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GEOETHICAL CONSIDERATIONS IN DISASTER RISK REDUCTION

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ABSTRACT

Natural phenomena (earthquakes, floods, landslides, volcanic eruptions, tsunamis) remind us that the Earth is a dynamic planet, with continuous changes and transformations. When these phenomena endanger life and activities of human communities, it is necessary that scientific knowledge, professional skills and political responsibilities cooperate effectively with the aim to defend population, economic activities, infrastructures and cultural heritage. Risk cannot be entirely eliminated, but can be mitigated, trying to minimize its negative effects. Nowadays we are able to predict, with a certain degree of uncertainty, the onset and development over time of some natural events. Scientific progress is proving that we can defend ourselves, through an in-depth knowledge of phenomena, their careful monitoring (even through satellites), the development of early warning systems, the use of reliable predictive models, prudent and farsighted policies of land management, the implementation of information and education campaigns for the population. However, the defence against georisks should not overlook the ethical and social aspects involved, which can support the scientific knowledge in identifying acceptable solutions for living together with natural phenomena. Geoethics was born as a response to the need to develop an ethical and social reflection on the relationship that link us to our territory and to the Earth system as a whole, and to consider the individual and collective responsibilities that arise from it. Geoethics aims to recall all those who must manage georisks to attend their responsibilities and to educate the population to know and face them improving the societal resilience to natural disasters.

Keywords: Geoethics, natural hazards, risk communication, citizen science, resilience.

RESUMEN

Consideraciones (geo)éticas en la reducción del riesgo de desastres. Los fenómenos naturales (terremotos, inundaciones, deslizamientos de tierra, erupciones volcánicas, tsunamis) nos recuerdan que la Tierra es un planeta dinámico, con continuos cambios y transformaciones. Cuando ello ponen en peligro la vida y las actividades de las comunidades, es necesario que el conocimiento científico, las competencias profesionales y las responsabilidades políticas cooperen eficazmente para defender la población, las actividades económicas, las infraestructuras y el patrimonio cultural. El riesgo no puede ser totalmente eliminado, aunque puede ser mitigado, tratando de minimizar sus efectos. Hoy somos capaces de predecir, con cierto grado de incertidumbre, el inicio y desarrollo de algunos eventos naturales. El progreso científico está demostrando que podemos defendernos a través del conocimiento profundo de los fenómenos, de su monitoreo (incluso mediante satélites), el desarrollo de sistemas de alerta temprana, el uso de modelos predictivos confiables, la implementación de campañas de información y educación. Sin embargo, la defensa contra los riesgos no debe pasar por alto los aspectos éticos y sociales, que pueden apoyar al conocimiento científico en la identificación de soluciones aceptables para convivir con fenómenos naturales. La Geoética nació como respuesta a la necesidad de desarrollar una reflexión ética y social sobre la relación que nos une al territorio y al sistema terrestre, y a considerar las responsabilidades individuales y colectivas que surgen de ella. La Geoética tiene como objetivo recordar a quienes deben gestionar los riesgos geológicos para asumir sus responsabilidades y educar a la población para conocerlos y afrontarlos mejorando la resistencia social a los desastres naturales.

ties of increasing their scientific preparedness and following ethical principles in their activities (Peppoloni and Di Capua 2016).

INTRODUCTION

GEOETHICS, AN EMERGING FIELD IN GEOSCIENCES

Geoethics consists of research and reflection on the values which underpin appropriate behaviours and practices, wherever human activities interact with the Earth system. It deals with the ethical, social and cultural implications of using Earth sciences for societal benefits (from the website of the International Association for Promoting Geoethics: <http://www.geoethics.org>; Bobrowsky *et al.* 2017). On the one hand it represents an opportunity for geoscientists to reconsider their activities from an ethical perspective. On the other hand it is a tool for increasing the awareness of society as a whole on problems regarding geo-resources, geo-environment and georisks (Wyss and Peppoloni 2015). Among the fundamental issues of geoethics, there are problems related to the management and mitigation of georisks and to the information provided to the public. In the field of the disaster risk reduction, geoethics fosters the proper and correct dissemination of the results of scientific studies; develops and promotes geo-educational tools for the population; aims to improve the relationships between the scientific community and the other components of the society during all the different phases that characterize the disaster cycle.

ETHICAL AND SOCIAL VALUES IN THE DEFENCE FROM GEORISKS

Georisk experts should consider some values of reference in conducting their activities that can support technical and scientific aspects. Values such as ability, competence, honesty, individual and joint responsibility, collaborative attitude, reliability, transparency are able to allow scientists to develop a good science. Making good science is the prerequisite in the strategy for an effective disaster risk reduction, but it is not sufficient. In order to increase the resilience of a community, scientists have to work for other values as prevention, safety, sustainability and education to root in society. The culture of emergency must be replaced with the culture of prevention and this should happen not only in view of saving costs, not only in economic terms. Prevention must be intended mainly as a social and cultural attitude that gives its fruits in the short, medium, and long terms. Not investing in prevention means to irresponsibly transfer the social and economic costs of a disaster on the shoulders of future generations. In this perspective, geoethics for disaster risk reduction may be the foundation on which to establish a new and profitable relationship between science and society, by recalling geoscientists to their du-

RESPONSIBILITY TOWARDS SOCIETY

The defence against natural risks involves many actors: not only geoscientists, but also decision makers, local authorities, government agencies, mass media, citizens, etc. All these actors form a “defence system” that must have a common goal and work in the same direction; each of them with a specific role and responsibility in relation to an impending risk. Roles and fields of action of all these actors should be based on clear protocols and procedures to be followed in risk management (Dolce and Di Bucci 2015) in order to improve the relationships among them, so that to avoid unfortunate situations, as it happened in Italy, that led to the L’Aquila trial (Cocco *et al.* 2015).

Taking into consideration geoethical aspects related to georisks can be helpful to make geoscientists more aware of their responsibilities towards society and to clarify the role they can play in the interaction with other actors, aiming at more effective actions for georisks mitigation. Unfortunately, often geoscientists do not pay sufficient attention to science communication and don’t succeed in making the population able to understand the scientific and technical language. It is also important that the models used for the study of risks scenarios are well-grounded on observational data, including clear indications of their uncertainties; and, before release, these models should be discussed carefully and in-depth within the scientific community. This can also help to reinforce the social credibility of scientists. The society should be supported in the defence against georisks by developing educational strategies, by disseminating scientific knowledge, by transferring appropriate and timely information on risk scenarios and consequences of unpreparedness (Di Capua and Peppoloni 2014).

Disasters always scared the population, the fear cannot be eliminated, but the proper dissemination of scientific knowledge and the adequate preparedness can help to better face the fear of a disaster and to better react for minimizing damages. Geoscientists possess the proper knowledge for bringing science closer to society. It is their task to make society aware that science cannot be the solution to all the problems, but it can provide population with helpful tools to defend lives and activities, no matter the existence of a certain level of uncertainty (Peppoloni and Di Capua 2012).

FUNDAMENTAL TASKS OF GEORISK EXPERTS

A geoethical approach by geoscientists to the disaster risk management should consider the following aspects in order to increase the preparation of society, by improving its resilience to natural disasters (Di Capua and Pe-

ppoloni 2014):

1. Making data and the results of their studies public, open access and user friendly, with explanatory information targeted to the population, with a clear distinction between observations and working hypothesis.
2. Transferring advanced knowledge and technology to different disaster risk reduction stakeholders, in particular industry and authorities.
3. Participating in educational campaigns for the population, paying attention to simplify concepts, without making them banal.
4. Increasing the synergy with government agencies and local administrations, through the development of operational protocols and the definition of an encoded stream of information from the scientific community to the authorities.
5. Assuring their ongoing professional training, in order to continuously update the knowledge on recent studies and results about natural phenomena.
6. Collaborating in the training of technicians and professionals to increase their skills and assure the knowledge transfer from academia to practitioners and industry.
7. To conduct their studies fairly, verify their sources of information and the adherence of results to observations taking into consideration uncertainties and errors.
8. To accept a fair debate with alternative hypotheses and theories, without being overconfident in their own results.
9. To develop a multidisciplinary approach to the problems, to guarantee multi-facets perspectives to address complex problems, like those related to georisks, which involve skills on hazard, vulnerability, exposure, communication, and education.

CONCLUSION: THE ACTIVE ROLE OF CITIZENS

Citizens have surely the legitimate right to demand to decision-makers actions in defence of their safety and to scientists and civil protection officers to be properly informed about georisks. But although citizens are usually considered passive actors in a risk scenario, on the contrary, they can play a key role for societal safety. Certainly they have to be trained to effectively contribute to improve the resilience to disasters of the community to which they belong. The activities relative to the new concept of “citizen science” are developed with this goal.

Starting from the idea that dissemination of knowledge is not a one-way road (from scientists to citizens), there is increasing awareness of the contribution that cit-

izens can give to scientists, providing them with precious insights that would otherwise be overlooked. In this line, scientific projects often involve volunteers for observations, measurements, and computation. Some tools have been created that involve citizens in the real-time transmission of observational data on effects provoked by earthquakes, and scientists use them as a primary source of information on seismic events. Online macroseismic questionnaires designed for citizens to fill them help geoscientists to collect information on the effects of any earthquake on buildings and the environment, helpful to better outline the felt areas, to study the intensity attenuation and to evaluate the possible local seismic amplification. All these data flow into studies aiming at developing actions for the risk mitigation, and even to obtain valuable testimonies on the earthquakes in themselves, especially for those events that are, by nature, transitory: when they occur, usually no scientist is on the spot ready to record them, but local people are there, ready to provide valuable information. From their participation in these activities citizens can realize the importance of observations in science, the need of accuracy of collected information and the necessity of gathering data to create or confirm a scientific model (De Rubeis *et al.* 2015). This example illustrates the ethical aspects involved in this matter, such as the collaborative attitude and the joint responsibility of geoscientists and citizen scientists. This fruitful cooperation contributes also to improve the credibility of science into society. In fact, if society is not sufficiently involved in the scientific knowledge, two main negative consequences can arise:

- the cultural and social marginalization of scientists, with a loss of sense of the role they can play in protecting society from natural hazards;
- the tendency of people to lose confidence in science.

Without a society scientifically prepared for it, risk reduction campaigns are less effective and the improvement of the resilience of the human communities becomes a too much difficult goal to be achieved.

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