

Geoethics: ethical, social and cultural implications in geosciences

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Abstract

Humans are recognized as a “geological force”, capable of modifying natural environments, and in virtue of this prerogative they have an ethical responsibility towards the planet. Indeed, studying and managing the Earth system, exploiting its geo-resources, intervening in natural processes are actions that involve great responsibilities towards society and the environment, of which perhaps we, as geoscientists, are not sufficiently aware. Only by increasing the awareness of this responsibility, can we work with wisdom and foresight, and respect the balances that exist in nature while guaranteeing a sustainable development for future generations. In order to define acceptable solutions to current global challenges, we need to take into proper consideration the ethical and social aspects involved in geoscience issues. Geoethics was born to define a conceptual substratum of categories, useful as framework of reference for geoscientists, to help them develop a new way of thinking and interacting with the Earth system. Geoethics widens the cultural horizon of geoscience knowledge and contributes to orient scientists and society in the choices for responsible behavior towards the planet. The paper provides an overview of the emerging field of geoethics, focusing on theoretical and practical aspects, by showing the trajectory that has led to the current point of development of geoethics and suggesting some cues for thought for further advancements of ethical thinking in geosciences.

1. INTRODUCTION

Since geosciences have ethical and social implications (Bobrowsky et al., 2017; Stewart and Gill, 2017; Wyss and Peppoloni, 2014), geoethics should become a key requirement in every geoscientists’ curricula (Bobrowsky et al., 2017). To achieve this goal, geoethics needs above of all to obtain dignity and credibility within the scientific community. Geoethics can represent a new way of thinking and interacting with the Earth system, and a new way to approach the global problems facing the planet. But the field of geoethics is still in the early stages of development, and its status as a new discipline has to be fully characterized, assessed and clarified, as well as its relationship with “environmental ethics” (Hourdequin, 2015). To start this process, in recent years a conceptual substratum has been developed following progressive steps, helpful

to provide a clearer framework of categories and contents within geoethics: a formal definition, as well as four levels of content including analyses, topics, goals, values. This framework is necessary to give a rational structure to geoethics, and to assure its authoritativeness. The founding of the IAPG – International Association for Promoting Geoethics (IAPG, 2017) in 2012 has stimulated the creation of a large geoscience community to share ideas, to build contents and to address geoethical issues.

2. MEANING OF THE WORD “GEOETHICS”

The first step was to clarify the etymological origin of the word “Geoethics” (Peppoloni and Di Capua, 2014). “Geoethics” is the union of the prefix “geo” and the word “ethics”. The prefix “geo” refers to “Gaia”, which means “Earth” in Greek. Although its ancient Sumerian meaning is “home, dwelling place”. Thus

“geo” refers to the place where humans dwell. The word “ethics” has a double meaning: first, “ethics” contains a sense of belonging to the social dimension of life, second, it is related to the individual sphere of each person. In both these two existential conditions (social and individual) the etymological root of the word “ethics” calls upon human beings to face their responsibilities. This concept stresses that geoethics means (social and individual) responsibility towards the Earth, an ethics for the planet.

3. RESPONSIBILITY AND FOUR LEVELS OF ANALYSIS IN GEOETHICS

The second step was to define one of the key concepts at the base of geoethics: the responsibility (individual and social), that can be referred to four different levels of analysis (Bobrowsky et al., 2017; TGEAGC, 2017); responsibility:

- we, as geoscientists, have towards ourselves in conducting our work to the best of our abilities (this implies the importance of each scientist’s individual conscience);
- towards our colleagues, with whom we have to work with a cooperative, respectful and honest attitude, with the common goal to find solutions to geoscience problems under a multidisciplinary approach;
- towards society that we, for our expertise, have the duty to serve to allow its development, as far as possible minimizing the environmental impact and respecting natural dynamics;
- towards the Earth system, as our irreplaceable home, that we have to preserve and to entrust to future generations.

We, colleagues, society and the Earth system are fundamental ambits for the geoethical analysis, to be considered in a hierarchical order. In fact, before our responsibilities towards society and the Earth system, we refer to our individual conscience and identify our own reference values, both ethical and professional. At the base of geoethics there is definitely an honest relationship with ourselves and conse-

quently with our colleagues, society, and environment.

4. A DEFINITION OF GEOETHICS

When a new discipline begins to be developing, definitions are fundamental to clarify to what we refer. Starting from the concept of ethics proposed by Aristotle (384-322 BC), and putting together the concept of responsibility related to the four levels of analysis and etymological remarks, geoethics has been finally defined as the “*research and reflection on the values which underpin appropriate behaviours and practices, wherever human activities interact with the Earth system. Geoethics deals with the ethical, social and cultural implications of geoscience knowledge, education, research, practice and communication, and with the social role and responsibility of geoscientists in conducting their activities*” (Bobrowsky et al., 2017; IAPG, 2017; Peppoloni and Di Capua, 2012). This definition implies three important matters:

- Understanding when an ethical issue arises.
- Building a framework of common values to be adopted by the geoscience community and society as a whole.
- Identifying an ethical criterion that can orient geoscientists, on which to base technical decisions.

5. ETHICAL ISSUE AND ETHICAL DECISION

An ethical issue arises when we are faced with at least two possible options and wherein one option is likely preferable to the other. If one option is clearly better than the other, then the decision to be taken is quite simple. However it is more complicated when we face ethical dilemmas, in which both the solutions generate negative consequences. In this case, which is the best decision from an ethical point of view? The definition of geoethics states that deciding and acting ethically, in other words taking an ethical decision, means to adopt “*appropriate behaviours and practices*”. An ethically correct and well-considered choice, and so “*appropriate*”, has to be based on identified common values, shared by all those with whom one will share also the effects of that choice (positive or

negative effects). Certainly we tend to base our decisions on practical and technical considerations. So we take into account the economic and temporal implications of the action to be taken (for example: a certain technical solution should be adopted because it costs less, or because it allows one to achieve the same result in a shorter time). In addition, our decisions may also take into account the greater social benefit that they can entail (for example, decisions that aim to protect the lives of citizens, as well as the economic activities in an area more effectively). And even in this latter case there could be important economic implications. Finally, we can base our decisions on specific environmental considerations, where we will choose interventions that aim to protect nature, its dynamics and balances. All these considerations are legitimate: they are the result of our personal beliefs and of the social values to which we refer. A thorough scientific analysis of a problem to be solved, rationally articulated and developed, must lead to that point of equilibrium that is able to optimize the sum of the effects. It is from this balance that a choice can arise, the decision that is ethically sustainable for the human community and the environment; both affected by the same problem. And it is clear that the human community and the environment cannot exist in contrast with each other. If we don't reach that point of equilibrium, and if our decision doesn't take into account the balance between the different variables involved, we may lose the overview of the problem, its vision in the long-term perspective, such that conflicts and problems might arise among those who would like to act in different ways. It is reasonable to think that professional, social and environmental considerations are connected with each other, so they should be carefully considered under a common perspective. Decisions are ethical if they are shared, contemplated, scientifically balanced, technically constructed and considered in their multi-facets.

6. IDENTIFYING AND SHARING VALUES

In order to adopt "*appropriate behaviors and practices*", we must identify the framework of our reference values, on which to base our choice,

which can orient us in the search for the "best" possible balance between the various options, the optimal choice or at least the one most acceptable in relation to a specific situation. If the decisive choice to solve a problem is based on a defined framework of reference values, on which to articulate the couple reflection-action, then one's decisions will not be biased, limited in time nor socially questionable. In fact, the choice of the "best" solution to a problem between multiple existing solutions is possible when the reference values have been clearly defined and shared within the professional or, more in general, the societal community. Only on the basis of these values can we answer the question: what do we want to achieve with our choice, with our decision? Which is our goal? The ethically correct solution will not be the result of a simplistic choice between what is right and what is wrong. In fact, right and wrong cannot be discerned if reference values have not been clearly established. So, what are these values? Sustainability, conservation of nature, future generations, human health and progress are some examples. But what takes priority? And is it possible to find a balance between conservation of nature and human development? Taking a well-weighed ethical decision is impossible if one doesn't answer these questions and fix shared values that can orient them in the problem solving.

7. ETHICAL CHOICES AND ETHICAL DILEMMAS

Reference values should take into due account the different cultural, economic and social contexts, existing in different parts of the world. Otherwise we run the risk of a conflict between values. "*Globalization is a fact. It is a contradiction to recognize ourselves immersed in a globalized world and at the same time to claim the right to act for our own interest, without considering the inter-relationships among ourselves and the world in which we live. Geosciences teach us that such relationships operate on a global scale*" (Peppoloni and Di Capua, 2016). But if we do not take proper account of local conditions, we risk believing in the possibility of exporting local values to a global context, as if they were commodities. Often, especially in more developed

countries, mining is considered as a threat to human health and nature. But surely mining is also a great opportunity for development especially in low-income countries. Reducing the carbon footprint is a priority of more developed countries, but is it ethical to demand the same reduction to less developed countries, constraining their economic development, in order to reduce their contribution to the global CO₂ emissions? Without doubt, a large dam has a significant impact on the environment. It is likely that the construction of the dam will lead to the destruction of numerous natural habitats, but at the same time it ensures protection from floods and manages water and energy supply for thousands of people. Is its construction unethical?

8. ETHICAL DILEMMAS AND THE APPROACH OF GEOETHICS

The examples above highlight that often geoscientists face especially ethical dilemmas when they have to take decisions or suggest choices between two or more options, each of them with a possible negative impact on the Earth system and/or the population. In such cases, we can take a (geo)ethical decision only if we justify it adequately from a scientific and technical point of view, if we clearly indicate pros and cons of the choice we are proposing, including a cost/benefit analysis also in societal and environmental terms, and if we include in our scientific analysis probabilities and uncertainties. From these considerations, it is evident that the role of geoscientists has not only a technical-scientific value, but also a socio-cultural one. In fact, geoethics implies not only the definition of standards and procedures (best practices), but also the constant search for universal values to be shared, in the light of geoscientists' expertise and their specific ability to approach environmental problems.

9. ETHICAL, SOCIAL AND CULTURAL VALUES OF GEOETHICS

On the basis of these considerations, some reference values can be identified, grouped into three different categories (Peppoloni and Di Capua, 2016):

- *Ethical values*: they concerns both the individual and social sphere of geoscientists. The Singapore Statement on Research Integrity (2010), the Hippocratic-like oath published in the form of a "Geoethical Promise" (Matteucci et al. 2014), and deontological codes of ethics/conduct of scientific and professional associations and societies (IAPG, 2017) include, in different and partially complementary ways, several ethical values to be followed, such as honesty, integrity, awareness, accuracy, cooperation, inclusiveness, courtesy and fairness.
- *Social values*: geosciences are essential to help society in facing great challenges, such as climate change, the search for raw materials and new sources of energy and the best management of the current ones, the need for a sustainable approach to the environment, the defense against geo-hazards, and the development of a society of knowledge. Sustainability, prevention and education are social values on which to base a new vision for future years. "Sustainability" means a prudent and prolonged use of a natural resources and low consumption of energy from two perspectives: in the near term, it aims to develop strategies and technologies for reduced use of energies and minerals, and to encourage the percentage increase of renewable energies. In the long term, it means building a new model of economic development for our societies that aims to give new generations the possibility of discovering and exploiting other ways to produce energy and use natural resources. "Prevention" implies developing an ethical way of thinking for the protection of populations from damages related to geo-risks. A preventive approach should replace an approach focused solely on emergency, in order to improve the community's resilience; that is their ability to cope with and recover from a disaster. Finally, "geo-education", that is transferring geologic knowledge to the public, can give geosciences a fundamental role in contributing to build a knowledgeable society by raising awareness about how the Earth system operates and evolves.

- *Cultural values*: geosciences have also a great cultural value, capable of influencing current and future ways of thinking about the Earth. Geoethics enhances cultural values such as geodiversity, geological landscape and geoheritage to strengthen the relationship between communities and the land they inhabit, and transforms those values into economic resources, such as geoparks and geotourism, that represent not only the synthesis of those values, but also an opportunity for a country's development.

10. THE (GEO)ETHICAL CRITERION: RESPONSIBILITY

What is the criterion that allows us to take (geo)ethical decisions, to deal with (geo)ethical dilemmas, in the light of the reference values that we set, on the basis of which we can follow "*appropriate behaviours and practices, wherever human activities interact with the Earth system*"? The ethical criterion must be sought in the concept of responsibility, since geoethics is grounded in an ethics of responsibility towards the Earth. The term "responsibility" derives from the Latin verb "responderere", which means to respond. It expresses the commitment to answer to someone for our actions and their consequences. In other words "*the duty or obligation to satisfactorily perform or complete a task that one must fulfill, and which has a consequent penalty for failure*" (www.businessdictionary.com/definition/responsibility.html, accessed 30 October 2017). For the scientific community the "penalty for failure" must be intended not only in legal terms (for example: if geotechnical calculations to analyse a slope are wrong owing to negligence and a disaster occurs, the geoscientist will pay for the consequences). A penalty for failure is also the loss of credibility of science, the loss of credibility of our role of experts of natural dynamics, the failure of our scientific and cultural role to guide society in managing the Earth system. It is the loss of the reason for being geoscientists.

The ethics of responsibility is considered the "bedrock" of geoethics, the ethical criterion underlying geoethics. It implies the ethical commitment of geoscientists towards their individual conscience, towards their colleagues,

society and the Earth system. For all these reasons, geoethics should become an essential element in the geoscientist's training. The "Geoethical Promise" (Matteucci et al., 2014), recently introduced as a fundamental part of the "Cape Town Statement on Geoethics" (Di Capua et al., 2017) can be the means through which early-career geoscientists become aware of this responsibility, and take care to adopt an ethical approach in conducting their future activities (Bohle and Ellis, 2017).

11. THE PREREQUISITE OF THE RESPONSIBILITY: INTELLECTUAL FREEDOM

Intellectual freedom is a fundamental prerequisite for practicing the ethics of responsibility. Its absence prejudices the possibility of taking an ethical decision. When we are not free to choose between alternative solutions, we can take only one road and act only in one way, whether it means adopting a right or a wrong solution. Harassment, discriminations, bullying, conflicts of interest, and pressures at work (St. John et al., 2016; Gawthrop, 2014; Neuberg, 2014), can result in a lack of freedom, since they threaten the serenity of the working environment and more generally limit freedom of choice. A respectful working environment is fundamental to maintain a high level of professionalism and to assure an ethical conduct while practicing geosciences. In particular, harassment, discriminations, political and business pressures offend the dignity of the person, and seriously undermine integrity, quality and credibility of the geoscience community. These kinds of behaviours prevent individuals from taking ethical decisions. Geoethics cannot be practiced if professional ethics are constrained.

12. ETHICS OF RESPONSIBILITY AND ETHICS OF THE TOOL

Sometimes, we believe that to improve the working conditions of a scientific and professional community, by increasing its ethical level, it may be sufficient to adopt codes of ethics or conduct, which prohibit wrong practices and foster correct ones. Certainly ethical codes are the result of a careful ethical reflection and are a very useful tool to try to prevent, monitor

and control inappropriate practices and poor policies within the geoscience community. But despite the existence of such codes, more and more often we learn about cases of "bad practices", "research misconduct" (Allison and Spencer, 2016; OIG, 2016) or "conflict of interests" (Andrews, 2014). It could depend on the tendency to confuse "the ethics of responsibility" with "the ethics embodied by the tool". The observance of practices deemed ethical (contained in codes of ethics) should not be confused with the essential ethics education that each geoscientist should have if he/she wants to reach a higher level of integrity, respectability and credibility within the professional community. Too many geoscientists will continue to ignore ethical codes, if they don't assimilate in their professional training those values that address the ethics of responsibility. Geoethics, implies a conscious and rational way of acting, scientifically constructed, respectful towards ourselves, colleagues, society and Earth system. An ethical decision can only come from a responsible choice, made freely. This ethical decision may be "certified" by a code of ethics.

13. CONCLUSION

Geoethics recognizes that human beings are a geological force capable of acting on natural environments, and in virtue of this prerogative assigns to them an ethical responsibility towards the Earth system. The awareness that humans can influence the processes of nature was earlier highlighted in the nineteenth century by the Italian geologist Antonio Stoppani (1824-1891), who first recognized the potential of human beings to be a "geological force", capable of influencing natural processes and changing environments (Peppoloni and Di Capua, 2014; Lucchesi, 2017). His intuition has gradually led to the modern concept of the "Anthropocene" (Crutzen, 2002), and to large and multi-faceted discussions, developed within the "environmental ethics" (Bohle, 2016). Today environmental challenges impose responsible answers. Regardless of the value we want to give to the Anthropocene, whether merely a political necessity or a real scientific item (Zalasiewicz et al., 2015; Finney and Ed-

wards, 2016; Waters et al., 2016), its cultural importance remains (Hamilton et al., 2015). That is to have understood that mankind is a modifier of the Earth system, and for this reason it has an ethical responsibility towards itself and towards all that is other than itself. In virtue of this prerogative, geoethics can propose a responsible neo-anthropocentrism, where human beings assume responsibly the role of critical and rational conscience of the Earth system, which is the synthesis of the biotic and abiotic elements of nature (Bobrowsky et al., 2017). When we are in front of a problem, geoethics remind us to consider not only "what we have to do", but also "why we have to do it" and "what are the consequences of our doing". Therein lies the value of geoethics.

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