

Response to WP1 (Italy)

Information for EU countries

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Activity	Title
1.2	Survey of established practices in EU countries for NDRM

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1 Natural disasters in Italy

Italy has a high exposure to natural risks: earthquakes, floods, landslides, volcanic eruptions, fires, avalanches and coastal erosion. Natural hazards, which add up to, those related to human activities, which contribute to making our fragile territory. Risk prediction and prevention, relief to the affected populations, contrast and overcoming the emergency and risk mitigation are the civil protection activities identified by the Law no. 225/92, which established the National Service. Protection of people and safeguard of the territory are the main objectives of these activities - which the Department addresses, promotes and coordinates in collaboration with regional governments and local self-government. Prediction activities - carried out with the participation of relevant scientific and technical subjects - aim to assess risk scenarios and, when possible, to give notice, monitor and supervise events and risk levels expected.

Early warning, planning, training, dissemination of knowledge of civil protection, information to the population, drills, and application of technical regulations are the main instruments of civil protection for the prevention of territorial risks and are intended to prevent or limit damage in the event of an emergency. Relief activities consist in the set of first assistance interventions to the affected populations. Finally, the emergency overcoming comprises all the necessary steps to remove obstacles in order to resume normal life conditions in the affected territories.

The whole territory is exposed at a high seismic risk, as witness by the continuous emergencies occurring in different region of Italy. Volcanic risks are concentrated in south Italy, mostly in Sicily (including Aeolian Islands) and Campania. Because approximately two thirds of the Italian national territory account for Alpines and Apennines regions, the natural hazards related to mountains are important, but they have a different develop depending from the sector. A distinction is drawn among hazards of northern rivers (floods), of southern streams and slopes (e.g.: mud and debris flows) and of avalanches occurring both in Alps or Apennines. Additionally, due to geological conditions, mass movements like landslides or rockfalls are repeatedly occurring in several areas in Italy. Italy with its 8,300 km of coastlines is the second longest one in Europe and 25% of these ones are under erosion with a land lost in the la 25 years of about 15- 16 Km².

1.1 Identification of natural disasters

Natural hazards by earthquakes

In Italy, numerous studies and documents regarding the seismicity have been produced. The first considerations, often imaginary, about the origin of earthquakes and the seismic characteristics of Italy can be traced right back to works in the fifteenth century. But it was only in the nineteenth century, with the development of seismological sciences, that research into the causes and geographic distribution of earthquakes started to be published. Wider use of seismic instruments from the end of the nineteenth century and monitoring networks in the twentieth century finally provided input for studies into seismic characterisation in Italy.

Seismic hazard studies have been used, above all in recent years, to analyse local and regional areas with a view to zonation (basic hazard information for seismic classification) or microzonation (local hazard information). In the latter case, hazard assessment means identifying areas on a municipal scale that, in the event of a seismic tremor, may be subject to amplification phenomena and provide data useful for urban planning.

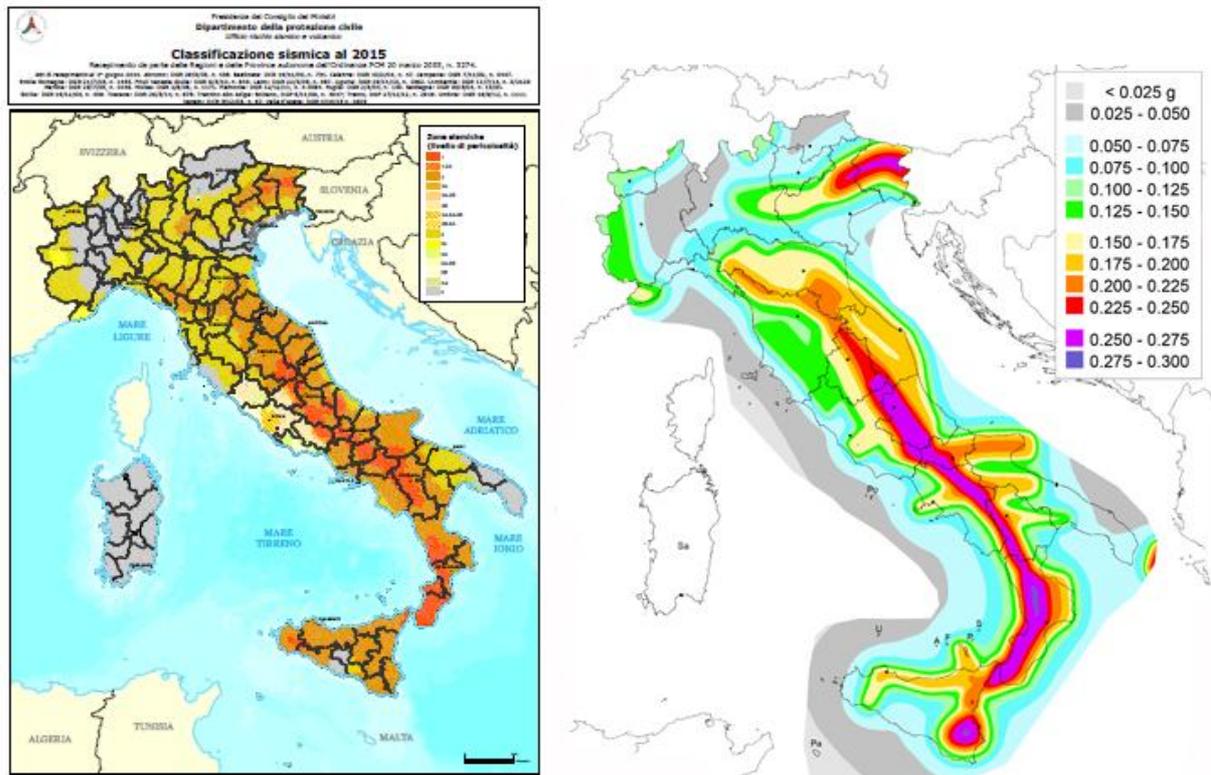


Figure 1. Map of seismic classification (left, <http://www.protezionecivile.gov.it/jcms/it/classificazione.wp>) and map of seismic hazard (right, <http://zonesismiche.mi.ingv.it/>) for Italy

Hazard studies can also be used in site analysis, to locate critical buildings from a point of view of safety, risk or strategic importance (power stations, military installations, hospitals). Hazard assessment in this case means calculating the probability of an earthquake of a magnitude (or PGA) that exceeds the threshold value established by political/decisional bodies, leading to the choice of different areas if necessary.

Earthquake monitoring is officially carried out by National Institute for Geophysics and Vulcanology (INGV) which provide in real time (and after any event) all the information (as magnitude, localisation, etc) regarding any seismic event occurred in Italy (<http://terremoti.ingv.it/>)

Natural hazards by floods

Inundations and floods are widespread phenomena in Italy, where they cause severe damage and pose a threat to the population. Italy has a very long history of disasters caused by floods (Polesine 1951, Florence 1966, Genoa 1970, 2011, Versilia 1996, Sarno 1998, Piedmont 1994 e 2000, Sicily 2009, Sardinia 2015) that invariably affected plains sweeping away houses and farmlands, damaging all properties and causing loss of human lives. A systematic review of the significant hazard events recorded some 2595 flood events in the period between 68CE and 2008 that resulted in deaths, missing persons, injured people, and homelessness (<http://webmap.irpi.cnr.it/>).

The safeguard protection concept has been implemented by establishing the rules responding to the appropriate land management principles. The river basin has been identified as basic unit for developing the proper land management in an integrated, multisectorial way and through consultation. On this basis, in 1989, the first Law for the “soil protection” in Italy was enacted; the Law fixed the rules for the actions needed to guarantee the hydrogeological land planning, suitable to the safety of the population, the protection of the cultural heritage, the environment and human activities.

Later, in 1998, in order to strengthen and enhance the previous Law, a new Act has been issued, defining the procedures to obtain a hydrogeological land planning aimed at more clearly applying the concept of safeguarding and protection. The concept of risk was introduced, occurring as a result of the combination of the hazard, the value and the vulnerability of the elements at risk. The constraints for the land use were defined with the aim of avoiding new risk and also the measures to reduce the existing risk through its classification, so identifying the degree of attention and the priority actions. The above rules and principles have been implemented by the River Basins Hydrogeological Plans which provided the following results:

- hazard and risk maps for floods and landslides, showing all scenarios;
- provisions regarding land use in “high risk” and “high hazard” areas to prevent the increasing or generation of risk;
- priority actions for risk reduction, identified according to the degree of risk;

On the basis of the Plans, the Map of the areas at high hydrogeological critical state has been prepared to support the priority actions. Only to face up these actions, a planned strategy of the required initiatives will be needed, to be financed by EU, National, Regional, Local and Private Funds.

On 26 November 2007 Directive 2007/60/EC (Flood Directive) on the assessment and management of flood risks entered into force. This Directive equires Member States to assess if all water courses and coast lines are at risk from flooding, to map the flood extent and assets and humans at risk in these areas and to take adequate and coordinated measures to reduce this flood risk.

Italy accepted the (Flood Directive) in 2010 with the Decree n.49. As the Floods Directive has entered into force the implementation of the Directive is starting.

Following Directive requirements, Italy have undertaken:

- The preliminary flood risk assessment of the river basins and associated coastal zones, to identify areas where potential significant flood risk exists
- The mapping of flood risk and hazard. The resulting maps identify areas with a medium likely hood of flooding (at least a 1 in 100 year event) and extreme events or low likelihood events, in which expected water depths should be indicated. In the areas identified as being at risk the number of inhabitants potentially at risk, the economic activity and the environmental damage potential shall be indicated
- The redaction **flood risk management plans** for above areas

Those activities have been implemented in the eight river basin districts in which the national territory was divided, out of which 2 are international sharing water courses with France to the west, Switzerland and Austria to the north and Slovenia to the east.

The Flood Risk Management Plans can be found on the pages of the respective competent authorities:http://www.isprambiente.gov.it/pre_meteo/idro/Piani_gest.html.

Natural hazards by landslides or rockfalls

Today, over two thirds of our peninsula are prone to hydro-geomorphological instability, with risk of landslides and floods. Prediction and prevention have been strategic for dealing with the hydro-geomorphological risk for some time now. Contact with the world of scientific research is increasingly closely knit as well as the use of new technological systems to estimate the foreseen damages and to monitor vulnerable zones in the event of extreme weather conditions such as floods or drought.

Mud and debris flows are the most dramatic among landslides phenomena in terms of loss of life. In recent past, several disasters have occurred in Italy that is attributable to such phenomena (Piemonte 1994, Versilia 1996, Sarno, 1998, Cervinara 1999, Val d'Aosta and Valle Anzasca, 2000, Ischia 2006 and 2009; Messina 2007 and 2009), with over 300 victims. In 2011, a catastrophic balance has been registered with four events concentrated in the Messina province (March 1th: Mili river basin; November 22th: Saponara village) and in the Ligurian Region (October 25th: Cinque Terre and Lunigiana; December 04th: Genoa town). The high risk of rapid flow is accompanied by the difficult hazard assessment. In fact, the source areas of these phenomena are rarely located twice in the same slope portion. Being primarily first generation phenomena, their spatial prediction is particularly problematic. This difficulty is closely related to the triggering causes of these landslides - consisting essentially of sporadic and sudden rainfall events - and to the extreme horizontal and vertical variability of the characteristics of the landslide material involved, essentially the bedrock's soil cover. An increasing trend in

precipitation and a decrease in their duration have been documented over the past 50 years in Italy. This scenario leads to assume an increase in debris-mud rapid flows hazard in the next future.

Recently, the Superior Institute for Environmental Protection and Research (ISPRA) has published a complete catalogue of landslide phenomena in Italy (IFF). The catalogue is accessible at the web site: <http://www.isprambiente.gov.it/it/evidenza/progetti/iffi-inventario-dei-fenomeni-franosi-in-italia>

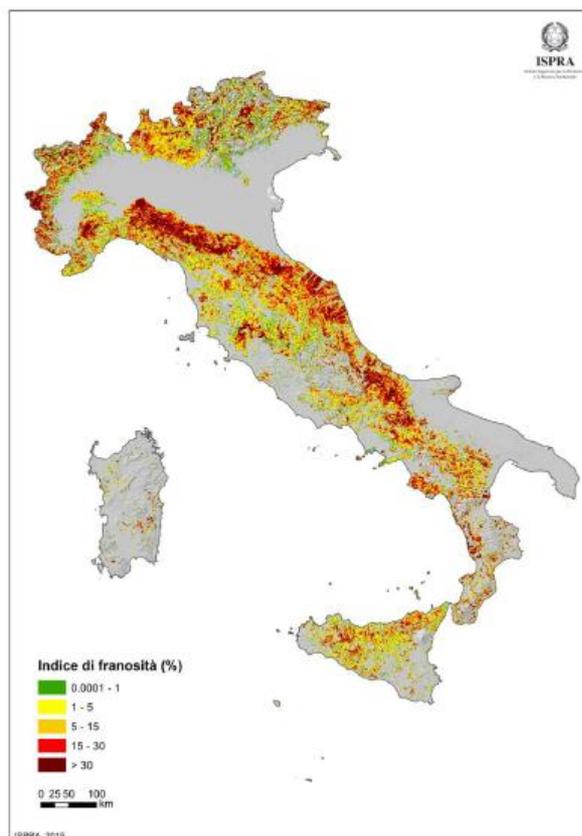


Figure 2. Map of landslide density in Italy (from IFF Catalogue)

Natural hazards by coastal erosion

According to the Atlas of the Italian Beaches (Fierro and Ivaldi, 2001), 27 % of the Italian beaches which constitute 61 % of the total Italian coastline are retreating, 70 % in equilibrium, and only 3 % prograding. The causes can be natural but mostly are anthropogenic ones.

In the 80s and 90s the problem was solved building hard structures like breakwaters, groins and seawall which protected the areas immediately behind, but moved the process downdrift.

Starting from 2000 some intervention of nourishment has been realized, but until now there is not a clear awareness about the need of monitoring and management this intervention, the builded beach will be stable for few months/years.

According with EUROSION (2004), a more strategic and proactive approach to coastal erosion is needed for the sustainable development of vulnerable coastal zones and the conservation of coastal biodiversity. In light of climate change it is recommended that coastal resilience is enhanced by: (a) restoring the sediment balance; (b) allocating space necessary to accommodate natural erosion and coastal sediment processes and (c) the designation of strategic sediment reservoirs.



Figure 3. Map of coastal erosion susceptibility in Italy

Natural hazards by volcanoes

Amongst the criteria adopted by the international scientific community to classify Italian volcanoes, we have the Activity Status dividing them into extinct, dormant and active.

Extinct volcanoes. Volcanoes, which last erupted over 10,000 years ago, is defined as extinct. These include the Amiata, Vulcini, Cimini, Vico, Sabatini, Pontine Islands, Roccamonfina and Vulture volcanoes.

Dormant volcanoes. Whereas dormant volcanoes have erupted during the last 10,000 years but are currently in a period of dormancy. According to a more exacting definition, volcanoes with a current period of dormancy shorter than the longest period of dormancy registered previously are considered dormant. Here we have: Colli Albani, Phlegraen Fields, Ischia, Vesuvius, Salina, Lipari, Vulcano, Ferdinandea Island and Pantelleria. Amongst these,

Vesuvius, Vulcano and Phlegraen Fields, have a very low eruptive frequency and their conduits are now obstructed. Not all the dormant volcanoes present the same risk level, both for the hazard of expected phenomena as well as for the differing extent of population under exposure. Furthermore some have a secondary vulcanism phenomena (degassing from the ground, fumaroles, etc.) which may well cause situations of risk.

Active volcanoes. Finally, volcanoes having erupted over the last few years are defined as active. These are Etna and Stromboli that frequently erupt and represent a reduced hazard at short term due to their open conduit activity.

Volcanic activity in Italy is also concentrated in the underwater areas of the Tyrrhenian Sea and Canale di Sicilia. Several submarine volcanoes are still active, others, now extinct, represent true and proper submarine mountains. Apart from the better known Marsili, Vavilov and Magnaghi volcanoes, the submarine Palinuro, Glauco, Eolo, Sisifo, Enarete volcanoes as well as the volcanic areas in the Canale di Sicilia should also be mentioned.



Figure 4. Map of active volcanoes located in Italy (in grey the submarine volcanoes)

Natural hazards by tsunamis

Due to the high seismicity (but also to the presence of various active volcanoes, both emerged and submerged) every coast of the Mediterranean Sea is exposed to tsunami risk.

Over the past thousand years, along the Italian coasts, tens of tsunamis have been reported, but

only some of them were destructive.

The most affected coastal areas are the ones of Eastern Sicily, Calabria, Puglia and Aeolian archipelago. Minor tsunamis were recorded also along Adriatic coasts, which can be reached by tsunamis generated far away (e.g. following a strong earthquake in the sea of Greece).



Figure 5. Tsunamis in the central Mediterranean region

1.2 Analysis of responsible institutes

The National Department of Civil Protection of Prime Minister Office, coordinates all civil protection measures in the country and informs citizens and civil authorities involved in this issue. The agency has an informative web site (<http://www.protezionecivile.gov.it/jcms/it/home.wp>) in Italian and in English, where further information can be found.

The Functional Centre for the Hydro-meteorological Risk (<http://www.protezionecivile.gov.it/jcms/it/cfcri.wp>) is the branch of the National Department of Civil Protection in charge for weather forecast and warning of extreme events as rainstorms, floods, landslides, etc.

1.3 Analysis of EU master curricula

Related Master Courses in Italy

LARAM is an **International School** on "Landslide Risk Assessment and Mitigation" of the **University of Salerno**. LARAM is directed at **PhD students** working in the field of Civil

Engineering, Environmental Engineering, Engineering Geology or similar Engineering background. (<http://www.laram.unisa.it/>)

Every year 40 students are selected to attend the School's Courses. The School is held annually. The Courses are residential and last 2 weeks.

The **main objectives** of LARAM are:

- to develop high educational interdisciplinary programs for assessing, forecasting and mitigating landslide risk over large areas;
- to promote the creation of "on the job" vocational training programs aimed at solving real landslide risk problems using the most advanced theories and methodologies in the fields of geotechnical engineering, geomechanics, geology, mathematical modelling, monitoring, GIS techniques, etc

[MEES – Master in Earthquake Engineering and Engineering Seismology](http://www.mees.org/site-pages/show/id/4)
(<http://www.mees.org/site-pages/show/id/4>)

The MEEES programme is an Erasmus Mundus Masters Course, that aims to provide higher-level education in the field of Earthquake Engineering and Engineering Seismology. Graduate students involved in this Erasmus Mundus Masters course have the possibility of following a 18-month MSc programmes on either Earthquake Engineering or Engineering Seismology. In addition, the proposed EM Masters course envisages also the possibility of students following a 18-month study programme that leads to the attainment of a Masters degree on Earthquake Engineering and Engineering Seismology.

If following the Engineering Seismology option, students will acquire the ability to design, execute and evaluate assessments of seismic hazard for site-specific engineering projects, for earthquake loss assessments, and for emergency planning scenarios. Students following the Earthquake Engineering option will acquire the ability to undertake seismic design of new structures and the assessment and strengthening of existing structures. The combined option of Earthquake Engineering and Engineering Seismology will enable students to acquire technical competence in both areas.

The MEEES consortium comprises four academic institutions, namely (i) School of Advanced Studies IUSS Pavia), (ii) the University of Patras, (iii) the University of Grenoble Alpes and (iv) the Middle East Technical University. It is noted that the first institution runs the postgraduate earthquake engineering programme in Pavia, through the Centre for Post-Graduate Training and Research in Earthquake Engineering and Engineering Seismology (ROSE School). Hence in subsequent sections of this website, the term ROSE School is employed to refer to the activities of IUSS within the scope of the MEEES consortium.

Master in Hydraulic Risk

<http://masterrischioidraulico.unica.it/>

The University of Cagliari has established the 1-year Master Course in Hydraulic Risk, in collaboration with the Universities of the Interuniversity Consortium for Hydrology (CINID) and with the support of the Autonomous Region of Sardinia. Objective of the master is to enhance the professional skills of graduates in science and technology, by acquiring their management capacity and mitigation of flood risks for the defense of the territory and protection of human activities. The training course is aimed at training professionals with technical skills of hydraulic risk prevention and mitigation, to operate in the areas of soil conservation, land use planning, civil protection and conservation and safeguarding of cultural heritage and environment.

Master HYDROMETHAZARDS

In the academic year 2017-2018 will start the Joint international Program of Postgraduate Studies "Management of Hydrological and Meteorological Hazards-HYDROMETHAZARDS" of the University of Thessaly, in collaboration with the Hellenic Open University, Università degli Studi di Messina and Universitat de Barcelona. The joint (distant learning) Postgraduate Master Program "Management of Hydrological and Meteorological Hazards-HYDROMETHAZARDS" will be able to admit 200 postgraduate students per year with the possibility of adjustment. The number of students admitted is indicative and it is subject to change after a justified proposal of the Academic Supervising Committee of the joint Postgraduate Master Program. The Postgraduate Program admits graduates of Greek and European Universities and Universities of third countries with a degree in Science and Engineering (e.g. Engineering, Natural and Environmental Sciences and Agriculture), who have accumulated at least 180 ECTS units or equivalent amount of other units.

References

- EUROSION. 2004. Living with coastal erosion in Europe: Sediment and Space for Sustainability. A guide to coastal erosion management practices in Europe.
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