

GEOETHICS CONCERNS

Considering that the reflection upon Geoethics concerns and values will allow GOAL members to elaborate the syllabus and the educational resources, this output presents a tentative list of Geoethics concerns in the different thematic of GOAL syllabus. Updates to that list will be done during the project development.

GEOETHICS CONCERNS RELATED TO GEORISKS

1. In the risk decision chain, roles and responsibilities by each involved actor have to be clearly fixed.
2. Geoscientists needs to be more aware of their social role: they are not decision-makers, but they must provide reliable, unbiased and updated science-based information to decision and policy-makers so that decisions and policies adopted will be scientifically grounded.
3. Synergy between geoscience community, 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 is necessary to assure a fruitful strategy to face georisks.
4. Informing population on natural risks is a priority and an ethical commitment for geoscientists: scientific data, results, and scenarios have to be explained to population and presented in appropriate ways to be understood.
5. Geoscientists needs to learn to communicate geoscience knowledge on georisks without trivializing it, using a language intelligible for the population, while respecting the scientific accuracy.
6. Geoscientists should organize a communication strategy before, during and after emergency phases, strengthening the use of new communication tools, like social networks and being available to hear and reply to doubts and personal beliefs of people on natural hazards.

7. Geoscience research outcomes must be public, with explanatory information targeted to the final users (such as citizens, decision makers, technicians), clearly distinguishing scientific observations from working hypothesis.
8. Population should be informed also about the limits of the scientific methods used, so that it can better understand and share the decisions taken to deal with geohazards.
9. Developing educational campaigns on geohazards and georisks needs a societal involvement so that citizens can contribute to the process of personal construction of knowledge background. The aim of educational campaigns should be not only to transfer scientific data and results, but also to make citizens aware on how geoscience can help to protect against georisks.
10. Society has to be helped to replace a culture based on facing the emergency with a culture centred on prevention to reduce georisks.
11. Scientific knowledge is not a one-way road, and citizens can also give to scientists a support, providing precious insights in collaboration with or under the direction of professional scientists and scientific institutions. This is the goal of “Citizen science”, in which the involvement of citizens in scientific endeavour generates knowledge, understanding, awareness and responsibility. This represents its educational and ethical value.
12. Geoscientists should contribute to develop a more correct risk perception in the population, avoiding a prolonged alarmism, that could have as extreme consequence a decrease of the attention and care by citizens.
13. Geoscientists have to act wisely, in the light of geoethical values, considering a reasonable precautionary threshold: if this threshold becomes too high, the costs of prevention could become excessive, with a consequent attitude of resistance by society towards risk mitigation policies.
14. An acceptable limit of risk can be evaluated on scientific basis, but it remains a political decision. Geoscientists can help decision makers but cannot replace them in this role.

GEOETHICS CONCERNS RELATED TO GEORESOURCES AND MINING

- 1.** The well-informed consent from the citizens.
- 2.** Regulation and standards operation procedures internationally recognized.
- 3.** Public awareness.
- 4.** Social responsibility.
- 5.** Clarity and transparency in media dissemination (regulated science communication).
- 6.** Region profits from the mining.
- 7.** Earth-system impacts.
- 8.** Reasonable values (e.g. integrity, racism, honesty...).
- 9.** Geoscientists (and other experts) professional training in Geoethics (educational responsibility).
- 10.** Complexity in global (and local) markets and non-renewable resources.
- 11.** Healthy and safety in workable mining area.
- 12.** Stakeholders engagement.

GEOETHICS CONCERNS RELATED TO GEOCONSERVATION AND GEOPARKS

- 1.** Implementation of specific procedures for the inventory, conservation, valuation and monitoring of geological sites.
- 2.** Code of conduct on field work and geological sampling.
- 3.** Legal setting to support effective protection of geological heritage.
- 4.** International regulations to prevent the smuggling of geoheritage elements.
- 5.** Public awareness of local communities and general public.
- 6.** Minimize the negative impacts of mass tourism on geoheritage.
- 7.** Interference between bad practices in fossil collecting and Earth System impacts (e.g., loss of the evidence of the life on Earth, interruption of the fossilization process, etc).
- 8.** Professional training of geoscientists (and other experts) in Geoethics and geoconservation (educational responsibility).
- 9.** Compatibility between conservation of geoheritage and development of rural areas.

10. Balance between touristic development of rural areas, wellbeing of local communities, environmental impact, and preservation of the natural character of landscapes.
11. Establishment of successful partnerships in geoparks.

GEOETHICS CONCERNS RELATED TO WATER MANAGEMENT (ENVIRONMENT)

1. Public awareness about competing goals of society concerning water management (e.g. agriculture, conservation of ecology, water supply, hydropower production, shipping, chemical and pharmaceutical industries, flood protection, pollution).
2. Need for coherence between water, energy, food and the environment policies as essential baseline to achieve societal goals and protect the primary resource (water) in contrast to different levels of political influence of lobbies.
3. Transnational implications of large infrastructure projects (transnational-/continental-/global-scale, e.g. flood protection and dams/reservoirs).
4. Transparency of information (drinking water quality) without professional interpretation (meaning of parameters) may lead to public fuss and discredit valuable institutions.
5. Ethical aspects – responsibility: water as a human right (see also Sustainable Development Goal 6: Ensure availability and sustainable management of water and sanitation for all – scarcity, access, water processing, treatment, recirculation, concurrence: consumption for extensive water consuming fruit production in arid regions).
6. Increasing global trend towards privatisation of water resources and water rights (price, quality, maintenance of infrastructure).
7. Implications of climate change on water management (e.g. additional stresses for the sector; eco-sociological implications; Energy efficiency, ecological electricity vs. impacts on environment and ecology; migration due to water scarcity).
8. Global connection of the water cycle (hydro–geosphere–groundwater–surface water–sea):
 - a) sharing of resources, effect of pollution

- b) lack of presence/emphasis of the topic in institutions for decision making;
lack of international direct democratic decision-making tools.

GEOETHICS CONCERNS RELATED TO EDUCATION AND PUBLIC AWARENESS

1. Awareness of academic Earth scientists of the need to include Geoethics as part of the university curriculum for future Earth scientists.
2. Geoethics values should be an integral part of almost each course that an Earth science student takes along his studies.
3. The teaching of Geoethics should be based on dilemmas and case studies.
4. The syllabus should develop oral and written communication and presentation skills, for making information accessible to the general public.
5. The outdoor learning environment is a powerful educational tool for the development of Geoethics awareness, but only if the teaching process is focused on the interaction of the students with the environment.
6. University teachers should be aware that one of the best educational methodologies is modelling.
7. The teaching of Geoethics should include the emotional aspect in addition to the cognitive aspect.
8. The teaching of Geoethics should start since the first years of schooling.