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The Anthropocene and the Sustainable Development Goals: key elements in geography higher education?

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Abstract

Purpose – The current "Anthropocene" epoch has witnessed an imbalanced global change, but it is an opportunity to design a better and sustainable future. Sustainability criteria need to be fully implemented in political institutions, companies, and universities. Moreover, sustainable pedagogies must accompany the process, in terms of students' professional competences to overcome crisis situations. This paper seeks to evaluate Geography Degrees in Spain to corroborate whether students and teachers consider that students are prepared to address the challenges of global change.

Design/methodology/approach – The research is focused on the Sustainable Development Goals, a clear and easily identifiable framework for society that reflects the principles of the UN 2030 Agenda. A statistically validated questionnaire answered by 319 respondents has been used. Data analysis with descriptive and inferential techniques were performed.

Finding – The results show that: (i) geography degrees do not meet the needs of students, for whom career opportunities will be related to the implementation of the 2030 Agenda; (ii) there are significant gaps between the perception of teachers and students; (iii) some geographical topics are undervalued; (iv) SDGs are more present in optional subjects; and (v) there is a need to "sustain" the curriculum, following this highly valued framework.

Originality/value – Geography educative programs had scarcely been empirically evaluated to check a sustainability framework implementation. This research provides innovative and unprecedented self-assessment results from higher education agents, in an empirical and statistically validated way.

Keywords Geographical education; University degree; Global change; 2030 Agenda; SDG; Spain

Paper type Research paper

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1. Introduction

Increasing human population numbers as well as the use we make of resources are changing the natural environment (Crutzen, 2006). The present moment is strongly marked by human action, although there is no consensus as to whether we are in a new geological era, namely the Anthropocene (Steffen et al., 2011b). One of the clear effects of this mode of occupation is what has been called global change, which is associated with a devastating and unequal exploitation that leads to a continuous degradation of natural resources, with major environmental and social effects at the global level (Kerr *et al.* 2007; Steffen *et al.*, 2011a, among others).

In view of this situation, many academics have addressed the need to design a new era based on sustainable development and social welfare (Holmberg and Sandbrook, 2019; Fletcher *et al.*, 2019; Hummels and Argrou, 2021). In addition, many international organizations have adopted this discourse, faced with the challenge of managing the Anthropocene, with innovative, sustainable, and effective measures (Stoll-Kleemann and O'Riordan, 2017). This is the case with the United Nations (UN), whose members established the eight so-called "Millennium Development Goals" in the year 2000, which were to be achieved in the period 2000-2015. The achievement of these goals by the countries committed to the declaration was uneven and although it received much criticism, the UN designed the Post-2015 Development Agenda that led to the adoption, by its General Assembly, of the 2030 Agenda for Sustainable Development (United Nations, 2017a). Its central element is 17 Sustainable Development Goals (SDGs), which describe the main development challenges for humanity and aim to ensure a "sustainable, peaceful, prosperous and just life on Earth for all, now and in the future" (United Nations, 2017b). They also set environmental limits and thresholds for the use of natural resources. Achieving the goals requires the involvement of governments, companies, and civil society, which necessitates their awareness and commitment, despite the fact that the SDGs have partially been designed without taking into account local realities (Brandner and Cumming, 2017).

These initiatives demonstrate the existing global interest in sustainability, which will probably give rise to other terms in the future, while maintaining the same philosophy. They support the basic ideas of sustainability understood in environmental and social terms, and also underline the urgency of implementing measures. These must not only be administrative, but must also be assumed by citizens, for which UNESCO, as the organization responsible for education in the UN goals, has designed strategies for implementing the SDGs in education (Murga-Menoyo, 2015).

As pointed out by the president of the International Geographical Union (IGU), the discipline of Geography allows a holistic understanding of global challenges, bringing together environmental and human aspects, which gives it an extraordinary value, rendering it fundamental for the generation of knowledge and skills to face future challenges (Meadows, 2020). This fact represents a relevant opportunity for geographic education at all academic levels, in creating awareness among citizens and agents of change, but especially in universities, where these aspects must be highlighted to train specialists not only in the identification and analysis of problems but also in the search for solutions for a "glocal" citizenship (Sklad *et al.*, 2016).

Precisely because of its close relationship with territorial management, a large part of the professional opportunities for geography students is associated with the implementation of the 2030 Agenda. Although it has significant shortcomings, it is the only tool available to many administrations to advance in sustainability criteria. Therein lies the importance of informing about this framework and training in sustainability, which facilitates the incorporation of geography students into the labor market. This leads us to hypothesize that the 2030 Agenda is not yet sufficiently present in Geography

degrees and, therefore, should be explicitly and analytically incorporated into their teaching programs. The objective of this paper seeks to evaluate the degrees of Geography in Spain from the perspective of both students and teachers to show to what extent they consider students are sufficiently qualified to address the challenges of the Anthropocene.

2. Literature review: Sustainable Development Goals in geography higher education

Geography is an ideal discipline to address issues related to the Anthropocene and the planetary boundaries and tipping points derived from it, because it has traditionally been characterized by its holistic approach (Pitman, 2005; Meadows, 2020) and its capacity for synthesis (Demerit, 2009; Maude, 2022). Both aspects can be added to the long tradition of geography in the study and teaching of human-environment or society-nature relations (Maude, 2022; Mitchell, 2022), which has caused some authors to consider it the science of sustainability (Žalėnienė and Pereira, 2021; Olcina, 2022). This binomial needs to be updated, due to the important and rapidly changing earth system, which marks the future of the discipline (Haubrich, 2007; Dryzek, 2016). Moreover, contemporary geography is increasingly applied and offers as an advantage the capacity to incorporate space technologies to improve measurement and observation (Demerit, 2009), therefore solution-oriented (Bailly and Gibson, 2004). This applicability brings it closer to policy (Griggs *et al.*, 2013; Sheppard, 2011), which is where action steps are established, and which is currently related to the SDGs. These have been strongly criticized by some geographers, who consider that they have legitimized neoliberal processes and policies (Liverman, 2018; Sultana, 2018, Nightingale, 2018, and others), and are embraced by others, who value their strong relationship with social engagement and especially their spatial impact (Patel *et al.*, 2017; Cañizares, *et al.*, 2020; Croese *et al.*, 2021).

Geography can be understood as an adaptive science, relevant to society and based on knowledge of spatial phenomena on a planetary scale, which must anticipate changes (Harden, 2012; Moss *et al.*, 2013). A fundamental part of this is research, which proposes narratives adapted to more current, non-conformist themes, and which sometimes provides an alternative. However, it seems that it is not fully transferred to teaching, wasting the power of knowledge (Castree, 2015a). The advances in research and the knowledge generated should be included in teaching to ensure anticipation and, consequently, to train the professionals of the future, offering them theoretical content and fostering certain skills, methodologies, and competencies (Meadows, 2020). This is one of the main challenges of geographic education, the mismatch of which represents a significant opportunity cost for degrees (Harden, 2012).

Sustainability has usually been considered in the training of geography professionals within the theoretical framework of the "Decade of Education for Sustainable Development 2005-2014" promoted by the United Nations Education for Sustainable Development initiative or more recently with the Sustainable Development Goals (De Miguel González and Sebastián-López, 2022). However, different experts claim further steps (Grindsted and Nielsen, 2022) and have shown the importance in curricula of associating theoretical knowledge with the competences defended by UNESCO in 2014 (Critical analysis, Systemic reflection, Collaborative decision making and Sense of responsibility towards present and future generations), and how it is related to skills such as Critical thinking, Ethical and intellectual commitment, Relational and holistic thinking, Sense of belonging to the community, Argumentative skills, Participatory skills, Democratic commitment and commitment to universal human rights (Murga-Menoyo, 2015).

The incorporation of a culture of sustainability in the curricula helps to improve the quality of university studies (Collado *et al.*, 2022) and its image (Žalėnienė and Pereira, 2021). The International Year of Global Understanding (IYGU) in 2016 provided an opportunity for geographers to learn about other educational practices and reinforce the role of geography

as 'the science for sustainability' (Meadows, 2020). However, despite the advances made by the IGU and some authors like Pretorius (2018), until now there has been limited in-depth and generalized discussion on the role of geography training studies, in Spain and other countries, and whether they offer students the competencies required by an ethical framework of sustainability and the current labor market itself, within a context of crisis and global change.

In Spain, geographic education has a long tradition as a university degree. It began as a specialty within the studies of Philosophy and Letters (since 1852), and in 1973 it became a specialty of the degree of Geography and History. Subsequently, it became an independent degree after a change in the regulation in 1990. It had a structure based on fundamental subjects of Physical Geography, Human Geography and Regional Geography, as well as instrumental techniques and the application of knowledge in the field of spatial planning and the management of natural resources. Between 2001 and 2011 it was adapted to the European Higher Education Area (EHEA), following the model of the Spanish 4+1 degree. A degree was designed to maintain the general training in Geography and adapt to the demands of the labor market (Tulla, 2010; De Miguel and De Lázaro, 2016).

Since the approval of the White Paper on Geography and Spatial Planning (ANECA, 2004), the programs of the different degrees, recognized under different invocations, have been occasionally modified, but not adapted to the new framework of the major global challenges, which are largely of a socio-environmental nature and becoming increasingly powerful and require a thematic, philosophical and methodological adaptation of higher education (Castree, 2015a).

Within the context of global changes, a significant part of the career opportunities for geography students are related to the 2030 Agenda, and education is central to achieving this (Yli-Panula *et al.*, 2019). Geographers can network with administration professionals (Agbedahin, 2019) applying sustainability competencies to interdisciplinary spatial thinking, becoming more competitive for the labor market (Teichert *et al.*, 2021), which is traditionally difficult to access (De Cos and Reques, 2010), and providing them with an ethical framework adapted to the current territorial reality.

3. Materials and Methods

3.1. Data collection tool and participants

In order to achieve the research objective, it is necessary to determine the opinion of students and teachers of undergraduate and graduate degrees in Geography. An online questionnaire (https://arcg.is/1HLDe10), designed in ARCGIS-Survey, was used as a data collection instrument. The questionnaire was structured into nine sections, to systematize the opinion of the respondents according to the theoretical framework of the SDGs and their presence in university geographic education.

This questionnaire underwent a validation process through an expert judgment and a subsequent pilot test. The six chosen experts assessed the adequacy and relevance of all the questionnaire items, scoring them according to a 4-value Likert scale (1-4, from a little to a lot). Their judgment, the result of which was excellent (mean value of 3.8 ∓ 0.5 for adequacy and 3.9 ∓ 0.3 for relevance), was subjected to the Cronbach's Alpha reliability test, which yielded a very high statistical consistency ($\alpha = 0.944$) and therefore allowed it to be considered valid. Nevertheless, some observations made by the experts were taken into account, such as the improvement in the wording of some items or the incorporation of explanatory statements in each section of the questionnaire.

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This updated version of the questionnaire was completed by six respondents in a pilot test, whose responses were subjected to the Cronbach's Alpha reliability test. The result was excellent (α = 0.943), so that the questionnaire design could be considered statistically validated. Likewise, they were asked to rate the appropriateness of a series of items on the completion of the questionnaire, following a Likert scale 1-4 (from a little to a lot), resulting in an average appropriateness of 3.4 ∓ 0.9, which serves to positively culminate the questionnaire validation process.

The definitive version of the questionnaire was disseminated among the degree coordinators of all the universities in Spain where Geography degrees are taught (n = 26), together with an open dissemination in social networks and through private contacts. Responses could be submitted for a period of two months. The submission period closed with 319 valid responses, a representative sample, with an unknown universe that tends to infinity, with a confidence interval of 95% and a margin of error of 5.5%, according to the sampling formula of Bartlett, Kotrlik, and Higgins (2001).

The research data were classified according to the sample categorical variables of gender, age, university, student or teacher condition, teaching areas, student status, student seniority, and graduate students (Table I).

Table I Classification variables. Source: Authors' own creation

Variables	Categories	Total	% In category	% In total
Gender	Male	215	67.4	
	Female	101	31.7	
	Other	3	0.9	
Age	<26	116	36.4	
	26-40	67	21.0	
	41-60	112	35.1	
	>60	24	7.5	
University	N	26	100.0	
Relation with the university	Teacher	168	52.7	
	Students	151	47.3	
Teaching areas	Physical G.	37	22.0	11.6
	Human G.	63	37.5	19.7
	Regional G.	62	36.9	19.4

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	Other	6	3.6	1.9
Student status	Active	119	78.8	37.3
	Graduates	32	21.2	10.0
Students according to Bologna Plan (2011)	Pre- Bologna	14	9.3	4.4
	Post-Bologna	137	90.7	42.9
Graduate students	N	25	16.6	7..8
Total responses	N	319	100.0	100.0

3.2. Research variables

The responses to the questionnaire enabled a series of research variables to be configured, 52 in total, associated with the nominal variables for classifying the sample (Table I). The first fifty research variables are ordinal quantitative variables, with a range of values from 1 to 4, and the last two are qualitative, with values of text (Table II).

Table II Research variables in terms of the information they provide. Source: Authors' own creation

Type of information	Variables	Total
Importance of the SDG	One for each SDG	17
Actual presence of the SDG	One for each SDG	17
Geographical fields of knowledge	GIT, Physical G., Economic G., Human G., Land use planning, Descriptive G. and Theory	7
Kind of subjects	Compulsory and optional	2
Kind of contents in Degrees	Theoretical, Practical, Ethical, and Degree overall	4
Kind of contents in Postgraduates	Conceptual, Procedural, Attitudinal	3
Opinion about the 2030 Agenda	Academic-professional adequacy and geographic relevance of the Agenda	2
Total	All	52

The variables related to the SDGs respond to the context of the 2030 Agenda on which this research is based. Their data reveal the importance that respondents believe each SDG should have in university geographic training and their current presence in their experience. The data will allow us to determine the extent to which there may be SDGs more or less related to Geography and more or less addressed in the degrees.

The variables on geographical fields of knowledge facilitate a more precise diagnosis of the presence that the 2030 Agenda has in geographic education. Geography is a science which incorporates multidisciplinary and interdisciplinary elements, which in the curricula are highly compartmentalized so as to facilitate its systematization and a cognitive approach. This gives rise to important internal differences between the formation of some geographical fields and others, in line with their particularities of research, which range from the more purely natural sciences to more purely humanistic aspects. The fields configured in the questionnaire are not intended to be related to specific subjects or groups of subjects, due to the implicit interdisciplinary nature of Geography, which makes it difficult to establish thematic limits. The categorization that has been carried out responds rather to epistemological issues, which are presented in a transversal way and can be addressed in subjects of different scopes (Table III). It is a classification of its own, with no pretensions of universalization, which in any case has been improved and ratified in the process of validating the questionnaire.

Table III Branches of knowledge related to the geographic fields that are part of the research variables. Source: Authors' own creation

Geographic fields	Branches of geographic knowledge
GIT (Geographical Information Technologies)	GIS, Cartography, Remote sensing, Geographic techniques and methods in general...
Physical / Environmental Geography	Geomorphology, Edaphology, Biogeography, Climatology, Risks...
Economic Geography	Economic sectors: Rural, Industrial, Services, Tourism, Transports...
Human / Social Geography	Cultural, Political, Population, Demography, Urban...
Land use planning	Planning, Resources management, Environmental assessment, Territorial development...
Descriptive Geography	Territorial units
Theory	Fundamentals, historical thinking and theory of Geography

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The variables of the kind of subjects and contents in Geography undergraduate and graduate degrees provide information on how geographic education linked to the 2030 Agenda is channeled with academic management criteria. The results indicate the role of compulsory and optional subjects in such channeling, regardless of the themes, as well as the more purely conceptual, procedural, and attitudinal contents. The authors have decided to opt for this classic classification of contents because they consider that it clearly delimits the dominant factor of the type of learning between those that are more theoretical, practical, or ethical, respectively. The authors are aware that learning is always, in essence, integral, which is more than implemented in the current educational context of learning competencies. However, this cognitive integration comes from theoretical, practical, and ethical knowledge, which are easier to recognize in the research sample, due to their clear cognitive delimitation.

Finally, the variables of opinion on the 2030 Agenda and its relationship with university geographic education make it possible to obtain open information on what the respondents think about the research topic, as the authors are able to obtain parameters that have not been taken into account in the research approach. This new information has been manually reclassified into types of opinions: 1. the adequacy of the contents of the Geography Degrees to the 2030 Agenda and 2. the importance of the 2030 Agenda and its relationship with Geography.

3.3. Statistical analysis

The statistical treatment of the research was carried out using SPSS v25 (IBM) and Excel (Microsoft Office 365). Descriptive statistics were calculated for all the research variables and plotted graphically. The reclassification carried out on the open opinion variables was also subjected to descriptive statistics, based on the calculation of frequencies of each type of opinion.

In order to determine whether the differences in the scores of the research variables between the different categories of the classification variables were significant and therefore relevant enough to highlight, inferential statistics were carried out. For this purpose, the nominal categories were reclassified into ordinal groups and statistical tests were performed according to the number of independent groups and nonparametric quantitative dependent variables: Mann-Whitney U significance test for 2 independent samples and Kruskal-Wallis test for K independent samples. It is assumed that quantitative variables, consisting of ordinal data, are nonparametric. The Kolmogorov-Smirnov normality test ($n > 50$) confirms this condition ($p = 0.000$).

Finally, in the field of inferential statistics, the authors also considered carrying out a longitudinal study on the SDG score between an initial moment of potentiality or expectation and a final moment of the actual situation. In this way, the authors would determine whether and how the differences between these moments were statistically significant. For this purpose, the Wilcoxon nonparametric significance test for two related samples was used.

All the quantitative and categorical data from the questionnaire, in raw form, are shown in Appendix A, available in the study dataset hosted in UCM repository (Martínez-Hernández and Mínguez, 2023). Meanwhile, the results of all the inferential statistical tests and the normality test have been compiled in Appendix B (same repository). The most important information is referred to and shown in the Results section. In Figure 1, a diagram to summarize the methodological process and the associated results is presented.

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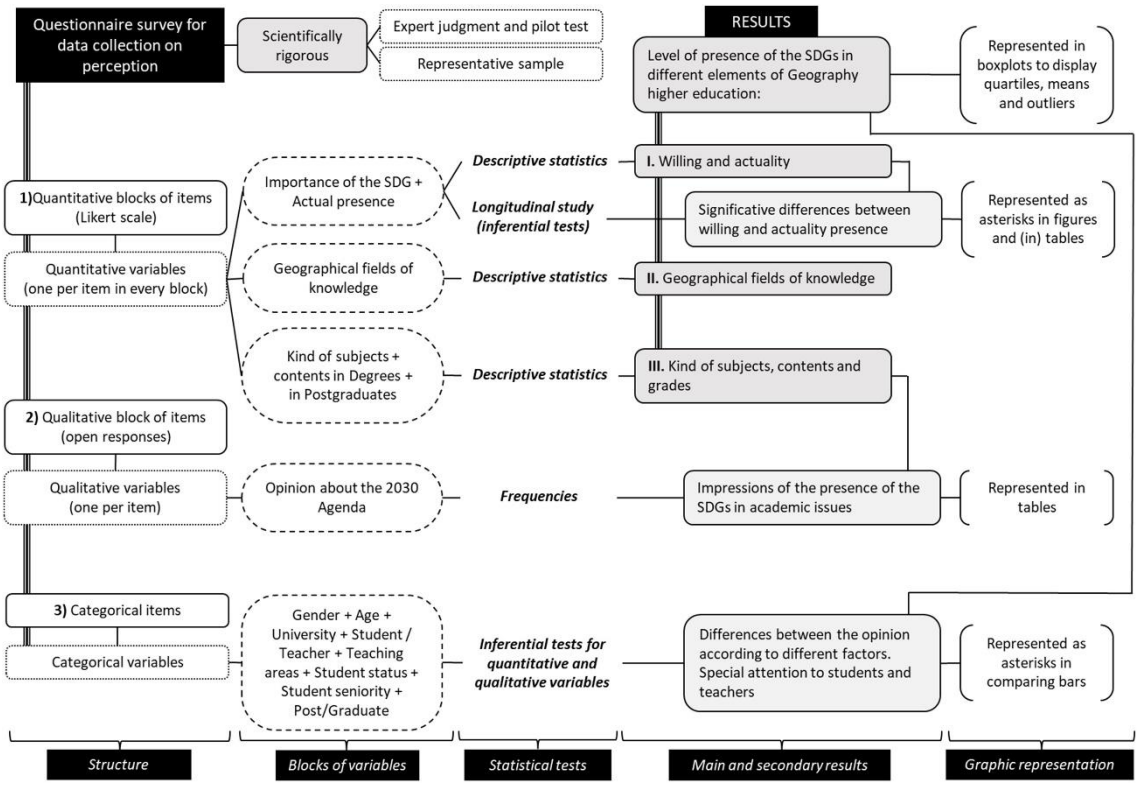

Fig. 1 Methodological diagram for the research approach. Source: Authors' own creation

4. Results

4.1. Presence of every SDG in Geography higher education

As can be observed in Fig. 2, at least 75% of respondents consider that all the SDGs of the 2030 Agenda should have a high or very high academic presence in university geographic training, with 11 (Sustainable cities and communities) and 13 (Climate action) standing out, receiving very high scores. The values of the average presence given to the SDGs is always above 3 (out of 4), ranging from the minimum average score of 3.1 for 16 (Peace, justice, and strong institution) to the maximum average score of 3.8 for 13 (Climate action). However, when assessing the actual presence of the SDGs according to their experience, the respondents reduce their scores considerably in all of them. Only the SDGs 11 and 13 maintain a majority perception of a high actual presence (mean of 3.2). The worst rated are the SDG 2 (Zero hunger) and 14 (Life below water), with an average of around 2.0.

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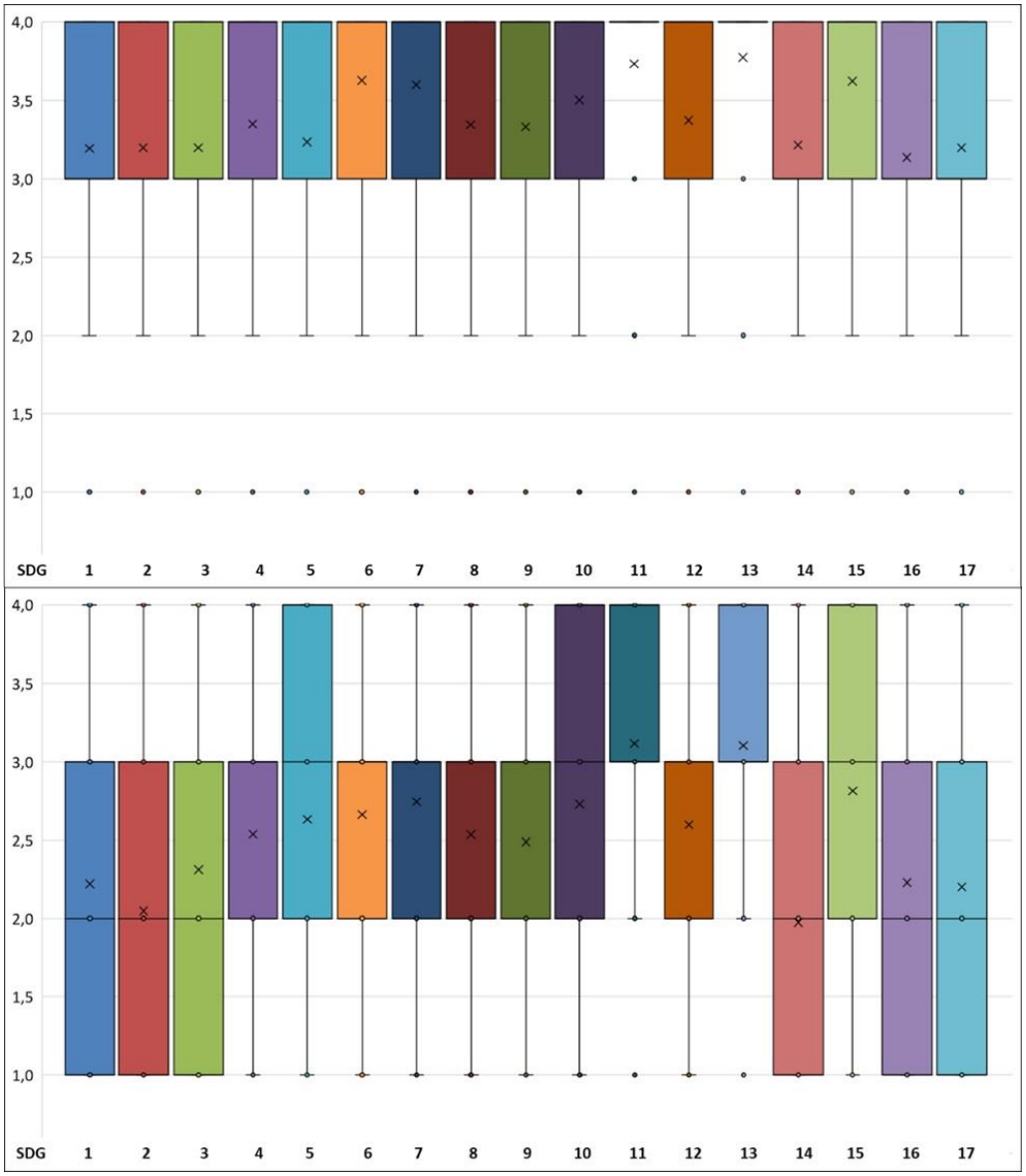

Fig. 2 Presence of every SDG in Geography higher education in a scale 1-4 (low-high). Above: willing presence. Below: real presence. Source: Authors' own creation

Fig. 3 shows that the perception of the presence of the SDGs in university geographic education drops so much with respect to the level considered adequate (around 1 point on average) that in all cases statistically significant differences are detected (with p-value < 0.05). The largest decreases, around 1.2 points on average, are recorded for SDG 2 (Zero hunger) and 14 (Life below water), which were already among those with the least expected presence (although with high values) and are now recognized as having little academic presence. The smallest decreases, although statistically significant, are around 0.6 points on average and correspond to SDG 5 (Gender equality) and 11 (Sustainable cities and

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communities). The latter is noteworthy for having obtained the highest value in both its expectation and its actual final presence (very high and high, respectively).

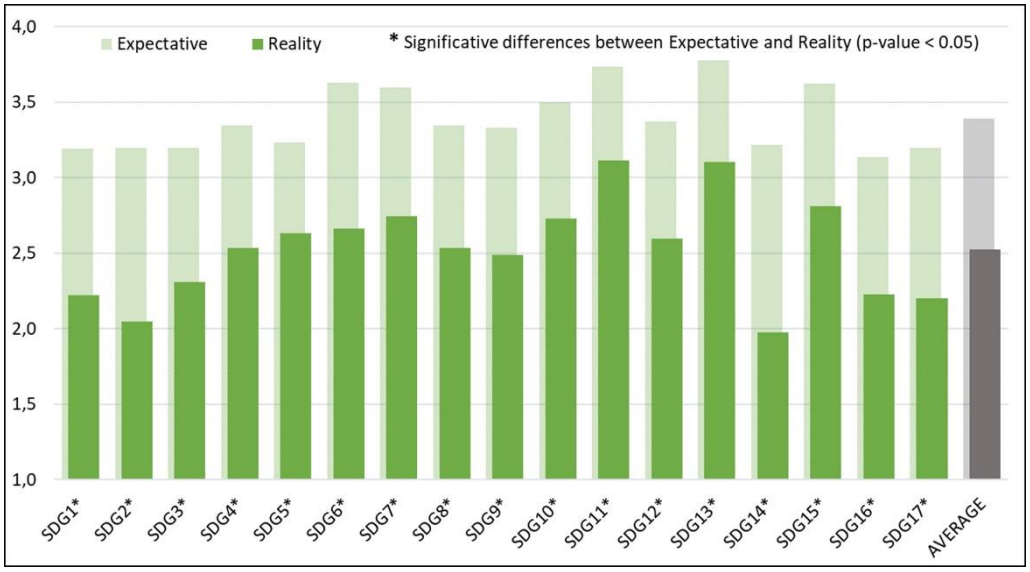

Fig. 3 Statistical differences between the average willing presence of every SDG in Geography higher education (expectative) and the real perceived one (reality) in a scale 1-4 (low-high). SDG codes are detailed in Fig. 2. Source: Authors' own creation

Not all of the educational community displays the same patterns in their responses when assessing the presence of the SDGs. In fact, there are statistically significant differences between teachers and students with respect to the expected and experienced presence of several of them (Fig. 4). In general, teachers give higher scores, both in expectation and reality. This is the case, with significant differences, for the desired presence of SDGs 1, 5, 8, 10, 11 and 13. SDG 14 (Life below water) is the only one for which students would like a significantly higher presence than teachers. A higher rating by students with significant differences is more frequent in the perception of what actually occurs. Only SDGs 1 and 10 maintain the same pattern as in the expectation of higher significant ratings by teachers. SDG 4 is also scored higher by teachers, but with significant differences only in reality.

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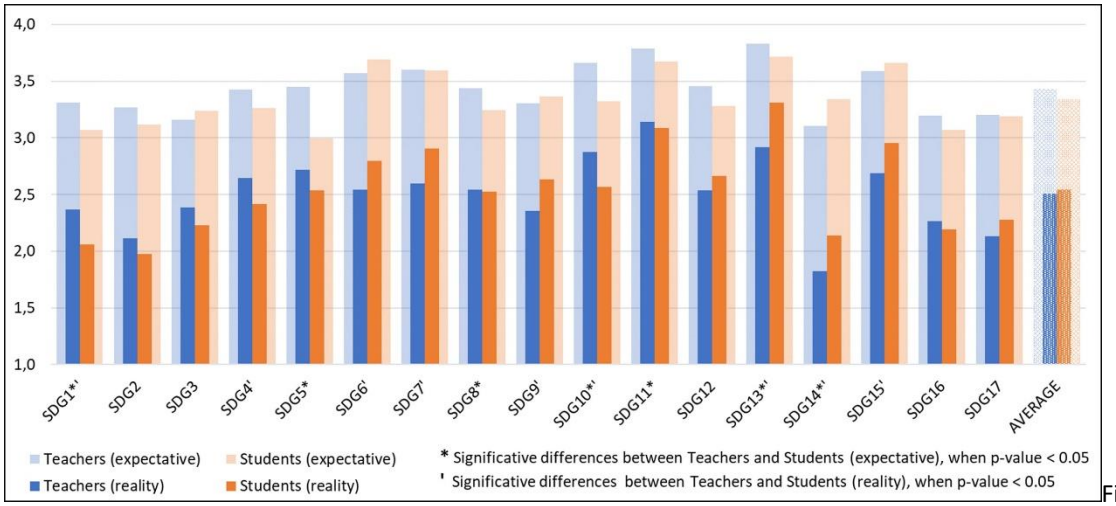

Fig. 4 Statistical differences between the average willing presence of every SDG in Geography higher education (expectative) and the real perceived one (reality) regarding teachers and students in a scale 1-4 (low-high). SDG codes are detailed in Fig. 2. Source: Authors' own creation

The age of the respondents also generates statistically significant differences in several of the SDGs where there are differences between students and teachers, both in expectation and reality (Table IV), and also following the same pattern (younger ages as students versus older ages as teachers). In terms of gender, it is noteworthy that significant differences are found in SDGs 4 and 5, both in expectation and reality, as well as in SDG 12 in expectation (Table IV), with women giving higher scores.

Table IV SDG where statistical differences have been found between the groups of some classification variables. Source: Authors' own creation

Classification variable	SDG (expectative)	SDG (reality)
Age	1, 5, 10, 11, 14	7, 13, 14
Genre	4, 5, 12	4, 5
Teaching areas	1, 4, 10, 11	1, 3, 5, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17
Student status	4, 10	1, 2, 3, 4, 5, 8, 9, 16, 17
Year of commencement of studies	-	-

With respect to the teachers' field of expertise, significant differences are found in the score of the SDGs that are perceived as more specific to a given field. SDGs 1, 3, 8 or 10, which are more linked to humanistic research, are less valued by Physical Geography teachers, who give higher scores to others, such as 14 and 15, which are more environmentalists. Among the students, statistically significant differences were found in most of the SDGs in accordance with whether they are still in training or are former graduates, always with higher scores given by students who are still active. No statistically significant differences were found for the year of commencement of studies.

4.2. Importance of the Agenda 2030 in geographical fields of knowledge

Knowledge about the level of presence that the university community believes the SDGs should have in university geographic education is enriched by breaking it down into different epistemological fields. Of the seven fields, there is a perception of a high presence of the SDGs in four, compared to the three that have been scored with moderate levels: Geographic Information Technologies, Descriptive Geography and Foundations of Geography (Fig. 5).

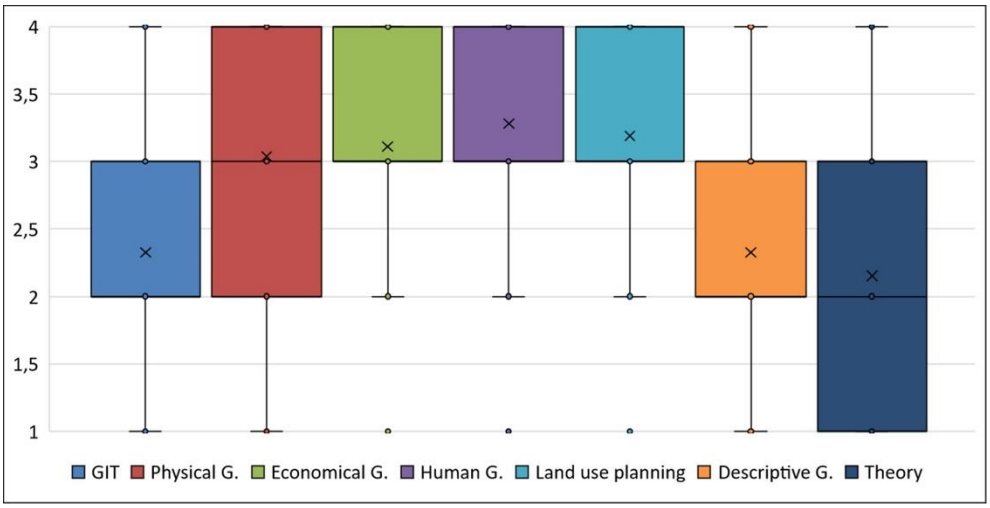

Fig. 5 The importance of the Agenda 2030 in geographical fields of knowledge in a scale 1-4 (low-high). Source: Authors' own creation

Students always score lower than teachers, and they do so significantly in all epistemological domains except for two of the lowest rated: GIT and Theory (Fig. 6). Despite the differences, the scoring patterns are equivalent. By age group, the responses maintain the same statistical trends, with significant differences between younger respondents and others. Statistically significant differences were not found in terms of the area of expertise of the teachers, student status, the year of the commencement of studies, or gender.

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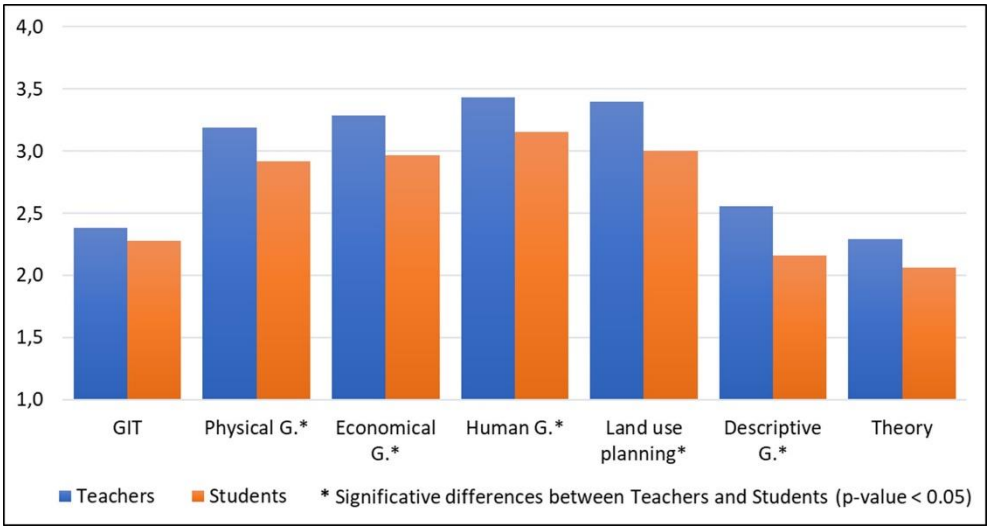

Fig. 6 Statistical differences between the average presence of the SDGs in Geography fields of knowledge regarding teachers and students in a scale 1-4 (low-high). Source: Authors' own creation

4.3. SDG management in degrees and postgraduates

Not referring to training in general but alluding to undergraduate and postgraduate degrees and kind of subjects and curricular content also provides more detailed information on the presence of the SDGs in university geographic education (Fig. 7). In fact, an important difference is observed between the valuation of compulsory and optional subjects, with the latter being considered as having a high presence of SDGs compared to the former, which are mostly regarded as having a moderate presence. With respect to the types of content in the undergraduate courses, there is not a wide range of scores in the assessment, with the presence of the SDGs being considered moderate in all cases, although slightly lower in practical contents and higher in ethical contents. In postgraduate courses, the evaluation is similar in theoretical and practical contents, but not in ethics, where the average is lower by around half a point. In any case, this is still a moderate evaluation. Finally, considering the classification variables of the respondents, the only statistically significant difference to be highlighted is the one found between students and teachers in the evaluation of optional subjects: students rate them lower, but they also rate the compulsory subjects lower, with no significant differences.

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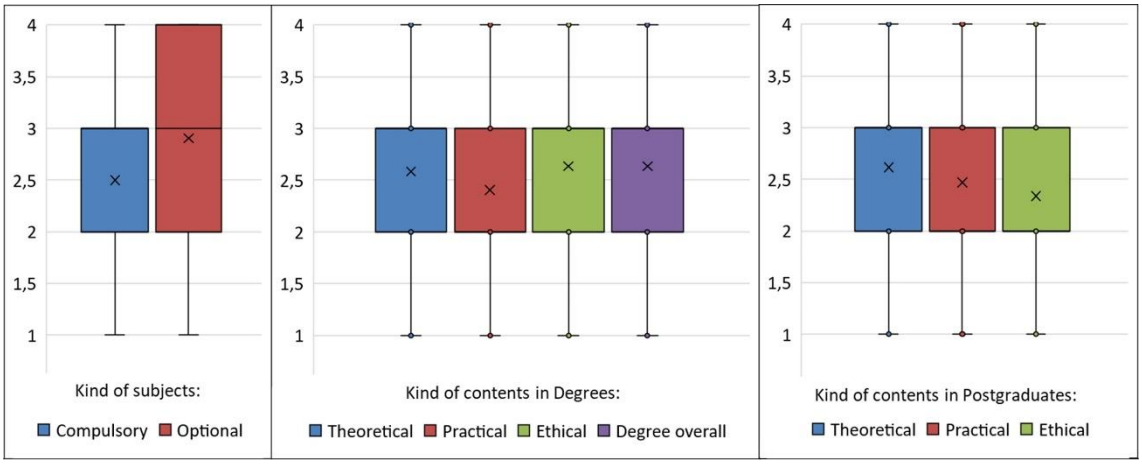

Fig. 7 Presence of the SDGs regarding kind of subjects (left), kind of contents in Degrees (center) and kind of contents in Postgraduates (right) in a scale 1-4 (low-high). Source: Authors' own creation

Forty percent of the respondents used the opportunity to qualitatively express their opinion on the adequacy of the contents of the degree in terms of the 2030 Agenda, from both an academic and professional point of view (Table V). Of this percentage, 34% demand a greater presence of procedural contents related to the SDGs, highlighting the incorporation of more practical content with case studies and field work in the context of the 2030 Agenda and the enhancement of GIT at the service of the SDGs. Next, 28.1% believe that conceptual content on sustainability should be enhanced, especially with respect to current social responsibility topics such as global change, the circular economy, food security, geopolitical conflicts or social participation systems. A greater importance of attitudinal contents is only called for by 8% of the respondents who express their opinion, in relation to incorporating a transversal ethical background of sustainability and critical thinking throughout the degree. However, the opinion of most of the respondents (40%) is directed towards a better integration of the contents, through the "sustainability" of the curriculum, with the inclusion of competences in sustainability, the creation of a specific subject, the teaching of seminars and workshops, service-learning experiences and greater training and experimentation in development cooperation.

Table V Categorization of opinions on the adequacy of contents from Degrees in Geography in terms of the Agenda 2030. Source: Authors' own creation

Kind of contents	Categorized opinion	% Opinion	respondents
All	Sustainability of the curriculum (competencies and contents)	21.1	39.8
	Service-learning experiences and external development cooperation internships	10.9	

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	Specific subject and seminars and workshops	7.8	
Procedural	Creative and related practices, through case studies, field work and communication and transfer experiences	18.0	34.4
	GIT in the service of the SDGs	12.5	
	More business linkage	3.9	
Conceptual	Current social responsibility issues	16.4	28.1
	Explicit theory on territorial sustainability	5.5	
	Legal/administrative training in sustainability	3.9	
	Others (more environmentalist vision, languages...)	2.3	
Attitudinal	Cross-cutting ethical background of sustainability and critical thinking	7.8	7.8
No contribution	Criticism of the 2030 Agenda	5.5	10.2
	Inability to express an opinion	4.7	

On the other hand, when the respondents expressed their opinion on the importance of the 2030 Agenda itself and its relationship with Geography (Table VI), it is noteworthy that 34% recognize it as a very important milestone and with great potential in Geography, although without specifying in what way, compared to 53% of the respondents who do express proposals, in line with the previous considerations: sustainability of the curriculum and teacher training, thematic updating to global change and more practical content. It is noteworthy that up to 23% of the respondents make a negative assessment of the 2030 Agenda and its relationship with Geography, alluding that it is insufficient and late, as well as that it is in line with neoliberal policies.

Table VI Categorization of opinions on the importance of the 2030 Agenda and its relation to Geography. Source: Authors' own creation

Categorized opinion	**% Opinion respondents**
Negative or null valuation of the SDGs	22.5

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Recognition of its importance, without proposals or with regret about the road still to be traveled	34.2
Proposals based on the recognition of its importance (sustainability of the curriculum and teacher training, thematic updating to global change, more practical content, supervision...).	53.3

5. Discussion

There is consensus in the consideration of geography as a basic discipline in the study of sustainability (Žalėnienė and Pereira, 2021; Maude, 2022; Olcina, 2022), due to its holistic approach (Pitman, 2005; Meadows, 2020) and its capacity for synthesis (Demerit, 2009; Maude, 2022). In addition, its value as a sustainability science is based on the knowledge of the many factors involved in the Earth system that are manifested in modern research. However, these aspects, which are already visible in the research agenda, are still limited in teaching and this knowledge is not transmitted in the classroom. According to our results, a significantly greater academic presence of the SDGs in university geographic education would be desirable. There is a significant mismatch between what is researched ("what geographers do") and what is taught ("how future geographers are prepared").

Therefore, over the last decade, many researchers have addressed the need to update the discipline, which should be carried out at different levels:

1. Thematic, conceptual and methodological updating. Beginning with Castree's contribution in 2015, contemporary geography has advanced in the first of the levels, generating literature that addresses the most current aspects in an alternative and non-conformist way, which is also favorable to changes and the need for new models (Castree, 2015a, 2015b).

2. A Breakdown of the division between physical and human geography, which weakens the capacity for a global conception of the world and an openness to collaboration with other disciplines (Goudie, 2017).

3. The generation of current narratives that recognize the reality and changes of the moment, while generating alternatives (Harden, 2020).

4. The articulation of a discourse of its own, which helps society to perceive the discipline as useful and associated with sustainability (Castree *et al.*, 2022).

In Spain, the incorporation of the 2030 Agenda in the curricula is an opportunity to address the challenge of updating the discipline, as can be observed that the SDGs are addressed unequally. There are only two that have a high and very high presence both in expectation and reality. They are related to urban planning and climate, two hot topics in geography, with a long academic and research trajectory. Although a greater presence of SGDs would be desirable, there are some that in reality achieve only a medium presence. These are topics with a less extensive trajectory in geographic studies, such as zero hunger or underwater life, and their lower presence (or absence) is justified. But others do allude to issues with a geographical trajectory and these results are a wake-up call to their neglect, such as SDG 16 (peace, justice and institutions).

In general, teachers give higher scores, similarly to other studies that address the perception of teachers and students (Mínguez *et al.*, 2021). In this case they value positively the incorporation of the SDGs in university geographic education, perhaps because they know their expectations better, but precisely because of this they are also more critical than students when they value their actual presence. Among teachers, significantly different perceptions are observed depending on the area to which they belong, in keeping with the traditional division between social and environmental geographic researchers (De Miguel and Sebastián-López, 2022) with different conceptions. Among students, those who are still active are more idealistic and score better than those who have already graduated, whose worse scores may reflect discouragement in the face of the poor situation of the labor market in which they find themselves or which they are trying to access (Colegio de Geógrafos, 2018).

The university where they study and the year in which they started do not influence their answers, indicating that the situation is generalized and structural. Similarly, age does not influence the perception in a different way to the student-teacher binomial, nor does gender, exclusively in relation to the SDGs on education and gender equality. These are better scored by women, in expectation and reality. It seems that men are less aware and follow up less on education for equality and coeducation, from their systemic privileged position (Heras-Sevilla *et al.*, 2021).

Geography is a very broad discipline, so assessing the presence of the SDGs in geography training without referring to specific epistemological fields may be too ethereal. In this sense, it can be observed that GIT, a markedly procedural subject matter, is among the lowest rated, despite being the most innovative and most in-demand (Colegio de Geógrafos, 2018). This result is particularly relevant, since, in a context of global change where ethical training in sustainability is a priority, technological training, which can tend to dehumanization, should not be disconnected from a sustainability framework. Another poorly valued field is Descriptive Geography, traditionally limited to territorial diagnosis without critical proposals in line with the SDGs (Lucendo Monedero, 2016). The worst valued field is Theory, based on geographical thinking throughout history, rooted in nature and the human-environment relationship. At present it refers to sustainability, configuring a new framework of thought that, in this case, has reached research before didactic transfer (Lucendo Monedero, 2016). On the contrary, the fields in which, according to teachers and students, greater attention is paid to the SDGs are those that focus on specific elements of the territory, to which one SDG or another is more easily associated, such as Physical, Human and Economic Geography and Land Use Planning.

Academically, the presence of the SDGs is perceived more in optional subjects, of less importance in the curricula. Therefore, teachers usually have more freedom and margin to introduce ethical contents which are traditionally undervalued, and which are inherent to sustainability (Sureda-Negre *et al.*, 2014; Gusmão Caiado *et al.*, 2016). If the SDGs were regulated in the curricula in terms of the theoretical and practical contents in a more structured way, their presence in compulsory subjects would be greater, and therefore also their presence in the degrees, even more so considering that the offer of electives in Spanish Geography degrees is not usually high (Esparcia and Sánchez, 2012). In this sense, the contents in terms of the SDGs, of a theoretical, practical and attitudinal nature would go hand in hand in the teaching programs in an interdisciplinary and inter-scalar way (Yli-Panula *et al.*, 2019), with a balanced weight that they currently lack.

A slight imbalance in the treatment of the SDGs according to the type of content is also observed in postgraduate courses, this time being ethical content the worst valued. At this level, training is more professional-oriented, and it has not yet been understood that the new labor demands give more importance to the ethical framework of sustainability (Harden, 2020). This is where one of the possible problems of employability of geographers in the current framework

of the 2030 Agenda can be detected. The perception is quite homogeneous among the entire sample, although it can be seen that students generally score lower, showing that they are more critical than teachers, even though they share the sense of the assessments.

When respondents give their opinions freely, they confirm the idea that the SDGs have little theoretical and practical presence in the degrees and call for this to change due to ethical and professional reasons. Without expressly mentioning it and reaffirming it when they also ask for a greater integration of contents, they are demanding a "sustainabilitization" of the curriculum (Murga-Menoyo, 2015). This contemplates the development of competencies in sustainability: critical analysis, systemic reflection, collaborative decision-making and a sense of generational responsibility. Sustainability competencies can easily be channeled into geographic education in theoretical topics on global change and other more procedural ones such as fieldwork, case studies and GIT. Sustainability programming would also include workshops and even the creation of a subject of its own, as also suggested, in line with the subject about Education for Global Citizenship, which have already been introduced in educative programs all over the world (Sklad *et al.*, 2016).

Finally, the vast majority of respondents agree on the importance of the 2030 Agenda and a structural incorporation of sustainability education in the degrees. Most countries throughout the world are immersed in a new development framework, defined by the UN, beginning a few decades ago with the MDGs, now with the SDGs and in the future most probably with an update of the sustainability goals to achieve. Within this framework, as Murga-Menoyo (2015) states, the acquisition of competencies in sustainability is an urgent pedagogical task, so a form of education that makes this possible is required, and geography degrees offer great potential for transmitting knowledge on sustainability and the SDGs (Pretorius, 2018). Despite important limitations, essentially related to the fact that they reflect new forms of governmentality and policies aligned with the processes of neoliberalism, as expressed by some respondents, it must be recognized that the SDGs have contributed to lifting more than one billion people out of extreme poverty (Liverman, 2018) and that they establish the guidelines for territorial management, with the high level of professional involvement of geographers. Therefore, an important opportunity cost for the degrees is detected (Harden, 2012). In the new era of the Anthropocene, the SDGs can be key elements to adapt geography higher education to the labor market and the consolidated framework of social responsibility around sustainability.

6. Conclusion

The results of this research reflect that teachers and students would prefer a significantly greater academic presence of the SDGs in university geographic education. According to the revision of the literature, this demand does not seem to be just trendy, but literally necessary: (i) it is essential in the training of future professionals in the Anthropocene to ensure anticipation to global changes, providing updated knowledge, skills, methodologies and competencies, and an ethical background; and (ii) it would improve the image that geography projects to society as a discipline of sustainability, and it would acquire more coherence and unity, breaking the traditional division between physical and human geography.

Students are more critical when they have finished the degree and are discouraged by the labor market. Teachers tend to deeply demand the implementation of the Agenda 2030, highlighting specific SDGs regarding their teaching areas. The most noteworthy ones are SDG 11 (cities) and 13 (climate), which correspond to two hot topics in Geography.

However, other hot topics like the study of institutions (SDG 16) are poorly assessed while highly desired. This problem is also observed for leading geographic areas like GIT. Indeed, SDGs are more present in optional subjects. So, the authors can determinedly conclude that academic programs could improve in terms of sustainability, especially regarding the core subjects, and the potential in Geography degrees is huge.

There is a need to "sustain" the curriculum, which is confirmed by the opinions expressed in the open comment section of the questionnaire by the respondents. The sustainability framework is highly valued, despite some minor critics to UN as a neoliberal organism. Moreover, the lack and desire of sustainability is a structural situation in Spain, as there are not significant differences between universities. Although the study sample is significant and it refers to a whole country, the study methodology could be replicated in other countries to determine the global extension of the results of this research.

The current "Anthropocene" epoch has witnessed an imbalanced global change, but it is an opportunity to design a better and sustainable future. As Geography pretends to be a science of sustainability, future geographers must be trained with sustainability criteria, in terms of students' professional competences to overcome crisis situations and ethical responsibility. This paper demonstrates that students and teachers consider that geography higher education students are not fully prepared to address the challenges of global change, but they could be, mainly if curricula were made "sustainable". This seems completely feasible for geography higher education.

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