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GOAL GLOSSARY

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Índice

Aim · [eɪm | from Latin]

It is something intended or desired to be achieved by one's efforts; purpose. At curriculum level, an aim is a general, and somewhat ambiguous, specification of the final intent or purpose to achieve in a syllabus, lesson(s), mission or institutional policy. It corresponds to broader descriptions of purposes or intentions presented in general terms, without specific criteria, and usually addressed to the collective instead of the individual. It is often misused as an equivalent of the term “Objective". Both are the desired result of the work performed by some entity, however, imply different concepts.

Examples:

- Aim: Diagnosing students’ Geoethics values. (the teacher wants to…)

Thomson P. (2014). *Aims and objectives — what’s the difference?* https://patthomson.net/2014/06/09/aims-and-objectives-whats-the-difference/

UNESCO. (2016). *Glossary of Curriculum Terminology*. International Bureau of Education.

Wallace, S. (2015). *A dictionary of education*. Oxford University Press.

Content · [contentum | from Latin]

The topics, themes, beliefs, behaviors, concepts and facts, often grouped within each subject or learning area under knowledge, skills, values and attitudes, that are expected to be learned and form the basis of teaching and learning.

UNESCO. (2016). *Glossary of Curriculum Terminology*. International Bureau of Education.

Wallace, S. (2015). *A dictionary of education*. Oxford University Press.

Disaster · [union of the pejorative prefix ‘dis’ and ‘astrum’ (star) (ill-starred event)| from Latin]

“*A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.”* Disasters are often described as a result of the combination of risk and “*insufficient capacity or measures to reduce or cope with the potential negative consequences. Disaster impacts*

may include loss of life, injury, disease and other negative effects on human physical, mental and social well-being, together with damage to property, destruction of assets, loss of services, social and economic disruption and environmental degradation." Disaster is about society.

Kelman, I. (2019). Axioms and actions for preventing disasters. Progress in Disaster Science, vol. 2, 100008, https://doi.org/10.1016/j.pdisas.2019.100008

UNISDR (2009). Terminology on Disaster Risk Reduction. https://www.preventionweb.net/files/7817_UNISDRTerminologyEnglish.pdf

Earth system

Earth system is referred to physical, chemical, biological Earth's constituents and their interacting processes and cycles on both the Earth surface and its interior, capable to transform and/or transfer matter and energy throughout the whole system in ways that are governed by the laws of conservation of matter and energy. The Earth system consists of geosphere (the solid Earth), atmosphere, hydrosphere, biosphere, anthroposphere (including the technosphere).

The geosphere is the solid outer shell and inner crust of Earth. It supports life and interacts directly with other spheres of the Earth system. Other definitions consider the geosphere as the "*lithosphere (The outer, relatively rigid layer of the Earth), hydrosphere, and atmosphere combined*", or "*any of the so-called spheres or layers of the Earth.*"

Atmosphere is the "*air surrounding the Earth. The atmosphere has no precise upper limit, but for all practical purposes the absolute top can be regarded as being at about 200 km.*" The hydrosphere is the "*discontinuous layer of water at or near Earth's surface. It includes all liquid and frozen surface waters, groundwater held in soil and rock, and atmospheric water vapour.*" The biosphere is the "*relatively thin life-supporting stratum of Earth's surface, extending from a few kilometres into the atmosphere to the deep-sea vents of the ocean. The biosphere is a global ecosystem composed of living organisms (biota) and the abiotic (nonliving) factors from which they derive energy and nutrients.*" "*The anthroposphere may be defined as the part of the environment that is made or modified by humans. Put differently, the anthroposphere is the sphere of the earth system or its subsystems where human activities constitute a significant source of change through the use and subsequent transformation of natural resources, as well as through the deposition of waste and emissions.*" It includes the technosphere, the realm of human technological activity and the technologically modified environment.

Allaby, M. (2020). *A Dictionary of Geology and Earth Sciences*. Oxford University Press.

American Geosciences Institute (AGI) (2020). *Glossary of Geology*. https://glossary.americangeosciences.org/.

Encyclopaedia Britannica (2020). https://www.britannica.com/science/

Kuhn, A. & Heckelei, T. (2010). Anthroposphere. In Speth P., Christoph M. & Diekkrüger B. (Eds). *Impacts of Global Change on the Hydrological Cycle in West and Northwest Africa* (pp. 282-341). Springer. https://doi.org/10.1007/978-3-642-12957-5_8.

Lexico powered by Oxford (2020). *Technosphere*. https://www.lexico.com/definition/technosphere.

Evaluation · [ɪˌvaljʊˈeɪʃ(ə)n | from Latin]

Allows teachers to determine and judge students' views and responses about the content taught and, therefore, the effectiveness of teaching strategies, lesson or course. It is a diagnostic and interactive process between students and teachers that informs about students' evolution, providing information to improve learning and teaching. As a formal process, evaluation can occur at specific occasions throughout the course and curriculum for institutional purposes of quality assurance, as well as auto-reflexion on teacher's professional practice. All the information is then used by teachers to determine the following educational steps, with changes in the learning environment, and is shared with students to help them improve their study habits.

To access the effectiveness and the impact that one curse or lesson has had on learner's levels of attainment, both qualitative evidence or quantitative assessment may be used. However, this information is often anonymous and without grading.

UNESCO. (2016). *Glossary of Curriculum Terminology*. International Bureau of Education.

Wallace, S. (2015). *A dictionary of education*. Oxford University Press.

Ethics

Ethics or moral philosophy is a branch of philosophy that seeks to resolve questions of human morality by defining concepts such as good and evil, right and wrong, virtue and vice, justice and crime (adapted from https://www.iep.utm.edu/ethics/).

Fossil

Remnant, impression, or trace of an animal or plant of a past geological age that has been preserved in Earth's crust. The complex of data recorded in fossils worldwide –

known as the fossil record – is the primary source of information about the history of life on Earth.

Encyclopedia Britannica, Retrieved from https://www.britannica.com/science/fossil

Geoconservation

1) Set of methods aiming the management of geoheritage comprising the inventorying and assessment, conservation, statutory protection, interpretation, and monitoring of sites. Management of *ex situ* geoheritage (museum collections) is also a geoconservation action. 2) Emergent geoscience domain such as mineralogy, geomorphology, geochemistry, etc.

Brilha, J. (2016). Inventory and quantitative assessment of geosites and geodiversity sites: a review. *Geoheritage, 8*(2), 119-134.

Henriques, M.H., Pena dos Reis, R., Brilha, J. & Mota, T.S. (2011). Geoconservation as an emerging geoscience. *Geoheritage, 3(2)*,117-128.

Geodiversity

Variety of abiotic nature elements, namely: minerals, rocks, fossils, landforms, soils, and active geological/geomorphological processes.

Gray, M. (2004). *Geodiversity - valuing and conserving abiotic nature*. John Wiley & Sons.

Geoethics

The word ‘Geoethics’ is the union of the prefix ‘geo’ and the word ‘ethics’. The prefix ‘geo’ refers to ‘gaia’, which means ‘Earth’ in Greek, but its ancient Sumerian base ‘ga’ refers more specifically to ‘home, the dwelling place’. The term ‘ethics’ was defined by Aristotle (384/383 B.C. – 322 B.C.) as the investigation and reflection on the operational behavior of humans, searching for legitimate criteria by which to evaluate behavior and choices, and identifies that part of philosophy dealing with the problem to take decisions by the human agent.

Geoethics consists of research and reflection on the values which underpin appropriate behaviors and practices, wherever human activities interact with the Earth system. It

deals with the ethical, social and cultural implications of geoscience knowledge, research, practice, education and communication, and with the social role and responsibility of geoscientists in conducting their activities. Geoethics encourages geoscientists and wider society to become fully aware of the humankind's role as an active geological force on the planet and the ethical responsibility that this implies. Geoethics is considered a point of intersection for Geosciences, Sociology, Philosophy and Economy. Its main issues and topics include: sustainable use of natural resources; reduction and management of natural and anthropogenic risks; management of land, coastal areas, seas and open oceans; pollution and its impacts on human health; global environmental changes, including the climate change; protection of natural environments; research integrity and the development of codes of scientific and professional conduct; literacy and education in geosciences; geodiversity, geoheritage, geoparks and geotourism; forensic geology and medical geology.

Initially developed as professional ethics (deontology) inside geosciences, and to frame inquiries on the responsible behavior of professionals in geosciences and the societal relevance of geosciences, geoethics is increasingly recognized as an emerging subject that goes beyond professional boundaries to inform human agents' actions and societal decisions as a whole, with well-established conceptual foundations and a developing framework for its practical application across a growing range of geoscience disciplines and sectors for assuring sustainable, safety and healthy conditions to human communities and protecting biotic and abiotic entities.

The concept of responsibility is a central pivot in geoethics: the human agent sits at the centre of an ethical reference system in which individual, interpersonal/professional, social and environmental values coexist, underpinning their responsibilities at these four levels (named "the four geoethical domains").

Values such as intellectual freedom, honesty, integrity, inclusivity, and equity, along with concepts such as geoheritage, geodiversity, geo-conservation, sustainability, prevention, adaptation and geo-education are proposed to society as references on which to base geoethical behaviors.

The four fundamental characteristics of geoethics can be summed up as follows: a) human agent-centric, b) shaped as virtue-ethics, c) geoscience knowledge-based, d) with space-time context dependent approaches.

Ideas that underpin the conceptual foundations of geoethics can be traced back to the eighteenth and nineteenth centuries when anthropogenic impacts on nature began to be recognized and documented. In the early '90, the word "Geoethics" began to be used to define the ethical and social implications of geosciences.

Bobrowsky, P., Cronin, V., Di Capua, G., Kieffer, S., & Peppoloni, S. (2017). *The Emerging Field of Geoethics. In Scientific Integrity and Ethics: With Applications to the Geosciences* (pp. 175–212). American Geophysical Union. https://doi.org/10.1002/9781119067825.ch11

Bohle, M. & Di Capua, G. (2019). Setting the Science. In *Exploring Geoethics*, pp. 1–24.Springer International Publishing. https://link.springer.com/chapter/10.1007/978-3-030-12010-8_1

Bonneuil, C. & Fressoz, J.B. (2013). *L'événement Anthropocène - La terre, l'histoire et nous*. Le Seuil.

Cronin, V.S. (1992). On the seismic activity of the Malibu Coast Fault Zone, and other ethical problems in engineering geoscience. *Geological Society of America, Abstracts with Programs, 24*(7), A284.

Di Capua, G., Peppoloni, S., & Bobrowsky, P.T. (2017). The Cape Town Statement on Geoethics. *Geoethics at the Heart of All Geoscience. Annals of Geophysics, 60*(7). https://doi.org/10.4401/ag-7553

Di Capua, G. & Peppoloni, S. (2019). *Defining geoethics. Website of the IAPG - International Association for Promoting Geoethics*. http://www.geoethics.org/definition.

Lewis, S. & Maslin, M.A. (2018). *The Human Planet: How We Created the Anthropocene*. Pelican.

Lucchesi, S. (2017). Geosciences at the Service of Society: The Path Traced by Antonio Stoppani. *Geoethics at the Heart of All Geoscience. Annals of Geophysics, 60*(7). https://doi.org/10.4401/ag-7413

Mogk, D.W. (2017). Geoethics and Professionalism: The Responsible Conduct of Scientists. *Geoethics at the Heart of All Geoscience. Annals of Geophysics, 60*(7). https://doi.org/10.4401/ag-7584

Peppoloni, S., Bilham, N., & Di Capua, G. (2019). Contemporary Geoethics Within the Geosciences. In *Exploring Geoethics,* pp. 25–70. Springer International Publishing. https://link.springer.com/chapter/10.1007/978-3-030-12010-8_2

Peppoloni, S. & Di Capua, G. (2012). Geoethics and Geological Culture: Awareness, Responsibility and Challenges. Geoethics and Geological Culture. Reflections from the Geoitalia Conference 2011 (pp. 335–341). *Annals of Geophysics, 55*(3). https://doi.org/10.4401/ag-6099

Peppoloni, S. & Di Capua, G. (2015a). The Meaning of Geoethics. In *Geoethics: Ethical Challenges and Case Studies in Earth Sciences* (pp. 3–14). Elsevier. https://doi.org/10.1016/B978-0-12-799935-7.00001-0

Peppoloni, S. & Di Capua, G. (Eds.) (2015b). Geoethics, the Role and Responsibility of Geoscientists. *Geological Society of London, Special Publications*. https://doi.org/10.1144/SP419.0

Peppoloni, S. & Di Capua, G. (2016). Geoethics: Ethical, Social, and Cultural Values in Geosciences Research, Practice, and Education. In *Geoscience for the Public Good and Global Development: Toward a Sustainable Future* (pp.17–21). Geological Society of America. https://doi.org/10.1130/2016.2520(03)

Peppoloni, S. & Di Capua, G. (2017). Geoethics: Ethical, Social and Cultural Implications in Geosciences. *Geoethics at the Heart of all geoscience. Annals of Geophysics, 60*(7). https://doi.org/10.4401/ag-7473.

Peppoloni, S. & Di Capua, G. (2018). Ethics. In *Encyclopedia of Engineering Geology* (pp. 1–5). Encyclopedia of Earth Sciences Series. Springer. https://doi.org/10.1007/978-3-319-12127-7_115-1.

Savolainen K. (1992). Education and human rights: new priorities. In *Adult Education for International Understanding, Human Rights and Peace. Report of the Workshop held at UIE*, pp.43–48. UNESCO Institute for Education.

Wyss, M. & Peppoloni, S. (Eds.) (2015). *Geoethics: Ethical Challenges and Case Studies in Earth Sciences*. Elsevier. https://doi.org/10.1016/C2013-0-09988-4.

Geological heritage

Geological heritage, or geoheritage in short, is part of the natural heritage of a certain area constituted by geodiversity elements with scientific value and hence worthy of safeguard for the benefit of future generations. Can include both *in situ* elements (geosites) or *ex situ* elements (collections of geological specimens) and may have other types of values such as the aesthetic, cultural, or educational.

Brilha, J. (2016). Inventory and quantitative assessment of geosites and geodiversity sites: a review. *Geoheritage, 8*(2), 119-134.

Brilha, J. (in press). *Geoheritage. Reference Module in Earth Systems and Environmental Sciences (Encyclopedia of Geology, 2nd edition edited by Scott Elias and David Alderton)*. Elsevier. https://doi.org/10.1016/B978-0-12-409548-9.12106-2

Geotourism

Type of tourism which sustains and enhances the identity of a territory, taking into consideration its geology, environment, culture, aesthetics, heritage and the well-being of its residents.

Arouca Declaration (2011). *International Congress of Geotourism*. Arouca Geopark.

Geosciences

Geosciences, a short form denoting the collective disciplines of the geological sciences or the Earth sciences, analyze the interaction between Earth constituents, the relationships between the planet Earth and other celestial bodies, the influence of human activities on the geological deposits, processes, dynamics, and ecosystems. Geosciences investigate both abiotic and biotic phenomena, the active and passive interaction between biological and a-biological processes and dynamics, how animal and vegetal life, and humans can determine or influence rock and geologic deposits formation and modifications. Geosciences study use direct and indirect methods to make observations and get data, and through models geoscientists provide deterministic or probabilistic scenarios to forecast the spatial and temporal occurrence and evolution of physical, chemical, and biological phenomena.

American Geosciences Institute (AGI) (2020). *Glossary of Geology*. https://glossary.americangeosciences.org/.

Methodologies · [mɛθəˈdɒlədʒi | from Modern Latin]

A body of practices, procedures and rules used by those working in a discipline or research work; a set of working methods. The overall rationale behind a lesson that

determinate how to conduct it. Usually reflective of different ontological and epistemological positions.

Example: positivism vs interpretivism, qualitative vs quantitive, and objective vs committed. Methodology and methods have distinctive meanings. The methods, comprising teaching/learning activities which are used when presenting instructional materials or conducting educational activities, are based on the chosen approach and rationale behind (methodology). A methodology comprises the teaching/learning activities, principles, approaches and sets of instruction methods/strategies used in presenting the subject matter to achieve different objectives. The choice of teaching method or methods to be used depends largely on the information or subject to be taught and can also be influenced by students' aptitude and enthusiasm.

Examples of Science Teaching Methodologies:

- "Case-Based Learning (CBL)": A process that employs the use of discipline-specific, situational narratives as a launch pad for student learning. It can cover a wide variety of instructional strategies, including but not limited to, role plays, simulations, debates, analysis and reflection, group projects and problem solving.
- "Problem-Based Learning (PBL)": A process designed to experientially engage learners in processes of inquiry into complex and real problems of significance and relevance to their lives and learning. It is intended to challenge learners to pursue authentic questions, wonders, and uncertainties in a focused way, which enables them to construct, deepen, and extend their knowledge and understanding.

Objective · [əbˈdʒɛktɪv | from Latin]

It is a specific statement about what students are expected to learn or be able to do as a result of studying a program: learning objective (what students are expected to learn), including products, performance, and processes achieved. The student or learner is taken as the subject in the objective. It is also a measurable operationalization of a policy, strategy or mission: implementation objective.

Objectives can be considered refinements of curricular purposes that, for example, specify: performance standards or those skills and knowledge that students should be able to demonstrate; degree of mastery inferred or precise; and the conditions under which performance will occur. Therefore, they should be concise and understandable for

teachers, students and parents; be feasible for teachers and students to do; encompass previous learning and require the student to integrate and then apply certain knowledge, skills and attitudes in order to demonstrate achievement.
It is often incorrectly used as an equivalent of the term “Aim". Both are the desired result of the work performed by some entity, however, imply different concepts.

Examples:

- Objective: To identify geoethical risks in mining; To argue anthropogenic causes for climate changes. (students have…)

Thomson P. (2014). *Aims and objectives — what’s the difference? [Blog Post].* https://patthomson.net/2014/06/09/aims-and-objectives-whats-the-difference/
UNESCO. (2016). *Glossary of Curriculum Terminology*. International Bureau of Education.
Wallace, S. (2015). *A dictionary of education. Oxford.* Oxford University Press.

Slate

Dark metamorphic rock highly fissile and fine grained. The smooth, hard, impermeable surface produced when slate is split makes it commercially valuable for roofing, cladding of buildings, and for making such items as billiard-table tops, laboratory benches, and blackboards.

Allaby M. (Ed.) (2008). *Dictionary of Earth Sciences, 3rd edition*. Oxford University Press.

Skills · [skɪl | from Old Norse]

The ability to perform tasks and solve problems, highly related to work-based training and vocational courses. It is the ability, proficiency or dexterity to carry out tasks that come from education, training, practice or experience (psychomotor domain). It can enable the practical application of theoretical knowledge to particular tasks or situations. It can be applied more broadly, for example to thinking (the cognitive domain) and to the social relations through sensitive handling of another’s feeling (affective domain). It is often misused as an equivalent of the term "Competencies". However, they have different terminology and meaning. Skills focus on the “what” in terms of the abilities a student needs to perform a specific task or activity. Competencies outline "how" the goals

and objectives will be accomplished. They are more detailed and define the requirements for success in broader, more inclusive terms than skills do.
Skills + Knowledge + Abilities = Competencies

Strategies · [ˈstratɪdʒi | from Greek]

A strategy is a plan to achieve a purpose; is more general than a technique but more specific than "Methodology". It's commonly used and accepted as a synonym with "Methods". A method, procedure or activity that is usually designed for teaching or supporting learning. It can involve different ways of organizing the classroom and planning a lesson.
These are ways of presenting instructional materials or conducting educational activities based on the chosen approach. Briefly, a teaching method is a procedure or way of materializing a teaching approach through a systematic plan. A number of different methods may be employed within one lesson or one method may take up the entire lesson, as in the case of a lecture, depending on preferred teaching style, nature of subject, ability of learners, their motivation and time available, etc.

Examples:

- "Debate": is based on activities in which opposing sides of an issue (e.g. groups or individuals) make oral presentations before a hearing or judge, following defined formats (e.g. parliamentary debate) and conventions (e.g. speaking order).
- "Field-trips": is based on activities where students, teachers, and volunteers leave the school building to find opportunities for experiential learning (e.g., in natural environments, museums, businesses, community settings, authentic contexts).
- "Role-playing": is based on a theatrical activity in which a person acts or performs a particular role in order to explore and dramatize the thoughts, feelings, and experiences of another person in a simulated situation.

Desinan, C. (2011). Current teaching and learning strategies. *Metodicki obzori, 6*(3), 145-152.
UNESCO. (2016). *Glossary of Curriculum Terminology*. International Bureau of Education.
Wallace, S. (2015). *A dictionary of education*. Oxford University Press.

Responsibility [‘respondēre’ (to respond) | from Latin]

It expresses the commitment to answer to someone for own actions and their consequences – the duty to satisfactorily perform a task, which has a consequent ‘penalty for failure’, to be conceived not only in legal terms, but also in terms of loss of personal and/or professional credibility of who acts in an irresponsible way. In the concept of 'responsibility' therefore emerges the person as the center of ethical action, as the conscious subject of action.

The concept of responsibility is a central pivot in geoethics: the human agent sits at the centre of an ethical reference system in which individual, interpersonal/professional, social and environmental values coexist, underpinning their responsibilities at these four levels (named “the four geoethical domains”).

To make responsible choices in humans-Earth system interaction requires us to apply ethical principles in pursuit of the greater good, not just in respect of present-day society but also considering the impact of one’s choices on future generations.

Peppoloni, S., Bilham, N., & Di Capua, G. (2019). Contemporary Geoethics Within the Geosciences. In *Exploring Geoethics*, pp. 25–70. Springer International Publishing. https://link.springer.com/chapter/10.1007/978-3-030-12010-8_2

Di Capua, G. & Peppoloni, S. (2019). *Defining geoethics. Website of the IAPG - International Association for Promoting Geoethics*. http://www.geoethics.org/definition

Jonas H. (1979). Das Prinzip Verantwortung: Versuch einer Ethik für die technologische Zivilisation. Suhrkamp, Frankfurt/M. The Imperative of Responsibility. In *Search of Ethics for the Technological Age* (translation of Das Prinzip Verantwortung) trans. Hans Jonas and David Herr (1979). University of Chicago Press.

Weber M. (1919) *Politik als Beruf – Gesinnungsethik vs. Verantwortungsethik. Translation in English*. https://www.academia.edu/26954620/Politics_as_Vocation.pdf

Risk

Risk is defined as the symbolic product of hazard, vulnerability and exposure. It is quantified such as the potential loss expected on an element or group of elements at risk as a consequence of the occurrence of a given phenomenon of a given intensity. The hazard is the probability that a phenomenon of a given intensity occurs in a certain area in a given time interval. The vulnerability is the capability of an element to resist to a given phenomenon, or as the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard. The exposure is the value of the elements at risk (in terms of human lives, or economic value or historical-artistic value) in a certain area. These concepts have been introduced to analyze the impact of natural or anthropogenic phenomena on humans and their effects are

quantified using mathematical tools, for example, the probability calculus and evaluation of errors and uncertainties. Risk is not entirely avoidable, but it can be reduced below a threshold that society considers acceptable. "*Acceptable risk is the level of potential losses that a society or community considers acceptable given existing social, economic, political, cultural, technical and environmental conditions.*"

Aven T. (2011). On some recent definitions and analysis frameworks for risk, vulnerability, and resilience. *Risk Analysis 31*(4), 515–522.

Beven K.J., Almeida S., Aspinall W.P., Bates P.D., Blazkova S., Borgomeo E., Freer J., Goda K., Hall J.W., Phillips J.C., Simpson M., Smith P.J., Stephenson D.B., Wagener T., Watson M., & Wilkins K.L. (2018a). Epistemic uncertainties and natural hazard risk assessment – Part 1: A review of different natural hazard areas. *Nat. Hazards Earth Syst. Sci., 18*, 2741–2768, https://doi.org/10.5194/nhess-18-2741-2018

Beven K.J., Aspinall W.P., Bates P.D., Borgomeo E., Goda K., Hall J.W., Page T., Phillips J.C., Simpson M., Smith P.J., Wagener T., & Watson M. (2018b). Epistemic uncertainties and natural hazard risk assessment – Part 2: What should constitute good practice?, *Nat. Hazards Earth Syst. Sci., 18*, 2769-2783, https://doi.org/10.5194/nhess-18-2769-2018

Di Capua G. & Peppoloni S. (2014). Geoethical aspects in the natural hazards management. In Lollino G., Arattano M., Giardino M., Oliveira R. & Peppoloni S. (Eds.). *Engineering Geology for Society and Territory - Volume 7, Education, Professional Ethics and Public Recognition of Engineering Geology*. Springer.

Peppoloni, S., Bilham, N., & Di Capua, G. (2019). Contemporary Geoethics Within the Geosciences. In *Exploring Geoethics, Cham: Springer International Publishing, pp. 25–70*. https://link.springer.com/chapter/10.1007/978-3-030-12010-8_2.

Tinti S., Armigliato A., Pagnoni G. & Zaniboni F. (2015). Geoethical and Social Aspects of Warning for Low-Frequency and Large-Impact Events like Tsunamis. In: Wyss M. 6 Peppoloni S. (Eds.), Geoethics: Ethical Challenges and Case Studies in Earth Sciences. Elsevier.

UNISDR (2009). Terminology on Disaster Risk Reduction. United Nations, Geneva, Switzerland, https://www.preventionweb.net/files/7817_UNISDRTerminologyEnglish.pdf.

United Nations (2016). *Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction* (Vol. A/71/644). United Nations.

Zoback, M.L., Geist, E., Pallister, J., Hill, D.P., Young, S., & McCausland, W. (2013) Advances in natural hazard science and assessment, 1963–2013. *Geological society of America, special papers, 501*, pp.81–154. https://doi.org/10.1130/2013.2501(05)

Riverine ecosystems

Riverine ecosystems are lotic ecosystems including flowing waters that drain the landscape and include the biotic (living) interactions amongst plants, animals and micro-organisms, as well as abiotic (non-living) physical and chemical interactions of its many parts (adapted from Schmutz & Sendzimir, 2018).

Schmutz, S. & Sendzimir, J. (Eds.) (2018). *Riverine Ecosystem Management – Science for Governing Towards* a Sustainable Future. Springer International Publishing. Available: https://www.springer.com/gp/book/9783319732497 (Open Access eBook).

Sanitary engineering

Sanitary engineering is the application of engineering methods to improve sanitation of human communities by supplying safe potable water as well as removing and disposing of human waste (adapted from https://en.wikipedia.org/wiki/Sanitary_engineering).

UNESCO Global Geopark

A territory recognized by UNESCO where sites and landscapes of international geological significance are managed with a holistic concept of protection, education and sustainable development. UNESCO Global Geoparks were established in 2015 with the launch of the International Geoscience and Geoparks Programme.

UNESCO (2020). *UNESCO Global Geoparks*. http://www.unesco.org/new/en/natural-sciences/environment/earth-sciences/unesco-global-geoparks/

Water management

Water (resource) management is the activity of planning, developing, distributing and managing the optimum use of water resources. Ideally, water resource management planning has regard to all the competing demands for water and seeks to allocate water on an equitable basis to satisfy all uses and demands (adapted from (https://en.wikipedia.org/wiki/Water_resource_management).

Water supply

Water supply is the provision of potable water by public utilities, commercial organizations, community endeavors or by individuals, usually via a system of pumps and pipes. Providing water for irrigation usually is dealt with separately (adapted from https://en.wikipedia.org/wiki/Water_supply).