journal of Geoethics and social Geosciences

Journal of Geoethics and Social Geosciences, 01, 02, 2026; doi:10.4401/jgsg-121

The socio-environmental outlook of the Chilean Geoethics Group: a Chilean approach to geoethics

Mauricio F. Collao Quevedo[*]

York University, Toronto, Canada

Article history: received July 6, 2026; accepted September 10, 2026; published October 30, 2026

Abstract

The article examines the socio-environmental outlook and geoethical approach of the Geoethics Group of the Chilean Geological Society/IAPG-Chile. Drawing on interviews with members of the group, I highlight the social and environmental significance of their work to transform how the geosciences are practiced and taught in the country. I argue that the study's findings are crucial for understanding the geosciences' evolving role in socio-environmental struggles for just green planetary futures and for ongoing efforts to integrate geoscientific insights with critical social science and humanities perspectives. Focusing on their recently published Chilean Code of Geoethics – the first document of this kind to date – I provide a socially and politically situated account of the work and pertinence of the Chilean Geoethics Group (CGG). Key topics explored in this study are the geoscience's place in Chile's education system, institutional support for the ethical oversight of geoscientists and geoscientific practice, the mining industry's relation to geologic expertise, and geological understandings of the relation between the biologic, the geologic, and the social. The study finds that the work of the CGG identifies key features of what I describe as the geosciences' "social turn," characterized by internal efforts to better align the geosciences with pressing social and environmental needs. In particular, their work tries to re-imagine and institutionalize alternative visions of geoscientists' social role and responsibilities, arguing for the integration of geoethics into geoscientific education, research, and practice and a corresponding reconceptualization of such notions as the biologic, the geologic, and the social.

Keywords: Chile, Geoscience, Geoethics, Social turn, Geology, Chilean Geoethics Group.

1. Introduction

Critical social and environmental scholarship is undergoing a "geologic turn" (Collao Quevedo, 2025a, 2025b), as scholars increasingly draw on geoscientific themes, concepts, and insights to examine pressing historical and socio-environmental issues. However, many of these currents of "geo-social" research have paid limited attention to what may be called the geosciences' "social turn," characterize by internal efforts to ethically re-evaluate the geosciences' role in society (Peppoloni and Di Capua, 2026). Instead, this scholarship has focused primarily on identifying the geosciences' ties to exploitative socio-historical formations, like capitalism and colonialism, portraying them as part of the problem rather than the solution (Collao Quevedo, 2025a).

However, the centrality of the geosciences' role in addressing the challenges of the Anthropocene cannot be overstated. As Davies and Jacob (2025) note, "Earth science is not a luxury – it is critical infrastructure for a stable, sustainable and secure society" (para. 7). Indeed, geoscientists play an essential, though often unacknowledged, role in everyday life. They

> *have the particular and unique skillsets necessary to solve problems created by the exploitation of the Earth's mineral, energy, and water resources, the defense against natural hazards, the protection and enhancement of geodiversity, and the compilation of geo-environmental knowledge for society.* (Bobrowsky et al., 2018, p. 176)

The geosciences' social turn channels these capacities into progressive social and environmental objectives, having matured over recent decades into a distinct field of research dedicated to a corresponding realignment of geoscientific knowledge, pedagogy, and practice. By directing the geosciences toward just and green planetary futures, this social turn answers Gardiner et al.'s (2023) call for a "geoscience transition" capable of supporting renewable energy systems and other climate goals. This transition, I argue, is already well underway, with important contributions being made by geoscience bodies like the International Association for Promoting Geoethics (IAPG[1]) and the Chilean Geoethics Group (CGG) of Chile's Geologic Society/IAPG-Chile.

By examining the work of the Chilean Geoethics Group (CGG), I show in this article the distinct style of geo-social thinking that has emerged within Chile's geoscientific community, highlighting how these developments foster vital dialogue with critical

[1] https://www.geoethics.org (accessed 16 October 2026).

perspectives from the social sciences and humanities. Focusing on the CGG's work, the study shows how Chilean geoscientists are navigating ethical and practical tensions within their professions, institutions, and research sites to better support pressing social and environmental needs. Specifically, I examine the distinct socio-environmental outlook and geoethical approach of the CGG, showing that the subgroup of the Chilean Geological Society is not only a leading body in the world of geoethics today – having drafted the first Code of Geoethics (Pinto et al., 2024a) – but also offers a situated approach to connecting geoscientific knowledge with changing societal needs and critical social and environmental scholarship. In doing so, the study provides a situated but globally significant account of the CGG's work and draws out the social and environmental implications of its effort to reimagine the social role of the geosciences in Chile. The CGG's work, I argue, thus offers a concrete roadmap for transforming both social institutions and human-nature relations for greener and more just geo-social arrangements.

2. Methods

The study is based on semi-structured interviews with members of the CGG conducted throughout 2025. The interviews lasted between 30-90 minutes, ensuring sufficient depth while respecting participants' time. Follow-up interviews were conducted to discuss emergent issues, gaps, request more insight, and reach sufficient saturation. The pool of participants represented diverse professional experiences (industry and academia), expertise in various fields of research (e.g., ethics, exploration geology, geologic risks), and affiliation with geoscientific societies (professional and scientific) and relevant government agencies (like municipal departments overseeing urbanization and land development). The overall objective of these interviews was to reveal the concerns, ideas, and practices shaping the geosciences' relation to social and environmental issues in Chile today. Accordingly, interview protocol encompassed three key areas: (i) disciplinary understandings of geologic matter and processes, (ii) the links between the biotic and abiotic world, and (iii) the geosciences' relation to pressing social and environmental issues. Please note that, as these interviews were conducted in Spanish, the quotes I report below are my own translation.

Participant identification was conducted using publicly available information about the CGG published on the website of the Faculty of Physical Sciences and Mathematics at the Universidad de Chile. That said, the interviewee sampling process was subject to some practical limitations, including constrained interviewee availability during the data collection window, difficulty locating up-to-date direct

contact information, and a lack of public documentation specifying which sections of the Code of Geoethics authors had worked on (which precluded more targeted recruitment). Consequently, I relied on a convenient sampling approach until thematic saturation was achieved within the recruited cohort. The final sample thus captures a representative cross-section of accessible academic and industry practitioners belonging to the CGG, rather than an exhaustive engagement with the Code's drafting committee.

Consequently, the interviews provide a schematic overview of the social and institutional context in which the CGG's work is currently intervening, capturing how geoethical considerations intersect with daily work across Chile's geoscientific community, beyond the immediate context of the Code's creation. Future studies should build upon these initial findings by engaging more directly with key section authors and institutional debates that could not be thoroughly included in this preliminary research.

3. Geoethics

Geoethics emerged within the geosciences to better understand their place and role in society and has gradually matured into an established disciplinary field (Peppoloni and Di Capua, 2026). The term began to be used in the 1990s to define the ethical and social implications of geoscientific work (Cronin, 1992; Savolainen, 1992). Since the 2000s, its scope has expanded to include a wider range of geo-disciplines, like the space sciences (Martínez-Frías et al., 2011), and social and environmental issues concerning the production and application of geoscientific knowledge. Today, geoethical explorations of the geosciences' place in society and the world focus on five key areas of application: education, investigation, professional practice, societal responsibility, and environmental responsibility (Bobrowsky et al., 2018), taking as its guiding star the work of geoethics' "older brother," bioethics (Matteucci et al., 2014; Rejas Ayuga et al., 2015).

Broadly speaking, geoethics addresses a gap in contemporary environmental thought, whereby the expansion of ethical reflection to environmental issues during the 1960s and 1970s (Vasconcelos et al., 2018) gave rise to what I have described as "bio-centric" styles of critical inquiry (Collao Quevedo, 2025a): approaches that tend to exclude the geosciences from critical social and environmental thinking, relying instead on the insights of life sciences like microbiology, ecology, and the health sciences. Geoethics responds to this omission by developing an ethical framework for geoscientific research and practice that aligns decisively with efforts to advance just, green planetary futures for all. For this reason, proponents of geoethics have long insisted upon the field's collaborative and multidisciplinary requirements, including

the importance of engaging with philosophers, sociologists, economists, lawyers, policymakers, and professional societies (Bobrowsky et al., 2018; Peppoloni and Di Capua, 2015).

At the individual level, geoethics provides values and normative frameworks for responsible geoscientific activity in and beyond academia, including codes of conduct for the ethical behaviour of geoscientists and strategies for addressing exclusionary practices in the field (see, for example, Clancy et al., 2017; Anadu, 2020; Anadu et al., 2020; Pico, 2023; Villacorta et al., 2023). At the societal level, geoethics emphasizes the societal significance of the geosciences, highlighting the disciplines' capacity to safeguard the public's interests and the need for geoscientists to responsibly navigate the social, cultural, political, and economic implications of their research and knowledge. This includes, for example, examinations of the ethical dimensions of the introduction of new technologies to resource and climate governance (Cleverley, et al., 2025) and strategies for sustaining collaborative relations with Indigenous peoples and knowledge systems (Peppoloni and Di Capua, 2026).

Globally, geoethics has evolved into a coherent and widespread way of thinking about how to build (or rebuild) healthier human-nature relations on a planetary scale by, for example, redefining the centrality of the human being in the Earth system (e.g., the Anthropocene) and exploring geologically-grounded theoretical interventions like "ecological humanism" (Peppoloni and Di Capua, 2022, 2023).

Among today's leading voices in geoethics are the International Association for Promoting Geoethics (IAPG), established in 2012 to secure geoethics' status within the scientific community, promote geoethical values, expand geoethics' presence on the international stage, and serve as a hub for multidisciplinary conversations about relevant topics. More recently, the Chilean Geoethics Group (CGG), created under the umbrella of the Chilean Geological Society and Chilean section of the IAPG, launched their Chilean Code of Geoethics (Pinto et al., 2024a) – the first and only geoethics document of its kind to date and thus a benchmark case in the international world of geoethics. The CGG's work has drawn important attention to the need to better equip the next generation of geoscientists to grapple with the social and environmental dimensions of their work (e.g., access to Indigenous territories) and to build more effective mechanisms for the ethical oversight of geoscientific activity (e.g., to prevent malpractice and empower civil society).

4. The Chilean Code of Geoethics

The history of the CGG dates back to 2018, when its founder, geologist Luisa Pinto Lincoñir (hereafter, Luisa) of the Universidad de Chile's Faculty of Physical Sciences

and Mathematics, presented on geoethics at a conference in Vancouver. The event was organized by the International Union of Geological Sciences (IUGS) and attended by Italian geologists Silvia Peppoloni (current President of the IAPG) and Giuseppe Di Capua (current Secretary General of the IAPG), who invited Luisa to join the IAPG. This is how the Chilean Geoethics Group first began to take shape. By then, there was already a growing interest in geoethics among the country's geoscientific community.

A panel at the national geology congress, in which Luisa presented upon her return to Chile, allowed her to discuss Peppoloni and Di Capua's proposal for joining the IAPG with other attendees. As she explained, "if we were going to be partners with this international association, we would have to do so as a group and in a way that was representative of Chilean society – not of a single person." Noting the strong interest generated by this discussion, Luisa compiled a list of interested researchers and proposed to the Geological Society of Chile (Sociedad Geológica de Chile) the establishment of a Geoethics Group associated with the IAPG (Pinto et al., 2023). The proposal was approved shortly after, and the Chilean Geoethics Group was formally created under the umbrella of the geological society.

The next step was to begin planning the CGG's first tasks, such as positioning of the Group within Chilean society and the international community of geoscientists. At the time, geoethics was not well known, so it was important to first build broader interest and literacy among researchers and other professionals. To this end, in 2020, the CGG hosted several virtual events attended by people from Chile and other parts of Latin America. The following year, it began developing a Code of Geoethics that could provide guidance and serve as a basis for future activities by the Group and its affiliates. Like the Group's establishment, the text would have to be agreed upon by the geoscientific community.

To begin the drafting process, philosopher Pablo Ramírez Rivas (hereafter, Pablo) of the Universidad de Chile's Faculty of Physical Sciences and Mathematics helped put together the required team of experts. He was one of the first members of the CGG and had many years of experience teaching professional ethics and drafting these types of documents. Over the course of a year, the CGG conducted a series of surveys, seminars, and thematic meetings that included invited guests and were open to the public. The goal was to first identify which aspects of geological activity (academic and professional) would be covered in the Code. The process was meant to be consensus-based and participative to produce a text that everyone could value and be willing to adopt. Multidisciplinarity was crucial to the success of the project, so the CGG invited experts from various backgrounds to participate in or advise in the drafting process, including lawyers, sociologists, ethicists, and geographers.

The Code also needed a strong set of values at its foundation, which would then guide its content and organization. For the CGG, it was very important that the values declared in the Code were built from the ground up, drawing on the priorities of the geoscientific community that would adopt it. The first value – sustainability – was identified early in the process, while the rest were discovered along the way, through the various meetings and surveys mentioned above. In the end, the values chosen were "responsibility," "sustainability," "respect for diversity," and "integrity."

Responsibility was listed first in the document because of its double meaning, as a matter of assuming responsibility (i) for the consequences of one's actions and (ii) for the products of geoscientific knowledge. It is with this second sense of the word "responsibility" that sustainability becomes a distinct geoethical value guiding the code. "Sustainability" has been, since the very beginning, a key component of the CGG's geoethical thinking, not only as a way of bringing questions of ethics and social and environmental responsibility into direct dialogue with geoscientists' work, but also because students themselves considered it an important principle guiding their academic and professional development.

The third foundational value of the Code is "respect for diversity," which encompasses human diversity (e.g., varying physical and cognitive abilities), the diversity of communities (e.g., local, Indigenous, etc.), and the diversity of geologic environments (e.g., geodiversity and biodiversity). Indeed, the Code dedicates a significant portion of its text to emphasizing the geoethical imperative to respect diversity in all forms. To quote Luisa, respect for diversity had to be included

> *because we have ancestral cultures in our country that are not well respected, especially in these types of [extractive] operations. There is forestry in the South and mines in the North of Chile…There are ancestral cultures and there are clashes with these companies. That is why we have [respect for diversity] as an important principle and value in the Code.*

Industry aside, this value had to also be included because of the nature of geoscientific work. As Pablo explains, "in Chile, for example, we have Indigenous peoples and archaeological remains such as burial sites, which complicate or create some tensions for geological work."

The last of the Code's foundational values is "integrity," which deals with matters of individual conduct, such as honesty, transparency, and respect. However, the text expands the range of ethical issues geoscientists are accustomed to focusing on, such as individual misconduct related to conflicts of interests, plagiarism, and data falsification. The section also draws attention to the ethical dimensions of scientific knowledge production, broadly understood as "academic integrity." As such,

this is a part of the Code that is largely oriented towards the internal workings of the organizations that adopt it and was one of the least controversial parts of the text. These values emerged gradually through conversations with geology students, researchers, and industry professionals in Chile and other parts of Latin America. The process was highly participatory and resulted in the drafting of a uniquely "Chilean" Code of Geoethics. The text was developed in conversation with the IAPG and was inspired by documents such as Chile's Order of Engineers' (Colegio de Ingenieros) ethics code and the IAPG's Cape Town Statement on Geoethics (Di Capua et al., 2017). That said, the Code differs from these sources in its reflection of the unique realities, values, challenges, and priorities of Chile's geoscientific landscape. Instead of featuring abstract or universal ideals, the text came to represent the situated and concrete commitments of geoscientists in Chile, providing guidance for navigating the challenges and opportunities they are likely to encounter throughout their career. Having selected and defined these foundational values, the Code was then organized around four key areas of geoethical consideration: (i) professional and scientific conduct, (ii) the geosciences' relation to society, (iii) the geosciences' relation to the environment, and (iv) geoscientists' contribution to the next generation of scientists and professionals. The final draft of the document was completed in 2023 and was then validated by colleagues throughout Latin America (Pinto et al., 2023; Pinto et al., 2024b). In April 2024, the Chilean Code of Geoethics was officially launched, becoming the first geoethics code and a benchmark case in the international geoethics community. That same month, it was also formally presented at the 2024 European Geosciences Union's General Assembly (Bobadilla et al., 2024) and later published on Zenodo for global open access (Pinto et al., 2024), thus bolstering its international visibility. The process took three years to complete and resulted in a comprehensive document with criteria and cases to support the professional and academic community in building critical ethical competencies. Since then, the Code has been well received by the geoscientific community in Chile and beyond, inspiring others to develop their own versions (e.g., geoscientists in Argentina). Before its launch, a document guiding the ethical conduct of geoscientists was the Code of Ethics of the Chilean Association of Geologists (Colegio de Geólogos de Chile), which focused primarily on professional and individual conduct. The Geoethics Code built on this foundation by placing greater emphasis on communities, researchers, and educators, in turn extending attention to issues of diversity, sustainability, and education.

While many professional and scientific societies have included geoethical principles in their codes of ethics and codes of conduct, the CGG's Code remains the only text of this nature. As such, it now serves as a foundation for geoscientific practice, providing not only a concrete framework for ethical decision-making among geoscientists but also setting the stage for further geoethical research.

5. A Chilean approach to geoethics

The following sections provide details about the socio-environmental context in which the CGG operates and intervenes today. I have separated each section thematically to highlight the significance of the CGG's work in various aspects of Chilean society: education, institutions, industry, and environment.

5.1. "Students started asking what our social role was": the educational dimensions of the CGG's work.

Luisa entered the world of geoethics through her students' inquiries about the social role of geoscientists. The story begins in 2011, a year marked by mass student protests in Chile. Protesters had mobilized against the right-wing government of President Sebastián Piñera (1949-2024), demanding education reforms through a series of organized mass demonstrations that carried over throughout 2012. During this period of student unrest, geology students began to ask pointed questions about their social role.

This is how Luisa began to question the highly technical way geology was taught in university programs in Chile, noting the limited attention they paid to the broader societal dimensions and implications of the discipline. Students were not being properly taught about their social role or the societal impacts and responsibilities of their profession. Therefore, there was an important mismatch between the interests and concerns of the new generation of geology students, on the one hand, and universities' curricular objectives, on the other. Crucially, how geology was being taught conflicted with students' social and environmental sensibilities. This point was emphasized by many of the CGG members I interviewed, who claimed that the new generation of geology students is much more environmentally conscious and unwilling to let companies harm communities and landscapes. Indeed, many join geoscience programs precisely to work on environmental and sustainability issues.

Students were well aware of their program's curricular gaps. They flagged, for example, the absence of courses on professional ethics. The topic occasionally appears in geology education through case studies but is not systematically included in the curriculum. This is a common issue in engineering and geoscience programs, where students sometimes have the option to take ethics as an elective (usually in the first year of their studies), but relatively few choose to do it. The exception here are Catholic universities, where ethics courses are often mandatory. However, despite their differences, these programs share an approach to ethics education: they offer philosophy courses that foreground key thinkers and debates in ethics and moral

philosophy. Meanwhile, the few courses that are offered on professional ethics tend to focus on specific ethical traditions, international ethics standards and declarations, and tools or strategies for ethical decision-making. Yet, little is known about how effective these strategies are in the ethical development of professionals, or how this effectiveness may be evaluated.

Therefore, although engineering and geoscience students are exposed to ethical concepts and problems during their studies, they often do not receive structured guidance on how they might contribute to society or on recognizing their distinct social roles and responsibilities. Aware of this problem, Luisa began to think carefully about what they, as instructors, were doing to contribute to the ethical development of the new generation of researchers and professionals. She developed a new course titled "The Social Role of Geologists," which would help correct this shortcoming in professional ethics education, taking seriously the ethical development of geology students and the types of environments and interactions that they are likely to encounter throughout their professional life. Importantly, the course would give students the opportunity to explore and reflect on their societal responsibility, encouraging them to focus on geologists' social role rather than their place within industry. Gradually, the course would become an important laboratory for the development of geoethics in Chile (then understood as the professional ethics of the geosciences).

Later, the "social role" course would be replaced by a geoethics one developed by Luisa and Pablo, based on a course Pablo taught on professional ethics in engineering and drawing inspiration from Peppoloni and Di Capua's (2015) edited volume "Geoethics: the Role and Responsibility of Geoscientists". Initially, the course was largely exploratory and relied heavily on the work of the IAPG. However, it soon became clear that the specific "Chilean" issues that it explored required an approach to geoethics that was different from that of the international organization.

A turning point in the development of Chilean geoethics was a sabbatical Luisa spent in the United States of America the semester following the creation of this course. During her time there, she was able to speak about the matter with engineers at various institutions, including the Massachusetts Institute of Technology (MIT):

> *I would ask them: How do you teach ethics to engineers? In the end, I realized that the only way to teach them geoethics was by teaching them about sustainability.*

Sustainability, she realized, made it possible to incorporate the social, the ethical, and the environmental into the professional development of engineers and geoscientists. With this in mind, Luisa adjusted the geoethics course to add a greater focus on sustainability – which served as an important entry point to geoethics.

Pedagogically, the course has been designed to be as participatory as possible, encouraging students to play an active role. As Pablo explains:

> *The professors do some things but, truly, we try to teach in such a way that the students are the protagonists. They themselves produce discussions through logbooks, through reflection, through contributions to the code of ethics that they believe are important to contribute. They participate a lot, ask a lot of questions, and so on.*

For these reasons, students' progress in the course is significant by the end of it. While they generally join the course thinking of ethics in broad terms as a matter of acting well and having good values, they leave with a concrete sense of the social and environmental responsibilities of their profession.

According to Luisa and Pablo, students frequently finish the course feeling deeply enriched, with many advocating for its establishment as a program requirement. But implementing this idea has been challenging. For one, the topic is not yet considered a core component of students' geoscientific education in Chile. Instead, the course is an elective among a long list of others, has not been taught every year, and is taken by few students relative to the program's student population.

It has also been difficult to find professionals willing to speak to students about their experience with geoethically relevant issues. As Luisa recounts,

> *I taught the geoethics course for various years. I always had difficulty finding guest speakers because it felt like everyone thought they might be questioned or something. So, in the end, the ones who agreed to participate were people with an unimpeachable sense of ethics and real experience in situations where they had had to act correctly and could share that with the students. But others had maybe been involved in complex situations that they did not feel very good about exposing. These are matters that could be delicate or even legal, so I think that's why people did not participate.*

This difficulty discussing ethical matters with geoscientists is also a reason Luisa decided to focus on sustainability. While many feel inadequate or uncomfortable talking about ethics, sustainability was a geoethically important topic that people were always excited to discuss.

Another challenge related to students' education has been getting instructors to follow the Code's values and recommendations in their teaching. These tensions have become particularly noticeable in panels of the national geological congress, where some researchers and educators have resisted the Code as an attempt by

the Geological Society to impose its standards, values, and practices on them. Consequently, issues related to academic freedom have become important points of discussion at these meetings.

In any case, the Geoethics course has undergone considerable development since it was first taught, with its institutional trajectory reflecting broader structural shifts in Chilean higher education. Following a Ministry of Education request to shorten degree programs by one semester – an ongoing topic of debate in the country (24 Horas – TVN Chile, 2026) – subsequent curricular restructuring eliminated general education slots in which the course was initially taught. However, the geoethics course has now been reinstated as an elective open to all students within the Faculty's School of Engineering and Sciences rather than just geology students. This new institutional footing has secured the course's continuity and place among the country's growing constellation of courses on the topics of geoethics and professional ethics in the geosciences (for a more detailed overview, see Villacorta et al., 2024).

5.2. "Ultimately, the weakness is systemic... The institutions are weak": the institutional context of the CGG's work.

The Code's guidelines regarding professional behaviour and the geoscience's relation to society were not particularly controversial parts of the drafting process. Geoscientists understand the importance of these aspects of their profession: they worry about people's safety, how they could be affected by geohazards, and are mindful of the consequences of different types of human-nature interactions. While the Code tries to make explicit and obligatory these concerns in geoscientific practice, the text does more than simply re-state these responsibilities. Rather than employing a reactive approach – providing guidance for addressing issues after they arise – the Code advances a decisively proactive and precautionary approach to geoscientific practice, extending geoscientists' responsibility beyond minimum legal and professional requirements. The goal is to remind professionals that a technical report can affect people, the environment, and the entire Earth system. This concern was shared by CGG geologist Rodrigo Rauld (hereafter, Rodrigo), whose company evaluates geological risks to people and infrastructure and issues corresponding reports for both public and private sector projects. His role in these projects is to ensure that proposed activities do not generate or increase geologic hazards or are affected by them. Although the work is highly technical, he notes, it still benefits from the Code, which provides valuable guidance for ensuring accurate and just results. As he explains, his work involves decisions made in conversation with planners and political actors and about matters that can be difficult to navigate.

For example, while local authorities may be interested in determining what is best for the city, geologic risk assessors must evaluate the safety of people's lives. As Rodrigo puts it,

> *Political actors never want us to "restrict" them, or that we take some of the space they want to play in. But, on the other hand, of course, they don't want to deal with the problems that could accompany a landslide or the effects of a tsunami.*

This is where geoethics is helpful for thinking beyond geoscientists' minimum legal and professional requirements. But ensuring that professionals adhere to the Code's values and recommendations has not been easy. The question of whether the Code should be enforced by the professional and academic associations that adopt it – for example, through the establishment of a geoethics tribunal – has been an important point of contention among geoscientists in Chile. Today, the Code has been adopted by the Geological Society of Chile and the Association of Geologists (Colegio de Geólogos). The CGG's ties to the Association had been an important topic of discussion in the early stages of the Group's formation. Unlike the Geological Society, whose members are scientists, professors, and students, the Association of Geologists brings together professionals working in industry (particularly in mining) and has more political influence than the Geological Society.

While the CGG has successfully promoted the adoption of the Code by professional societies like the Association of Geologists, the extent to which the document will be treated or implemented as a fundamental part of professional practice among their members remains to be seen. In fact, some have resisted adopting the Code, viewing it as the Geological Society of Chile telling them how to do their work. But while some see the document as an impediment to their work or as simply unnecessary, others would like the Code to have a stronger implementation or punitive component. According to Pablo, the situation resembles old debates about "informed consent" in research. He hopes that, just as informed consent was eventually institutionalized and formally incorporated into research practices, geoethics may also become integral to geoscientists' work. For these reasons, the Code has been promoted as an invitation rather than a normative document: an invitation to reflect and incorporate its values and guidelines into everyday professional and pedagogical practice.

An important part of this issue are individuals' own views about their social role. In fact, navigating deeply conflicting worldviews has been a key part of the CGG's work. While many recognize the importance of codifying geoscientists' social and environmental responsibilities, the extent of these responsibilities has sparked disagreement in the geoscientific community. As Rodrigo put it, some can have a very extractive mindset: for them, "the idea is that everything that can be extracted

better be extracted now because, in the future, we don't know how much it will be worth. And if it is worth more now, then let's take what we can." But, as in society, these attitudes are not representative of the entire geoscientific community. Within geo-disciplines one also finds people who became geoscientists precisely to preserve the environment.

Another crucial difficulty related to the Code's implementation is that, legally speaking, professional and academic societies in Chile do not have the power to enforce these types of documents (e.g., by exercising ethical oversight and sanctioning violations of the Code in legally binding ways). The Code does not include sanctions precisely for this reason. However, this does not rule out the possibility of introducing into the Code some type of enforcement mechanism. There is, after all, some precedence of this in Chile. The Medical Association (Colegio Médico), the oldest professional organization in the country, has an ethics code that contains one enforceable sanction: expulsion from the Association. However, its enforcement powers end there, meaning that someone expelled from it could continue to work independently, as a non-member.

The Code of Geoethics faces similar challenges, particularly because of the limited political weight of the Geological Society of Chile. While the organization has important ties to universities, it does not have the power to enforce the Code (even when the document has been adopted by professional societies and university departments). This is further complicated by the fact that membership in these organizations is entirely voluntary in Chile and professional practice does not require formal affiliation, meaning that relatively few professionals join them.

Differing work cultures can also pose obstacles for the broader adoption of the Code. For example, commenting on the Association of Geologists, Luisa states that despite shared interests and outlooks, the CGG's way of working is sometimes at odds with that of the Association. As she puts it, "those of us in academia are kind of picky about how things are written, how messages are sent – so we kind of overthink it." The Association, by contrast, works at a faster pace, which can sometimes cause misalignment between the two organizations. Therefore, ongoing efforts to ensure widespread adoption of the Code also highlight the need to carefully consider organizations' operational paces and expected levels of technical detail to foster productive collaboration between professional and academic bodies.

Another challenge for the implementation of the Code is that it has not reached the right institutions. For Pablo, this is a systemic problem:

> *The institutions are weak. It has nothing to do with geoethics. It has to do with the institutions of professional associations and of civil society. They are weak. They are not very influential. Some have a little bit of voice – they are listened*

> *to more or are invited to Congress when a law is discussed. But very randomly. It is not something one could choose to do or plan for.*

Unfortunately, in their current state, the institutions that have adopted the Code lack the power (or willingness) to meaningfully ensure geoethical compliance among their members. But this could change. Currently, in Chile, efforts are underway to legally restore ethical oversight to professional societies, which, in turn, would help empower civil society. Until these laws are changed, geoethics will continue to be the "cherry on top," to borrow Pablo's expression:

> *The cherry on top of the cake is ornamental. It looks good. The cake has to have the cherry. But no on eats the cherry. It's always put aside. Ethics has become urgent but continues to be the cherry on the cake – which everyone says is important and needs to be there. But the truth is, when the time comes, we remove the cherry so we can cut and enjoy the cake.*

5.3. "There will always be a conflict of efficiency versus doing things in ways that are geoethically correct": the industry dimensions of the CGG's work.

Despite common depictions of geology as closely tied to extractive industries (Collao Quevedo, 2025a), the situation looks quite different in Chilean universities. Geoscience programs like those at the University of Chile tend to focus on scientific training, offering courses on physics and mathematics. As a result, students graduate with scientific (academic) rather than professional degrees. This situation has raised concerns about the relevance of these programs for Chile's industries, as graduates often enter the workforce without sufficient preparation to apply their scientific expertise in industry settings (even though relatively few graduates pursue careers in scientific research). Although many mining companies have their own research departments, these typically address production-related challenges instead of advancing geoscientific knowledge.

This lack of industry-relevant training in geology programs is largely due to practical matters related to the amount of material students must learn to become geologists:

> *In geology, there is a lot to learn. It's not easy because it's not taught in primary or secondary schools. It requires a lot of petrology, lab work, and chemistry. Therefore, there is not much room to offer courses with a more "business" focus.* (Luisa)

The demanding, specialized nature of geologic education could also be a reason the discipline is not taught in schools. Graduates are unlikely to become teachers, opting instead for work in academia, mining, or consulting. Not to mention that there are no financial incentives for them to pursue careers in teaching either (a geologist in Chile can earn 10 times as much as a schoolteacher).

But this situation is changing rapidly. While the media has been instrumental in promoting geology careers by drawing attention to their salaries, these have declined in recent years due to a saturation of the job market:

> *There is not enough work for everybody. So, I think the interest in the career will start to decline. This interest was largely linked to income. Many students joined because they expected to earn more in their lifetime, not because of a sense of vocation.* (Luisa)

Luisa's comments point to yet another way in which Chile's geological landscape is being transformed by a new generation of geoscientists: as the number of financially motivated students shrinks, the number of students with strong social and environmental commitments appears to be on the rise. This is happening as geology departments focus on cultivating students' scientific and environmental competencies.

This growing socio-environmental interest in geology programs across the country raises different issues and opportunities for geoscientists, particularly in the context of mining. According to Pedro Elissetche (hereafter, Pedro), CGG member and retired exploration geologist affiliated with the Association of Geologists, the ethical cases with which geoscientists were typically concerned were often related to economic activity. This included, for example, cases of large-scale fraud involving geoscientists who falsified information about the size and content of new mineral deposits to artificially inflate the value of mining projects and the companies they were affiliated with (often junior companies) (see, for example, Abbott Jr., 2018). These are the types of ethical issues that the geosciences are accustomed to dealing with. The Code broadens this scope to include societal and environmental considerations, placing new pressures on extractive industries, which employ a significant portion of the geoscientific workforce.

Specifically, the Code tightens demands on mining activity by proposing limits, objections, and precautions for their application of geoscientific expertise. Interviewees noted that these provisions have sparked hesitation among some parts of the geoscientific community, particularly from those who view mining companies as already addressing many of the Code's concerns through Corporate Social Responsibility (CSR) initiatives. These include, for example, the introduction of new

environmental and community engagement standards, self-reporting systems, industry certifications, training programs for community relations managers, community investment funds, and grievance mechanisms for local stakeholders (Godfrid, 2024; Riofrancos, 2025). Major mining companies present these measures explicitly on their websites, expressing interest in aligning internal codes of ethics with broader corporate governance, international Environmental, Social and Governance (ESG) standards (e.g., ICMM's Mining Principles[2]), and other mandatory frameworks such as the Environmental Impact Assessment System (SEIA) (see, for example, BHP sustainability[3]; Antofagasta Minerals[4]; CODELCO[5]).

The argument is that today's mining industry is substantially different from what it was a few decades ago. The industry now pays closer attention to environmental dynamics and community relations, while also being closely monitored by state agencies like the Ministry of the Environment (Godfrid, 2024). These pressures have driven the industry to invest significantly in extraction techniques that minimize environmental and community harms, while simultaneously supporting initiatives that foster positive outcomes in these areas (e.g., ecosystem restoration). Although these shifts stem primarily from economic and reputational rationales (Haslam and Godfrid, 2023) rather than ethical ones, they nonetheless help bolster a preference for CSR approaches over the Code.

The problem, as Pedro points out, is that the mining industry will always face a "conflict of efficiency versus doing things in ways that are geoethically correct." Indeed, companies' engagement with CSR is often limited to meeting minimal legal requirements while balancing economic interests with social and legal risks. Rather than proactively trying to safeguard the common good – even in the absence of the state and intensifying protest and local demands, as the Code tries to do – critics argue CSR initiatives tend to rely on fragmented, voluntary initiatives that do not adapt sufficiently to local socio-cultural, environmental, and economic conditions beyond what is needed to minimize reputational risk (Devenin and Bianchi, 2018; Boiral et al., 2025; Deberdt et al., 2026).

By contrast, the Code positions geoethical principles as foundational to all aspects of mining, fostering a more cohesive framework for responsible extraction grounded in continuous, ethically informed adaptation and alignment with local realities. While CSR allows companies to frame responsibility as a matter of internal governance

[2] https://www.icmm.com/our-principles (accessed 25 October 2026).
[3] https://www.bhp.com/sustainability (accessed 19 October 2026).
[4] https://web.mineracentinela.cl/nosotros/quienes-somos/transparencia/codigo-de-etica#:~:text=C%C3%B3digo%20de%20%C3%A9tica.%20Revisa%20el%20documento%20que,guiando%20el%20actuar%20diario%20de%20nuestros%20trabajadores (accessed 19 October 2026).
[5] https://www.codelco.com/en/prensa/2026/codelco-ratifica-su-liderazgo-en-responsabilidad-esg-en-el-ranking-merco (accessed 19 October 2026).

and voluntary risk management, the Code asks geoscientists to integrate social and environmental impacts directly into professional practice. This underscores the expanded role geoscientists equipped with the Code can play in the development of responsible and sustainable mining – for example, by introducing new ways to safeguard community interests, restrict or prevent potentially harmful activities, facilitate effective decision-making, and mediate company-community conflicts. As Luisa puts it,

> *Together, we understand very well how the Earth works, so I think we also have a responsibility: a responsibility to communicate what we as experts know also to the community, to other disciplines, and to other individuals. It is a great responsibility.*

5.4. "We are not people who care only about rocks or mining": the environmental dimensions of the CGG's work.

When asked about the commonly held view of geologists as people who research rocks and whose interests align with those of the mining industry, Luisa referred to this as "an antiquated idea": "We are not people who care only about rocks or mining. There are several other types of geologists and geoscientists who are concerned about the risks to environmental conservation" (see, for example, Villacorta et al., 2023; Benado et al., 2019). Therefore, it is difficult to situate geologists' work neatly within such categories as "biological/biotic," "geologic/abiotic," or "social" areas of research. For example, some geologists work with geohazards such as volcanic eruptions, while others examine the quality and replenishment of water sources along with the animal, plant, and microbial life they sustain.

Consequently, geology conferences typically address an extensive array of topics pertaining to the protection and restoration of vulnerable environments, extending beyond minimizing environmental harm or managing natural resources sustainably. For example, commenting on a project he was recently involved in, Pedro told me that for them it was very important to help preserve the animal and plant species in the region, which he characterized as being part of a "very sensitive world" that needs to be engaged with respect and geoethical consideration. For Pedro, this respect for the environments with which geologists interact "is fundamental, and we also make it fundamental." "We, as geoscientists," he continues, "have the fortune of being in extremely close and permanent contact with the other world – with the biotic world. So, there is a respect. An important respect and consideration for it." He described this as a prevalent attitude among the new generation of students,

which tends to have a strong "consciousness about the harms that one could do to the environment and to communities (communities are part of that environment)." For these reasons, throughout the drafting of the Code, competing attitudes towards the environmental responsibility of geoscientists often turned into highly technical debates about how to describe their relation to it. For example, the process included conversations about whether to describe geoscientists' responsibility towards the environment as one of "stewardship," "protection," or "collaboration." Each term carried with it a specific set of values and politics:

> *Every verb with which we start each article [of the Code] was reason for controversy. And that was a very interesting process and very enriching because, in the end, those discussions showed a diversity of opinions – but we were also able to reach a consensus. Slowly. That is why it took us three or four years.* (Pablo)

These discussions mark an important attitudinal shift in geoscientists' relation to the environment. As Pedro points out, among prior generations of geologists there was little introspection about the work they did. Geologists did not orient themselves towards "the world." At least in Chile, he tells me, they always tried to maintain good relationships with the communities they worked with. But the situation was different with the environment. While geologists always shared a sense of environmental responsibility, this was not as strong as it is today. Nowadays, there is "a strong movement, a strong commitment among geoscientists to the environment in general" (Pedro).

Consequently, recurring themes in my discussions with members of the CGG were the interconnectedness of the natural and the social world, on the one hand, and the difficulties of conceptually separating biologic/biotic from geologic/abiotic matter and processes, on the other. Pablo stated this plainly when he told me that although it is true that geologists study rocks, this also entails "understanding the environment, understanding human settlements, understanding, well, the whole botanical dimension." As he indicates, pervasive misconceptions about geologists' relation to the biological and the social are not surprising given the education prior generations received about these topics:

> *Back in the 70s and 80s, when I was in school…we were taught that there were minerals and that there were organisms. And that minerals weren't alive, but organisms were living things. They explained that to you in school. It was part of our cultural background, so to speak. Part of twentieth-century schooling.* (Pablo)

Now, he adds, this distinction has blurred, and there is a growing number of voices challenging it from various perspectives: "Even the language that we use has changed. Minerals are said to "adapt" … It's not that something "happens" to them, but that the minerals find ways to adapt to certain environments." The abiotic world, he notes, no longer seems so abiotic. Instead, it appears to be "part of a broader cycle of organic behaviour."

This view was shared by all interviewees, who found it very difficult to identify the boundaries and defining features of the biotic and abiotic world. In Rodrigo's words, the relationship between these is "very, very strong. It is difficult to differentiate them. They are completely connected and at different levels." Echoing this sentiment, Pedro commented that

> *All of us work with the environment* […] *There are people who work with the aquatic world. There are people that work, well, with more mathematical matters related to the earth – to this living element. Because the earth is a living element. It's dynamic, not static. One could say the rocks are static, but they are the most dynamic things there are.*

The rocks' dynamism, Pedro added, is not only due to internal properties but also due to the environments they inhabit:

> *The rock, deposited in a given place, is constantly being subjected to dynamic processes. Erosion processes, weathering processes, chemical attacks, physical attacks by the wind* […] *These are processes that are always there. The rock is always there. It keeps changing. In some parts more than others – but always.*

Simply put, the geologic world is neither static nor impervious to external biotic and abiotic forces. Rocks are chemically attacked by plants, lichens, and moss, while plant roots penetrate and fracture the rock underneath. In some tropical regions, the biotic world may even contribute to the formation of mineral deposits by dissolving rocks and leaving behind concentrations of more durable metals like gold.

6. Conclusion

This article highlighted the socio-environmental turn underway in Chilean geology and the implications this could have for geoscientific practice in industry and academic settings. The article followed the work of the Chilean Geoethics Group, describing its initial formation and subsequent publication of the Chilean Code

of Geoethics. The study also drew attention to the broader social and environmental context in which the CGG's work intervenes. Key areas of discussion included Chile's education system, institutional support for the ethical oversight of geoscientists and geoscientific practice, the mining industry's relation to geologic expertise, and geological understandings of the relation between the biological, the geological, and the social.

As the article demonstrates, the CGG's work puts the geosciences (specially geology) in direct conversation with pressing socio-environmental issues impacting Chilean society today. For this reason, the Group's approach to geoethics may be described as distinctively Chilean: the CGG's values and documents were developed through highly participatory processes intended to establish a consensus among the Chilean geoscientific community about the values, priorities, and standards of practice that characterize the profession in Chile. This led to the publication of the Chilean Code of Geoethics, which now serves as a key point of reference for geoscientific practice and education in the country.

My conversations with members of the CGG further elucidated the specific societal context in which their work is situated and intended to intervene. The interviews highlighted:

i) The need to update geoscientific education and university departments to better fit students' socio-environmental sensibilities and define more concretely the social and environmental responsibility of the geosciences
ii) The lack of institutional support for ethical oversight of geoscientific activity and the need to protect and empower civil society through legal reform aimed at establishing professional regulatory bodies with mandatory membership, ethics tribunals, and legally binding disciplinary power
iii) The importance of understanding the geosciences' evolving role in the mining industry, which must simultaneously navigate the shifting socio-environmental sensibilities of the new generation of geoscientists, geology departments' limited provision of industry-relevant training, and tensions between CSR initiatives and geoethical commitments
iv) The growing recognition of the challenges of separating the biologic from the geologic in geoscientific practice, which views the latter as much more than the mere environment, habitat, or context of the biologic world, and is taking important steps to maintain responsible relations with these dynamics

It is thus possible to identify in the CGG's work a roadmap for transforming social institutions in ways that can adequately embody geoethical principles for a just transition to more socio-environmentally responsible geo-social arrangements. This includes changes to not only extractive practices and regulatory regimes,

but also to geoscientific education, professional societies, and pervasive cultural understandings of the biological, the geological, and the social. Now an established disciplinary field (Peppoloni and Di Capua, 2026), geoethics is well positioned to provide crucial guidance on these matters. Like its "older brother" (Rejas Ayuga et al., 2015), bioethics, the field may provide an important link between the geosciences and the social, environmental, and legal imperatives of a world undergoing state transformation.

Acknowledgments. I would like to express my sincere gratitude to the Chilean Geoethics Group and the International Association for Promoting Geoethics (IAPG) for their time, cooperation, and insightful support throughout this research. This work would not have been possible without their participation. It has been a privilege to work alongside such an enthusiastic and dedicated group of experts.

Ethics statement. This research received ethics review and approval by York University's Delegated Ethics Review Committee, which is delegated authority to review research ethics protocols by the Human Participants Review Sub-Committee, York University's Ethics Review Board, and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines. All participants received detailed information about the study's purpose, procedures, potential risks and benefits, and confidentiality measures. Informed consent from each participant was obtained before conducting each interview and was documented by a signed consent form. Explicit permission was also sought for session recording. All research materials were stored securely on password-protected devices that only I could access.

References

24 Horas-TVN Chile, (2026). Can university degrees be shortened? 24 Horas TVN Chile, YouTube. https://youtu.be/os48FC3lj90?si=tY0DYO3MNF42CBzV (accessed 19 October 2026) (in Spanish).

Abbott Jr. D.M., (2018). Professional Ethics in Mineral Property, Mineral Resource, and Mineral Reserve Estimates, and Feasibility and Evaluation Studies. In Bullock R.L. and Mernitz S. (eds.), Mineral Property Evaluation: Handbook for Feasibility Studies and Due Diligence. Society for Mining, Metallurgy & Exploration, Englewood, pp. 467-480, https://www.mineomics.online/sitepad-data/uploads/2023/06/2018-R-Bullock-MINERAL-PROPERTY-EVALUATION.pdf (accessed 19 October 2026).

Anadu J., (2020). Hazards of Field Work While Black. https://youtu.be/W0B7xwGkl00?si=o3703ddk0ClratGG (accessed 19 October 2026).

Anadu J., Ali H. and Jackson C., (2020). Ten Steps to Protect BIPOC Scholars in the Field. Eos. https://eos.org/opinions/ten-steps-to-protect-bipoc-scholars-in-the-field (accessed 19 October 2026).

Benado J., Hervé F., Schilling M. and Brilha J., (2019). Geoconservation in Chile: State of the Art and Analysis. Geoheritage, 11, 793-807. https://doi.org/10.1007/s12371-018-0330-z.

Bobrowsky P., Cronin V.S., Di Capua G., Kieffer S.W. and Peppoloni S., (2018). The Emerging Field of Geoethics. In Gundersen L.C. (ed.), Scientific Integrity and Ethics with Applications to the Geosciences. American Geophysical Union and Wiley, USA, pp. 175-212. https://doi.org/10.1002/9781119067825.ch11.

Bobadilla H., Pinto Lincoñir L., Ramirez P., González T., Benado J., et al., (2024). Proposal for a Geoethics Code for the Geoscientist Community of Chile. EGU General Assembly 2024, EGU24-6573. https://doi.org/10.5194/egusphere-egu24-6573

Boiral O., Brotherton M.-R. and Talbot D., (2025). Anticipating the unforeseeable? ESG risk management in mining companies. Resources Policy, 106. https://doi.org/10.1016/j.resourpol.2025.105628.

Clancy K.B.H., Lee K.M.N., Rodgers E.M. and Richey C., (2017). Double jeopardy in astronomy and planetary science: Women of color face greater risks of gendered and racial harassment. Journal of Geophysical Research: Planets, 122(7), 1610-1623. https://doi.org/10.1002/2017JE005256.

Cleverley P.H., Kochupillai M., Lindsay M. and Ruttkamp-Bloem E., (2025). Artificial Intelligence (AI) Ethics Recommendations for the Geoscience Community. Task Group on AI in Geosciences, Commission on Geoethics of the International Union of Geological Sciences, 38 pp. https://www.geoethics.org/_files/ugd/5195a5_5dcf66f87cca492c958319c3f4cdeffb.pdf (accessed 19 October 2026).

Collao Quevedo M.F., (2025a). Geo-themed and geo-centric thought: Reflections on the onto-epistemological basis of critical thought's geologic turn. Environmental Politics, 1-21. https://doi.org/10.1080/09644016.2025.2588008.

Collao Quevedo M.F., (2025b). What do you mean by "epochal" change? Theorizing planetary transformations in the Social Sciences and Humanities. The Anthropocene Review, 13(1), 141-161. https://doi.org/10.1177/20530196251399126.

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, https://croninprojects.org/Pubs/Cronin-MCFZ-Geoethics[abs]1992.pdf (accessed 19 October 2026).

Davies R. and Jacob D., (2025). Earth science is critical to national resilience – so why is it being gutted? Times Higher Education, https://www.timeshighereducation.com/opinion/earth-science-critical-national-resilience-so-why-it-being-gutted (accessed 19 October 2026).

Deberdt R., Saavedra M.S., Smith N.M. and Bazilian M., (2026). Review of sustainability challenges for lithium production: The case of Argentina, Bolivia, and Chile in the Lithium Triangle. The Extractive Industries and Society, 25. https://doi.org/10.1016/j.exis.2025.101789.

Devenin V. and Bianchi C., (2018). Soccer fields? What for? Effectiveness of corporate social responsibility initiatives in the mining industry. Corporate Social Responsibility and Environmental Management, 25(5), 866-879. https://doi.org/10.1002/csr.1503.

Di Capua G., Peppoloni S. and Bobrowsky P., (2017). The Cape Town Statement on Geoethics. Annals of Geophysics, 60, Fast Track 7. https://doi.org/10.4401/ag-7553.

Gardiner N.J., Roberts J.J., Johnson G., Smith D.J., Bond C.E., et al., (2023). Geosciences and the Energy Transition. Earth Science, Systems and Society, 3(1). https://doi.org/10.3389/esss.2023.10072.

Haslam P.A. and Godfrid J., (2023). The social determinants of CSR practice: Between headquarters policy and local mobilization. The Extractive Industries and Society, 15. https://doi.org/10.1016/j.exis.2023.101306.

Martínez-Frías J., González J.L. and Pérez F.R., (2011). Geoethics and Deontology: From Fundamentals to Applications in Planetary Protection. Episodes, 34(4), 257-262. https://doi.org/10.18814/epiiugs/2011/v34i4/004 (accessed 25 October 2026).

Matteucci R., Gosso G., Peppoloni S., Piacente S. and Wasowski J., (2014). The "Geoethical Promise": A Proposal. Episodes, 37(3), 190-191. https://doi.org/10.18814/epiiugs/2014/v37i3/004.

Peppoloni S. and Di Capua G., (2015). Introduction. In Peppoloni S. and Di Capua G. (eds.), Geoethics: The Role and Responsibility of Geoscientists. The Geological Society, London, pp. 1-4. https://doi.org/10.1144/SP419.21.

Peppoloni S. and Di Capua G., (2022). Geoethics: Manifesto for an Ethics of Responsibility Towards the Earth. Springer, Cham, XII+123 p. https://doi.org/10.1007/978-3-030-98044-3.

Peppoloni S. and Di Capua G., (2023). Geoethics for Redefining Human-Earth System Nexus. In Di Capua G. and Oosterbeek L. (eds.), Bridges to Global Ethics: Geoethics at the Confluence of Humanities and Sciences. Springer, Cham, pp. 5-23. https://doi.org/10.1007/978-3-031-22223-8_2.

Peppoloni S. and Di Capua G., (2026). Geoethics: The Role of Geoscientists in Shaping a Responsible Future. Annual Review of Earth and Planetary Sciences, 54, 333-363. https://doi.org/10.1146/annurev-earth-032524-123956.

Pico T., (2023). Performing Geology: Risk and Conquest in the Origin Stories of a Field Science. Catalyst: feminism, theory, technoscience, 9(2), 1-22. https://doi.org/10.28968/cftt.v9i2.38296.

Pinto L., Ramírez P., González T., Benado J., Bobadilla H., et al., (2024a). Código de Geoética de Chile. Zenodo, 1-18. https://doi.org/10.5281/zenodo.12604863.

Pinto L., Ramírez P., González T., Benado J., Bobadilla H., et al., (2024b). Código de Geoética para la comunidad geocientista de Chile. In Simposio Latinoamericano de Geoética Abstracts, Lima, Peru. https://geoeticaperu.blogspot.com/2023/12/simposio-latinoamericano-de-geoetica.html (accessed 19 October 2026).

Pinto L., Ramírez P., Lay N., Bobadilla H., Villaseñor T., et al., (2023). Propuesta de un Código de Geoética para la Comunidad geocientista de Chile. Actas, XVI Congreso Geológico Chileno, p. 1042, https://www.congresogeologicochileno.cl/assets/Acta-XVI-Congreso-Geologico-Chileno-BP9t3hyF.pdf (accessed 19 October 2026).

Rejas Ayuga J.G., Bosque Sendra J., Malpica J.A., Maza Vázquez F., Dalda Mourón A., et al., (2015). Aspectos geoéticos en la docencia del ordenamiento y la gestión del territorio. Revista Ciencias Espaciales, 8(1), 110-125. https://doi.org/10.5377/ce.v8i1.2044.

Riofrancos T., (2025). Extraction: The Frontiers of Green Capitalism. W.W. Norton & Company, New York, 289 p. ISBN 978-1-324-13425-1.

Savolainen K., (1992). Education and human rights: New priorities. In UNESCO Institute for Education, Adult Education for International Understanding, Human Rights and Peace: Report of the Workshop Held at UIE, Hamburg, 18-19 April 1991, pp. 43-48. UNESCO Institute for Education, Hamburg. https://unesdoc.unesco.org/ark:/48223/pf0000095164 (accessed 19 October 2026).

Vasconcelos C., Meléndez G., Azanza B., De Miguel D., Tomás Negredo M., et al., (2018). Geoética y la responsabilidad común hacia la existencia de la especie humana sobre el planeta Tierra. Enseñanza de las Ciencias de la Tierra, 26(2), 249-251. https://raco.cat/index.php/ECT/article/view/338692 (accessed 19 October 2026).

Villacorta S., Pinto L., Camprubi A. and Cervantes Y., (2024). Integrating geoethics in tertiary education: A strategy for sustainable development in Latin America and the Caribbean. Episodes, 47(4), 733-751. https://doi.org/10.18814/epiiugs/2024/02404s02.

Villacorta S., Pinto L. and Mansur K.L., (2023). Importancia de la geoética en las carreras de ingeniería geológica y geociencias: La experiencia latinoamericana. Boletín de la Sociedad Geológica Mexicana, 75(2). https://doi.org/10.18268/BSGM2023v75n2a100423.

*Corresponding author: **Mauricio F. Collao Quevedo**

e-mail: mcollao@yorku.ca

© 2026 Istituto Nazionale di Geofisica e Vulcanologia

All rights reserved