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For a Sustainable Future: A Survey about the 2030 Agenda among the Italian Geosciences Community

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Abstract: The combined annual Congress of the Italian Geological Society (Società Geologica Italiana, SGI) and the Italian Mineralogical and Petrological Society (Società Italiana di Mineralogia e Petrologia, SIMP), dedicated to *Geosciences for a sustainable future*, took place in Turin in September 2022. This was an opportunity to critically reflect on the role of geosciences for our society and planet, and the role that geoscientists have to play in the education of citizens, for the prevention of natural hazards and the conservation of cultural and natural heritage. In continuity with our previous work on the awareness of the Sustainable Development Goals among young geoscientists in Italy, the present study attempts to expand the investigated sample to include the entire Italian community of geoscientists. The aim is to highlight: (1) the most widespread opinions on the link between Earth Sciences and the Sustainable Development Goals of the UN 2030 Agenda; (2) what steps have been taken by Italian Earth Sciences departments for sustainability education and what could be the best strategies to develop sustainability related to geoscience topics. According to 229 answers to a questionnaire sent to congress participants (corresponding to 20% of the total amount), the results highlight that the Italian geocommunity (at least its younger members) has a high awareness of the implications of its work and research with sustainability issues, and, in particular, their responsibility to the environment; notwithstanding this awareness, the level of average familiarity with the 2030 Agenda and its goals is still low. In order to bridge this gap, it is recognized that there is an urgent need for sustainability education efforts in departments and the use of inter- and trans-disciplinary teaching approaches that can educate both students and practitioners to be capable of addressing the challenging issues of today.

Keywords: 2030 Agenda; sustainable development goals; education for sustainability; geoscience education; trans-disciplinarity



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1. Introduction

The current environmental crisis has become more and more complex during the recent years: pandemics, disasters due to climate changes (drought, floods, wildfires, etc.), and the addition of the threats of a new global war with its worrying economic and ecological consequences. This plight calls for a reconsideration of philosophical and ethical frameworks to ensure a future for humanity on this planet and to increase the probability of overcoming local or global bottlenecks [1–3]. In this context, the skills of the scientists of the future will be distinctly different from those of the present: their real societal influence will be contingent on the extent to which they are capable of using an inter- and trans-disciplinary perspective to share with other relevant stakeholders and players [4]. Geoscientists, in particular, have a professional and social responsibility to reflect on the engagement needed to contribute to the implementation of sustainability issues. This engagement includes, for example, determining the information needs of stakeholders such as policy makers or development NGOs; how information is used; and how best to present it to policy makers [5] or in any other public setting, including the

media. Translating geoscience knowledge into tools to support policy and practice therefore requires a capacity for dialogue and a partnership between geoscientists and a broader audience [6].

Since the involvement of governments, as well as the private sector up to a certain level, is crucial, geologists need to communicate the importance of considering the context, boundaries, and feedback of the Earth system to policymakers and stakeholders charged with implementing sustainability [7]. The global challenges of our time can only be faced effectively with policies based on scientific knowledge. Earth Sciences (ES) provide essential knowledge to understand the resources and the limits of our planet, if we want to tackle problems arising from the biosphere decline, global warming, water availability and management, demand for mineral resources and raw materials, and the transition from fossil to renewable energy resources [8].

Considering this, it is easy to understand the central role of ES in developing strategies for a sustainable future; without a deep familiarity with Earth's history and dynamism, in fact, the risk for any strategy is that it is too shortsighted or anthropocentric to produce durable solutions [9]. This risk is significant if we consider global initiatives, such as the UN 2030 Agenda.

The UN Agenda 2030 was launched to put the world on a sustainable and re-sustainable path [10]. To better address the aims of this major project, 17 Sustainable Development Goals (SDGs) were designed; achieving them has become a great challenge for humankind, and scientific knowledge is essential to guide and measure this process. [6]. It has been demonstrated [11] that all of the SDGs are linked to ES; it is hence required for the geo-community to act for this collective goal, and to take a leading role in the realization of the SDGs. Since the turn of the millennium, the growing role of ES in the journey towards a sustainable society has been widely recognized [12], especially in the development of the necessary holistic approach to comprehend key Earth systems, such as the water and carbon cycles [13]. Furthermore, with climate change as the main issue that faces our society today, geoscientists could contribute by showing the potentially harmful effects that rapid climate change can have on the Earth [14].

For this reason, many initiatives have been launched to engage the ES in the discussion of the SDGs and to raise geologists' consciousness of their important contribution. One of these is Geology for Global Development (GfDG, www.gfgd.org, accessed on 1 May 2023), an NGO established in 2011 by Joel Gill that advocates a worldview in which every geologist is endowed with the expertise and know-how to make a successful contribution to sustainable development. Another example worth mentioning is that of the International Association for Promoting Geoethics (IAPG, www.geoethics.org, accessed on 1 May 2023), which for the past decade has been engaged in popularizing and advancing this new field, geoethics, which is described as a quest for and deliberation on the values that underlie proper conduct and practices each time human activities interface with the Earth system [15]. By addressing the position and social accountability of geoscientists [16], geoethics can be seen as a comprehensive school of thought [17] that fosters geoscientists and society at large to be acutely conscious of humanity's position as an operating geological presence on the Planet and the ethical liability that this entails [18].

The geoethical issues are related not only with the behaviors and practices of the professionals and researchers, but also with the educational side. The formative purpose of geoethics is to build a pedagogical proposal that must be based on the values of dignity, freedom, and responsibility, in order to address planetary anthropic changes [19]. Broadening the discussion, it can be argued that the 2030 Agenda and its 17 Sustainable Development Goals integrate the ethical dimension of geoscience education, linked to the concern and responsibility for guaranteeing that the current necessities are met without compromising the sustainability of future generations [20]. The awareness of the importance of the ES for sustainability goals can direct the work and research of geoscientists, but also the educational efforts of university departments, which must take a leading role in training professionals and researchers who are aware of the ethical and sustainability implications

of their future careers. Moreover, it has been noticed that geoscience education should be a key component of education for sustainability and that, to achieve the ambitious aims of sustainability, we need to consider how ES educators can promote an attitudinal change, first in their students, but also in public opinion [21].

A good example of promoting geosciences education in sustainability is the role of UNESCO Global Geoparks (UGGPs, www.visitgeoparks.org, accessed on 1 May 2023). These are areas where geologically significant sites and scenery are operated on the basis of a holistic approach to preservation, education, and sustainable development [22]. Education for sustainability is therefore one of the three key cornerstones of every geopark, along with geoconservation and geotourism [23,24]. UGGPs are outstanding examples of opportunities to support students with open-air classrooms; they must be considered as incentives for sustainable development, sustainable lifestyles, enhancement of natural diversity, integration of diverse cultures and, finally, by that, advocacy for peace [25].

In our previous paper [26], illustrating the results of an investigation conducted among young Italian geoscientists on the links between ES and the UN 2030 Agenda, we found that the word “sustainability” is not prominent in the curricula of Italian Earth Sciences departments and that it is conceivable that most students would graduate without having taken a subject course focused specifically on how geosciences can tackle the SDGs and contribute to their fulfilment. Therefore, since it is our belief that the primary objective of the ES community is to put its very important and unique contributions on the floor of the public discussion via an educational program [27], it is crucial to investigate the role of Italian departments in disseminating sustainability education related to geoscience issues. Broadening the sample analyzed, to give voice not only to the young geoscientists, but also to the entire Italian geocommunity, we wanted to understand if the results confirm the vision of our previous study or whether, on the contrary, Italian Earth Sciences departments are fully aware of the environmental and ethical implications of their disciplines and of the fact that comprehension of the Earth’s past is distinctly linked to a sustainable future for humanity.

2. Materials and Methods

In this paper we present the results of a survey of the attendees of the 91st joint Congress of the Italian Geological Society (Società Geologica Italiana, SGI) and the Italian Mineralogical and Petrological Society (Società Italiana di Mineralogia e Petrologia, SIMP), held in Turin in September 2022 (<https://www.geoscienze.org/torino2022>, accessed on 15 October 2022). Since the title of the SGI-SIMP Congress was *Geosciences for a sustainable future*, it seemed perfectly in harmony with our interests. With many sessions dedicated to sustainability issues, it was an opportunity to reflect critically about the role of geosciences in a sustainable future for our society and our planet, and to understand the importance of the role of the ES in achieving this aim and raising awareness among Italian researchers and professionals.

As in the previous study [26], we first created a simple-to-use survey via Google forms, composed of three main parts: (I) personal information; (II) geology and sustainable development; and (III) education for sustainability; as a conclusion, we gave the possibility of leaving a free commentary (Table 1).

The goals of the study were to understand:

- (1) the widespread opinions on the connections between ES and the 17 Sustainable Development Goals of the UN 2030 Agenda;
- (2) what initiatives have been implemented by Italian ES departments for sustainability education and what might be the most appropriate approaches to develop sustainability education tied to geosciences topics.

Table 1. Sections and questions presented in the questionnaire.

Questions	Types of Answer
(I) Demographic data	
1. Gender	Closed
2. Age range	Closed
3. What area do you belong to?	Multiple choices
4. Affiliation	Open
5. Years of work experience	Closed
6. Field of specialization	Multiple choices
(II) Geology and sustainable development	
7. Have you heard of the 2030 Agenda and its 17 Sustainable Development Goals yet?	Closed
8. How important is responsibility to the natural environment in your work activity?	Likert's scale
9. Please indicate if and which of the associations and/or initiatives listed you are familiar with	Multiple choices
10. Are you aware of any other associations and/or initiatives dealing with the relationship between geosciences and sustainable development?	Open (not mandatory)
11. In your opinion, for the achievement of which of the 17 Sustainable Development Goals can geosciences play an important role?	Multiple choices
12. In your opinion, which fields of geosciences activities and research are of great relevance to the achievement of sustainable development goals?	Multiple choices
(III) Education for sustainability	
13. How important do you think it is to educate about sustainability in academia?	Likert's scale
14. To the best of your knowledge, in what areas does your organization carry out activities related to the theme of sustainability?	Multiple choices
15. Which of the following aspects of sustainable development do you think should be addressed in a University Course in Earth Sciences?	Multiple choices
16. If you do teaching, how often do issues related to sustainable development come up in your lectures and activities?	Likert's scale (not mandatory)
17. Which of the following do you think is the best approach to education for sustainability?	Closed
Conclusion	
18. If you would like, you can write your free idea or comment here regarding the relationship between geosciences and sustainable development.	Open

In the first section, we collected the demographic data of the respondents, asking about their gender and the age ranges, but also some professional information, such as the affiliation, the areas of specialization, and the years of working experience. Sections (II) and (III) are taken from our first survey, with some changes for the response modes, i.e., the possibility of multiple responses, or the use of Likert scales. To avoid differences in the number of answers to each item and to have the most stable sample possible, it was mandatory that most answers were required to complete the questionnaire. We left the option of not answering only the questions that involved a personal variable (e.g., question 16, If you do teaching, how often do issues related to sustainable development come up in your lectures and activities?). At the conclusion of the survey, we gave the opportunity to comment on the connection between geosciences and the 2030 Agenda with an open-ended question. The responses to this were evaluated with a content analysis; the other data, however, were quantitative.

The survey was sent to all attendees (about 1000 people) using the organization's staff mailing list 10 days before the conference. In addition, we generated a QR code with a link to the form and displayed it during our lectures at the convention.

3. Results

A total of 229 responses were collected, i.e., around 20% of the SGI/SIMP 2022 congress attendees ($n = 1086$). The outcomes are presented in this chapter, segment by segment.

3.1. Section (I): Demographic Data

The majority of the respondents to our questionnaire were men (56.1%), while the remainder were women (42.1%). Only four persons (1.8%) preferred not to specify their gender. The most represented age range was under 30 (32%), followed by 31–40 (25.9%) and 51–60 (17.1%) (Figure 1). In terms of working years, the majority had less than 10 years of experience (54.8%). In this regard, it should be noted that we did not have access to the age data of all participants.

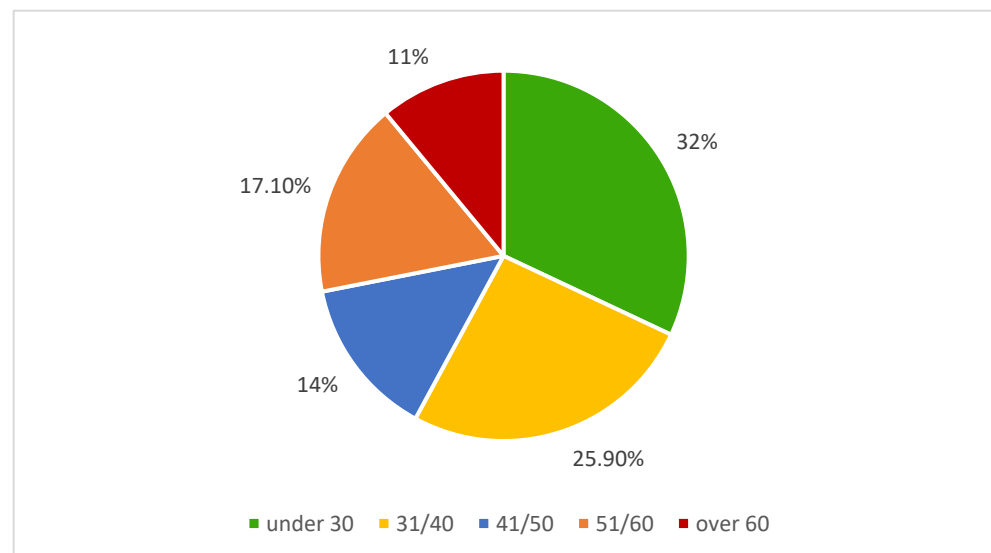


Figure 1. Age ranges of the respondents.

Both questions 3 (*What area do you belong to?*) and 6 (*Field of specialization*) allowed multiple answers and helped us to understand the work context and research interests of the respondents. More than three-quarters of the respondents belonged to academia, both in tenured and permanent positions; another 5.3% were university students. Only a few came from different realities, such as research centers (11.4%) or freelancing (3.9%). As the congress was organized by the Italian Geological Society and the Mineralogy and

Petrography Society, the most represented fields of specialization were structural geology (20.2%), georesources (19.3%), and petrography and mineralogy (17.1%). However, it is remarkable that 22.4% of the respondents also chose the option “other” (in this question we allowed multiple answers), which means that their fields of specialization were not completely covered by the 17 options we provided.

Considering only those that work in academia, the respondents came from more than 30 different Italian departments, as shown in Figure 2. A small group of answers declared an affiliation with foreign universities: one each in Switzerland (ETH Zurich, Geneve), France (Grenoble), Germany (Achen), and Nepal (Tribhuvan University, Katmandu); these cases are not represented in the map below.

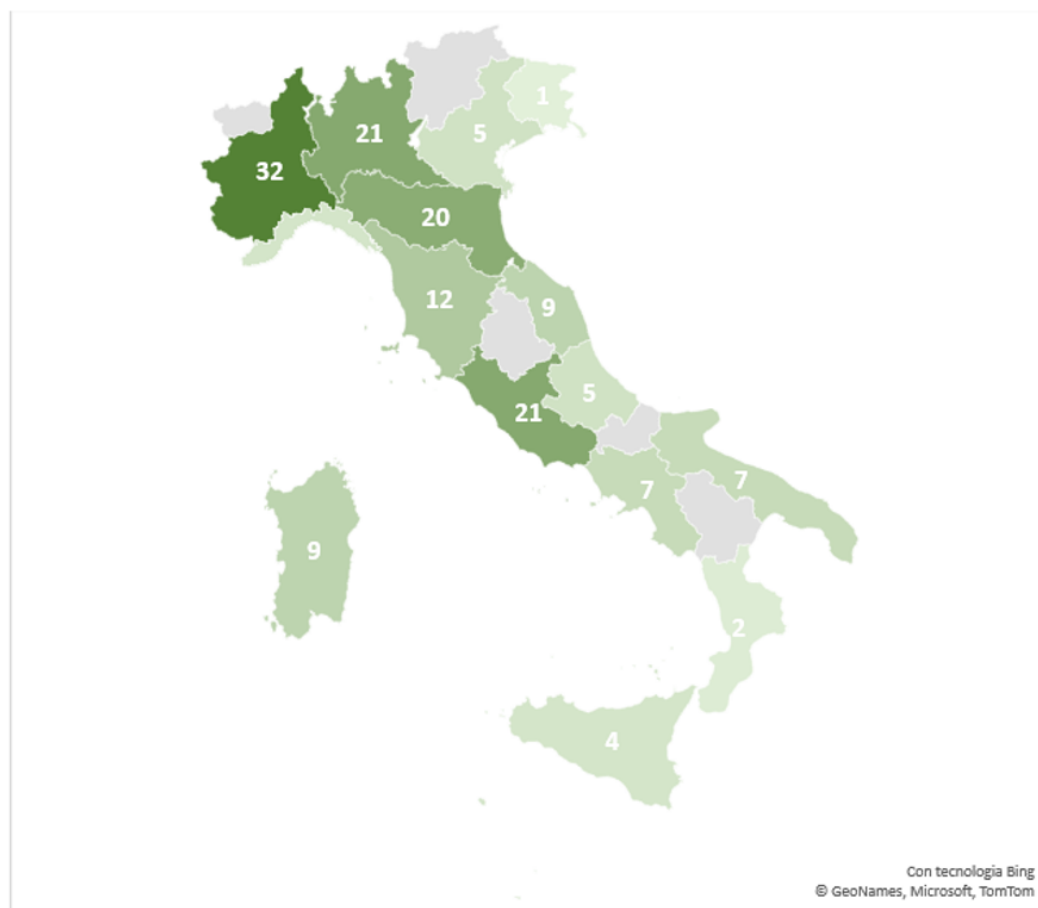


Figure 2. Geographical distribution of the participants, according to their university’s affiliation. Numbers in the figure represents the number of answers received from the region.

As previously noted, other participants belonged to research centers, such as the Consiglio Nazionale delle Ricerche (National Research Council, CNR) or Istituto Superiore per la Protezione e Ricerca Ambientale (The Italian Institute for Environmental Protection and Research, ISPRA). It was not possible to indicate the geographical distribution of those who declared this affiliation, as these institutions have offices in several Italian cities.

3.2. Section (II): Geology and Sustainable Development

In continuation with our previous study [26], this section aims to highlight not only the knowledge of the respondents about the 2030 Agenda and the 17 SDGs connected to geosciences, but also their interests in the sustainability issues in their disciplines and the possible developments of related educational and professional pathways. To do this, we inserted into the questionnaire three items: n.7 (*Have you heard of the 2030 Agenda and its 17 Sustainable Development Goals yet?*); n.9 (*Please indicate if and which of the associations*

and/or initiatives listed you are familiar with); and n.10 (Are you aware of any other associations and/or initiatives dealing with the relationship between geosciences and sustainable development, to which an open answer was allowed) to focus on prior knowledge. Regarding answers to question 7, nearly half of the respondents (49.6%) declared to have often heard about the 2030 Agenda; 34.2% had only a vague idea of it; 16.2% ($n = 37$) had never heard about it (Figure 3).

Have you ever heard about UN 2030 Agenda?

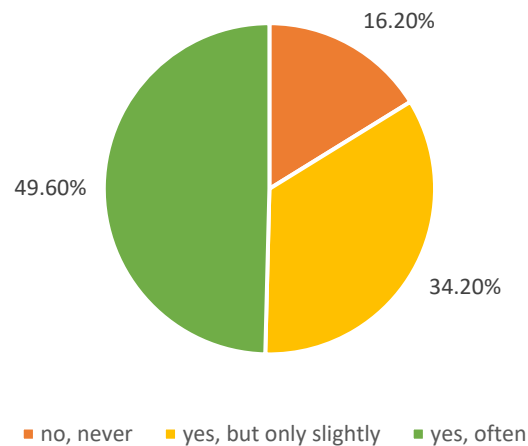


Figure 3. General knowledge about the 2030 Agenda.

Among a list of the most famous association or initiatives that work on the connections between geosciences and sustainability, 52.6% declared they know none; 37.7% had already seen the poster *Geosciences for the future* published in 2020 by the Geological society of London (<https://www.geolsoc.org.uk/Posters>, accessed on 20 June 2022); 18% knew of the IAPG and its initiatives. The less-known were the Geology for Global Development group created by Joel Gill (12.3%) and the Cape Town Statement for Geoethics (6.6%). Asking about the awareness of other associations and/or initiatives dealing with the relationship between geosciences and sustainable development, we received only a few answers ($n = 15$, excluding the ones that answers that were simply “no”), in which the most cited association (three times) was the International Association of Hydrogeologists (IAH).

Question 11 listed the 17 SDGs and asked interviewees to pick those in which geosciences can play an important role (multiple selection was possible). As Figure 4 shows, four of the SDGs were the most popularly ticked: goal 7 (affordable and clean energy, 81.6%); goal 13 (climate action, 75%); goal 15 (life on land, 64%); and goal 6 (clean water and sanitation, 63.2%). The least chosen, by far, was goal 16 (peace, justice, and strong institutions, 7.9%), followed by goal 17 (partnership for the goals, 10.1%) and goal 5 (gender equality, 14.5%).

Question 8 focused on the perception of the responsibility towards the natural environment in respondents’ work activity: a Likert scale from 1 (not at all) to 5 (completely) was designed for the responses. Almost all of the answers rated the perception from 3 to 5, with the highest percentage for option 5 (44.3%); only 10 persons rated 1 or 2 (Figure 5).

The section closes with question n.12, which asked about the fields of geosciences activities and research that can be of great relevance to the achievement of sustainable development goals. With multiple choices allowed, the sustainable use of geological resources (81.6%), renewable sources of energy (81.1%), and management of the territory (81.1%) were the most chosen options (Figure 6); in general, all the options we gave obtained a percentage above 50%, apart from agrogeology, which was chosen by only 35.1%.



Figure 4. The most popular goals in which geosciences can have a major influence, in the view of the interviewees. From left to right we have goal 7 (affordable and clean energy); goal 13 (climate action); goal 15 (life on land); goal 6 (clean water and sanitation); goal 12 (responsible consumption and production); goal 14 (life below water); goal 11 (sustainable cities and communities); goal 4 (quality education); goal 9 (industry, innovation and infrastructure); goal 1 (no poverty); goal 2 (zero hunger); goal 3 (good health and well-being); goal 10 (reduced inequalities), goal 8 (decent work and economic growth); goal 5 (gender equality); goal 17 (partnership for the goals); and goal 16 (peace, justice and strong institutions).

In your work, how important is responsibility to the natural environment?

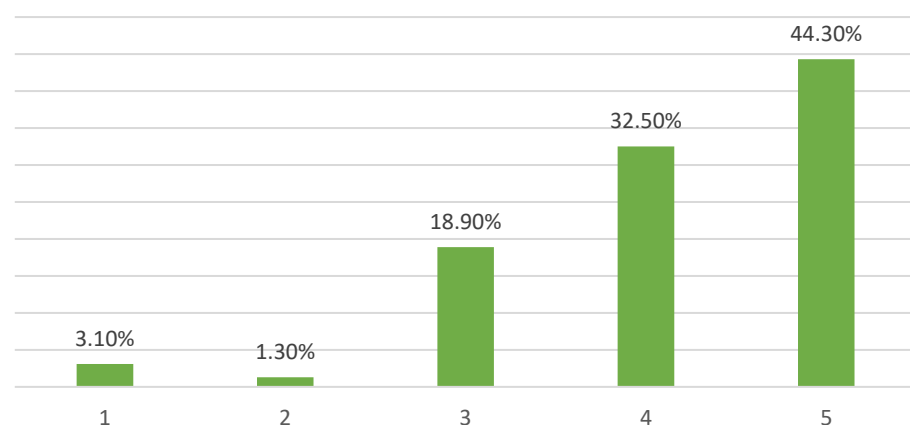


Figure 5. Responsibility towards the natural environment in respondents' perception.

Which fields of geosciences' activities and research are of great relevance to the achievement of sustainable development goals?

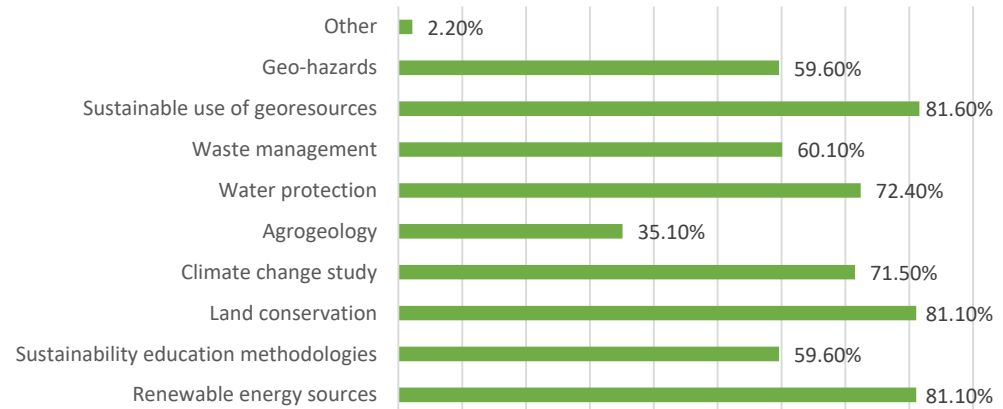


Figure 6. Fields of geosciences that can be of great relevance to the achievement of sustainable development goals.

3.3. Section (III): Education for Sustainability

This section focuses on the second of our objectives, namely to understand what initiatives have been implemented by Italian ES departments for sustainability education and what might be the best approach to develop geoscience-related sustainability education. Generally speaking, the opinion of our respondents is that education for sustainability is a primary goal for academic training: on a Likert scale from 1 to 5 proposed for the answers to question 13, 78.1% rated its importance with a 5, 14.9% rated it 4, and 6.1% rated it 3. Answering question 16, in fact, on a scale between 1 (never) and 5 (always), more than 80% rated the frequency of issues coming up that were related to sustainable development in lectures and educational activities from 3 to 5 (Figure 7). Please note that this answer was not mandatory due to the fact that not everyone among our respondents conducted educational activities; here, we received 143 answers (62.4% of the total).

How often do sustainable development issues come up in your lectures and activities?

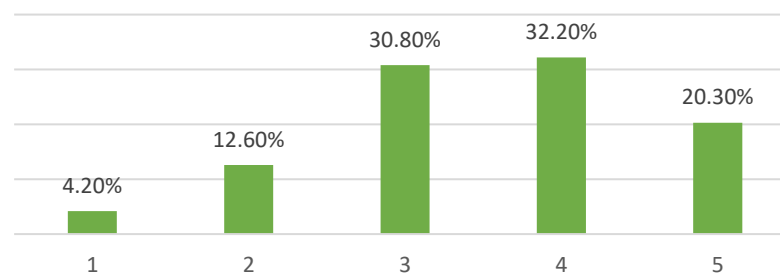


Figure 7. The frequency of issues coming up related to sustainable development in lectures and educational activities.

In order to gain a better understanding of the current situation, we proceeded with question 14, which asked participants to indicate the areas in which their organizations carry out sustainability-related activities, giving a multiple selection of four choices (courses, seminars or workshops, doctorates or specific degree courses, and special projects). According to the answers, sustainability activities were often workshops and seminars (68%),

rather than discipline-specific courses (45.6%). Special projects (32.5%) and training courses for employees (21.5%) were also quite common. A few survey participants had heard of specific degree courses (21.9%) or PhDs (21.1%), and 17.1% of special projects. Almost 10% had never heard of sustainability-related activities in their organization.

For possible developments of educational strategies for sustainability, we asked which aspects of sustainable development should be addressed in a university course in ES, setting a list of possible answers with the possibility of multiple answers (question 15). As shown in Figure 8, the main interests of the respondents focused on sustainable use of geological resources (78.9%) and land protection (74.4%). Between 60% and 70% of the respondents chose renewable sources of energy (69.2%), climate change studies and water management (67% each), and geohazards (61.7%). Only a few people chose the answers legislation (39.2%) and agrogeology (22.5%).

Which of the following aspects of sustainable development do you think should be addressed in a University Course in Earth Sciences?

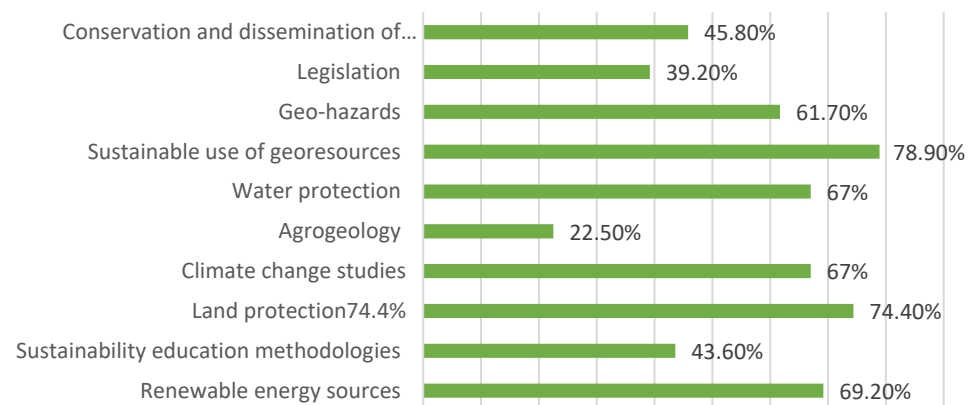


Figure 8. Main interests of the respondents for future courses about sustainability issues.

Finally, in accordance with the answers to question 17 (Figure 9), these aspects should be approached with an inter or trans-disciplinary strategy, i.e., crossing the boundaries between disciplines and the division of knowledge (66.7%), or at least with a multidisciplinary strategy (simply juxtaposing different disciplinary knowledge, without crossing its boundaries, 31.1%), rather than disciplinary (only five responses, 2.2%).

Which is the best approach to educating for sustainability?

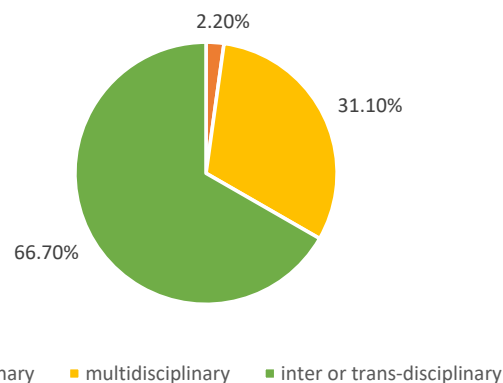


Figure 9. Best approaches to education for sustainability.

3.4. Content Analysis

As in the previous study, we decided to give the opportunity to make a free comment on the relationship between geosciences and sustainable development with an open question at the end of the questionnaire. We received 25 responses, which corresponds to approximately 10% of the respondents. Despite the small sample available, we carried out a content evaluation to establish the occurrence of some topics or ideas.

Some responses were outspokenly skeptical about the real possibility of developing a pathway towards sustainable development in the Italian geocommunity; they emphasize the delay with which this debate has started in our country (*I am afraid that in general the Italian academy was 20 years late in discovering these issues or In Italy, the relationship has just begun. We are very late and on an uphill road*), but also the inconsistency (*Too much hype and too little substance when it comes to energy, environment and raw materials*) and opportunism of some choices (*The very recent interest of many is related more to personal and venue opportunistic choices. New teachings are proposed by those who have never been interested in it so far and consequently have a partial and limited view*).

Some comments underline the lack of *the right sensitivity regarding these issues* and the need of a *specific training for teacher-researchers to concepts related to sustainability*. This seems somewhat related to the organization of ES departments, in that *the superspecialization of geological disciplines in academia has led to a rigid mutual incommunicability between related subjects and a muteness toward the outside world*.

According to some respondents, one solution to build a closer relationship between geosciences and sustainable development is precisely to overcome this *muteness*, especially toward civil society:

I believe that the Earth Sciences, in addition to devoting themselves to the specific aspects of sustainability, must make a great effort to become part of the public's background of awareness. People distinguish a pine forest from a beech forest, but they don't know that they can tell a volcano from an orogenic mountain.

I believe that it is necessary to provide a privileged channel of communication to the non-GEO world (. . .) to develop and apply geological disciplines that can contribute significantly to bringing about a paradigm shift from a current world, oriented toward the individual good, to a sustainable world, oriented toward the common good.

Another decisive aspect is the relationship with policy makers. If the feeling today is one of weak recognition of *geoscientists as scholars par excellence in the fields of sustainability, the study of natural hazards and georesources*, the urgency that emerges from some of the responses is that of full support from the political world: *This is a very important path, but it must be promoted right from the policy and government actions.*

URGE AT THE MINISTERIAL LEVEL ATTENTION TO SUCH ISSUES IN LOWER-ORDER SCHOOLS!!!

Until we have an interlocutor in the ministries of Education, Economy, Environment (. . .), our individual actions will only have a mild (and reversible) effect.

Finally, some respondents suggest some general strategies to better interconnect sustainable development goals and ES, such as *revisiting our disciplines for the 2030 Agenda goals or developing studies on the Anthropocene*; others focus on specific actions such as *providing databases for the scientific community to share from the geological map of Italy and incorporating geoethics into the 'Socio-Scientific Issues' (SSI)-based teaching approach*.

The word-cloud represented in Figure 10 illustrates the most occurring terms in the comments.

their students and researchers. Without a good or even basic knowledge of the aims of the 2030 Agenda, it is difficult to reason about the role of geoscientists for a sustainable future. In addition, the low level of knowledge, also confirmed by the responses to question 9 (*Please indicate if and which of the associations and/or initiatives listed you are familiar with*) and question 10 (*Are you aware of any other associations and/or initiatives dealing with the relationship between geosciences and sustainable development?*), clashes with the high level of awareness of responsibility towards the natural environment shown by the responses to question 8 (*How important is responsibility to the natural environment in your work activity?*), where 44.3% chose the higher level 5 and 32.5% chose level 4. This clearly shows that there is adequate sensitivity to sustainability issues among Italian geoscientists, but educational activities need improvement or a new approach. It is easy to find further confirmation of this in the answers given to questions 13 of Section (III), where a large majority chose the highest level to rate the importance of education for sustainability in academia (78.1%); this broad consensus can be explained by the fact that, in teaching practice, sustainability issues emerge very frequently. Answering question 17, respondents suggested the inter- or trans-disciplinary approach as the best for educating about sustainability (66.7%). It is also notable that the rest of the respondents chose mainly the multidisciplinary option (31.1%), and only 2.2% (corresponding to 5 answers) pointed out the disciplinary approach.

In our previous paper, we noticed that only five of seventeen SDGs were selected by at least half of the respondents as those for which geoscience research and practice can be helpful, while just a small fraction of the answers addressed some fundamental issues such as the defeat of hunger, the reduction in poverty or gender inequalities, and the promotion of peace or social justice [26]. The answers given to question 16 lead us to the same results: once again five goals were selected by more than half of the respondents, and four of the five were the same, i.e., affordable and clean energy (goal 7), climate action (goal 13), life on land (goal 15), and clean water and sanitation (goal 6). The less chosen were again goals 1 (no poverty), 2 (zero hunger), 5 (gender equality), 10 (reduced inequalities), and 16 (peace, justice and strong institutions), but in this case also goal 8 (decent work and economic growth), which is quite surprising. As we have already noted, this suggests that, in the perception of geologists, their input into the achievement of the Sustainable Development Goals is more expected to be technical than ethical [26].

5. Conclusions and Future Actions

Is the geoscience community conscious of the fact that good ES education can be a catalyst for change? In our previous paper this question was pivotal. With this second survey, even if we do not have a measurable answer about the awareness of the geoscience community as a whole [29], we can argue that the problem is not about awareness or sensitivity, but about educational strategies. Our results show that the Italian geocommunity has a relatively high consciousness about geoscientists' role in building future sustainable societies, but that it still lacks specific (sometimes basic) knowledge in the realm of the UN 2030 Agenda and its 17 SDGs. We suggest that Italian departments of ES should give more visibility to sustainability issues related to geosciences, either by incorporating new specific courses into their educational offerings or by making more explicit the connections of existing courses with UN goals and sustainability issues in general. This would be the first step to better connect geoscience education with education for sustainability. One way forward might be to put together a transversal effort on these issues, involving other departments in collaboration with ES ones and creating a "center of sustainability" with the ES at its core. To do this, it is therefore necessary to embrace an inter- or trans-disciplinary approach, as long as sustainable development and its ecological, social, and economic dimensions can be regarded as a highly complex task. Educating for sustainable development thus also has a complex character [30], which is not easily captured with traditional disciplinary methodologies.

The two studies we conducted are intended as a general overview of the Italian geoscience community. For this reason, we decided to use the two congresses (BeGeo 2021

and SGI-SMPI 2022) as a good chance to gather together people from different areas and different universities in Italy, even with a limited sample. In order to deepen the analysis, it would be useful to submit a similar questionnaire to every Earth Sciences department, including also the students; this would help to gather a more significative percentage of answers and to compare different realities. Furthermore, an international survey would be a good occasion for a comparison with the Italian situation, in order to understand the sensitivity of these topics in the global geocommunity and if and where there are activities related to sustainability issues.

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