer to the following questions:

- What are the main hazards/threats faced by people in their context, and what level of impact or consequences do these have?
- How likely is the hazard/threat to occur (i.e. probability)?
- What level of exposure do people have to these hazards/threats?
- How vulnerable are people to these risks, noting that different groups have different vulnerabilities?
- What is the coping capacity of the community?

The required information for the Assessment phase come from commercial and open-source satellite images and maps, project reports from national and international environmental agencies, local knowledge, environmental assessments, national/international environmental databases, wildlife and fisheries management plans, development plans, and land tenure records, climate trends, projections and adaptation options.
This phase includes a Qualitative and Quantitative Risk Analysis. The Qualitative Risk Analysis individuates, per each identified risk, its chances of occurrence and the related consequences in terms of severity for the continuation of the project. Each risk is evaluated through the combination of two parameters: the *impact* (intended as the severity of the consequences) and the frequency of occurrence of the event (*likelihood*).

Figure 2: Example of risk matrix



[2]

Risk matrix made from two parameters: impact of a disaster and relative likelihood.

In addition, a Quantitative Risk Analysis can define the economic impact of a negative event on the project costs (especially those who resulted riskier in the Qualitative Risk Analysis). This whole phase is a continuous process – in constant dialogue with local communities and institutions – that should be constantly kept updated. Once identified local strengths and weaknesses - as also stated by the World Bank[3] - a plan which will include **structural and nonstructural measures** to reduce the natural and man-made risk should be developed.

Structural measures will include buildings, facilities and other infrastructures that should be created and/or modified in order to reduce the risk, especially to reduce the impact of a disaster.

Non-structural measures will include:

a. **People and Education sector,** by the involvement of volunteer fire-corps, neighborhood associations and schools

b. **Institutions**: The creation of a Disaster Management Council, with national and local institutions and defined roles and responsibilities.

8. ANALYSIS FOR RISK REDUCTION

8.1 RISK ASSESSMENT IN THE EU

Disaster risk policies deal with various issues at the European level, including natural and man-made disasters, health threats, industrial and nuclear risks, and others. Some regions have developed valuable expertise for particular types of hazards.

Risk assessments are a first step in mitigating such risks and establishing appropriate mechanisms to prevent as many as possible their occurrence and impacts. Sharing these experiences will help further reduce the effects of hazards and allow better cooperation in facing challenges ahead. Based on the findings from the "Overview of natural and man-made disaster risks in the EU" made by the European Commission and data findings from the author, we provide an initial disaster assessment of the significant threats that can affect the European Union. These data will help estimate the hazards and clearly define the national assessment needed for this and future projects.

8.1.1 FLOODS

Flooding is a temporary overflow of water onto land that is usually dry. Ailing to evacuate flooded areas or entering floodwaters can lead to disruption and death.
Floods may result from meteorological events, coastal storms, storm surges, and overflows of dams and other water systems.
It can be developed slowly or quickly, and flash floods can come with no warning. Furthermore, flood events can cause outages, disrupt transportation, damage buildings, and create landslides.

National Risk Assessment
The flood risk is identified by 16 Member States, Cyprus and Norway. Several floods can also affect vast areas, cross borders, and maintain high water levels for a long time. Flooding can cause environmental conditions that are breeding grounds for diseases. While some European countries have a low flood risk, such as areas of low population density and low economic or ecological value, many places are prone to one or more flood types.

Major disaster events have occurred in Europe, such as the ones in Southern and Eastern Germany and neighboring countries in 2013 (estimated costs of €12 billion), the Elbe basin in 2002 (calculated costs of €20 billion), in Italy, France, and the Swiss Alps in 2000 (economic costs of €12 billion).

8.1.2 FOREST AND WILDFIRES

Forest and wildfires are a high probability risk and a recurrent phenomenon in the EU.
About 70,000 forest fires occur every year in the European Union, burning half a million hectares of forest and natural lands. Over 95% of fires result from intentional or unintended human action.
Yearly economic losses due to forest fires are estimated at €2 billion. Forest fire hazards are not fairly distributed in Europe. Drought, high temperatures, and strong

winds are all meteorological conditions under which forest fires take place. Southern and Southeast European are suffering most from the damages caused by fires.
About 85% of the total annual burnt location in Europe is found in five EU Mediterranean countries: Portugal, Spain, France, Italy, and Greece. The forest fire season that impacts Southern Europe every summer requires many human and material resources such as firefighting planes and helicopters. The number of forest fires in these zones has increased in recent years, confirming projections of increased extreme events caused by climate change.

National Risk Assessment
Forest and wildfires are highly prominent hazards in Southern Europe. Fires are recurrent hazards across Portugal, Spain, France, Italy, Greece, and Cyprus during the summer season.
The significant impacts of forest and wildfires are predominantly environmental but may also be human and socio-economic.
Wildfires can cause damage and disruption of transport systems and critical infrastructure (airports, power lines, etc.), businesses, and private property; in fact, "the impacts of wildfires will be most significant if they occur close to urban areas.

8.1.3 EARTHQUAKES

Earthquakes are generally the result of a sudden subterranean release of energy due to an abrupt shift along a fault fracture. More than 90% of earthquakes are caused at plate boundaries. The main fault lines in Europe are where the Eurasian plate meets the African plate and runs through the Mediterranean Sea. Greece, Italy, Cyprus, Portugal, Slovenia, Croatia, Romania, and Bulgaria around the Black Sea have a higher risk compared to other European zones.
The consequences of earthquake hazards are difficult to assess in a top-down approach. Earthquakes can activate secondary effects like landslides, floods caused by dam breaks, liquefaction, and tsunamis resulting from submarine quakes in sea basins such as the Atlantic west and the Mediterranean. Local amplification (local soil conditions that amplify the seismic motion and cause more destruction), for which local knowledge is necessary.
Furthermore, to assess the potential risk for infrastructure and population, local knowledge is required on vulnerability and exposure, including the location and structural characteristics of buildings, the applicable zonation and building codes, and the level of compliance with the principles. For instance, the population's vulnerability, socio-economic deprived people with worse housing conditions, might be expected to be more vulnerable.

National Risk Assessment

All South-Eastern European countries underline the exceptionally high risk of this natural hazard. The biggest concern is the human and socio-economic impacts of this hazard.
The cross-border proportions of the earthquake risk are connected to the exposure of areas along the fault lines in the Eastern Mediterranean and the Black Sea regions.
Greece, along with neighboring countries along the Mediterranean coast, is in a particularly high-risk area for earthquakes. Historical records show several central earth or seaquakes occurring in the region.
Yet, Italy is also a country with high seismicity, characterized by areas where earthquake risk is of high probability and inferior impact (Vesuvius and Etna regions) and regions of low likelihood and high impact (Calabria, Apennines, Eastern Sicily). The mortality rate due to earthquake hazards in Italy is 30,000 times more important than for any other natural risk.

8.1.4 PANDEMICS/EPIDEMICS

A pandemic or epidemic can have direct impacts on life, health and well-being, and severe indirect consequences in the form of socio-economic losses and strain on public health services and other areas of governance

Three flu pandemics occurred worldwide in the 20th century. The Spanish flu killed over 20 million people between 1918 and 1919; the Asian flu killed over one million people between 1957 and 1958; the third flu pandemic occurred in Hong Kong in 1968- 69 killing 800,000 people. Pandemics recur every 30-40 years following a variation in the virus' antigenetic structure, leading to the emergence of new Type A flu virus subtypes.
Another example is the severe acute respiratory syndrome (SARS), a viral respiratory illness caused by a coronavirus, called SARS-associated coronavirus (SARS-CoV). SARS was first reported in Asia in February 2003. The illness spread to more than two dozen countries in North America, South America, Europe, and Asia before the SARS global outbreak of 2003 was contained.

COVID- 19 OUTBREAK

The well-known infectious coronavirus was discovered in Wuhan in late 2019, and since that date, it has spread rapidly at a worldwide level. In January 2020, the World Health Organization announced a global pandemic, posing significant challenges to global safety in public health. Covid-19 clinical trials have similar symptoms to other respiratory syndromes like MERS and SARS. For years, a possible global crisis has been speculated, and the COVID-19 crisis has affected all aspects of everyday life and work and heavily impacted the global economy. This crisis also offers unprecedented insights into how the global climate crisis may be managed[28]. There

are many parallels between the COVID-19 outbreak and what we expect from the imminent global climate emergency. As with taking early action in controlling COVID-19, identifying, and preventing the crossing of climate change thresholds will help avert worst-case scenarios and reduce climate change's economic and social costs.
Fewer economic resources, social instability, and infrastructure have put societies at a higher risk, not only in the short-term as they bear the brunt of the current health crisis but also because the future impact on their economy is likely to be higher and their recovery slower, thus further increasing economic inequalities between nations. Climate change will operate similarly, as wealthier nations can invest in climate change prevention and reconstruction and less developed countries will suffer the worst impacts without a globally coordinated response to climate change.
Climate change and pandemic emergencies also do not equally affect social groups within nations. Low resource groups, such as those living paycheck-to-paycheck and underrepresented groups, will suffer the most from lockdowns, rising unemployment, and unexpected medical costs.

National risk assessments

In reacting to COVID-19, many countries use a combination of containment and mitigation activities to delay significant surges of patients and level the demand for hospital beds while protecting the most vulnerable from infection, including older adults and those with comorbidities.
A distinction should be made between epidemics – more localised viral outbreaks – and pandemics – global scale outbreak. Member States tend to focus on an assessment of pandemics based on the greater severity and the geographical scope of this hazard.

Tools that properly assess and communicate health-related risks are urgently needed by health departments and governments to inform their decision-making. [29]
National risk assessments often include estimated numbers of patients requiring hospitalization and availability of hospital beds and ventilation support. Most national response strategies include[30]:

- Varying levels of contact tracing and self-isolation or quarantine
- Promotion of public health measures, including handwashing, respiratory etiquette, and social distancing
- Preparation of health systems for a surge of severely ill patients who require isolation, oxygen, and mechanical ventilation
- Strength the health facility infection prevention and control, with particular attention to nursing home facilities.
- Postpone or cancellation of large-scale public gatherings

Countries need to rapidly and robustly increase their preparedness, readiness, and response actions based on their national risk assessment, especially those who have scarse measures for preventing the transmission scenario.
Countries should consider updating their national risk management, learning from the previous pandemic infections and the Covid-19 experience, in case another pandemic outbreak may occur. Containment or other actions that aim to delay the onset of patient surges needs to be implemented where feasible, and measures such as public awareness, promotion of personal protective hygiene, preparation of health systems for a rise of severely ill patients are measures taken into account for national risk assessment.[30]

8.2 MAN-MADE NON-MALICIOUS DISASTER RISKS

8.2.1 Industrial accidents

The 'Seveso' Directive on controlling significant accident hazards involving dangerous substances sets a European framework for preventing, preparedness for, and responding to industrial accidents107. The Seveso Directive obliges the Member States to ensure that operators have a policy to prevent major accidents. Operators handling dangerous substances above certain thresholds must notify their activities to the relevant national competent authorities, submit safety reports, establish a safety management system and set up an internal emergency plan. The Member States shall ensure that the public likely to be affected by an industrial accident is regularly informed and that relevant information is kept permanently available for the people.

Incidental discharges involving dangerous substances in chemical installations, petrochemical, and oil refineries frequently happen in Europe and demonstrate the need for better and more efficient control of significant industrial hazards.
Industrial accident prevention and preparedness are aimed not only at preventing significant catastrophes, such as the fire in the petroleum storage depot at Buncefield or the ammonium nitrate explosion in Toulouse but also at more minor incidents that violate the right to a safe community, a safe workplace, and a clean environment.

National Risk Assessment

The main consequences of industrial and chemical accidents identified are human risks of getting involved in a fire, explosion, and contamination.
The environment can be harmed due to the risk of water and ground contamination, economic damage and repair costs, and the cascading effect on surrounding economic activity.

According to the results of Member States' risk assessments, the risk of major industrial or chemical accident scenarios is considered relatively low due to high levels of regulation and control measures in place, the national phasing out of hazardous substances, and, in some cases, too few existing lower and upper-tier Seveso sites domestically. Notwithstanding, while other hazards may supersede industrial accidents in their assessed level of risk (for example, in Greece, these accidents are considered much less frequent than earthquakes and wildfire), Member States insist that the risk of industrial accidents cannot be underestimated. This is the case as many industrial and chemical sites may be located close to local communities.

8.2.2 MARITTIME TRANSPORT ACCIDENTS

Maritime transport constitutes a complex network posing safety, environmental, and security challenges. With many elements of critical infrastructure, the sector needs a comprehensive approach to assessing the associated risk landscape with quantitative risk analysis. From a risk analysis perspective, maritime transport is a naval network that interfaces with shore-side operations at intermodal connections as part of the overall European supply chains or domestic, commercial operations. The networks include vessels, port facilities, waterways and waterway infrastructure, and intermodal connections and users, including crew, passengers, and navigation infrastructure and services.

National Risk Assessment

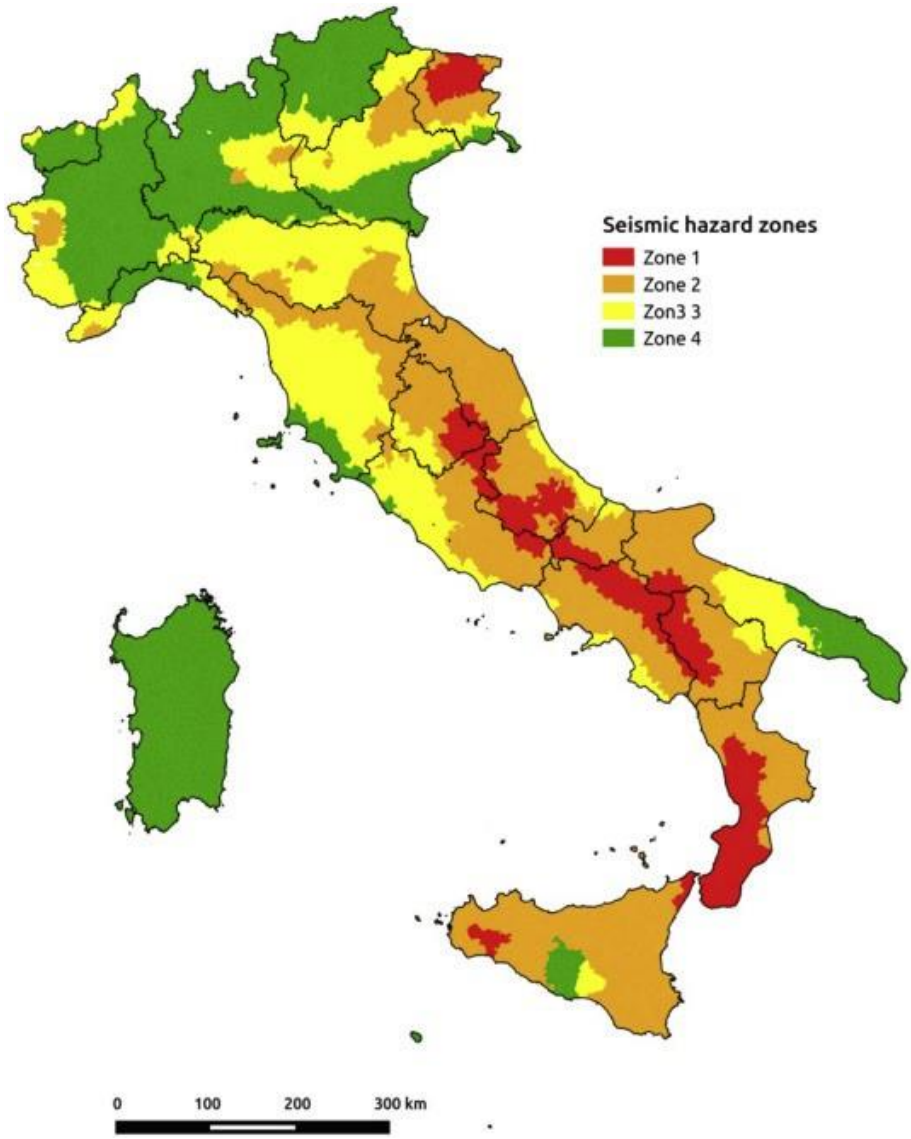
Maritime transport accidents are granted particular attention across. Most of the countries addressing this hazard have coastal borders. Lithuania, Sweden, and Norway only address maritime accidents, while Estonia and Ireland assess the risk of marine transport accidents as higher than other forms of transport. Maritime transport accidents involving cruise ships, containers, and tankers tend to present a high risk due to the severity of their human, economic and environmental impacts.[31]

9.DISASTER MANAGEMENT IN ITALY

Italy is periodically subject to disasters of various kinds. Studies show that fatal events happen almost every year, distinguishing between casualties provoked by floods and landslides most frequent in the Alpine regions and landslides in the southern, especially in the Campania regions.

Italy, owing to its inherent geological, geomorphological peculiarities and climatic conditions, is characterized by high exposure to natural hazards with potentially severe consequences.

In particular, the seismic activity in the Italian peninsula is mainly caused by the converging movements of the African and Eurasiatic plates, resulting in high seismicity. The most critical areas are found in the Apennine mountains, where in the last year's most of the major events have taken place; and the regions of Calabria, Molise and the lower part of the Tirrenian Sea affected by seismic events as well[32]



(Seismic hazard map, from the INGV[33] website)

In this chapter, we give a synthetic account of the harmful events that hit the Italian territory in the last 70 years. For further information on the Italian Disaster Management and Legislation see (Reporting Governance on the Disaster Management).

FLOOD OF THE RIVER PO (22 NOVEMBER 1951)

The flood of the Po river that occurred in 1951 was the most catastrophic flood that interested the river basin.
The principal damages registered the Po traits from Parma province to the mouth, hitting an Italian territory characterized by flourishing agriculture. The drying up process required 195 working days officially ended the 23 May 1952 with the construction of 512 houses in a period of nine months. Within the Law 184 of 1952, the Italian government has established the **"Magistrate of the Po"** to study, monitor, and plan the defense intervention of the Po basin territory among the hydrogeological risks.

Lesson Learned
The occurrence of the catastrophic flood of 1951 determined the institution of the Magistrate for the Po, as an effective unitary structure operating at basin level. The national law of July 12, 1956, n. 735, was followed by the law of March 18, 1958, n. 240 and the law of October 10, 1962, n. 1484, which transformed the Magistrate from a simple coordinating office into an active administrative body with full powers in the planning, execution and management of the defense works of the entire basin.

VAJONT DAM (OCTOBER 1963)

On 9 October 1963, 260 million cubic meters of rock broke off from the top of Monte Toc. The dam was built without the due geological local knowledge of the territory and Monte Toc's instability. They fell into the reservoir of the Vajont Dam, producing enormous flooding that destroyed several villages in the valley and killed over 2,000 people.[34]

(Vajont Disaster image taken from the Ministry of Italian Defence)

The Italian Army mainly brought aid to the survivors, counting over 10.000 units. The Fire Fighters contributed to over 850 units equipped with three helicopters and 271 mechanical means, providing rescue and assistance, and cooperating with the Arma dei Carabinieri (Italian army corps which is also a police force) to help those still alive and recognize the bodies.

Leasson Learned

The disaster, although caused by a landslide, can be considered a disaster of anthropogenic origin, i.e. directly linked to human action (in this case the decision to build a dam in a geologically unstable area).

- The overall management of the emergency highlighted the lack of an organization capable of effectively dealing with natural disasters.

- The rescue forces, belonging to different corps, lacked a chain of command, hence the necessary coordination.

- No central body was set up to provide precise and official information on the progress of rescue operations.

The event led the government to adopt safety measures to be applied in case of disasters. On October 18th , 1963, the law decree n. 1358 was approved (converted into law on November 6th , 1963) which sanctioned the suspension until April 10th , 1964 of the expiry date of "promissory notes, bills of exchange and any other title having executive force" issued before October 10th . On October 31, 1963, it was the turn of Decree Law 1408, containing "norms to assure indispensable interventions for safety in the areas struck by the disaster" amounting to 7 billion lire (4 billion for interventions relative to safety and 3 billion for urgent assistance and relief). On November 4, it was then the turn of Law no. 1457 concerning "Measures in favor of the devastated areas".

FLOOD OF FIRENZE (NOVEMBER 1966)

After two days of continuous rain, the River Arno broke the barriers and flooded to Firenze the 4 November 1966. The water infiltrates the historical center of Firenze, causing severe damage to the artworks. The Arno River left Firenze 2 days later, leaving the city in a catastrophic situation: the water level increased to reach 4 meters and 92 cm.
The firefighters and the Army made the prior intervention, but many volunteers, mainly students, rushed to help for the first time. Today they are remembered as " Angeli del fango" (lit. Mud's Angels).
The devastating events, amplified by the notorious place, attracted considerable youngers from many parts of Italy and abroad, ready to clean up the city and secure the artworks. As soon as the news reached the United States, groups of curators, scholars, and conservators created the Committee to Rescue Italian Art (CRIA), intending to raise funds to support the rescue operation and provide assistance to the restoration[35].

50th anniversary of the Florence Flood: Memories from a drowned world, theartnewspaper.com

Lesson Learned

To cope with the disaster, a Coordination Committee was set up in the Prefecture, composed of the mayor (Piero Bargellini), the prefect, the military and representatives of the government and local administrations, who from time to time had the task of contacting the fire brigade, the Red Cross, and the army units.

On a regulatory level, the Florence flood accelerated the process of revising provisions on soil conservation.

The ministerial decree of November 23, 1966 entrusted the Interministerial Commission for the Study of the Hydraulic System and Soil Defense, better known as the De Marchi Commission, with the task of "examining the technical, economic, administrative and legislative problems of interest in order to continue and intensify the interventions necessary for the general hydraulic system and soil defense, on the basis of a complete and updated program". Composed of authoritative technicians and experts, the Commission (which completed its work in March 1970) not only highlighted the main defects of the existing system but also produced an extremely advanced text in terms of content, in line, among other things, with what was being proposed at the same time in other advanced European countries.

THE BELICE VALLEY EARTHQUAKE (JANUARY 1968)

In January 1968, a violent earthquake hit western Sicily, comprehending Palermo, Agrigento, and Trapani's provinces, impacting more than 14 villages destroying most of them. The victims were over 400, more than 1000 wounded, and 100.000 homeless. The earthquake of Bellice's valley was one of the sadly known case histories of the Italian state unpreparedness: the initial abandonment, the delays in the reconstruction phase, the population forced to immigrate, and the horror of the shacks are a few examples.
Firefighters and the Army were entrusted with the first rescue. However, it was below the expectations due to the lack of infrastructure that characterized Sicily during that time. Remarkable is the assistance provided by NGOs and associations of northern Italy to host the affected population.

Lesson Learned

"In some severely affected centers, according to the Sicilian press, for the entire the day following the main shock, the population did not receive any organized relief; many people, having fled the towns, wandered for hours in the surrounding countryside."[36]

After 10 days from the event, 11 tent camps had been set up to accommodate more than 16,000 people, the evacuees in the collection centers were about 14000. Around the end of the month there was the denunciation from the mayors of the affected centers to communicate the lack of food and necessities.
The huts built were small and the sanitary organization was very bad.
There were problems of overcrowding in the tents.
In part, this general disorder was also due to conflicts and overlapping of responsibilities between civil, military and institutional powers.

"The reconstruction of Belice represents the latest case of a centralistic approach, with the aggravating circumstance of adding to the state inefficiency the weight of a thaumaturgic conception of cascade planning, which proposed to invent the economic
to invent the economic development of the depressed area through the drastic and sudden overturning of the socio-economic structure of a community which was still largely and deeply agricultural

THE EARTHQUAKE OF THE FRIULI (MAY 1976)

In May and September 1976, the Friuli was shuttered by two strong earthquakes. Due to the tragic events, more than 1000 people died, 2.400 wounded, and 100.000 were homeless. The first shock had an intensity of 6,4 on the Richter scale and the second, which occurred in September, was more violent, giving the final blow to the

Pordenone's population. The dual shock registered 9° on the Mercalli scale, causing landslides of the mountains around Braulis and Bordano. Comprehensively, damages were encountered in 50 villages with an estimated cost of around 13 billion dollars.[37]
This time, the earthquake hit a zone within a solid Italian and Nato Army presence that made the first aid yet; the major news of this event was the direct participation of a vast number of citizen volunteers in the recovery operation. The Extraordinary Commissioner appointed by the Government, On. Giuseppe Zamberletti, who from this experience onwards will be the main protagonist for the foundation of a Civil Protection structure in Italy.

Lesson Learned

The first rescues arrived in very short times, thanks to the fact that a good part of theof the Italian army was stationed in Friuli. NATO troops also intervened
and some Austrian and German relief organizations.

Another very important aspect of the first aid phase was the first manifestation of the first manifestation of the "Friuli model", characterized by a decentralized organization of the emergency, which would lead to the modern concept of Civil Protection.

Law 546/77 was approved, entrusting the municipality directly with the task of identifying areas of temporary shelter and of providing and realize the necessary infrastructures and urbanization works. The choice was made according to common criteria, namely: the proximity to the damaged centers, the, the reachability with the means of relief, the availability of local productive resources, the configuration of the land, the hydrogeological safety and the susceptibility of connection to infrastructure networks

Reconstruction was characterized by many slogans, one of the most important was "**first the factories, then the houses and after the churches**"
This slogan summarized the purpose and direction of the reconstruction process that had been decided.

THE INDUSTRIAL DISASTER OF SEVESO (JULY 1976)

Icmesa, chronostory of a disaster, Corriere della Sera 1976.

In July 1976, an explosion occurred in Seveso, a small town located in Northern Italy near Milan. The disaster involved the ICMESA chemical plant. The reactor violently exploded, releasing a toxic cloud containing TCDD, a chemical substance used to fabricate pesticide and considered one of the most toxic chemicals, were released into the atmosphere. The Seveso disaster had a traumatic effect on the exposed local population due to the gradually recognized hazardousness. The Icmesa accident was the first significant industrial disaster in Europe, leading to creation of the European community's Seveso Directive (Directive 82/501/EEC), a system of industrial regulation. The competence for administering this industrial accident was entrusted to the Firefighters, the first regional centers of prompt intervention of industrial calamities. The disaster has had a long-term impacts: more local died from cardiovascular and respiratory disease and certain types of cancer increased in frequency, years after. Due to the substances involved in this kind of disaster, a

protocol was defined to manage the intervention, pointing out the necessity of defining specific competencies for the Civil Service operators.

THE EARTHQUAKE IN IRPINIA AND BASILICATA

On 23 November 1980, two earthquakes of 10 intensity in the Mercalli scale occurred in the southern Apennines, straddling through Irpinia and Basilicata, causing more than 2.000 deaths and over 10.000 witnesses, destroying over 77.000 constructions and damaging another 275 thousand. The disaster was remembered for the lack of management by the Italian government, delays in rescues with solid criticism from the public for the lack of adequate civil protection legislation, especially after the Friuli earthquake experience.
It will be necessary to wait until 1992 to have the first organic law for Civil Protection, the law n. 225/92; meanwhile, the 266 of 1991 had given the first framework for voluntarism.

Lesson Learned
In 1981 the guidelines and criteria that the municipalities should have used to plan temporary settlements were made explicit through Law 219.
that the municipalities would have had to use in order to plan the temporary settlements; there were, however, considerable delays due both to the projects and then to the implementation in work, which led the settlements to be operational and usable about two years after the seismic event.

the fundamental law for the reconstruction was the n.219 of the 14 May of 1981, this made known the two roads to be traveled in a parallel manner in order to parallel way to carry out reconstruction:

- the first, entrusted to local authorities, related to the reconstruction of housing and related local public works;
- the second, entrusted to the state, related to infrastructure and the design of economic economic development of the affected populations.

THE FLOOD IN PIEMONTE OF 1994

The flood occurred in November 1994; the prelude to the disaster was a week of heavy rain and harsh meteorological conditions that affected the Piedmont region, mainly involved in the provinces of Cuneo, Asti, and Alessandria. In these areas, the Tanaro, the Covetta, and the Bovina flow out of their beds simultaneously, dragging an enormous quantity of debris downstream. Because of waterpower, grown disproportionately with time and the number of kilometers covered, these courses

will turn into tumultuous rivers, capable of overwhelming everything with the intensity of their waters. In flood, more than one hundred people will lose their lives, while the number of homeless will exceed five thousand.

The flood destroyed countless homes, thousands of cattle heads were lost, stocks of cereals and fodder vanished, agricultural land, invaded by the flood, became overgrown. The number of destroyed urban infrastructures, interrupting roads and railway lines, and artisan companies, almost five thousand prostrated by the flood, was also high.

Compared to the events of the previous disasters, the rescue systems functioned with remarkable timeliness and efficiency. The territorial structures actively responded, and the voluntary association took a primary role in the first emergency rescues. The institutions of a dedicated emergency line created known coordination between the population, association, and public institutions; from this experience, the voluntary role has been transformed into a referenced active member for the first rescue emergency.

UMBRIA – MARCHE EARTHQUAKE (1997)

The 26 September, a long sequence of telluric shocks instills panic and destruction in Umbria and Marche. Three hours after the seism, the first association of voluntary (the Misericordia) is lending the first rescues to the populations.
In the following twelve hours, the volunteers of the Misericordia produce the maximum organizational effort.
The Reception Camp of Taverne at Serravalle del Chienti was set up, first with tents and immediately after with roulotte. A kitchen was immediately put into operation at the camp and remained in use for the entire emergency period.
The Operational Center was arranged to organize and manage the interventions of the Misericordia throughout the area. Meanwhile, a warehouse was set up to sort the aid that the Misericordia was collecting and making distributing to the population.

Similarly, a second Operational Center was placed in Nocera Umbra. Here, the Misericordia managed two Reception Fields and a Warehouse as part of the aid collected by the Misericordia.
The anomalous Umbrian earthquake continued to hit the surrounding area, panicking the population already alarmed. While it proceeds in the rescues trying to overcome the emergency, new, sudden, seismic solid shocks repropose the drama of the first days forcing the rescuers and the population to begin again from the beginning.

The sanitary conditions of the population, even where relief efforts were immediate, caused more than one concern. The "Misericordia" made available, at the same

time, up to 24 ambulances that presided over as many localities, also making use of volunteer doctors and nurses.
The Misericordia did not underestimate the aspect of the psychological impact on the population; for this purpose, initiate a whole series of animation and support activities so that the weakest subjects, the elderly and children, can overcome the trauma caused by the earthquake.
Altogether at the end of the operations that last six months, there will be more than 3,000 volunteers of the Misericordia employed in the Umbria-Marche earthquake emergency, and at least twice that number counting the volunteers from all the associations that intervened.

Lesson Learned
In order to be able to manage to the best the emergency it came instituted to Foligno a regional operating center that had the functions of coordination, and other six mixed centers in as many communes, individualized between those more hit.
The intervention of the Civil Protection happened in the same day of the shake of Assisi, 26 september, with approximately 2500 operating persons, than increased then in the turn of little days to beyond 6000 persons.
The region Umbria brought innovations in terms of reconstruction physical reconstruction of the damaged buildings, with the aim of improving the quality of the interventions to be implemented.

It defined three types of reconstruction:

- Light Reconstruction: it concerned the uninhabitable buildings that had suffered minor damages, consequently restructurable in contained times;

- Heavy reconstruction: it concerned uninhabitable houses with structural damage structural damage, therefore severely damaged, it was expected the restoration through operations without urban transformations;

- Integrated Reconstruction: it concerned the repair and reconstruction of buildings inside the historical centers and urban or rural nuclei of particular landscape interest, the interventions were all part of the Integrated Recovery Plan. (Umbria Region, 1999)

MOLISE EARTHQUAKES (OCTOBER 2002)

In late autumn of 2002, two strong earthquakes took place in the Italian region of Molise. The magnitude and intensity of the two events were remarkable: the magnitude was between a range of 5.4-5.8 and the intensity reached 8/9.0 Mercalli scale which caused the collapse of infrastructures and building. Significant was the

collapse of a primary school that caused the death of 26 young children. Victims were 30 in total.

The episode has placed the attention of public opinion on the events related to the seismic resetting of the Italian territory, often opposed by local authorities who feared an increase in costs on construction. Updates of the legislation will have to wait for the "New Technical Standards for Construction" with the DM 14 January 2008. The first Ordinance of the Presidency of the Council of Ministers in 2003 was continually delayed in its application. Even the DM of 2005 has functioned as a transitional regulatory tool while waiting for a comprehensive one, which arrived in 2008. However, based on the decree of 2005, it came to update the map of seismic hazard of the Italian territory.

AQUILA EARTHQUAKES (APRIL 2009)

Since December 2008, a seismic swarm of the third degree of magnitude has affected Sulmona and L'Aquila. Still, on 6 April 2009 at 3.32, an earthquake of magnitude 6.3 with an epicenter in the area of Roio Colle affected the entire area of the basin of L'Aquila.
The dead were 309, 1600 injured, and about 80,000 displaced. The emergency room of the National Department of Civil Protection was activated in real-time, and already in the early morning, DICOMAC (Direzione Di Comando e Controllo) was operational.
The earthquake heavily hit the vast historic center of L'Aquila and neighboring towns, putting out of using the main emergency structures, such as the Prefecture. The relief structures, the new building of the school of the Guardia di Finanza that has not suffered damage from the earthquake, becomes the headquarters of the operational structures for relief. The entity of the people and the involved building patrimony push the government to try the media card for consistent fundraising.

(A church destroyed in the earthquake that devastated L'Aquila. Photograph: Christian Sinibaldi for the Guardian)

The G8 summit, initially planned in the Maddalena island, was relocated to the department of the Guard of finance of the Aquila. The principal heads of state meetings were held in L'Aquila from 8 to 10 July 2009 while the municipality was still in full rescue emergency.
The Government also attempts a new approach to overcoming the emergency. In all the previous earthquakes experience,the emergency steps of relief foresaw an immediate first aid with tents, the second step of a short time in relief structures more suitable for the life and privacy of the evacuees using containers or prefabricated houses, and a third phase which consists in the reconstruction. The previous experiences in Italy (except perhaps that of the 1976 earthquake in Friuli) have prolonged the second phase of the temporary relief structures for a very long time. Based on these considerations, the Government launched the CASE project to skip the second phase of temporary structures and move from tents to reconstruction. In August 2009, the number of evacuees, thanks to systematic verification of the buildings, was reduced to about 49,000. At the closure of the tent cities at the end of September, there remained about 20,000 evacuees who had to be accommodated differently; in January 2010, there were still 10,000 evacuees housed in hotels or other temporary structures.

Despite the efforts of some planners, the administration has favored a reconstruction of the urban fabric "as it was and where it was" - in particular concerning the largest area of the Plan - reconstructing the pre-existing architectural forms but also the

spatial organization, not supporting interventions of more profound reorganization. The city in 2018 still looked like an open-air construction site with reconstruction continuing to proceed.

Lesson Learned

The strategy of the government, headed by Silvio Berlusconi, included a project, the C.A.S.E. (Complessi Antisismici Sostenibili ed Ecocompatibili - Sustainable Earthquake-proof and Eco-compatible Complexes) project, through which new living quarters would have been built, durable, anti-seismic, technologically advanced, and inspired by energy saving criteria.

Unfortunately, the so-called new towns, did nothing more than make fragmented the idea of urban life structured as dormitories without the slightest thought of spaces for social and community exchange.
The government provided therefore to the installation, mainly near the small nuclei, of the M.A.P. (Moduli Abitativi Provisional).

The community was particularly affected by the top-down management imposed by the government, in addition to the media exploitation of the events, a general climate of discontent was created.
events, a climate of general discontent was created. Moreover, the lack of confrontation
In addition, the lack of discussion and involvement of the population in decisions concerning their housing fate was demoralizing at the local level.

EMILIA EARTHQUAKES (20-29 MAY 2012)

The strongest earthquakes of this period occurred in recent times. The earthquake that struck Abruzzo on April 6, 2009 was magnitude 6.3, and caused 308 casualties. Another major earthquake affected Emilia-Romagna, Italy, Lombardy, and Veneto on May 20 and 29, 2012 (magnitude 5.9), and killed 27 people. Earthquakes also have a major impact in economic and social terms.
On May 20, 2012, at 4,03 PM, an earthquake of magnitude 5,9 with an epicenter in the town of Finale Emilia had affected a wide area causing damages in the provinces of Modena, Reggio Emilia, Bologna, Ferrara, Mantua, and Rovigo. A second earthquake hit the same spot-on May 29 at 9.00 am with 5.8 magnitudes of intensity. Other shocks greater than magnitude five were recorded in the following hours of the same day. There have been 27 victims, 400 injured, and more than 15.000 displaced in the two main events. Six relief camps were set up in the province of Modena, 2 in Mantua, one in the province of Ferrara, and one in the area of Reggio Emilia. According to the seismic risk map, the site is located in a low seismic risk area.

The emergency management was entrusted separately to the regions of Emilia Romagna and Lombardy, which used their personnel and volunteers from the two regions. There was a great deal of work to assess the post-seismic fitness of the residential structures involved. The earthquake, however, affected many production facilities, both industrial and agricultural, highlighting a legislative deficiency regarding the anti-seismicity of large, prefabricated structures. The lack of availability of even a specific form for the analysis of the post-seismic agility of prefabricated structures has put the evaluation system in crisis and a particular improvisation of operations. The regulatory gap has been filled with a specific DM that should address the reconstruction.

It could be defined as the earthquake of warehouses. The quake hit a highly productive area characterized by medium-small industrial settlements for the first time. Buildings made quite recently with heavy prefabrication systems that were not required to comply with anti-seismic regulations as they were located in a low-risk area. The area is further valued for the agricultural production with buildings for agricultural production also historical that
have suffered heavy damage.
For the agricultural production sector transformations, in recent years, most of the staff employed is non-EU. The most significant number of evacuees who have benefited from the relief structures of the camps were represented by non-EU citizens. Refugee camps have been formed with people from different cultures that have highlighted various problems of camp management, expressing vulnerable categories.

Lesson Learned

For the emergency management the volunteers of the mobile column of Emilia-Romagna were engaged, about 7000 and another 14000 from other Italian regions.
Initially 36 emergency camps were set up, 29 of which were in the municipality of Modena; in addition, 53 indoor structures were made usable, for a total of about 16,000 people assisted.
By time, the number of people assisted progressively decreased until the emergency camps were to arrive at the closure of the emergency camps at the end of October 2012 with 2900 people, 5 months after the earthquake

In the second phase one of the first measures to support the affected population,so that they can find alternative accommodation to those provided, is the Contribution of autonomous accommodation (**CAS)**, managed by the Department of Civil Protection.

The "Institutional and Steering Committee for Reconstruction and Full Recovery of reconstruction and the full resumption of economic activities', saw to its

inside the provinces and the mayors of the affected municipalities. This committee had the function to program activities and choices that concern reconstruction.

EARTHQUAKE OF AMATRICE-NORCIA-VISSO (2016 – 2017)

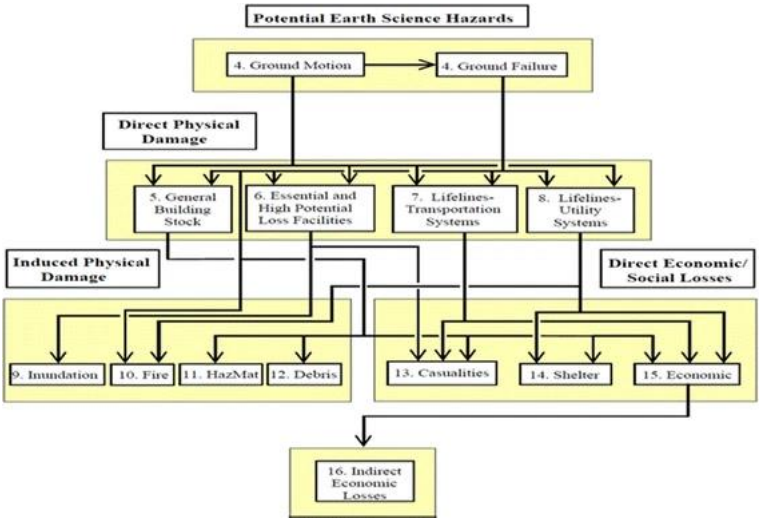
On August 24, 2016, a magnitude 6 earthquake hit close to the city of Amatrice, causing severe damage and killing about 300 inhabitants. Any increase in seismic activity did not anticipate this earthquake. It initiated a very complex seismic sequence with several bursts of seismicity and an intricate spatial pattern, with more than 50,000 earthquakes recorded. After two months of a typical aftershock sequence characterized by many more minor earthquakes, in late October, the northern portion of the sequence was hit by Magnitude 5.9 and Magnitude 6.5 earthquakes that caused significant damage to a vast area around the city of Norcia. The famous 14th-century basilica of San Benedetto that had resisted earthquakes for more than six centuries was destroyed during the seismic event. Later in January, four M5 and more earthquakes occurred close in time and space in the southern part of the sequence, raising concerns for the potential impact on the nearby Campotosto dam that forms the second-largest man-made lake in Europe.[38]

The construction during 2017 of the Area Food at Amatrice, a complex of commercial buildings designed by the architect Stefano Boeri, attempts to stimulate the devastated local economy of this corner of the Apennines, which is primarily based on stock farming, agricultural produce, and hospitality. Overall, the damage caused by the earthquakes between mid-2016 and early 2017 touched 24 billion euros, as certified by the Civil Protection to the European Union. 340 thousand damaged buildings, distributed over an area of 8 thousand square kilometers, 140 municipalities invested, 600 thousand people involved, a quarter of the elderly people over 65 years.
Unfortunately, Italy ranks second in Europe for incidence of seismic events with ten events of great intensity only in the last 30 years.
Reconstruction interventions in the territories of the four regions affected by the earthquakes of 2016 and 2017 have immediately faced several difficulties, from removing the massive amount of rubble to the insufficiency and precariousness of the staff to be used in the administrative management of damage claims. Subsequently, since 2020, the health emergency from COVID 19 has strongly conditioned all activities due to the unprecedented restrictions and difficulties in the lives and activities of citizens, professionals, businesses, staff of municipalities, and all the authorities in charge of the various levels of governance[39].

10. EARTHQUAKE RISK ASSESSMENT

The seismic activity in the Italian peninsula is mainly caused by the converging movements of the African and Eurasiatic plates, resulting in high seismicity. The most critical areas are found in the Apennine mountains, where in the last year's most of the major events have taken place. The regions of Calabria, Molise and the lower part of the Tirrenian Sea are affected by seismic events as well[32].

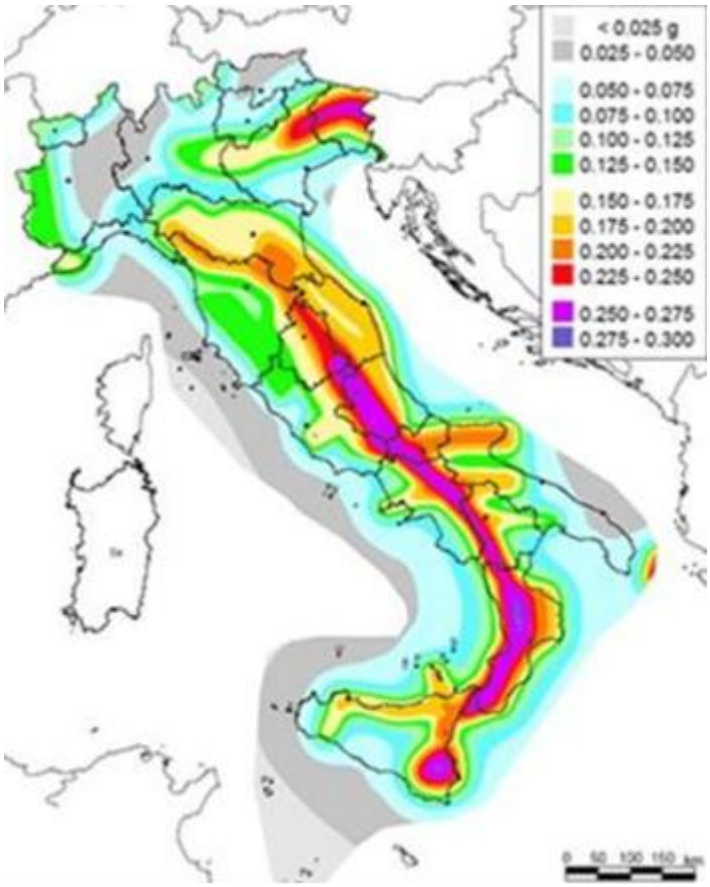
Earthquake prediction, generally defined as predicting an imminent damaging earthquake with enough accuracy, is still something to be achieved. Prediction of seismic events is not an option to mitigate earthquake hazards.
Assessment of earthquakes risk is the key step in the earthquake risk management, that includes risk mitigation and emergency plan.
Earthquake risk assessment methodologies combine three factors: hazard, fragility/vulnerability and inventory of assets exposed to hazard.



Earthquake risk estimation

This flowchart represents elements, location, and physical characteristics, exposed to seismic hazard that explain the relation and the correlation between the Potential earth science hazards, Direct physical Damage and/ or induced Physical Damage, as well as the direct economic/ Social Losses.
For a given **Ground motion** (intensity measure), the direct physical damage is determined by the relations of **fragility/vulnerability** of the area examined, which provide the probability of **losses/damages** correlated to the ground motion level of intensity.
The vulnerability relations generally quantify the losses (direct cost for the retrofit) or the relation of losses (cost of repairing/ cost of substitution), considering the uncertainty during all phases of the earthquake risk assessment.
Interesting and used software for estimation of earthquake risk assessment are HAZUS **(www.fema.gov/hazus)** produced by the FEMA (US Department of Homeland Security); CAPRA **(http://www.ecapra.org/)** produced by the World

Bank, use probabilistic risk assessment tools and software to generate a probability for a seismic hazard in defined areas[40].



Seismic hazard map of Italy expressed in terms of horizontal peak ground acceleration for soil type A with a probability of exceedance of 10% in 50 years, referring to stiff soils (www.ingv.it).

Prediction of Seismic hazard is also developed by earthquake hazards map. For instance, The Italian Civil Protection Department report that seismic hazard is obtained by the probabilistic seismic hazard analysis or PSHA[41]. This model is based on a Seismic hazard map developed by the INGV (Istituto Nazionale di Geofisca e Vulcanologia). The PSHA model displays maps showing the value of peak ground acceleration (PGA) and spectral acceleration (Sa)corresponding to an exceedance probability in a given period or, equally, to an assigned return period.
The earthquake risk is evaluated by making earthquake hazard maps, as in the case of Japan, where the National hazard map seriously understated the risk in the area struck by the 2011 Tohoku earthquake. The Japanese government uses this model for various zones, chooses the parameter for each site as input for their model, and produces a probabilistic hazard map47, a similar methodology as the INGV does. Despite the consensus, this assessment method is inaccurate, and earthquakes still occur in places assigned relatively low probability.

Exposure

The exposure database is derived from census data provided by the Italian National Institute of Statistics (ISTAT). Currently, 2001 and 2011 census databases, which provide information about buildings, dwellings and population, are available and publicly accessible. The data about buildings and dwellings include the structure's material (masonry, reinforced concrete or other), the number of stores and the construction period[42].

Damage assessment and Impact indicators

The consequences of a seismic event are expressed in terms of human impacts, economic/environmental impacts, and political/social impacts. For each municipality, the following impact indicators should be determined for :

1. expected number of unusable buildings or dwellings in the short and long term;
2. expected number of collapsed buildings or dwellings;
3. expected number of homeless people, casualties in terms of the expected number of fatalities and injured people;
4. direct economic losses.

The evaluation of seismic risk in terms of damage levels is the starting point for assessing the above impact indicators.
It should be noted that the different types of hazards are considered in isolation. Still, some regions are projected to be affected by collocated and/or simultaneous changes in various threats. Two examples are sea-level rise and heavy precipitation

in some areas, possibly leading together to more flooding, droughts, and heatwaves, increasing the risk of fire occurrence. Such events, also called compound events, may substantially increase risks in some regions.

10.1 PREPAREDNESS ACTIONS

10.1.1 STRUCTURAL MEASURES:

- Disaster Urban Resilient infrastructure

Cities and societies are constantly exposed to unexpected risks, triggering health, social-economic threats, climate change effects. Urban resilience is a concept that emerged for studying the capacity of cities, communities, and societies to resist, absorb, adapt and recover from the effects of risks in a timely and effective manner[43].

Urban areas are increasingly vulnerable to disruption risks. A preparedness action approach to prevent and mitigate disasters should include an assessment of critical infrastructure, which concentrates on essential urban functions and their ability to recover from disruption.

These phenomena are particularly true in the case of earthquakes.

Telecommunication, energy transport networks, emergency services, hospitals, water, and food supply are all examples of critical infrastructure that can be stand-alone, interconnected, or interdependent.
Interconnected infrastructures connect people and territories and offer resources and opportunities, still, are highly vulnerable in the event of a crisis. If all urban operations depend on them, a single failure can disrupt the entire network or impact the whole city.
There is a distinction between direct and indirect impacts.
Direct impacts are directly caused by the disaster and refer to the infrastructure elements' damage. Yet, **indirect impact** can be related to the interruption or the disruption of critical infrastructure service.

Before constructing buildings and infrastructures, an assessment of the disaster risks that can occur in the areas, the material and techniques used are all essential aspects to determinate the network's resilience during a disaster event.

Based on the findings of Charlotte Heinzlef et all., 2020, we reported three indicators in order to measure urban, technical, and social resilience at a local urban scale.

- **An urban resilience indicators**: embrace all urban dynamics such physical (age of buildings, elevation, ecc) and critical infrastructure such

as access to medical infrastructure in case of an emergency, business creation and transportation.

- **Social resilience indicators:** ability of a population to adapt and recover from high impact's calamities. Some indicators are age (percentage of elderly people to the total pf population), socio-economic status, education levels, government support.

- **Preparedness resilience indicators** indicate all measures implemented before a calamitous event happen. Housing type, medical capacities (number of hospitals beds per 10,000 population), access and evacuation potential (principal arterial miles per square miles)[44].

- Communication as obligatory step for Preparedness

As reported in the chapter related to the Tampere Treaty, communication before, during and after a hazardous event can have enormous impact in prevention and mitigation of disasters effect.
Development of effective response for communication means improving inter-organisational collaborative processes e.g. early warning systems and communication chains, roles, tasks and responsibilities of citizens, communities, local authorities, NGOs, business companies and practitioners, taking into account the legal framework, procedures for normal operation and organizational boundaries.

10.1.2 NON-STRUCTURAL MEASURES

- Empowerment of individuals

To build a disaster-resilient communities, the population need to be empowered as the first step for a proper disaster prevention. Communities that can cope with the effects of disaster hazardous are more resilient than those who do not have a proper knowledge. Through an appropriate program of community-based activities, active participation would induce sense of ownership that results in engagement and long-term commitment. National and international organizations implemented various programs before and after disasters, proven to be successful at initial stage but gradually diminish the success as the years pass. Community empowerment for disaster risk management demands participation in every stage from initial risk assessment to monitoring process, which ensure local attention.[45]
Important factors to take in account for population empowerments:

- Community based action plans and training improve community's problem-solving skills.

- Disasters are unpredictable, it is important to train people's awareness skills
- What is accepted by the community' is more important than what is necessary
- Funds and goods are temporary relief, and can be dangerous in the long-term because a community will not learn to help itself

CHILDREN AND YOUNG PEOPLE'S PARTICIPATION IN DISASTER RISK (THE CUIDAR FRAMEWORK AS AN EXAMPLE OF ACTIVE PARTICIPATION)

The Sendai framework for disaster reduction 2015-20306 highlights the need to include children and young people as active participants in DRR; governments are resistant to engage them in matters that are perceived as above their level of competencies, as they may be considered vulnerable categories. Understanding the c
hildren's perspective has been an essential element of building resilience by international organizations such as Save the Children (Save the Children, 2011).
Although initiatives targeting students and children have taken place in the last decade, especially with the involvement of the Civil Protection agency and Ngo sectors, there is a significant lag at the European level compared to the measures implemented in Australia, Japan, Us, New Zealand and in many countries of Latin America, in this field. [4]
Education, in particular empowerment of teachers, has emerged as a focal point for risk reduction learning, and schools are identified as a key site for building a community post-disaster. The approach **must** be flexible to address the risks that children identified, considering different ages, cultures and backgrounds, and distinct adult cultures should be considered and accommodated.

These steps were identified according to the authors of the CUIDAR framework[46].

11. CONTINGENCY PLANNING

Contingency planning is a management tool used to analyze the impact of potential hazard events so that adequate and appropriate arrangements are made in advance to respond in a timely, effective and appropriate way to the needs of the affected populations.[47]

A well-developed contingency plan helps ensure that all relevant decisions and provisions related to required resources (human, technical, financial, and material), roles and responsibilities, coordination mechanisms, information/communication management, and logistics in all relevant sectors are taken in advance, agreed, and well understood by all relevant actors.
The plan should be multi-risk or at least consider compounding risks and the interaction between risks to foresee the action that might be necessary to respond comprehensively to them.

The development of a contingency plan should contain an analysis of existing emergency plans and procedures, resource and equipment inventories, training records, and reviews of past disaster experiences.
The preventing scenarios should be based on the most likely and recurring events, and the consequent reactions would need to be adapted in the case of a potential hazard event.
It is helpful to discuss what would be the **early warning signs** and catalysts that could be used to observe the progress of a hazardous event and its human impact.

Contingency plans should include an analysis of how responsive the organizations are themselves would function if their facilities, staff, or systems were immobilized by the hazard event (such as crucial warehouses being destroyed in an earthquake or staff not reporting to work as usual during a flood). This process, known as 'business continuity planning, can ensure that crucial organizations remain operational in a hazardous event.

The plan must be tested and exercised by the people and organizations that will use it. Classroom or actual field simulation exercises, based on specific scenarios, are an effective means to determine how realistic the plan is and assess the different actors' capacities. Based on the results and lessons learned during exercises, strategies can then be adjusted accordingly.

Response Requirement and Preparedness action

Provide rapid and appropriate life saving response during the first 72 hours ("the Golden Hours") after an earthquake

Conducting life saving measures such as **Search and Rescue**; **emergency first aid**; evacuation of families directly impacted by the earthquake and those exposed to secondary hazards

- Declaration of Disaster
- Immediate Response and Relief (Deploy emergency rapid assessment teams to gather immediate humanitarian
- Support the provision of Search and Rescue services, including for those trapped in collapsed structures.
- Assist in provision of emergency medical evacuation and emergency medical services, including orthopedic surgeries, intensive care, life saving and emergency first aid assistance to injured persons and other medical services

Ensure advance agreements and mechanisms for effective response and recovery.

Advance agreements and mechanisms for organization, coordination, resource mobilization, pre-positioning of stockpiles and communication needs and procedures both within the zones and partners and the communities for achieving timely and sustained relief operations for the first two weeks in the aftermath of the earthquake.

- Ensure sustained basic humanitarian needs (food, shelter, water-sanitation, health and protection, psycho-social counseling and trauma management, dead body management) for affected families and maintain public order including traffic management.
- Provide continuous safety and awareness information to the public on the earthquake, aftershocks, its effects, etc.
- Regulate market supplies and prices and establish relief supply chain including warehouses, transportation fleets, and distribution network.

Build resilience for continuity of zone's functions and services.

continuity of governance and delivery of basic services, public safety and protection and effective implementation of measures for early recovery. Emergency response and relief operations should encourage and facilitate, instead of obstructing and hindering early recovery of affected communities and sectors.

12. CONCLUSION AND RECOMMENDATIONS

Based on the findings of this report, recommendation for Italian and EU public and private authorities are introduced in order to strengthen the Management Plan after a Natural and/or a Man-Made disaster.

THE IMPORTANCE OF THE HUMAN RIGHT IN THE DISASTER MANAGEMENT LAWS

The individuals' vulnerability to disaster may be reduced if laws and policies incorporate a human rights-based approach. International human rights law connected to disaster risk reduction is profoundly associated with protecting human rights. The definition of disaster implies the involvement of losses referred to human beings (lives, properties, resources). Natural disasters most severely affect the vulnerable segment of the population because those subject to discrimination and lack of opportunities will experience similar patterns of exclusion in the calamity's events. In addition, because of their pre-existing conditions, these individuals likely lives in risky areas and precarious conditions[48]
Vulnerable groups are women, children, people with disabilities, the elderly, indigenous, and minorities communities.
The common causes and assets that make vulnerable a community system include exploitation of natural resources, dictatorship, massive and increasing poverty, uncontrolled urbanization, inappropriate land use, environmental degradation, and climate change.[49]
Categories of individuals that are likely to be found in a position of vulnerability in disasters
Because of pre-existing conditions that make them more vulnerable, which are present long before disasters occur. These conditions relate to the negative way a given society treats persons, mainly due to their gender, age, disability, or ethnicity. Such unfavorable treatment and the higher vulnerability become apparent in disasters when these individuals need specific protection[50].
Over time we agreed that the concept of disaster is increasingly decentering the priority of the hazard and instead centering the role of the population experiencing vulnerability.[15]

The main elements that a Disaster Risk Management system should have:

Investment in structural measures

Reinforced building and seawalls, early warning systems, and hazard mapping supported by sophisticated technology for data collection, simulation, information, and communication to assess risks and to plan responses.

Culture of Preparedness

Design of preparedness actions linking together multilevel interventions that need to involve citizens, communities, business organizations, public administrations for empowering citizens and their communities to act by themselves together with emergency services and managing spontaneous volunteers in the case of a disaster or crisis-related emergency of any kind (natural hazards, including pandemics, or man-made including terrorist threats) in the form of best practices and guidelines exploiting local resources (knowledge, networks, tools) developed with practitioners and local decision-makers.
Also, involve and incorporate children and young people as **partners and** encourage them to take a more active role in designing, developing, and evaluating disaster risk education programs, awareness campaigns, and emergency plans.

Effective Communication systems

Improved early warning systems, forecasts, and strategies to reach different public representatives with proper messages in the event of a disaster.
Training and evacuation drills are practiced at local and community levels and in schools and workplaces.

Stakeholder Involvement

Demonstration exercises involving citizens, training and educational institutions, local decision-makers, employees in public administrations and in business companies, and practitioners, to identify practices, test guidelines and communication strategies in near-real-case situations in the framework of field exercises, virtual trainings and serious gaming, school / university curricula and professional training.
National and local government, communities NGOs, and private sector must know their role.

Effective Training

Building a 'culture of disaster preparedness' for citizens, communities, public administrations, business companies, practitioners: Development of an effective education system and integration of theory and practice of preparedness in school

curricula; development of an effective integration of multilevel action in public administration (at local and regional national and international levels) focusing also on responsibility and deliberation issues; development of effective preparedness practices for citizens, communities, business organizations and practitioners (and their associations).

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