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ORIGINAL RESEARCH PAPER

Dissemination strategies to instil a culture of safety on earthquake hazard and risk

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Abstract Dissemination of knowledge should be a core objective for scientists who work with communities exposed to natural disasters. This task requires the spread of knowledge, to make the public aware in a simple, easy-to-understand, manner, yet without any loss of accuracy. 'Urban Disaster Prevention Strategies using Macroseismic Fields and Fault Sources' (UPStrat-MAFA) was a European project devoted to the implementation of strategies for urban disaster prevention of several aspects of seismic hazard, including the damage state and the earthquake impact. The project carried out numerous outreach activities for the public and stakeholders, to encourage the development of a bottom-up strategy towards disasters mitigation. Here we provide a description of actions that have been aimed at: (1) ensuring effective dissemination and communication of the project outcomes, also after its completion; and (2) raising public awareness and understanding in countries exposed to earthquake hazard.

Keywords Disaster prevention · Education · Risk reduction · Earthquake hazards · Dissemination

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1 Introduction

In recent decades, science communication has focused progressively on the non-expert audience, to answer the increasing requests for information and curiosity about scientific issues (Bauer 2014). The nature and extent of public understanding of science and its adequacy for an advanced society has been a matter of debate and research since the early 1980s (Bodmer 1985). The importance of making science understandable to non-experts is also based on the evidence that more effective public policies on scientific matters can arise from more informed and aware citizens (Durant et al. 1989). Properly informed on useful actions towards reduction of vulnerability and improvement of building resilience, the citizens can indeed promote political choices that include disaster mitigation. Such information also acts on the likelihood that an at-risk population will take self-protective measures (Paton 2003). Consequently, the recognised role of scientific research on social objectives (Pielke 2014; Candela 2010) encompasses a social role for scientists, and for geoscientists like us, to promote scientific outreach to the public and to convey scientific achievements to stakeholders who are also responsible for decisions leading to building codes enforcements (Donovan et al. 2012). In doing so, public engagement and outreach activities have often been quoted as among the main tasks of several research institutes.

Incisive science dissemination has to highlight research findings and place their outcomes in a context where they can be understood and appreciated (Shipman 2013). This is an essential duty, especially when research projects and their outcomes deal with civil protection aims, such as for the Urban Disaster Prevention Strategies using Macroseismic Fields and Fault Sources (UPStrat-MAFA) project (Zonno 2013). The general objective of this project was to cover the topics addressed to: (1) the development of effective knowledge-based disaster prevention strategies that can respond to seismic hazard mitigation; (2) the achievement of measurable progress beyond the state-of-the-art for urban prevention strategies, based on the level of risk and the education information systems in the countries involved in the project: Portugal, Iceland, Italy and Spain. These actions have a high potential impact, since 68 % of the world's populations is forecast to live in urban areas by 2050, and earthquakes threaten many of them (Sundermann et al. 2014). A pilot study on schools in the countries participating to UPStrat-MAFA claims the lack of appropriate information towards safety measures (Bernhardsdóttir et al. 2015). Yet, the thrust in local authorities and governance has a negative correlation with hazard perception (Ricci et al. 2013).

This paper describes how the UPStrat-MAFA team has chosen to convey main tasks and practical outcomes of the project through dedicated channels formal as well as informal, and has contributed to the solution of the paradox between the need of information and the lack of thrust in local authorities that are responsible for providing safety.

2 Dissemination strategies

Dissemination is a process that requires a match between the creation of knowledge and the target audience. In particular, scientific dissemination refers to active intervention that is aimed at communicating research findings with the purpose of creating a positive impact on the acquisition of knowledge, attitudes and practice (Lafrenière et al. 2013).

Therefore, effective dissemination strategies must take into account the content of the message, along with the most convenient media and format to transfer the outcomes to the audience. Generally, the communication channels by which scientific dissemination takes place are scientific conferences and journals. However, beyond these formal means, there are more appropriate channels that can be targeted for dissemination to a wider audience, without the specific identification of the audience (Lafrenière et al. 2013). When the goal includes disaster prevention, special care needs to be devoted to translate the knowledge into best practice, while replacing the attitude that drives people to choose recovery over preparedness, as preparedness is far less costly in terms of deaths, damage and/or economic rebound (World Bank 2010).

Communication has a fundamental role in risk perception and awareness and can strongly influence people's preparedness in facing with an emergency (Johnston et al. 1999; Perry and Lindell 2008; Solana et al. 2008; Bird 2009; Njome et al. 2010).

The objectives of the dissemination of the UPStrat-MAFA project dealt with both the scientific achievements of prevention strategies ('dissemination of understanding') based on the level of risk, and the best practice ('dissemination of actions') based on the rising of risk awareness. We therefore defined the target audience as belonging to (1) the scientific community, (2) the general public (the 'layman'), (3) the stakeholders, and (4) the educational community (Table 1). This separation has allowed us to define the specific content that is best suited to each of these communities. Accordingly, we have relied on an outreach approach that has encompassed several formats, including newsletters and leaflets, public meetings, the Layman's report, along with a Multimedia Platform and a variety of ways for virtual communication computer mediated.

2.1 Leaflets and newsletters

The UPStrat-MAFA leaflet was designed in a 30 cm × 30 cm format, easy to fold and to pocket (Fig. 1). It provides a scheme of the activities and tasks towards urban disaster prevention: "Forecast of damage scenarios", "Evaluation of the site seismic hazard", "Evaluation of the risk", "Definition of prevention strategies", "Activity of publicity and management". In addition, the leaflet explains objectives and actions that are aimed at the development of probabilistic hazard assessment, risk analysis, and disaster prevention strategies. Special emphasis is given to the innovative approaches on hazard assessment, including probabilistic processing of macroseismic fields (i.e., historical information) and characteristics of fault sources, and the new concept of global disruption (i.e., the Disruption Index, Ferreira et al. 2014), which provides a systematic measure of earthquake impact in urban areas.

The leaflets had broad distribution through the internet and as paper copies during the major national and international conferences on seismological studies that took place in Europe from 2012 to 2014. They were also part of the educational material that was provided at schools and to the public during *ScienzAperta*, a scientific outreach event that took place at the *Istituto Nazionale di Geofisica e Vulcanologia* (INGV; National Institute for Geophysics and Volcanology) Catania, in May 2013. *ScienzAperta* ("Open Science") was a 5-days open-door event during which 1100 visitors, encompassing schools and public, also gained information about seismic prevention in urbanised areas in Portugal, Iceland, Italy and Spain.

We have used newsletters to comply with the need of giving updates on the on-going activities and their results to all the four groups of target audience (see Sect. 2). The newsletters provided an overview of the project, including the goals, methods and highlights, to encompass all of the elements of novelty. They also acknowledged the possibility of giving a feedback, to share opinions, suggest topics or contribute with short-news items or pictures.

Table 1 Dissemination venues grouped according to the type of audience

Research	Layman	Stakeholders	Schools
6 February 2012: Kick-off meeting, Brussels http://ec.europa.eu/echo/en/funding-evaluations/financing-civil-protection-europe/selected-projects/urban-prevention-strategies			2012-on: Contribution to the permanent exhibition in the city of Hveragerði, Iceland
19–20 August, 2012: ESC—European Seismological Commission 33rd General Assembly, Moscow, Russia			
10 September 2012—Meeting FNEP, Milano, Italy			
24–28 September 2012: 15th WCEE World Conference on Earthquake Engineering, Lisbon, Portugal		24–28 September 2012: 15th WCEE World Conference on Earthquake Engineering, Lisbon, Portugal	
21–22 March 2013 SYNER-G "Systemic Seismic Vulnerability and Risk Analysis for Buildings, Lifeline Networks and Infrastructures Safety Gain", Workshop, Milano, Italy		January 2013: Civil Protection Department, Rome, Italy	6–10 May, 2013: ScienzAperta, Catania, Italy
16–18 April 2013: Final Workshop of the European DrHouse project, Alessandria, Italy	6–10 May, 2013: ScienzAperta, Catania, Italy		12–13 May, 2013: Pre-alpine Geophysical Observatory open doors, Varese, Italy
17–19 June 2013: ICEGE—International Conference on Earthquake Geotechnical Engineering, Istanbul	12–13 May, 2013: Pre-alpine Geophysical Observatory open doors, Varese, Italy		14–16 May, 2014: ScienzAperta, Milano, Italy
23–26 July, 2013: UPStrat-MAFA 3rd General meeting, Selfoss, Iceland		23–26 July, 2013: UPStrat-MAFA 3rd General meeting, Selfoss, Iceland	30 May–21 June 2013: international Earthquake Engineering and Engineering Seismology graduate summer course, Selfoss, Iceland
11–15 August 2013: StatSei-8—8th International Workshop on Statistical Seismology, Beijing			
11–14 December 2013: UPStrat-MAFA 4th General Meeting, Catania, Italy		11–14 December 2013: UPStrat-MAFA 4th General Meeting, Catania, Italy	20 November 2013: Treme–Treme test, Escola Básica com Jardim de Infância de Setúbal, Setúbal, Portugal

Table 1 continued

Research	Layman	Stakeholders	Schools
14 July 2014: Meeting with a Corean Delegation, Milano, Italy	8 June, 2014: Pre-alpine Geophysical Observatory open doors, Varese, Italy	27 January, 2014: Civil Protection Department headquarters, L'Aquila, Italy	21 March 2014: Treme–Treme test, Colégio Amor de Deus, Cascais, Portugal
24–29 August 2014: 2ECEES, Istambul, Turkey			
15–19 September, 2014: IAEG XII Congress, Torino, Italy			8 June, 2014: Pre-alpine Geophysical Observatory open doors, Varese, Italy
6–7 November, 2014: Videojogos 2014 (Conference of Science and Art of Video Games), Barcelos, Portugal			
26–28 November, 2014: JPEE Congress, Lisbon, Portugal			

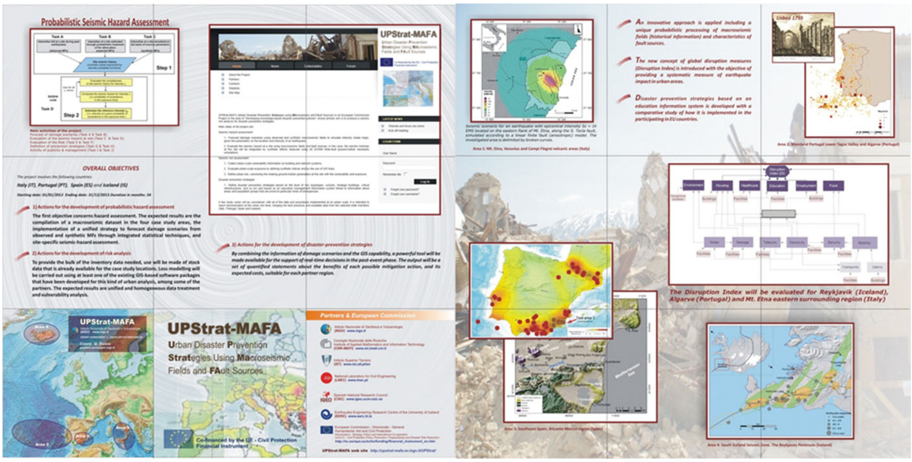

Fig. 1 Leaflet of the UPStrat-MAFA project. The image depicts both sides

Added value to the disasters preventions strategies of the UPStrat-MAFA project was the innovative approach for hazard assessment that uses a unique probabilistic procedure to process the synthetic and observed macroseismic fields through statistical techniques. A new concept of global damage (the Disruption Index) provides a systemic way to measure earthquake impact on urban areas and helps in the prevention strategies as well as in the decisions for emergency planning and the post-event phase. In the first newsletter (three pages long), a brief insert recalled a field survey run after the Emilia earthquakes of May 20, 2012 (M 6.0) and May 29, 2012 (M 5.8), useful for the calibration of the Disruption Index in the Padania Plain (Italy). In the second newsletter (five pages long), the UPStrat-MAFA pilot areas for the application of the Disruption Index, namely Mt Etna in Italy and the town of Hveragerði in Iceland, were presented. All kinds of edifices (e.g., buildings, healthcare facilities, school buildings, security buildings) and infrastructures (bridges, power stations, natural gas pipelines, water pipelines) were taken into account in these applications to evaluate the level of damage that might be caused by an earthquake. It is worth noting that the aforementioned newsletters offered just a brief explanation of hazard assessment approach based on macroseismic intensities and Disruption Index, while we relied on the Layman's Report and Multimedia Platform for their description (see Sects. 2.2, 2.3).

The newsletters also allowed us to highlight how the disaster mitigation strategies have to encompass education as a long-term action that drives people to choose prevention over recovery (Musacchio et al. 2015). A brief description of the most relevant tools and activities towards education was included. A special insert was assigned to a new international summer school on Earthquake Engineering and Engineering Seismology that took place in Selfoss (Iceland) in 2013 (Fig. 2). The preparation of audio-visual products for raising the general public awareness on earthquake hazards and risks was also announced.

2.2 Layman's report

If the layperson has to contribute to earthquake hazard mitigation as a citizen of this globalised modern society, it is necessary to provide information on the science and natural


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Summer course in Iceland

A new international Earthquake Engineering and Engineering Seismology graduate summer course will be held in Iceland during 30 May – 21 June 2013. The course deals with the nature and characteristics of strong earthquakes and their intense ground motions. Earthquake source processes, seismic wave propagation, wave amplification due to local site effects, and structural response due to seismic waves are key elements of the course.

The goal is to provide the participants with knowledge and understanding of the multi-disciplinary nature of earthquake effects on the man-made environment.

In line with the actions of Task H of the UPStrat-MAFA the consortium is lending its support to the Graduate Summer Course. In the third week of the course Professor Carlos S. Oliveira of Instituto Superior Técnico in Lisbon, Portugal, will provide the participants with a unique perspective on the multidisciplinary field of earthquake engineering, with special emphasis on practical applications on UPStrat-MAFA test-sites.

Fig. 2 An article from the second newsletter. One of the strategies towards disaster prevention relies on education. The course described in the newsletter was a summer school, which offered an in-depth study of earthquake causes, effects and responses

hazards in a form that is understandable by everyone. The Layman's report provides a general description of two of the main objectives towards risk reduction: knowledge-based disaster prevention strategies that can respond to seismic hazard and scientific progress beyond the state-of-the-art. The European Union also specifically requires a report that is targeted to a non-specialist audience.

The Layman's report of the UPStrat-MAFA project is available in both digital (see supplementary material) and print formats and, as it is addressed to a wide audience of readers, the language of the report is English (Fig. 3). The digital version is available for download from the project website (http://upstrat-mafa.ov.ingv.it/UPStrat/).

In its opening pages, the report presents the target areas. These are zones prone to seismic activity and that were place of damage during past earthquakes. Then, it focuses on innovative prevention approaches proposed by UPStrat-MAFA to link prevention measures to preparedness and response needs (Fig. 4). The innovative approach called SASHA, described in details in the Multimedia Platform (see Sect. 2.3), is presented in the report with graphical examples of its applications (Fig. 4a). Consequently, the reader can personally appreciate the great potential of the method for hazard assessment in urban areas using macroseismic intensity to parameterize earthquakes effects. It is worth noting that a wealth of macroseismic intensity data exist in most of the European countries where long lasting documentary history is available. The Layman's report also mentions the Disruption Index (Ferreira et al. 2014) and the two steps required for its computation. The first step encompasses the evaluation of the seismic hazard (i.e., the probability that the shaking exceeds a prescribed value in a coming time interval) and the vulnerability functions or fragility functions of the urban elements (i.e., building stock, school buildings, strategic buildings, lifelines, and others). The second step (Fig. 4b) then requires the definition of the cascading effects in urban systems (i.e., how a small change in some components can introduce perturbations that can cause high levels of disruption in a global system). Visual results of the application of the Disruption Index refer to the following places: the Azores Islands and mainland Lisbon-Algarve areas (Portugal); the Hveragerði area (Iceland); the Mt. Etna area (Italy); and the Lorca area (southeast Spain). The new way to visualise

Fig. 3 Introduction page of the Layman's report of the UPStrat-MAFA project

earthquake impact offered by the Disruption Index has contributed to: (1) identify and prioritise the facilities that are most prone to suffer damage; (2) facilitate the disaster preparedness and policy recommendations to increase earthquake resilience; (3) improve the engineering ability of the local government officials who are in charge of promoting earthquake disaster mitigation.

Finally, the Layman's report acknowledges the meetings of the project, which were structured in the form of General Assembly. These general meetings hosted special guests, such as local authorities, representatives of the Icelandic and Italian Civil Protection, external experts of the project, and delegates of the European Union, who were informed of the new results achieved. All of the guests were asked to share their experiences and opinions on the deliverables of the project, setting up a useful feedback between scientists and stakeholders.

2.3 Multimedia platform

The Multimedia Platform was meant to explain the achievements and the best practice towards urban disaster prevention to all the four groups of target audience mentioned in

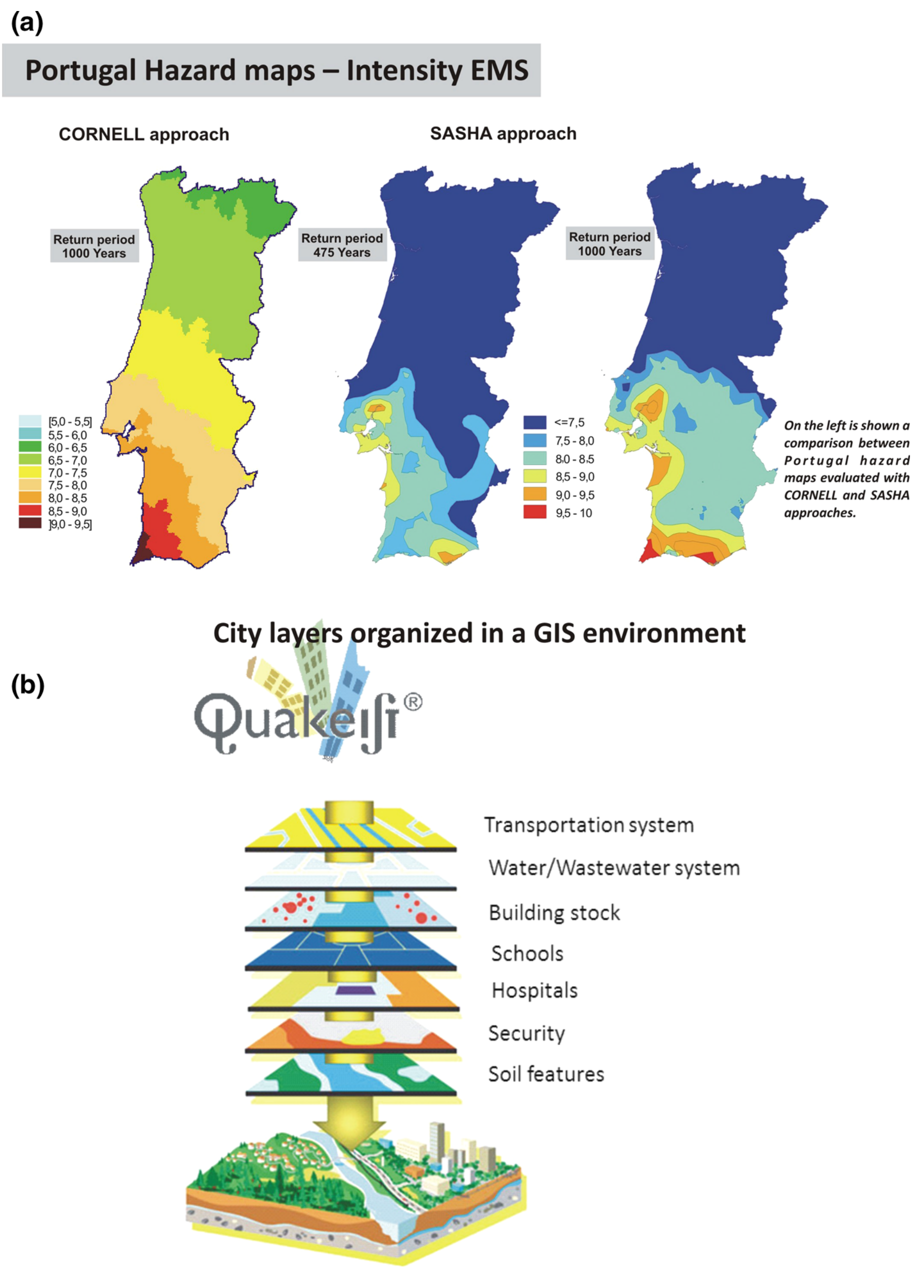

Fig. 4 Layman's report: examples of hazard maps for Portugal (**a**) and city layers organized in a GIS environment for the application of the Disruption Index, using QuakeIST earthquake scenario simulator (**b**)

Sect. 2. It is available in different formats (e.g., DVD, USB card) and on the UPStrat-MAFA website (http://upstrat-mafa.ov.ingv.it/UPStrat/index.php/documents?id=119). The thematic menu refers to four major topics: (1) Probabilistic Macroseismic Attenuation, (2) Seismic Hazard Assessment, (3) Seismic Risk Assessments and (4) Disaster Prevention strategies. Although these topics are mentioned in other tools for dissemination, such as the leaflet and the newsletters previously described, the Multimedia Platform offers the chance to present each topic in detail. In addition, this application takes advantage of different communication methods, with interactive contents that promote risk mitigation knowledge in an accessible way.

A tool named "My Notebook" gives the user the opportunity to take notes and to save these in a file (Fig. 5). Screenshots can be taken by using a specific button, to save an image in a custom location. Users can also insert and manage bookmarks inside the various chapters of the product.

The product interactivity is designed to further increase the users' interest and to retain their attention, by offering a multi-level presentation of the contents that can be accessed following personalized reading paths. Indeed, the Multimedia Platform can be surfed by using a thematic menu or by following a geographic path, from the home page to the pages related to a specific country (Fig. 6).

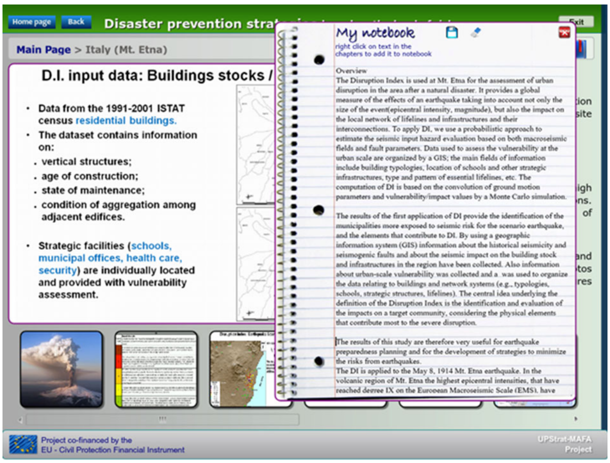

Fig. 5 Multimedia platform: example of annotations made using the "My Notebook" tool

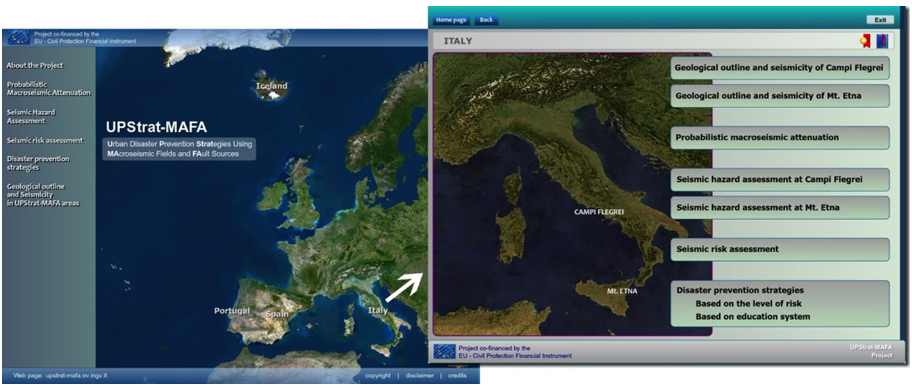

Fig. 6 Home page of the multimedia Platform (*left*) and page of the project results relating to Italy (*right*)

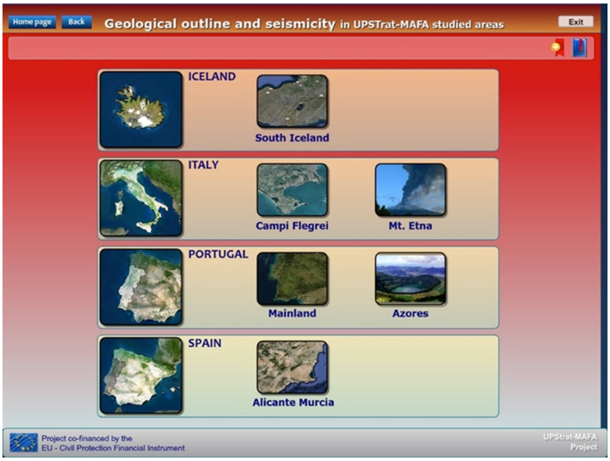

Fig. 7 Multimedia platform: chapter containing the geological and seismological details about the areas studied in the UPStrat-MAFA project

The Platform devotes a whole section to the knowledge of the territory (Fig. 7), describing the geologic and seismological settings as the ground level motivation to implement strategies towards natural disaster prevention. Seismicity of the study areas covers different geodynamic environments, including the divergence margin along the Mid-Atlantic ridge, the Azores triple junction, and the convergent margins between the African and European plates. Here earthquakes mostly occur in volcanic regions and awareness concerning seismic hazard is in part overwhelmed by volcanic hazard, contributing to an add-on source of misperception. A clear and accessible explanation to non-experts of the geologic and seismologic settings is therefore fundamental to give an appropriate perspective of the problem. In doing so, the multi-level contents of the Platform highlight where the seismicity occurs and its different characteristics in each region, providing details on the last damaging earthquakes. The areas investigated are Portugal (mainland and the Lower Tagus, Valley, Algarve and the Azores Islands), Iceland (South Iceland Seismic Zone and Reykjanes Peninsula), Italy (Mt. Etna and the Phlegrean Fields), and Spain (southeast part of the country, the Alicante–Murcia region).

Portugal The seismicity is discussed with reference to the mainland and the Azores, in order to highlight the existence of two distinct districts having their own geodynamic settings both resulting into offshore low-magnitude seismic sequences in between to large earthquakes that cause the major damage. One of those earthquakes that still strike the memory of the Portuguese population is the so-called Great Lisbon Earthquake, which hit the city and the country in 1755.

Iceland When surfing the Platform for seismic hazard in this country, major emphasis is given to the last three strongest earthquakes and the effects they produced in the life of the inhabitants of the zones prone to seismic activity. The earthquakes occurred in the South Icelandic Seismic Zone close to the Reykjanes Peninsula, and in the surrounding of Hveragerði, within the area that was a case study for the UPStrat-MAFA project.

Italy The threat of catastrophic eruptions at the Campi Flegrei is also associated with seismic hazard, and in particular, with earthquakes swarms related to the caldera unrest crises. The Platform offers information on the type of volcanism, the age, effects on landscape and on monuments, the state of activity. The description of local seismicity encompasses information such as the depth of hypocentres, their location and the fact that caldera uplift is associated with intense activity while subsidence is usually aseismic.

In the section of the Platform devoted to Mt Etna, the user finds a general description of the volcano. Apart from the regional high-magnitude seismicity, here seismic hazard is related to frequent and shallow volcano-tectonic earthquakes, which can locally cause severe damage and destruction despite their small to moderate magnitude.

Spain The Alicante–Murcia region is described as a zone of shallow as well as moderate magnitude seismicity. The Lorca Mw 5.2 earthquake in 2011 is mentioned, along with a description of the damaged it caused.

The Multimedia Platform describes geological and tectonic framework in the section on Seismic Hazard Assessment, where an introductory overview explains the need of identification of the faults causing the earthquake in terms of source parameters for ground motion computation. Here the user finds information on the three strategies used for seismic hazard computation: deterministic, statistical, and the hybrid approach. In computing the hazard in the study areas, we have chosen the hybrid and purely statistical approaches using the SASHA code (Site Approach to Seismic Hazard Assessment). SASHA implements a numerical procedure to define probabilities associated with possible earthquake scenarios (D'Amico and Albarello 2008). For the interested readers, the Platform provides a multimedia presentation of the SASHA main features along with visual results of seismic hazard computation.

The section devoted to Seismic Risk Assessment starts with the definition of risk and the description of the factors that contribute to its computation. This knowledge is fundamental for a proper perception of what the hazard is, and what we can do to mitigate the risk.

A special section of the Platform is devoted to prevention strategies based on the level of risk. For example, the Algarve region in South Portugal is a densely populated area where tourism can triple the population. Here maps of the Disruption Index computation allow stakeholders to visualize those facilities most prone to suffering damage. Local government officials can find here a tool to promote earthquake disaster mitigation. Accordingly, they may act on disaster preparedness and policy recommendation to raise earthquake resilience.

The Disruption Index computations evaluate several aspects of the potential loss of services and their interdependencies in the test areas. In the Platform, the Disruption Index computation for Mt Etna highlights an earthquake scenario in which, for example, contaminated drinking water might pose a serious health threat for the local population. Functional disruption (human needs) maps show areas where mobility difficulties might hinder the normal delivery of food. The worse impact scenario concerns housing, and emphasizes the need for semi-permanent housing. Significant displacements of residents might act on traffic patterns, changes in school locations, business, and commerce.

In the Multimedia Platform, the chapter related to "Disaster prevention strategies based on educational information system" contains various materials related to the risk mitigation, including five educational videos discussed in the Sect. 2.4. The chapter explains the role of scientists as those who can provide a better understanding of natural hazards and informative support to mitigate their effects. The Multimedia Platform also includes the results from a study developed by UPStrat-MAFA members, which provides an assessment of the education plan in Portugal, Iceland, and Italy. The study describes various actions that might be done to improve education, including open-door events that allow a face-to-face communication between the public and the scientists. Special emphasis is given to the promotion of hands-on tools and learn-by-playing approaches for children, as they can educate explaining how to be prepared in case of earthquake. The Platform also offers a game that deals with the do's and don'ts during the shaking and the handling of the evacuation of a household. In the game named "*Treme–Treme*" (Portuguese for "Shaking-shaking"), the players learn how to prepare an emergency kit and where to find a shelter in their home in order to avoid dangerous places during the shaking.

2.4 UPSTrat-MAFA in the social media

The number of people having access to the Internet is high, steadily growing, and virtual communication is even replacing all of the other sources of information. However, over the past years, the scientific community did not see Internet as an opportunity for dissemination and for interaction with the public on scientific issues, some of which are fundamental in building the culture of safety. As non-scientists have meantime fulfilled the gap between science and society, establishing trust in experts has become an increasingly complicated issue in the present internet-era (Solarino 2014).

Bering this in mind, we devoted efforts to the objective of disasters prevention communicating through Internet by a project website as well as devoted YouTube channels and social media.

The website of the UPSTrat-MAFA project was launched in March 2012 at the URL address http://upstrat-mafa.ov.ingv.it. It was designed both to share information between the project's partners and to create a communication channel open to the scientific community and stakeholders. The site has a public section accessible by everyone and a registered section accessible by registered users only (i.e., the partners of the project). This last section contains a download page to get documents of the project, and a Forum (Kunena module) to exchange information.

The public section of the website contains the deliverables of the project. In the "About the project" section, images reminding seismic hazard in the study areas are scrolled sequentially. Here the user gets general information on the European countries involved in the project and the study areas. The three main topics addressed, namely seismic hazard assessment, seismic risk assessment and disaster prevention strategies, are synthetically presented. Surfing the website, the reader gains a first-hand understanding on SASHA and the Disruption Index previously described.

As the website was a fundamental component of our dissemination strategy during the project, it devoted a whole section to the "News". This section includes activities, meetings, newsletters, and meeting's agenda that document the on-going progresses of the project tasks. In this section, there are also notes presented to scientific conferences to ensure update information to the community.

The "Deliverable" section is mainly devoted to the spreading of knowledge. The first page contains previews of scientific articles, the leaflet, the Layman's Report, the Multimedia Platform and educational videos.

Four educational audio–video products (10–29 min long) were produced in the framework of the dissemination activities of UPStrat-MAFA. The videos are addressed to the populations living in regions prone to seismic hazards chosen as test sites during the project. A fifth video, mostly devoted to the general public and not specifically to local communities, assembled all the issues worked out in the project concerning strategies for risk mitigation and policy recommendations. The videos are useful as educational material for both schools and the public (see Musacchio et al. 2015 for a detailed description), and are freely available through the Internet. To reach the widest and most general audience, two YouTube channels were created:

1. Before it's too late: https://www.youtube.com/user/beforeitis2late/feed.
2. UPSTrat-MAFA project: https://www.youtube.com/channel/UCg0VxYGPYa2bUGXIhZl35zQ/feed.

The "Before it's too late" YouTube channel also includes the film with subtitles in Portuguese and English, and the movie making-of, where interesting shots of street interviews are shown. The channel was also used to disseminate risk education to young children in the age between 3 and 6 years, with a video titled "Riscos Dos Pequeninos" (Risks of children), where the advantage of a more efficient spreading of the culture of safety is evident with respect to the transmission of fear. Since the YouTube channel "Before it's too late" was created, it has achieved more than 2900 viewers, indicating an effective way to spread awareness through the new media technology.

In total, the overall number of visual accesses to the five videos is 4132 at the time of preparation of this note (December 2014).

We profited of social media potential to involve a wide range of population—even though likely formed mostly by young people—and built up a Facebook webpage devoted to raise awareness of general public on earthquake hazard (https://www.facebook.com/pages/Before-it-is-too-late/364231290361280). Another Facebook webpage was also specifically targeted to earthquake preparedness using serious games (https://www.facebook.com/pages/Treme-Treme/731295750254697?ref=bookmarks); this includes the video game *Treme–Treme* and a list of posts related to game testing in schools in Portugal.

An image from the 2012 Emilia earthquake, with a small insert displaying scientists' interviews during the last World Conference on Earthquake Engineering held in Lisbon in 2012, form the "before it's to late" Facebook page banner (Fig. 8). The message we want to convey is that the scientific community is debating on seismic risk and scientists and experts challenge their skills to disseminate awareness on earthquake hazards. The community section of the page includes a list of posts devoted to public campaigns towards preparedness, newspapers articles on the political debates concerning seismic risk in Portugal, and science outreach venues (i.e., *ScienzAperta* in Italy). Video posts range from documentaries on the 1775 and 1969 Lisbon's earthquakes, interviews to scientists, television shows on earthquakes preparedness. A link to the YouTube channel on the United Nations Global Assessment Report for Disaster Risk Reduction 2013 highlights that mitigation has a high and positive impact on the economy. Cutting-edge approaches on evaluation of seismic risk based on the interaction between a wide variety of services, networks and urban facilities that may be unavailable to the public during the system failure (i.e., the Disruption Index approach) are also posted. The question of how natural hazards can influence our life and/or daily choices is addressed in the same "before it's to late" Facebook webpage with a link to the TEDx YouTube channel, which highlights the need of being informed about past disasters. This link has achieved more than 15 thousands visitors. The post "What do they have in common?" displays pictures from ghost cities in China related to dysfunctional urbanization, such as the Kangbashi district of Ordos, and earthquakes destructive effects, such as those in Beichuan.

We carried out a statistical analysis of the website access of the UPSTrat-MAFA project using Google Analytics. The website traffic in the period from April 2013 to November 2014 highlights a worldwide geographical distribution of the visitors, although the majority of them is mostly concentrated in Europe. This result is consistent with the issues addressed by the UPStrat-MAFA project, which concern urban disasters in European countries. The access peaked during the Second General Meeting of the project, which was held in Selfoss, Iceland, and again during the last General Meeting of the UPStrat-MAFA project held in Catania, Italy. The highest number of access points was from Italy

Fig. 8 A screen shot of the "before it's too late" facebook page. The post links to a science outreach event at the Lisbon Science Museum where the movie "before it's too late" is going to be shown

(~66 %), followed by Portugal and Spain. This result highlights the interest of local users in strategies that might prevent disasters in their own country.

3 Conclusions

Although social research demonstrates the increasing concern and consequent demand of information about disaster risk of any kind, risk perception is far from being aligned with the need to take efficient actions towards safety. One reason might be the lack of trust in the scientists, experts, and politicians, and in those who are in charge of making decisions that will affect the future consequences of natural hazards on people and infrastructures.

In this paper, we have presented the various forms of dissemination of innovative strategies for urban disaster prevention proposed in the framework of the UPStrat-MAFA project. For their preparation, we have strongly relied on the transparency and correctness of information as well as formats to make the scientific results accessible to lay people and to the world of education. In the test areas prone to seismic hazards belonging to four European countries, namely Portugal (Lisbon and Azores Islands), Iceland (South Iceland Seismic Zone and Reykjanes Peninsula), Italy (Mt. Etna, Phlegrean Fields) and Spain (Alicante–Murcia region), the project has developed and implemented methodologies for hazard and risk assessment, and strategies for risk mitigation. The tools proposed for the dissemination of the scientific results (leaflet, newsletters, Layman's report, videos) were all made available and free downloadable from the Internet. The Multimedia Platform and the virtual communication have also allowed us to walk through the doorway of households and schools to reach a wide audience.

A better understanding of seismic hazard and its consequences in terms of a society miss-functioning can promote political actions and drive decision makers to enforce policy for risk mitigation. It should always be clear that scientific results entail uncertainties and that preparedness needs to be tuned accordingly. Geoscience knowledge is still far beyond prompting absolute answers and might cause even advanced societies to be caught unprepared to face the worst. Nevertheless, lessons learned from past disasters demonstrate that education and dissemination are fundamental to save human lives and, therefore, of paramount importance in the construction of the culture of safety.

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