Long-Term Disaster-Prevention Strategies Based on Education

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Abstract

Although human behavior is the crucial factor in the degree of vulnerability and the likelihood of disasters taking place, preparedness and prevention programs are not mandatory in all countries around the world. Within the framework of UPStrat-MAFA (Urban disaster Prevention Strategies using MAcroseismic FAults), we have defined the disaster prevention strategies based on education management information and actions taken in Iceland, Portugal, Spain, and Italy. A detailed comparative study shows that compulsory school in these four participating countries is greatly unprepared with regard to hazard education, and these results are in line with worldwide studies. Moreover, when hazards are addressed, this is not done at an early age, which results in a missed chance to intervene in the noncognitive side of awareness, which decreases at later ages. To comply with the urge to take actions towards training and education at an early age, we used hands-on tools and learn-by-playing approaches in an informal learning environment. To reach the older population, the audio-visual media appears to be the best and lowest cost alternative to promote risk perception, awareness and education.

Keywords

Disaster prevention • Education • Seismic hazard • Information strategies

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14.1 Introduction

There is a misconception about disasters, in terms of being Nature's curse, which has mostly to do with the mindset of people towards safety culture and the chance to live in areas prone to natural hazards in a sustainable way. Although seismicity is one of the most acknowledged causes of disasters, seismic hazard responses are far from being aligned with longer-term perspectives in terms of development, crucial socio-economic investments and infrastructure, and above all, preparedness (Horton 2011).

Risk awareness and correct perception are salient prerequisites for disaster risk reduction; a risk must be perceived before it triggers risk-reduction efforts. There is an absence of risk perception in the lives of many people, and thus in community and state development planning, in the educational curriculum, and in the media priorities.

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UPStrat-MAFA (Urban disaster Prevention Strategies using MAcroseismic FAults) is a project founded by the European Union that is intended both to assess seismic hazard and risk at an urban scale, and to define disaster prevention strategies based on an education management information system that is linked to information about areas and population groups that are prone to particular kinds of emergencies (UPStrat-MAFA European project, 2013). Here, we present the actions that have been taken by the partners of this EU project in Iceland, Portugal, Spain, and Italy, concerning two major targets: children and the general public.

14.2 Information Strategies

To spread the necessary information about hazards is not an easy task. One might end up scaring people, or the approach might be too trivial. An additional challenge is intrinsic to this topic: disasters are infrequent in nature, and their recurrence is not predictable or linear. Often people have the idea that disasters will strike others, but not them. In part, this is connected with the education process itself: textbooks often present "horrible" cases from far away, compared to which, local disasters appear trivial. People might feel that scientists are presenting them with just another trouble to deal with.

Research has shown that the memory of a disaster remains preserved in the social sphere only for a certain period of time, unless it is kept vivid in the minds of the people, or they are reminded by the provision of information (media, web) and the socially active preservation of the memory (Wisner 2006; Biernacki et al. 2008; Komac 2009; Komac et al. 2013). People tend to deal with hazardous situations in the way they did in the past, no matter that they might have been trained otherwise. Strategies to spread knowledge and raise perception should either include repeated training until earlier incorrect behaviors are replaced, or start training and education at an early age when emotional intelligence is prevalent. The information needs to be balanced, easily understood, and accessible to all, and it should be linked to the areas and population groups that are prone to particular kinds of emergencies. It is important to distinguish between disaster prevention strategies in the field of education and those that are addressed to the general public.

14.2.1 Hazard and Risk Education and Schools

To be effective, long-term activities like education should be permanent and integrative, and should cut across all formal and informal educational efforts, while remaining in close contact with reality. Assessments of the educational curricula on natural hazards and accessibility to risk reduction information have highlighted how schools worldwide are greatly unprepared in their natural hazards education (Komac et al. 2013).

We have run a detailed comparative study on seismic and volcanic hazard education across four European countries: Iceland, Portugal, Spain, and Italy. The outcome of the study has highlighted in particular that no matter what the average level of education is, the risk of exposure to seismic and volcanic hazards are not mandatory subjects in the compulsory education (Bernhardsdóttir et al. 2012). We have analyzed standardized curricula and textbooks, and we have considered the age at which natural hazards are discussed.

None of these four countries provides a specific course that is devoted to the education of earthquake and volcano hazards and risks. Instead, standardized curricula include these aspects within different subjects, such as geography, geology, physics and history. Textbooks do not even thoroughly discuss all of the fundamental scientific and/or safety issues that are needed to understand a hazard. Furthermore, the core science textbooks on the market are riddled with errors. Our study highlights the gap that exists between the science world and that of education, which grows deeper as the misconceptions of the teachers themselves regarding the geosciences are passed on to their pupils (Bernhardsdóttir et al. 2012). Children do not approach hazard education at an early age, and the result is that the noncognitive side of awareness may never be triggered.

Bearing in mind what the major weak points of hazard education are in the four countries, we have developed tools to first take up informal learning, and then to plan to take actions on the formal curricula in the future. As we need to first address children, good approaches include the use of hands-on tools and learn-by-playing approaches.

Scientists need to challenge their communication skills to educate children through scientific role-play games and hands-on laboratory activities. In Italy, the National Institute of Geophysics and Volcanology (INGV) has built a portable shaking table, which allows children of every age to have direct experience of the motions related to an earthquake and its effects. In Portugal, the Advanced Technical Institute (IST) uses its digital educational small shaking table to demonstrate to students the dynamic performance of a building.

The IST has also been working on an interactive online game, named "*treme-treme*" (shake-shake) which allows children of 8 years to learn the skills and concepts for survival during an earthquake. The players are meant to build a survival kit, finding all of the safe and unsafe areas of their home, and to learn how to protect themselves (Fig. 14.1).

For younger children, as 5–10-year-olds, the Civil Protection of Lisbon Municipality promoted a space that is known as the "House of Tinoni", where each child learns to

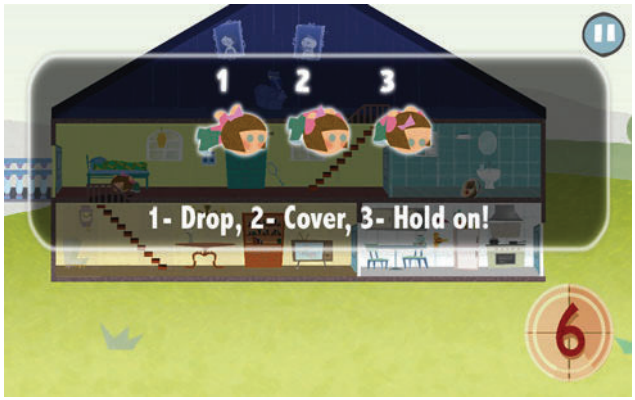

Fig. 14.1 A snapshot from the *treme-treme* game

identify and respond to the risks involved in everyday life, as well as to exceptional events like earthquakes. Some pedagogical information is provided, and the experience culminates in an interactive game that summarizes the contents that are disseminated through the activities (http://www.tinoni.com/casa-do-tinoni.php).

In Iceland, the Earthquake Engineering Research Centre (EERC) provides awareness training for school children, and contributes to a permanent exhibition on seismicity in Hveragerði. Here, visitors can, for instance, enter a small "house" that shakes—an earthquake simulator—that allows them to experience powerful earthquake vibrations.

14.2.2 Hazard and Risk Education and the General Public

Hazard dissemination to the general public needs to be informative and balanced, and to be in a language form that is accessible to everybody.

The interactions between schools and the science world vary among these countries, from being formally defined in a curriculum, to being informally initiated by teachers and scientists. Both the formal and informal approaches are valuable for the educational system, but when the interaction depends on individuals, institutions and/or nongovernmental organizations, consistency can be lacking, due to the more unstable finances.

Science festivals and open days for research institutions are often environment hosting activities and exhibitions that are devoted to risk education and, in general, to Earth Sciences. However, these are spot initiatives that cannot reach the whole population. Audio-visual clips are, in our opinion, a more effective and long-lasting tool for the dissemination of information on hazards to a wider range of the population. Therefore, in the framework of the UPStrat-MAFA project, efforts have been devoted to the preparation of videos that can promote risk awareness and education. For example, in Portugal, the IST and the National Engineering Laboratory (LNEC) have produced a 16-min video titled, "Before it's too late", where the public perception and interviews with experts are presented, to bring people closer to the science (Fig. 14.2).

In Iceland, the EERC has produced the film "Hveragerði—in Compliance with Nature", which focuses on a small community coping with the risk of earthquakes. Similar actions have been taken in Italy, and together, Portugal, and Iceland have also contributed to the preparation of a video that provides an overview of the seismic hazard in these countries.

14.3 Discussions and Conclusions

We have presented the actions taken within the framework of the UPStrat-MAFA project. Comparing the education systems within countries participating to the project, namely Iceland, Portugal, Spain, and Italy, we have found that the compulsory school curricula are greatly unprepared in terms of hazard education. Our results are in line with worldwide studies concerning natural disaster education at each level (Komac et al. 2013).

To comply with the need of training and education at an early age, and to intervene in behavior that children, the future adults, will have in the case of hazards, we have

Fig. 14.2 Snapshots from the video "Before it's too late"

taken actions that include the education of children using hands-on tools and learn-by-playing approaches. To raise the perception and awareness of the older population, we have found that audio-visual media will be the best and lowest cost way to promote risk awareness and education.

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