D4.8 Report on Strategic Mapping of current available higher education programmes and products on climate change issues

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Key takeaway messages

- Education has been emerging as a key tool in supporting the implementation of the UN's Agenda 2030, and higher education has been taking centre stage with higher education institutions now seen as fundamental in delivering the UN's SDGs through their education, research and service activities, as well as via their ability to convene multiple stakeholders, something that is particularly strong in Europe.
- As the concept of sustainable development emerged as a recognized academic field, sustainability-related degree programmes have proliferated rapidly among higher education institutions and sustainability literacy is therefore quickly emerging as a trend in Europe and rooted on the updating of existing programme curricula and the setting up on new dedicated degree programmes (MSc and PhD).
- The geographical distribution of dedicated sustainability-related MSc and PhD programmes across Europe presents a marked concentration in Western and North followed by the South, with a clear gap in Eastern Europe and outside the EU.
- An evolution in the mobilization of European higher education institutions towards the concepts of sustainability and sustainable development, and their integration and diffusion in MSc and PhD degree programmes is visible. It remains unclear if that mobilization is extended to all regions and countries in Europe or if it remains concentrated in a small number of countries, whose higher education systems can adjust faster to this emerging trend.

Summary

Over the past two decades, the United Nations (UN) has been mobilizing the world community to tackle a wide range of global problems and to promote a global improvement in the quality of life, via two interrelated phases of its flagship development project: the Millennium Development Goals (MDGs, 2001-2015) and the Sustainable Development Goals (SDGs, 2015-2030). While pursuing its aims, the UN has placed education at the heart of its strategy to promote sustainable development, including thought a dedicated SDG 4 that focus on a more holistic approach to education and sustainability, with a specific target that aims to ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, by 2030. Since education has been emerging as a key tool in supporting the implementation of the UN's Agenda 2030, higher education has been taking centre stage in its educational targets. As the top of the education pyramid, higher education institutions are now seen as fundamental in delivering the UN's SDGs through their education, research and service activities, as well as via their ability to convene multiple stakeholders, something that is particularly strong in Europe. The European Higher Education Area (EHEA) and the Bologna Process aim to make higher education systems across Europe coherent, cohesive and comparable, and together are often consider the largest and most influential higher education project in the world, with an influence that has been felt well beyond Europe. As the concept of sustainable development emerged as a recognized academic field, sustainability-related degree programmes have proliferated rapidly among higher education institutions and sustainability literacy is therefore quickly emerging as a trend in Europe and globally, rooted on the updating of existing programme curricula but also on the setting up on new dedicated degree programmes (MSc and PhD). The main objective of this report was to produce a first strategic mapping and characterization of the dedicated higher education academic offer on sustainability-related degree programmes (MSc and PhD) in Europe. The method used in this strategic mapping was a desk review of secondary data sources on higher education degree programmes complemented with a survey of MAGICA partners on additional sources of information. The review consisted of 3 steps: 1) sampling of freely available secondary data sources, 2) search, extraction and collection of data, and 3) quality control, analysis and mapping of data. Data gathered totalled 2173 dedicated higher education sustainability-related degree programmes in Europe, in 2024, including 1921 MSc programmes and 252 PhD programmes. Results show that the geographical distribution of dedicated sustainability-related MSc and PhD programmes across Europe presents a marked concentration in Western and North followed by the South, with a clear gap in Eastern Europe and outside the EU. Additionally, results show that there is, to some extent, an evolution in the mobilization of European higher education institutions towards the concepts of sustainability and sustainable development, and their integration and diffusion in MSc and PhD degree programmes. However, it remains unclear if that mobilization is extended to all regions and countries in Europe or, on the other hand, still concentrated in a small number of countries, whose higher education systems can adjust faster to this emerging trend.

List of abbreviations

Acronym	Full name
AI	Artificial Intelligence
EC	European Commission
EEA	European Environment Agency
EHEA	European Higher Education Area
EU	European Union
ERASMUS+	EuRopean Community Action Scheme for the Mobility of University Students
MDGs	Millennium Development Goals
MSc	Master of Science
PhD	Doctor of Philosophy
SDGs	Sustainable Development Goals
SRIA	Strategic Research and Innovation Agenda
UN	United Nations

1   Introduction

Since its original appearance in the 1987 Brundtland Report (WCED, 1987), the concept of sustainable development has acquired the status of near hegemonic reference for scientific research on the environment and economic development. Often used as synonyms, the concepts of sustainable development and sustainability have been incorporated into global treaties, international protocols and national laws, and have become the foundational framing of conceptual approaches such as the green economy and circular economy (Ruggerio, 2021). Defined as the "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987), sustainable development (and to a greater extent sustainability) has become a common-sense notion for a large proportion of the world's population and is commonly used in environmental-defence and political slogans (Ruggerio, 2021). Additionally, sustainable development and sustainability, which are often considered synonyms, serve as the theoretical reference for multiple other research and policy concepts of major environmental importance such as global change, climate change, resilience and transition.

Over the past two decades, the United Nations (UN) has been mobilizing the world community to tackle a wide range of global problems and to promote a global improvement in the quality of life, via two interrelated phases of its flagship development project: the Millennium Development Goals (MDGs, 2001-2015) and the Sustainable Development Goals (SDGs, 2015-2030) (UN, 2015). The need for a more sustainable and fairer world has been at the centrepiece of these development projects, leading to a growing application of the concepts of sustainable development and sustainability. To achieve that, a full mobilization of global-to-local actors, across all areas and sectors, has been promoted to tackle major socio-ecological problems that threaten planetary and mankind's wellbeing. This endeavour is currently framed under the UN Agenda 2030 (*Transforming our world: the 2030 Agenda for Sustainable Developmen*t) with its 17 SDGs (and 169 targets) representing the goals and ambition this universal Agenda (UN, 2015).

While pursuing its aims, the UN has placed education at the heart of its strategy to promote sustainable development, including the definition of 2005-2014 as the *UN Decade for Education for Sustainable Development* (Landorf et al., 2008; Unterhalter, 2014), and later by dedicating the 4th SDG to *Quality Education* (Annan-Diab & Molinari, 2017). This process was also supported at the civil society level, including higher education institutions, which called all governments to give priority to process that develop and strengthen education for sustainable development (Davis et al., 2008). While the MDGs focused primarily on achieving universal primary education (Heleta & Bagus, 2021), the SDGs focus on a more holistic approach to education and sustainability, including a specific aim in SDG 4 that reads:

By 2030, ensure that all learners acquire the knowledge and skills needed to promote sustainable development, including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship and appreciation of cultural diversity and of culture's contribution to sustainable development (UN, 2015).

This specific aim is complemented with several targets and indicators that support the continuous monitoring of SDG 4, including measuring and assessing the quality of education. Particularly, target 4.3 is of special interest to higher education efforts by stating that *equal access*

for all women and men to affordable and quality technical, vocational and tertiary education, including university should be assured by 2030[1].

In line with the evolution of the UN's global development project, education has been emerging as a key tool in supporting the implementation of the UN's Agenda 2030 (Abad-Segura & González-Zamar, 2021; Kushnir et al., 2024; Kushnir & Nunes, 2022; Lim et al., 2022). Particularly, higher education has been taking centre stage in educational targets. As the top of the education pyramid, higher education institutions[2] are now seen as fundamental in delivering the UN's SDGs through their education, research and service activities, as well as via their ability to convene multiple stakeholders (Aleixo et al., 2018; Findler et al., 2019; Günther et al., 2022; Ritchie-Dunham et al., 2023).

However, higher education has itself changed dramatically over the past decades with increasing enrolment, mobility, course offer, demand dynamics and links to research and innovation. Approximately 254 million students are enrolled in universities globally – a number that has more than doubled in the past couple of decades – and is set to continue expanding. Yet despite growing demand, including for international mobility education, significantly large differences between countries and regions remain[3].

In Europe, and in parallel to the UN sustainable development dynamics, the European Higher Education Area (EHEA)[4] started with the Sorbonne Declaration of 1998 and the Bologna Declaration of 1999[5], that established the Bologna Process[6]. The Bologna Process aimed to make higher education systems across Europe coherent, cohesive and comparable, and currently includes 49 active countries plus the European Commission (EC)[7]. This has been by far the largest and most influential higher education project in the world, with an influence that has been felt well beyond Europe (Kushnir et al., 2024).

Although the notion of sustainable development is not totally novel to the EHEA and to European higher education institutions, a formal incorporation into its objectives can be traced back to the 2001 Prague Ministerial Communique of the EHEA, that adopted the EU goal of becoming "the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion" (Kushnir et al., 2024). However, the sustainability (or sustainable development) discourse has only recently been incorporated into European higher education policies, such as those reflected in the EHEA and partaking institutions (Kushnir et al., 2024; Kushnir & Nunes, 2022), as well as in higher education policies in other regions of the world (Heleta & Bagus, 2021). Additionally, higher education institutional commitment to sustainability still shows strong linkages with the signature of a declaration, charter, or initiative, with the literature suggesting that such a signing is usually tied to academic leadership commitments (Lozano et al., 2015).

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[1] https://sdgs.un.org/goals/goal4#targets_and_indicators
[2] https://www.whed.net/home.php
[3] https://www.unesco.org/en/higher-education/need-know
[4] https://www.ehea.info/index.php
[5] https://www.ehea.info/page-ministerial-declarations-and-communiques
[6] https://education.ec.europa.eu/education-levels/higher-education/inclusive-and-connected-higher-education/bologna-process
[7] https://www.ehea.info/page-members

As the concept of sustainable development emerged as a recognized academic field, sustainability-related degree programmes have proliferated rapidly among higher education institutions in Europe (Aleixo et al., 2018; Farinha et al., 2018; Krah et al., 2021; Obrecht et al., 2022; Ritchie-Dunham et al., 2023) and across the world (Alkaher & Avissar, 2018; Boarin & Martinez-Molina, 2022; Cavalcanti-Bandos et al., 2021; Etse & Ingley, 2016; Gamage et al., 2022; Membrillo-Hernández et al., 2021; Mokski et al., 2023; O'Byrne et al., 2015; Ritchie-Dunham et al., 2023; Semeraro & Boyd, 2017).

Higher education for sustainable development and sustainability literacy is therefore quickly emerging as a trend in Europe and globally, rooted on the updating of existing programme curricula but also on the setting up on new dedicated degree programmes (MSc and PhD). Although many of these programmes are focused on STEM (Science, Technology, Engineering, and Mathematics) topics, a recent surge across social science and humanities (SSH), makes the trend transversal across most higher education national systems. Furthermore, along with the setting up of new academic curricula, this approach is reinforced by multiple additional dedicated academic resources, such as scientific journals[8], associations[9], initiatives[10], conferences and other forums[11]. The further inclusion of sustainability-related topics is some of the major scientific journals on education, science education, pedagogy and higher education policy[12], seems to promote the additional strengthening and growing importance of these academic fields across the EHEA.

Undergoing a still expanding offer across many European countries, often connected to the research foci of higher education institutions and supported by EHEA mechanisms such as the learning mobility ERASMUS+ programme[13] set up in 1897, it is expected that this growing trend of incorporation of sustainability-related topics into European higher education continues over the coming years. In addition, a surge in international, multi-university programmes has been observed in recent years, further expanding the offer in the area. All these developments make tracking the number and quality of sustainability-related degree programmes (MSc and PhD) in Europe a difficult task.

It was against this background, and in line with the goal of MAGICA of engaging European science-education-policy actors and fostering dialogue opportunities that address younger generations, that task 4.3.1 set out to produce a strategic mapping of currently available dedicated sustainability-related higher education programmes (MSc and PhD) in Europe.

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[8] As for example, the International Journal of Sustainability in Higher Education (https://www.emeraldgrouppublishing.com/journal/ijshe).

[9] As for example, the US Association for the Advancement of Sustainability in Higher Education (https://www.aashe.org/)

[10] As for example, the UN Higher Education Sustainability Initiative (https://sdgs.un.org/HESI).

[11] As for example, the Sustainability in Higher Education Conference (https://sustainability.unisg.ch/news/sustainability-in-higher-education-conference/), the Global Conference on Sustainability in Higher Education (https://www.aashe.org/conference/), and the HESI Global Forum (https://sdgs.un.org/HESI/2023GlobalForum).

[12] As for example, Higher Education - International Journal of Higher Education Research (https://link.springer.com/journal/10734), Review of Educational Research (https://journals.sagepub.com/home/rer), and the Journal of Research in Science Teaching (https://onlinelibrary.wiley.com/journal/10982736).

[13] https://erasmus-plus.ec.europa.eu/

The main objective of this report is to produce a first strategic mapping and characterization of the dedicated higher education academic offer on sustainability-related degree programmes (MSc and PhD) in Europe[14].

Additionally, and in line with the MAGICA remit, this report seeks to contribute to the setting up of research-policy agendas, such as the MAGICA Strategic Research and Innovation Agenda (SRIA)[15] and to support future developments in the setting up of sustainability-related academic degrees in, inter alia, the EHEA and the ERASMUS+ programmes.

The number of studies that have reviewed and analysed higher education institutions and programmes and their relation to sustainability-related topics has grown recently[16]. However, these have focused either on understanding how national study programmes incorporate sustainability topics in their contents and resources (Aleixo et al., 2018; Obrecht et al., 2022) or on mapping the evolution and global trends of those integration processes, typically through bibliometric and literature reviews (Abad-Segura & González-Zamar, 2021; Findler et al., 2019; Lim et al., 2022; Serafini et al., 2022).

Therefore, and while recognizing that a review of such a broad field is necessarily incomplete, to the best of our knowledge, this MAGICA report represents a primer about the offer of dedicated sustainability-related higher education degree programmes in Europe. It also represents the first to specifically cover such a wide range of interrelated academic fields, including global change, climate change, resilience and transition, among others. Additionally, this study is also the first to cover actual existing MSc and PhD programmes, as it is not a bibliometric academic analysis of the topic.

Because a wide thematical scope was covered in this study, choices had to be taken as to what (and how) to search for, when screening for sustainability-related degree programmes. Table 1 below details the initial list of concepts and academic topics covered in this report, under the broader definition of sustainability and sustainable development, hereinafter treated as synonyms for simplification. The choice of concepts and topics was agreed internally, after consultation with MAGICA partners. The application of these topics in the actual searching of available MSc and PhD programmes is described in more detail in section 2 (methods).

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[14] Europe in the context of this report means the wider European area, which goes beyond the EU-27 and includes all countries of the commonly accepted 'geographical' definition of Europe as a continent. For more information check section 2 – methods.

[15] For further information check MAGICA Deliverable D3.1 - Report on Stock Taking and prioritisation of research and innovation needs and foreseen synergies.

[16] A quick ad-hoc query (July 2024) on the Web of Science, using the search keywords "sustainab*" (title) and "higher education institutions" (title) yielded 261 publications in the last 10 years (2015-2024), including 22 review papers published in the last 6 years (2019-2024). Please note that it is beyond the scope of this report to produce an in-depth analysis of this literature.

Table 1: List of key concept and academic topics covered, under the broader definition of sustainability. Key topics where the basis of the screening of dedicated sustainability-related higher education degree programmes in Europe.

Sustainability (key concept)	Sustainable development (key academic topic)
Climate change	Climate adaptation
	Climate mitigation
	Climate risk
	Decarbonisation
	Geoengineering
Global change	
Energy	Energy transition
	Renewable energy
	Sustainable energy
Environment	Environmental risk
	Environmental policy
Resilience	Climate resilience
	Resilience
Transition	Social transformation

This report is structured in 5 sections. This first introductory section set ups the contexts of how sustainability-related higher education degree programmes have been evolving in Europe and globally and details the objectives of the study. Section 2 presents the methodology used in this study, including the geographical scope, and the sampling, search, collection, quality control and mapping procedures that were followed. Major results of the study are described in section 3. Section 4, presents the analysis and discussion of results obtained, reflects on major uncertainties and knowledge gaps associated with the study and concludes, presenting the major findings of this report.

2   Methods

2.1   Scope and study area

After an initial consultation within the MAGICA project and given the topic of analysis, it was decided that the scope of this study should use a broad definition of Europe and go beyond the 27 EU member-states. Therefore, this strategic mapping includes all the current members and cooperating countries of the European Environment Agency (EEA)[17], plus other European members of the Council of Europe[18], and other remaining countries in the geographical definition of Europe. In total, 46 countries were included in this mapping. The countries analysed are presented in table 2, according to their criteria for inclusion.

Table 2: Countries included in the strategic mapping, according to their criteria for inclusion.

EEA Member countries	EEA Cooperating countries	Council of Europe Member States	Geographical Europe
Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey	Albania, Bosnia and Herzegovina, Kosovo*, Montenegro, North Macedonia, Serbia	Andorra, Moldova, Monaco, San Marino, Ukraine, United Kingdom	Belarus**, Russia**

*All references to Kosovo, whether the territory, institutions or population, shall be understood in full compliance with United Nation's Security Council Resolution 1244 and without prejudice to the status of Kosovo.

**Following the decision of the Committee of Ministers on 16 March 2022, Belarus and the Russian Federation are no longer members of the Council of Europe.

2.2   Sampling, search, collection and analysis

The method used in this strategic mapping was a desk review of secondary data sources on higher education degree programmes (MSc and PhD), complemented with a short survey of MAGICA partners on additional sources of information. The review consisted of 3 steps: 1) sampling of freely available secondary data sources, 2) search, extraction and collection of data, and 3) quality control, analysis and mapping of data.

Important note: While recognizing that sustainability can be part of the curricula of any traditional degree programme (e.g., physics, biology, mathematics), especially in the STEM areas (e.g. engineering, life or earth sciences, among many other courses), the objective of the methodology applied in this study was to specifically extract information on dedicated (or mostly dedicated) higher education sustainability-related degree programmes. Dedicated (or mostly dedicated) programmes are considered all the programmes that have one or more of the selected keywords

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[17] https://www.eea.europa.eu/en/countries (Note: all 27 EU Member-states are part of the EEA)
[18] https://www.coe.int/en/web/about-us/our-member-states   14

related to sustainability and environmental topics in its title or, in particularly relevant cases, multiple keywords in another one of the search fields.

2.2.1 Step 1 – Sampling of data sources

Two complementary approaches were used to sample for freely available data sources: 1) online search for websites, portals and platforms that offer wide and freely available access to information on degree programmes available across the broader European area considered in the study; and 2) short consultation among MAGICA's partners, that explained the scope of the study and requested national or university-specific information (e.g. reports, websites from ministries or other institutions) in their respective countries.

Following an extensive online search conducted between February 2023 and May 2023 it was decided to restrict data collection to two major online sources of freely available degree programme information for Europe:

- Masterportal[19], for MSc programmes; and
- PhDportal[20], for PhD programmes.

During this investigation both websites have been included in a wider platform called Studyportals[21] but previously available information has been retained. Studyportals, is based in Eindhoven, the Netherlands, and describes itself as "an international study choice platform" that seeks to "help universities with easier and more effective international marketing and recruitment solutions". It was set up in 2007 as a spin-off from large international study associations, focusing on MSc programmes only. Since 2009, Studyportals BV is a private enterprise[22].

The consultation with MAGICA partners only yielded significant results for two countries, Finland and Sweden. Two websites were identified, and data was screened and later added to the global database, namely the Aalto University[23] (data later extracted on 15.02.2024) and the University Admissions.SE[24] (data later extracted on 16.02.2024). Regarding the Swedish University Admissions.SE website, no information about PhD degrees was available, only for MSc programmes.

2.2.2 Step 2 – Search, extraction and collection of data

Data search, extraction and collection from all online portals and platforms took place between December 2023 and April 2024. Fifteen keywords were defined to proceed with the screening and extraction of data. After some preliminary studies, using the longer list of concepts and academic topics described in table 2, these 12 keywords were considered as capturing the intended scope of the study. Table 3 presents the 12 search keywords and respective search queries used in this study, along with its relation to the initial concepts and academic topics (as described in the previous section Table 1).

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[19] https://www.mastersportal.com/
[20] https://www.phdportal.com/
[21] https://studyportals.com/
[22] https://studyportals.com/about-us/our-story/
[23] https://www.aalto.fi/en/study-options?search=
[24] https://www.universityadmissions.se/intl/start

Table 3: Keywords and search queries used in the search of information on dedicated sustainability-related higher education degree programmes in Europe.

Sustainability (Key concept)	Sustainable Development (Key academic topic)	Search keyword	Search and filter queries (and/or/"term")
Climate change	Climate change	Climate change	climat*; chang*
	Climate adaptation	Adaptation	climat*; adapt*
	Climate mitigation	Mitigation	climat*; mitigat*
	Climate risk	Climate risk	climat*; risk*
	Decarbonisation	-	CO_2; carbon*; net-zero
	Geoengineering	-	climat*; geological; geoengineering*
Global change		Global changes	chang*; global
Energy	Energy transition	Energy transition	energ*; sustainab*; transit*
	Renewable energy	Renewable energy	energ*; geoenerg*; renewabl*; sustainab*
	Innovation	Sustainable energy	energy*; sustainab*
Environment	Environmental risk	-	environment*; risk*;
	Environmental policy	Environmental policy	environment*; polic*;
Resilience		Climate resilience	climat*; resilien*
		Resilience	resilien*
Sustainability	Sustainability / Sustainable development	Sustainability / Sustainable development	sustainab*; develop*
Transition	Social transformation	-	transform*

The search in both the Masterportal and PhDportal web portals used the "programmes" tab and the filter "Europe" (in location). After an initial search two countries - Iceland and Norway - did not yield any results. Further inquiries suggested they should, so a new complementary search was carried out using 'programmes' tab but with the specific country location. Additionally, after this situation, the same procedure was carried out with all other countries to double-check and quality control the search results. For the Swedish portal supplied by the MAGICA partners, search was expanded by using the filters: "programmes" tab, "Master level" option and then selecting four additional settings, namely "Spring 2024"; "Summer 2024"; "Autumn 2024"; and "Spring 2025".

Finally, all search data was extracted using the Instant Data Scraper software (chrome extension version 1.1.9), from UAB Webrobots[25].

Information extracted included the following fields:

- Type of programme (MSc or PhD).

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[25] https://webrobots.io/

- Country (or main country).
- Institution.
- Programme or course title.
- Description (when available).
- Duration (when available).
- Keywords used.

2.2.3 Step 3 – Quality control, analysis and mapping of data

All information extracted was compiled into a single global database containing 8653 entries (7545 MSc and 1108 PhD programmes). In step 3, this database was checked for quality control since for multiple reasons (e.g., international programmes with multiple countries, missing information in the portals, extraction bugs, information on non-European countries, among others) many of the entries were repeated, or incomplete.

The objective was to construct a final database were each entry represented in a single course with a single institution (albeit sometimes representative of the main institution, in the case of international or multi-institution programmes). For some of the entries it was not possible to attribute a main country to the programme and, in these cases, the programme was registered under "multiple locations" and included in the database.

The following quality control and filtering procedures were followed:

a) Programmes with multiple entries were merged in a single entry per programme.
b) Programmes outside Europe were excluded.
c) Programmes that had any of the primary keywords in the programme title were selected for inclusion.
d) After manual verification, programmes with the following additional terms (or search queries) in the programmes title were selected for inclusion:
    o Carbon; CO_2; geological; disciplinary; net-zero; transform*;
    o Combinations of transformation*[agriculture; carbon; city; forest; green; mobility; urban].
e) After manual verification, programmes that contained 5 or more primary keywords in any of their original information fields were selected for inclusion.
f) After manual verification, any remaining programmes that were deem relevant, but which had not been selected in previous points, were selected for inclusion. Relevance was subjectively judged by the authors considering all individual information fields available for the programme.

All maps were created in QGIS (v3.32.2), using the shapefile World Administrative Boundaries: Countries and Territories, freely accessible from opendatasoft[26].

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[26] https://public.opendatasoft.com/explore/dataset/world-administrative-boundaries/export/

3   Results

3.1   Database analysis and mapping

Initial results of the methodology described in the previous sections yielded a global database that included a total of 8653 entries, including 7545 entries related to MSc programmes and 1108 to PhD programmes.

After the quality control and filtering procedures were applied, the final database includes a total offer of 2173 dedicated higher education sustainability-related degree programmes in Europe, in 2024. These include 1921 MSc programmes and 252 PhD programmes (see Table 4 and Annex I for a complete description).

Table 4: Dedicated higher education sustainability-related MSc and PhD programmes, number of higher education institutions and population, per European countries, in 2024 (Bold = EU Member States).

Countries (n=46)	MSc	PhD	Total	# of higher education institutions*	Population (2024)**
Albania	0	0	0	n/a	2,826,020
Andorra	0	0	0	1	77,000
Austria (EU)	**24**	**1**	**25**	**73**	**9,059,525**
Belarus	0	0	0	47	9,312,267
Belgium (EU)	**22**	**0**	**22**	**63**	**11,722,080**
Bosnia and Herzegovina	0	0	0	46	3,213,400
Bulgaria (EU)	**0**	**0**	**0**	**48**	**6,491,395**
Croatia (EU)	**3**	**0**	**3**	**43**	**3,834,781**
Cyprus (EU)	**9**	**1**	**10**	**n/a**	**1,266,124**
Czechia (EU)	**12**	**0**	**12**	**59**	**10,681,161**
Denmark (EU)	**38**	**1**	**39**	**26**	**5,899,808**
Estonia (EU)	**4**	**0**	**4**	**16**	**1,188,968**
Finland (EU)	**58**	**5**	**63**	**35**	**5,541,494**
France (EU)	**113**	**5**	**118**	**234**	**65,600,000**
Germany (EU)	**131**	**14**	**145**	**367**	**83,712,000**
Greece (EU)	**9**	**0**	**9**	**32**	**10,241,060**
Hungary (EU)	**5**	**1**	**6**	**42**	**9,664,626**
Iceland	7	0	7	7	381,688
Ireland (EU)	**72**	**0**	**72**	**29**	**5,427,366**
Italy (EU)	**114**	**18**	**132**	**86**	**58,935,691**
Kosovo	0	0	0	n/a	1,845,300
Latvia (EU)	**3**	**0**	**3**	**27**	**1,826,400**
Liechtenstein	0	0	0	3	39,993
Lithuania (EU)	**10**	**10**	**20**	**37**	**2,672,514**
Luxembourg (EU)	**2**	**0**	**2**	**1**	**665,123**
Malta (EU)	**2**	**0**	**2**	**6**	**525,285**
Moldova	0	0	0	21	2,564,562
Monaco	0	0	0	1	39,000

Countries (n=46)	MSc	PhD	Total	# of higher education institutions*	Population (2024)**
Montenegro	0	0	0	1	615,000
Multiple locations***	9	0	9	n/a	n/a
Netherlands (EU)	**103**	**12**	**115**	**54**	**17,656,585**
North Macedonia	0	0	0	16	1,821,108
Norway	46	1	47	29	5,507,331
Poland (EU)	**25**	**2**	**27**	**127**	**37,601,280**
Portugal (EU)	**15**	**8**	**23**	**92**	**10,274,751**
Romania (EU)	**1**	**0**	**1**	**78**	**19,205,000**
Russia	14	0	14	376	145,102,755
San Marino	0	0	0	1	34,000
Serbia	0	0	0	n/a	6,797,105
Slovakia (EU)	**1**	**0**	**1**	**32**	**5,445,324**
Slovenia (EU)	**2**	**1**	**3**	**21**	**2,109,314**
Spain (EU)	**43**	**8**	**51**	**75**	**46,566,073**
Sweden (EU)	**136**	**20**	**156**	**39**	**10,568,203**
Switzerland	0	1	1	23	8,857,899
Turkey	16	0	16	n/a	88,792,000
Ukraine	3	0	3	186	34,658,000
United Kingdom	869	143	1012	167	67,732,000
Total	**1921**	**252**	**2173**	**-**	**-**

* de Dosch (2021) based on UniRank[27] (2020).
* AI generated 2024 population estimates based on World Population Review[28]
*** For some of the entries it was not possible to attribute a main country to the programme and the programme was registered under "multiple locations".

From the 46 countries screened in this study, a total of 33 countries (72%) displays at least 1 MSc or PhD programme related to the search keywords. However, only 17 (37%) offer graduate programmes at both levels, i.e., MSc and PhD. Total variability is very large, with 3 countries with only 1 programme, 14 countries having less than 10 programmes and only 6 countries having over 100 programmes, including one, the UK, with over 1000 programmes (46% of the total number of programmes). In total, 13 countries (30%) still do not present any programmes in neither types of degrees: Albania, Andorra, Belarus, Bosnia and Herzegovina, Bulgaria, Kosovo, Liechtenstein, Moldova, Monaco, Montenegro, North Macedonia, San Marino and Serbia (see Figures 1 and 2). A more detailed discussion on the spread of results, implications for the field and possible uncertainties related to these results can be found in section 4. Considering only the EU, all Member States apart from Bulgaria have at least 1 programme represented in the analysis. Also, here the spread of results is significant, with Slovakia and Romania having a single MSc programme, while France (113), Germany (131), Italy (114), the Netherlands (103) and Sweden (136) having above 100 MSc programmes each. As expected, the spread in the number of PhD programmes across the EU is less significant, ranging from 1 (in Austria, Cyprus, Denmark, Hungary and Slovenia) to 20 (in Sweden). However, 11 EU Member States (41%) do not present any PhD programme in the area,

namely Belgium, Croatia, Czechia, Estonia, Greece, Ireland, Latvia, Luxembourg, Malta, Romania and Slovakia.
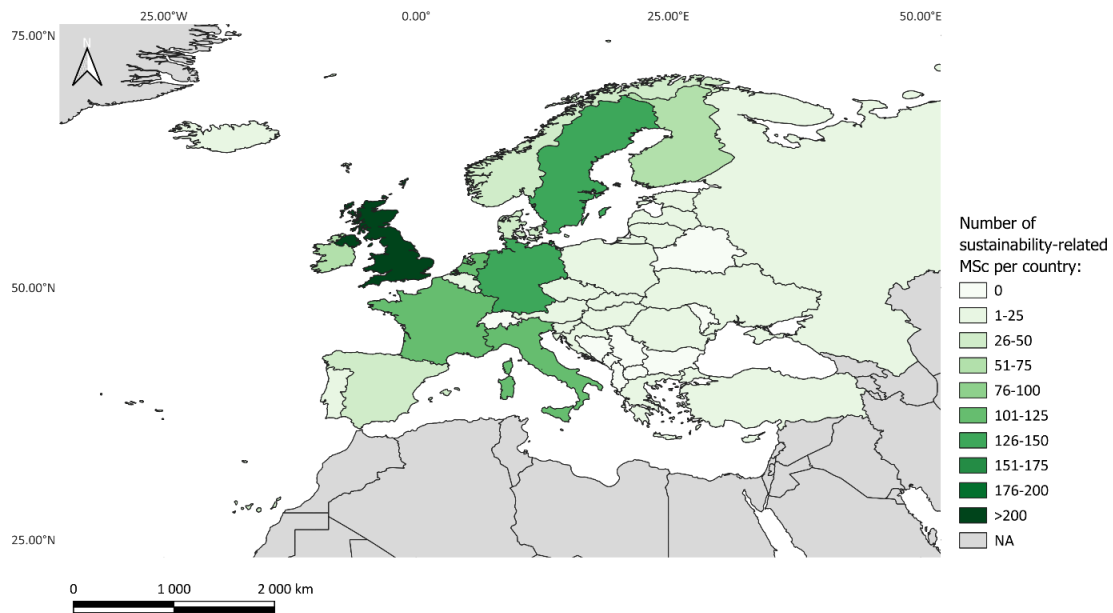

Figure 1: Distribution of the number of dedicated sustainability-related MSc degree programmes in Europe, per country, in 2024.
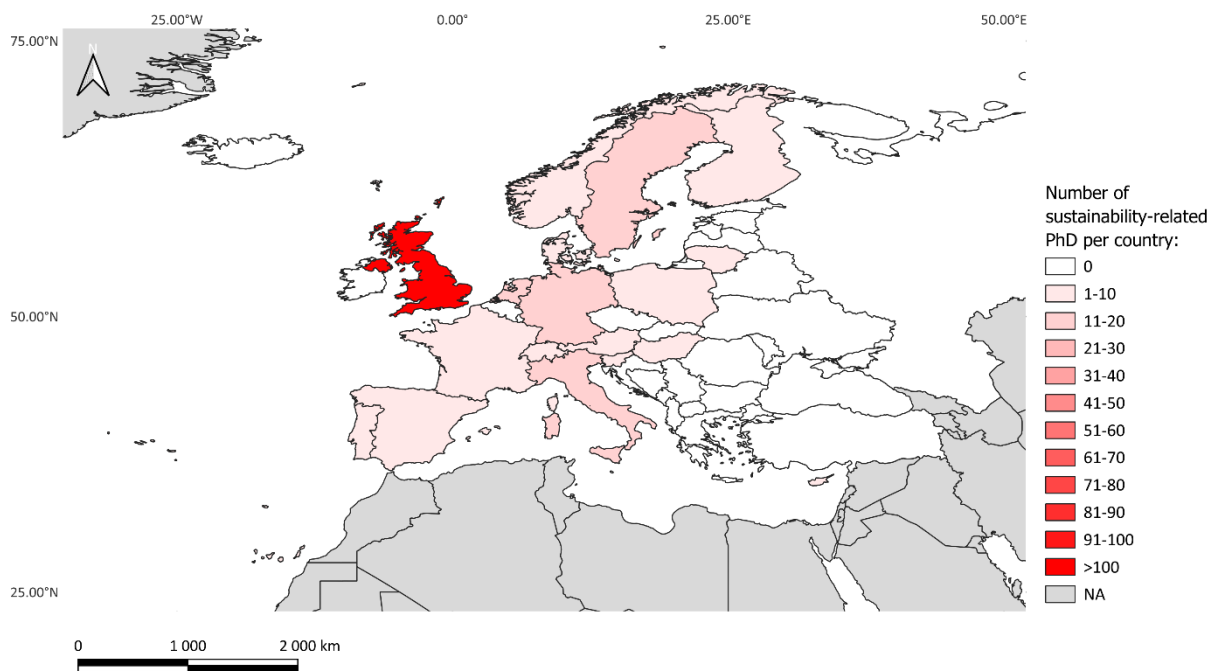

Figure 2: Distribution of the number of dedicated sustainability-related PhD degree programmes, in Europe, per country, in 2024.

Geographically, the distribution of sustainability-related MSc and PhD programmes across Europe presents a marked concentration in Western and North followed by the South, led by Italy where the number of both MSc and PhD programmes rivals those of France, Germany, the Netherlands and Sweden. A clear gap in Eastern Europe and outside the EU is visible in the results of this analysis.

In terms of keyword analysis, most results are related to sustainability/sustainable development (n=1776; MSc=1269, PhD=147) which is in line with the historical evolution, and diffusion across the EHEA, as described in section 1. Additionally, and since programmes can be classified with multiple keywords, it is expected that the broader concepts do appear more often in conjugation with other topics. Programmes under the keywords of climate change (n=558; MSc=495, PhD=63), global change (n=601; MSc=556; PhD=45) and environmental policy (n=463; MSc=421; PhD=42) also stand out as having a larger number of programmes, which can possibly be attributed to their larger conceptual scope, when compared for example, to more specific areas illustrated by related keywords such as Adaptation, Mitigation, Climate risk or Resilience. Finally, energy related keywords such as Renewable energy and Sustainable energy show strong presence in MSc programmes but not as significant at the PhD programme level (see Figure 3).
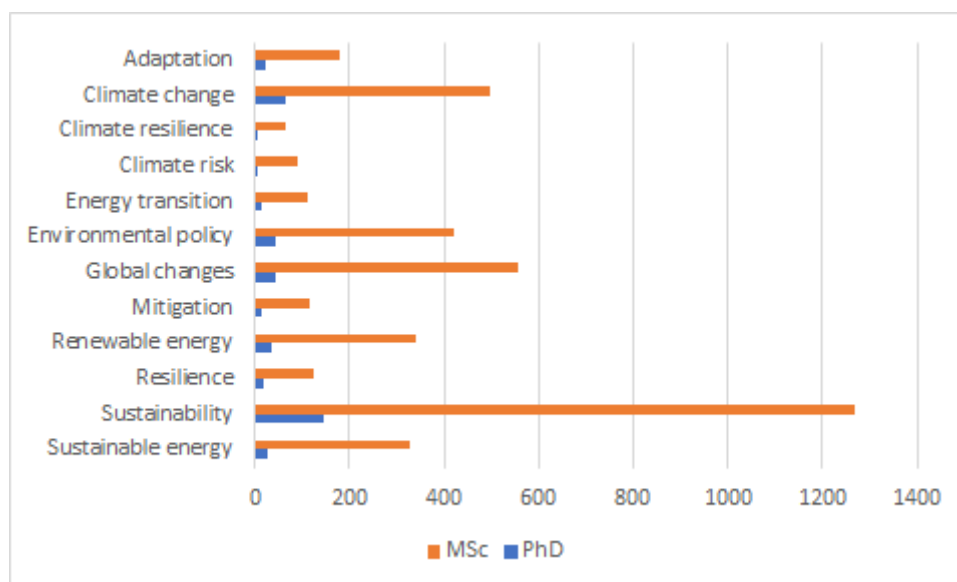
Figure 3: Distribution of the number of sustainability-related MSc and PhD programmes per keyword used, in Europe 2024.

For more detailed information on the number of dedicated higher education sustainability-related programmes, by country and keywords check Annex II.

To access the full list of results, including all the fields and details of the degree programmes collected during this analysis, per country and keyword, please check Annex III (online access information provided).

For a detail mapping of the distribution of dedicated sustainability-related MSc and PhD programmes in Europe, per country and search keyword, please check Annex IV and V, respectively.

3.2   Ad-hoc cross-checking and validation

The analysis of the results described in the previous section, raised one very specific case of interest, the unexpected lower number of programmes is Switzerland, which since the country is well known for the quality of its higher education institution. This could reflect a problem with the underlying data made available through the web portals that were used in this analysis. The idea was that perhaps, for reasons unknown, Swiss programmes were not being properly captured by the two web portals used. Additionally, this result could not be explained by the number of international (multiple locations) programmes (9 MSc programmes only), even if part of them would be led by Swiss institutions. Given the uncertainties, the situation prompted a further procedure of validation and cross-checking to understand the root causes behind this specific result.

To this end, the authors to develop a quick ad-hoc procedure of cross-check and validation, during June 2024, using national online freely available information from official ministry sources. Since a full-scale analysis of all individual countries was unfeasible, as it would fundamentally change overall results – e.g., programmes recently added to the web portals and not captured in the original search would skew data (for more information see section 4.1 uncertainties and gaps) – the authors decided to analyse Switzerland and one additional country. The choice fell on analysing Switzerland and Portugal, a country which the higher education landscape is personally known to the authors, and have the advantage of being able to directly assess information in the local language, without the need for online translating services. Both searches used the exact same keywords of the original search.

The official ministry sources used were:

- Switzerland: https://www.studyprogrammes.ch/en
  - Swissuniversities is an association part of the Rectors' Conference of the Swiss Universities, which represents the interests of the Swiss universities at the national and international levels[29].
  - Swissuniversities became operational under the Federal Act on the Promotion of Universities and Coordination in the Swiss Higher Education Sector (HFKG).
  - Swissuniversities search portal is recognised and directly accessed via the Swiss State Secretariat for Education, Research and Innovation (SBFI)[30].
  - Swissuniversities portal allows to search for both programmes and institutions.
- Portugal: https://www.dges.gov.pt/simges/public/www/cursos_instituicoes?plid=372
  - DGES portal is part of and directly accessible via the Portuguese Directorate General for Higher Education (DGES)[31].
  - DGES portal allows to search for both programmes and institutions.

The results of this cross-checking procedure are detailed below.

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[29] https://www.swissuniversities.ch/en/welcome
[30] https://www.sbfi.admin.ch/sbfi/de/home/hs/hochschulen.html
[31] https://www.dges.gov.pt/pt

3.2.1 Switzerland

In the case of Switzerland, seven additional MSc and one additional PhD programmes that meet the criteria for inclusion in the analysis were found. On the other hand, the single PhD programme in our original database did not appear in the Swiss ministry portal search.

The seven additional MSc found were:

- Foundations and Practices of Sustainability - Université de Lausanne[32]
- Science in IT, Digitalization and Sustainability - Lucerne University of Applied Sciences and Arts[33]
- Sustainable Development - Universität Basel[34]
- Sustainable Management and Technology - Ecole Polytechnique Fédérale de Lausanne[35]
- Sustainable Societies and Social Change - University of Geneva[36]
- Sustainability Transformations - Universität Bern[37]
- Tourism and Change - Fachhochschule Graubünden[38]

The additional PhD found was:

- Sustainability Research - Universität Basel[39]

Results of this cross-check for Swiss programmes show that the original database results are not far from the Swiss reality in terms of dedicated sustainability-related degree programmes. Only seven additional MSc and one PhD were uncovered in this search. However, after closer inspection it was found that one MSc (Sustainable Management and Technology) was in fact already in the original database, filed under multiple locations. Additionally, five other MSc – "Sustainable Development", "Science in IT, Digitalization and Sustainability" (filed under the name Digitalization and Sustainability), "Sustainable Societies and Social Change", "Sustainability Transformations" and "Tourism and Change" – can now be found in the original search portal (MasterPortal), which means they all have been included after our original search. Regarding the additional PhD it cannot be found in the original search portal.

Therefore, these results demonstrate that these type of dedicated programmes are few in the Swiss higher education landscape. This analysis also uncovered that some of the programmes filed under multiple locations and online formats do also appear in the Swiss landscape in this topic, which can be a reason for the incapacity of the search to allocate them to Switzerland.

In summary, all but two of the dedicated sustainability-related programmes discovered in this cross-check analysis are now available in the original search portal, but they were not at the time of our original search, which validates the initial search effort and mapping.

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[32] https://www.studyprogrammes.ch/en/studyprogramme/22280
[33] https://www.studyprogrammes.ch/en/studyprogramme/28227
[34] https://www.studyprogrammes.ch/en/studyprogramme/23355
[35] https://www.studyprogrammes.ch/en/studyprogramme/25428
[36] https://www.studyprogrammes.ch/en/studyprogramme/23519
[37] https://www.studyprogrammes.ch/en/studyprogramme/29144
[38] https://www.strawww.studyprogrammes.ch/en/studyprogramme/22846
[39] https://www.studyprogrammes.ch/en/studyprogramme/23233

3.2.2 Portugal

In the case of Portugal, 16 additional MSc and six additional PhD programmes that meet the criteria for inclusion in the analysis were found. Another three MSc and four PhD programmes found were already included in our original database. On the other hand, 12 MSc and four PhD programmes listed in our original database did not appear in the Portuguese ministry portal search.

The 16 additional MSc found where:

- Air transport sustainability management - ISEC LISBOA[40]
- Anthropology, Globalization and Climate Change - University of Coimbra[41]
- Biodiversity, Ecology and Global Change - University of Minho[42]
- Biological Resources, Territorial Development and Sustainability - University of Coimbra[43]
- Design for Sustainability - University of Lisbon[44]
- Innovation and Research for Sustainability - ISEG University of Lisbon[45]
- Marine Biology and Global Change - University of Coimbra[46]
- Marine Governance and Sustainability - ISCTE[47]
- Psychology and Environmental Sustainability - Universiade Católica Portuguesa[48]
- Renewable Energies and Energy Efficiency - Instituto Politécnico de Bragança[49]
- Renewable Energy Engineering - NOVA University of Lisbon[50]
- Social Studies of the Environment and Sustainability – ISCTE[51]
- Social Service and Sustainability - Instituto Superior de Ciências Sociais e Políticas[52]
- Sustainable Energy Systems - University of Aveiro[53]
- Tourism Management and Sustainability - Universidade de Trás-os-Montes e Alto Douro[54]
- Transition, Innovation and Sustainable Environments - NOVA University of Lisbon[55]

The six additional PhDs found where:

- Agrobusiness and Sustainability - Universidade de Trás-os-Montes e Alto Douro[56]
- Environment and Sustainability - NOVA University of Lisbon[57]
- Social Sustainability and Development - University Aberta[58]
- Sustainability Sciences - University of Lisbon[59]

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[40] https://www.dges.gov.pt/simges/public/www/cursos/11047
[41] https://www.dges.gov.pt/simges/public/www/cursos/7482
[42] https://www.dges.gov.pt/simges/public/www/cursos/1665
[43] https://www.dges.gov.pt/simges/public/www/cursos/6990
[44] https://www.dges.gov.pt/simges/public/www/cursos/6751
[45] https://www.dges.gov.pt/simges/public/www/cursos/10652
[46] https://www.dges.gov.pt/simges/public/www/cursos/7531
[47] https://www.dges.gov.pt/simges/public/www/cursos/6357
[48] https://www.dges.gov.pt/simges/public/www/cursos/11571
[49] https://www.dges.gov.pt/simges/public/www/cursos/2058
[50] https://www.dges.gov.pt/simges/public/www/cursos/2351
[51] https://www.dges.gov.pt/simges/public/www/cursos/3181
[52] https://www.dges.gov.pt/simges/public/www/cursos/10944
[53] https://www.dges.gov.pt/simges/public/www/cursos/5373
[54] https://www.dges.gov.pt/simges/public/www/cursos/10984
[55] https://www.dges.gov.pt/simges/public/www/cursos/7644
[56] https://www.dges.gov.pt/simges/public/www/cursos/6008
[57] https://www.dges.gov.pt/simges/public/www/cursos/96
[58] https://www.dges.gov.pt/simges/public/www/cursos/5482
[59] https://www.dges.gov.pt/simges/public/www/cursos/6211

- Sustainable Built Environment - University of Minho[60]
- Transitions to Sustainability - ISCTE[61]

Results of this cross-check for Portuguese programmes show that the original database results are not far from the Portuguese reality in terms of dedicated sustainability-related degree programmes. The number of additional programmes uncovered in this cross-checking (16 MSc and six PhD) almost matches the number of originally discovered programmes (12 MSc and 4 PhD) that are not available in the ministry portal. On the other hand, three MSc and four PhD programmes are present in both our original search and the ministry portal.

After closer inspection it was found that only one of the additional MSc (Sustainable Energy Systems) can now be found in the original search portal (MasterPortal), which means it has been included after our original search. This means that all the other MSc and PhD existing programmes – that is if the ministry portal is itself updated, which cannot be taken for granted due to the missing entries – have yet to be updated in the original searched portals. This may indicate some lag between the setting up of new programmes and their capture by these sort of international freely available portals about higher education information.

One example of this sort of situation is the MSc programme "Innovation and Research for Sustainability". As a matter of curiosity, one of the authors of this report teaches in that programme and thus knows for a fact that this new programme only started in September 2023, which means after our original search. Therefore, this MSc could not be captured in any search before that date, even if that search had covered both the MastersPortal and the ministry portal.

A more in-depth analysis of the results of this cross-check in the ministry's portal reveals that six out of the 16 additional MSc programmes and one out of the six additional PHd programmes, are new programmes[62]. This means they were approved after our original search and, for that reason, they could not have been included in the MasterPortal initial search database. This further validates our approach since the number of additional programmes found in the ministry's portal that are not in our database are lower than the ones in our results that are not in the official ministry's registry.

The reason why some MSc programmes remain absent in the MastersPortal, and vice-versa remains unknown, but strengthens the hypothesis that some lag remains in the updating of these sort of information portals. This is most likely an issue in many other countries, a question that only a very detailed analysis, but one that would anyway be necessarily outdated very quickly, could respond.

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[60] https://www.dges.gov.pt/simges/public/www/cursos/5480

[61] https://www.dges.gov.pt/simges/public/www/cursos/11386

[62] This in-depth analysis is only possible because the Portuguese ministry's portal has an indication of each programme's official registry date, which for example does not happens in the Swiss case.

4   Discussion and conclusions

The results of our analysis show that there is, to some extent, an evolution in the mobilization of European higher education institutions towards the concepts of sustainability and sustainable development, and their integration and diffusion in MSc and PhD degree programmes. However, it remains unclear if that mobilization is extended to all regions and countries in Europe or, on the other hand, still concentrated in a small number of countries, whose higher education systems can adjust faster to this emerging trend.

From the 46 analysed countries, 72% (33) display at least 1 MSc or PhD programme related to the search keywords. However, only 37% (17) offer graduate programmes at both levels, i.e., both MSc and PhD. Additionally, 30% of European countries (13%) still do not offer any dedicated sustainability-related programmes in either of the types of degrees.

If the analysis is restricted to the EU Member States these figures correspond to 96% (26), 56% (15) and 4% (1), respectively. This is consistent with the perspective that the EU efforts towards mobilizing higher education actors towards the UN development project centred on the Agenda 2030 and its SDGs is taking effect. However, these results raise questions around the capacity of EU and its EHEA, by far the largest higher education project in the world, to quickly expand its influence in these topics, well beyond its Member States, even in Europe, as proposed by recent authors (Heleta & Bagus, 2021; Kushnir et al., 2024).

The variability of programme numbers is extremely high, and despite this study reporting absolute numbers, results do appear as a representative picture of the region's overall offer of these sustainability dedicated higher education programmes. Considering that by some estimations, Europe is home to close to 5,000 higher education institutions (not verified), 17.5 million tertiary education students, 1.35 million people teaching in tertiary education and 1.17 million researchers[63], this programme offer is very significant in the role it can take to foster sustainable development at the global scale.

The cross-checking procedure using national ministry online data sources for Switzerland and Portugal validates the original search database but uncovers additional questions. Namely, what is the level of quality control and quality assurance, and the pace of information updating of these sort of portals, considering both the international/commercial types and the national and state-led ones.

A final concluding note on MAGICA's own work, particularly the development of its SRIA (see Deliverable 3.1). The results presented here highlight the need to consider higher education (and education in general) as a key pillar on research for innovation in sustainability and sustainable development, including, inter alia, climate change and resilience. The incorporation of research for sustainability, alongside proper research on education for sustainability represent a very clear requirement for future agendas at European, EU and national level.

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[63] https://education.ec.europa.eu/education-levels/higher-education/about-higher-education

4.1   Uncertainties and knowledge gaps

Like in any study about education there are a wealth of uncertainties and gaps that need to be acknowledged. In this case, given that this reports represents a primer analysis on dedicated sustainability-related higher education degree programmes in Europe, these gaps need clear recognition so future work can address them.

Some of the key uncertainties and knowledge gaps in this study include:

- Gaps in the representativity of countries in the online portals that were analysed. This can have multiple underlying factors, such as,
    - lack of engagement with the web portals and/or different marketing practices by higher education institutions.
    - language issues that prevent information about programmes to be collected.
    - lack of proper filtering systems on the portals and websites.
    - quality control and quality assurance protocols.
    - pace of information updating.
- The need to confirm if the results in some of the countries represent a real lack of interest in dedicated sustainability-related programmes or, if on the other hand, simply reflect a lack of creation of new dedicated programmes, since sustainability-related contents may currently be included in the curricula of traditional degree programmes (e.g. STEM courses), which this analysis fails to capture due to its dedicated nature.
- The growing offer of international programmes with multiple locations, of which only the main country is captured in this analysis (if at all), lowering the actual number of offered programmes in other countries, typically positioned lower in higher education rankings.
- The growing offer of fully online programmes not yet captured by the web portals and platforms used in this analysis.
- Potentially, the type of provided education, namely public/private/a mix of both, may also differently affect the offer of PhD and MSc programmes at national level, and their incorporation into online information portals.

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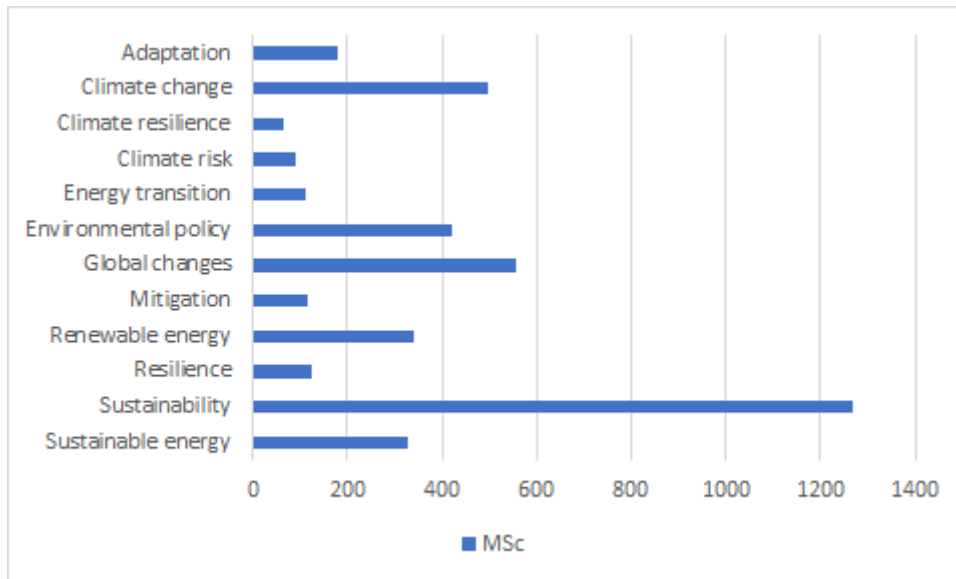
Annex I

Figure I.1: Distribution of the number of sustainability-related MSc degree programmes, per keyword, in 2024
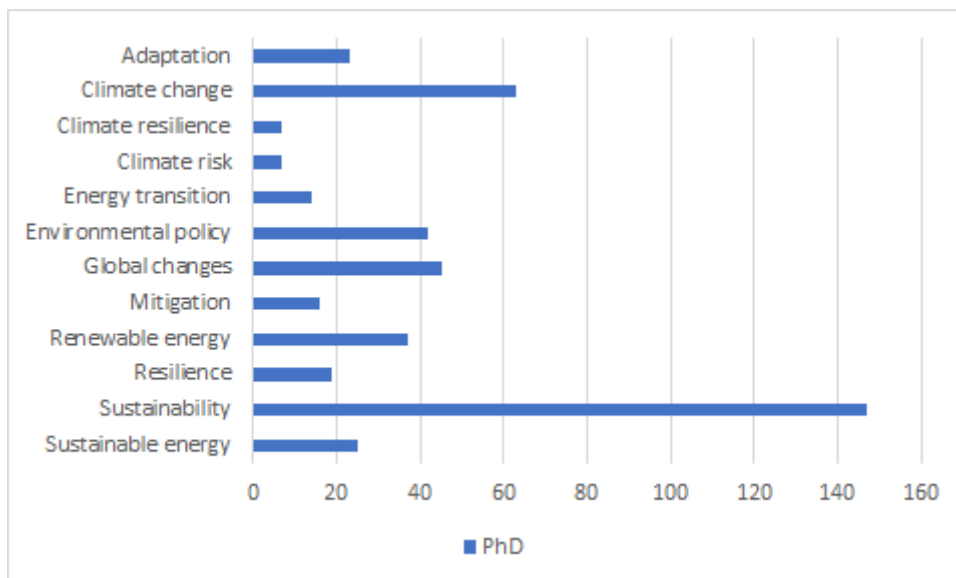

Figure I.2: Distribution of the number of sustainability-related PhD degree programmes, per keyword, in 2024

Annex II

Table II.1: Distribution of the number of dedicated higher education sustainability-related MSc degree programmes, per country and keyword, in 2024. Note: each programme can have multiple keywords, so the total reports number of MSc programmes found, not the sum of keywords.

Country	Adaptation	Climate change	Climate resilience	Climate risk	Energy transition	Environmental policy	Global changes	Mitigation	Renewable energy	Resilience	Sustainability	Sustainable energy	Total n of MSc programmes
Albania	0	0	0	0	0	0	0	0	0	0	0	0	0
Andorra	0	0	0	0	0	0	0	0	0	0	0	0	0
Austria	2	5	2	1	2	5	5	0	5	3	18	2	24
Belarus	0	0	0	0	0	0	0	0	0	0	0	0	0
Belgium	0	7	1	0	1	9	11	1	3	1	16	2	22
Bosnia and Herzegovina	0	0	0	0	0	0	0	0	0	0	0	0	0
Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0	0
Croatia	1	0	0	0	0	1	0	0	0	0	3	0	3
Cyprus	1	2	1	0	1	0	2	0	3	1	5	4	9
Czechia	2	4	0	1	0	1	3	1	3	0	4	0	12
Denmark	4	10	1	1	3	6	12	2	4	1	24	10	38
Estonia	1	1	0	0	0	1	2	0	0	1	3	0	4
Finland	5	8	1	2	10	4	11	2	12	0	44	17	58
France	7	14	1	4	8	9	21	4	20	2	80	24	113
Germany	14	30	2	6	3	9	33	3	28	3	92	20	131
Greece	3	2	0	0	0	2	0	1	3	1	3	0	9
Hungary	1	1	0	0	0	3	2	2	0	0	1	0	5

Country	Adaptation	Climate change	Climate resilience	Climate risk	Energy transition	Environmental policy	Global changes	Mitigation	Renewable energy	Resilience	Sustainability	Sustainable energy	Total n of MSc programmes
Iceland	2	1	1	0	0	5	1	2	3	1	6	3	7
Ireland	4	19	6	4	0	26	17	9	10	14	41	14	72
Italy	11	19	2	5	7	14	19	13	15	5	84	11	114
Kosovo	0	0	0	0	0	0	0	0	0	0	0	0	0
Latvia	1	0	0	0	0	1	0	0	0	0	1	0	3
Liechtenstein	0	0	0	0	0	0	0	0	0	0	0	0	0
Lithuania	1	3	0	0	0	1	1	0	3	0	8	2	10
Luxembourg	0	0	0	0	0	0	0	0	0	0	2	0	2
Malta	0	0	0	0	0	0	0	0	1	0	2	1	2
Moldova	0	0	0	0	0	0	0	0	0	0	0	0	0
Monaco	0	0	0	0	0	0	0	0	0	0	0	0	0
Montenegro	0	0	0	0	0	0	0	0	0	0	0	0	0
Multiple locations	*0*	*0*	*0*	*0*	*0*	*0*	*7*	*0*	*1*	*0*	*8*	*0*	*9*
Netherlands	12	38	3	5	14	23	29	5	15	7	71	24	103
North Macedonia	0	0	0	0	0	0	0	0	0	0	0	0	0
Norway	5	13	2	2	4	7	15	0	11	2	37	8	46
Poland	2	2	0	0	1	7	5	2	7	2	12	5	25
Portugal	3	4	0	1	0	4	2	0	3	0	12	3	15
Romania	0	0	0	0	0	0	0	0	1	0	1	1	1
Russia	3	2	0	1	1	1	3	0	4	0	7	4	14
San Marino	0	0	0	0	0	0	0	0	0	0	0	0	0

Country	Adaptation	Climate change	Climate resilience	Climate risk	Energy transition	Environmental policy	Global changes	Mitigation	Renewable energy	Resilience	Sustainability	Sustainable energy	Total n of MSc programmes
Serbia	0	0	0	0	0	0	0	0	0	0	0	0	0
Slovakia	0	0	0	0	1	0	0	0	1	0	0	0	1
Slovenia	0	0	0	0	0	0	0	0	1	0	2	0	2
Spain	2	11	0	1	3	6	15	0	7	1	29	14	43
Sweden	12	32	4	5	6	21	45	4	23	5	114	28	136
Switzerland	0	0	0	0	0	0	0	0	0	0	0	0	0
Turkey	0	3	0	0	0	4	3	1	7	0	11	2	16
Ukraine	0	0	0	0	0	0	1	0	0	0	0	2	3
United Kingdom	82	264	36	53	47	251	291	63	147	73	528	127	869
MSc total	181	495	63	92	112	421	556	115	341	123	1269	328	1921

Table II.2: Distribution of the number of dedicated higher education sustainability-related PhD degree programmes, per country and keyword, in 2024. Note: each programme can have multiple keywords, so the total reports the number of PhD programmes found, not the sum of keywords.

Country	Adaptation	Climate change	Climate resilience	Climate risk	Energy transition	Environmental policy	Global changes	Mitigation	Renewable energy	Resilience	Sustainability	Sustainable energy	Total n of PhD programmes
Albania	0	0	0	0	0	0	0	0	0	0	0	0	0
Andorra	0	0	0	0	0	0	0	0	0	0	0	0	0
Austria	0	1	0	0	0	1	1	0	0	0	0	0	1
Belarus	0	0	0	0	0	0	0	0	0	0	0	0	0
Belgium	0	0	0	0	0	0	0	0	0	0	0	0	0
Bosnia and Herzegovina	0	0	0	0	0	0	0	0	0	0	0	0	0
Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0	0
Croatia	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyprus	0	0	0	0	0	0	0	0	1	0	0	0	1
Czech Republic	0	0	0	0	0	0	0	0	0	0	0	0	0
Denmark	0	1	0	0	0	1	0	0	0	0	1	0	1
Estonia	0	0	0	0	0	0	0	0	0	0	0	0	0
Finland	0	2	2	1	0	3	3	0	1	1	2	2	5
France	2	1	0	0	0	1	3	0	0	0	2	0	5
Germany	4	2	0	0	0	0	4	0	2	0	6	1	14
Greece	0	0	0	0	0	0	0	0	0	0	0	0	0
Hungary	0	0	0	0	0	0	0	0	0	0	1	0	1
Iceland	0	0	0	0	0	0	0	0	0	0	0	0	0
Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0
Italy	1	3	1	1	4	7	2	1	2	1	12	3	18
Kosovo	0	0	0	0	0	0	0	0	0	0	0	0	0
Latvia	0	0	0	0	0	0	0	0	0	0	0	0	0

Country	Adaptation	Climate change	Climate resilience	Climate risk	Energy transition	Environmental policy	Global changes	Mitigation	Renewable energy	Resilience	Sustainability	Sustainable energy	Total n of PhD programmes
Liechtenstein	0	0	0	0	0	0	0	0	0	0	0	0	0
Lithuania	2	1	0	0	0	0	2	0	2	0	7	1	10
Luxembourg	0	0	0	0	0	0	0	0	0	0	0	0	0
Malta	0	0	0	0	0	0	0	0	0	0	0	0	0
Moldova	0	0	0	0	0	0	0	0	0	0	0	0	0
Monaco	0	0	0	0	0	0	0	0	0	0	0	0	0
Montenegro	0	0	0	0	0	0	0	0	0	0	0	0	0
Multiple locations	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Netherlands	1	4	0	1	0	2	3	0	1	0	10	0	12
North Macedonia	0	0	0	0	0	0	0	0	0	0	0	0	0
Norway	0	1	0	0	0	0	1	0	0	0	1	0	1
Poland	0	0	0	0	0	0	0	0	2	0	0	0	2
Portugal	1	2	0	0	0	1	1	3	1	0	6	2	8
Romania	0	0	0	0	0	0	0	0	0	0	0	0	0
Russia	0	0	0	0	0	0	0	0	0	0	0	0	0
San Marino	0	0	0	0	0	0	0	0	0	0	0	0	0
Serbia	0	0	0	0	0	0	0	0	0	0	0	0	0
Slovakia	0	0	0	0	0	0	0	0	0	0	0	0	0
Slovenia	0	0	0	0	0	0	0	0	1	0	1	0	1
Spain	2	2	0	0	0	1	0	0	1	0	4	2	8
Sweden	1	4	0	1	2	3	0	0	1	1	14	0	20
Switzerland	0	0	0	0	0	0	0	0	0	0	1	0	1
Turkey	0	0	0	0	0	0	0	0	0	0	0	0	0
Ukraine	0	0	0	0	0	0	0	0	0	0	0	0	0
United Kingdom	9	39	4	3	8	22	25	12	22	16	79	14	143
PhD total	23	63	7	7	14	42	45	16	37	19	147	25	252

Annex III

To access the full list of results, including all the fields and details of the degree programmes collected during this analysis, per country and keyword, please visit:

https://ulisboa-my.sharepoint.com/:x:/g/personal/ccrvieira_fc_ul_pt/EcIhP2tPkHxNt2cFOUCWPV4BwniD95OHEYRnFgyjsSXHPg?e=9VNYrN
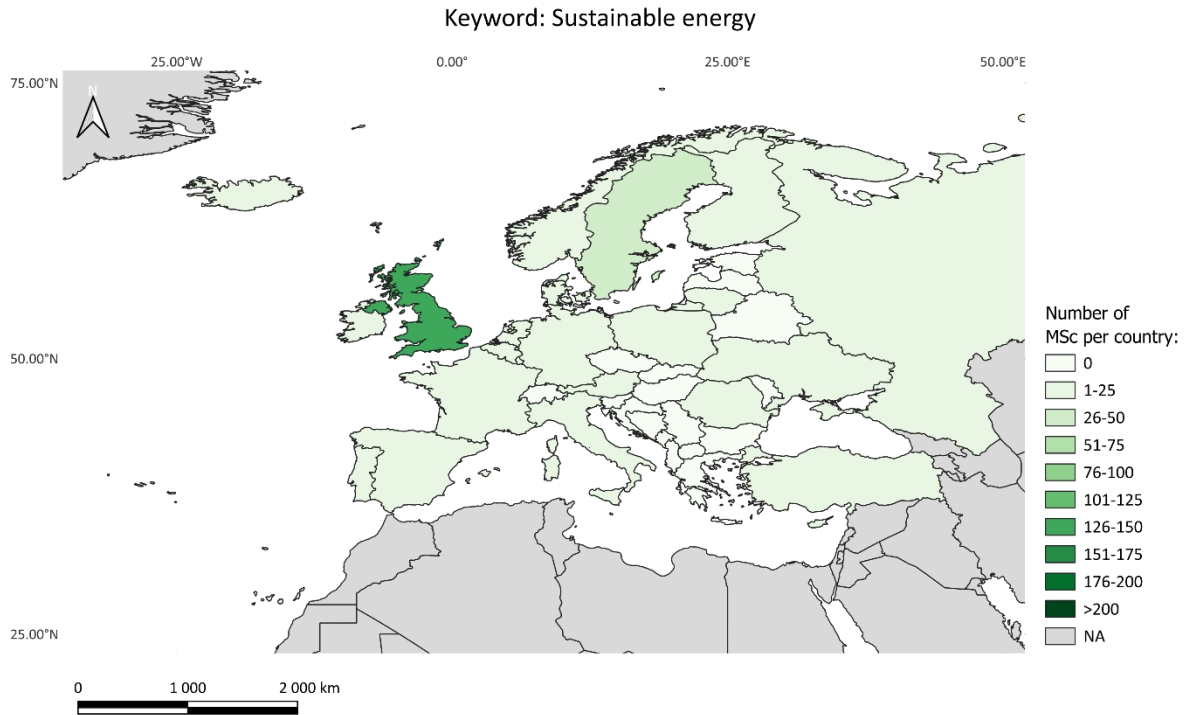
Annex IV

The following figures represent the distribution of the number of dedicated sustainability-related MSc degree programmes in Europe, per country, in 2024, per each of the 12 keywords used in the study search.

| Search keyword	Figure
Climate change	IV.1
Adaptation	IV.2
Mitigation	IV.3
Climate risk	IV.4
Global changes	IV.5
Energy transition	IV.6
Renewable energy	IV.7
Sustainable energy	IV.8
Environmental policy	IV.9
Climate resilience	IV.10
Resilience	IV.11
Sustainability / Sustainable development	IV.12
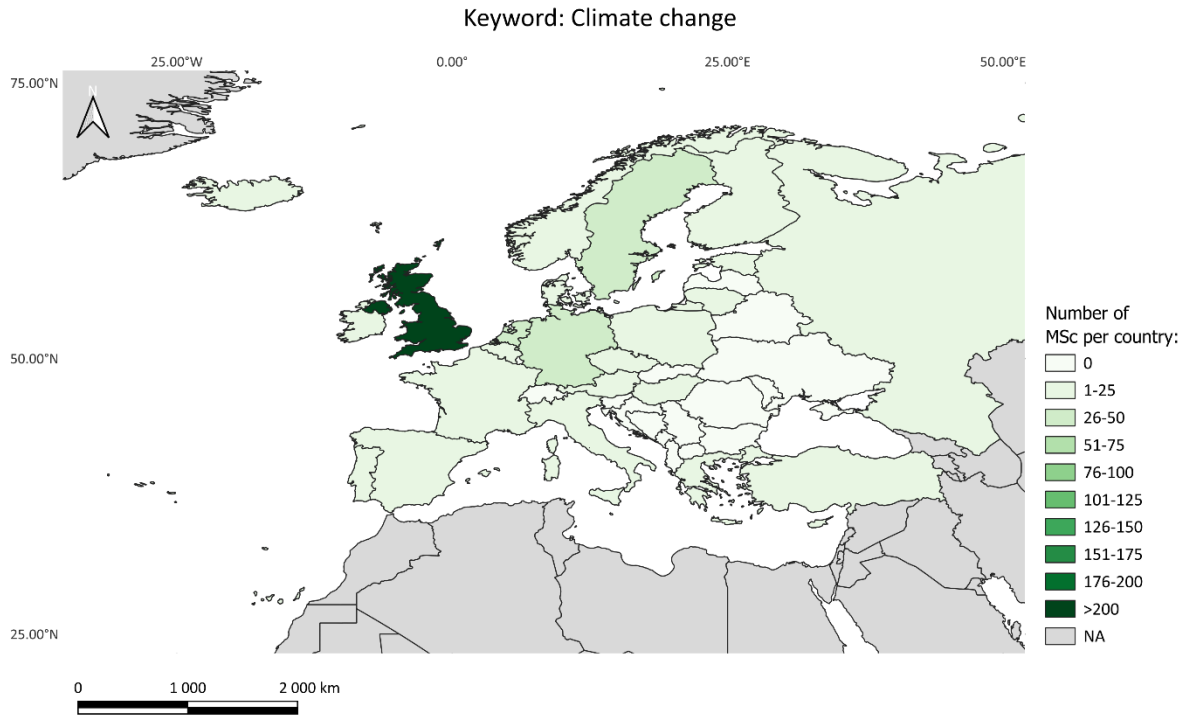
Figure IV.1: Distribution of the number of dedicated sustainability-related MSc degree programmes in Europe, per country, in 2024, using the keyword climate change.
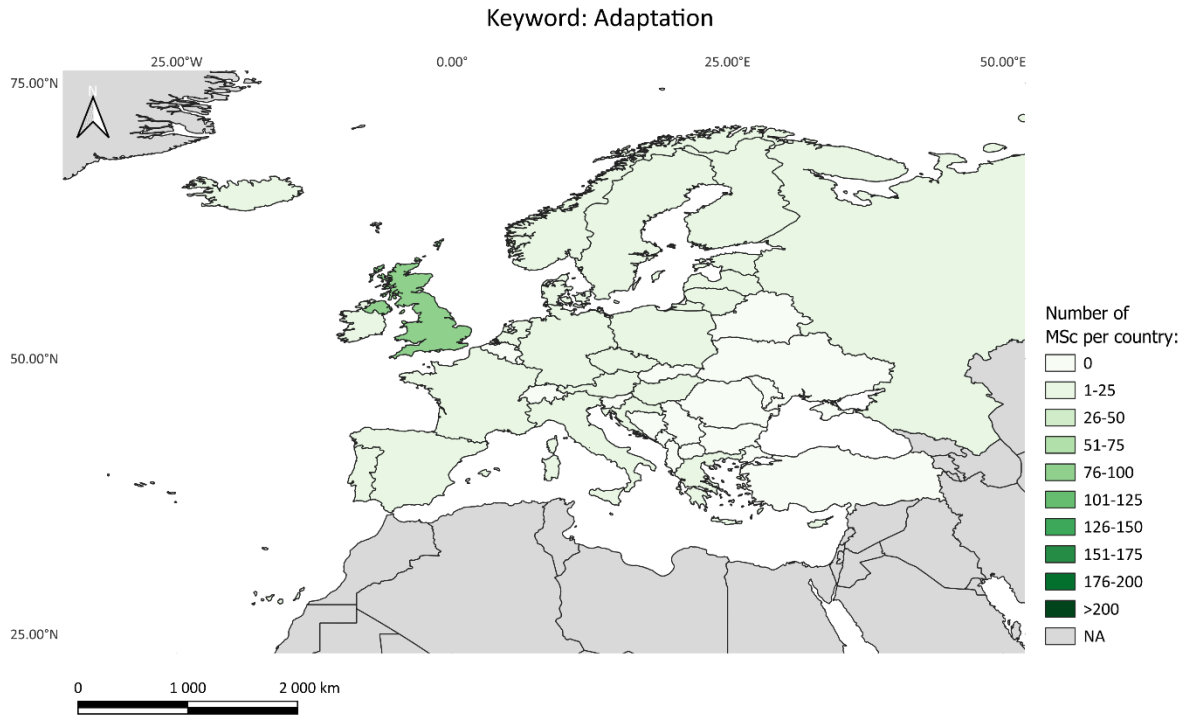
Figure IV.2: Distribution of the number of dedicated sustainability-related MSc degree programmes in Europe, per country, in 2024, using the keyword adaptation.
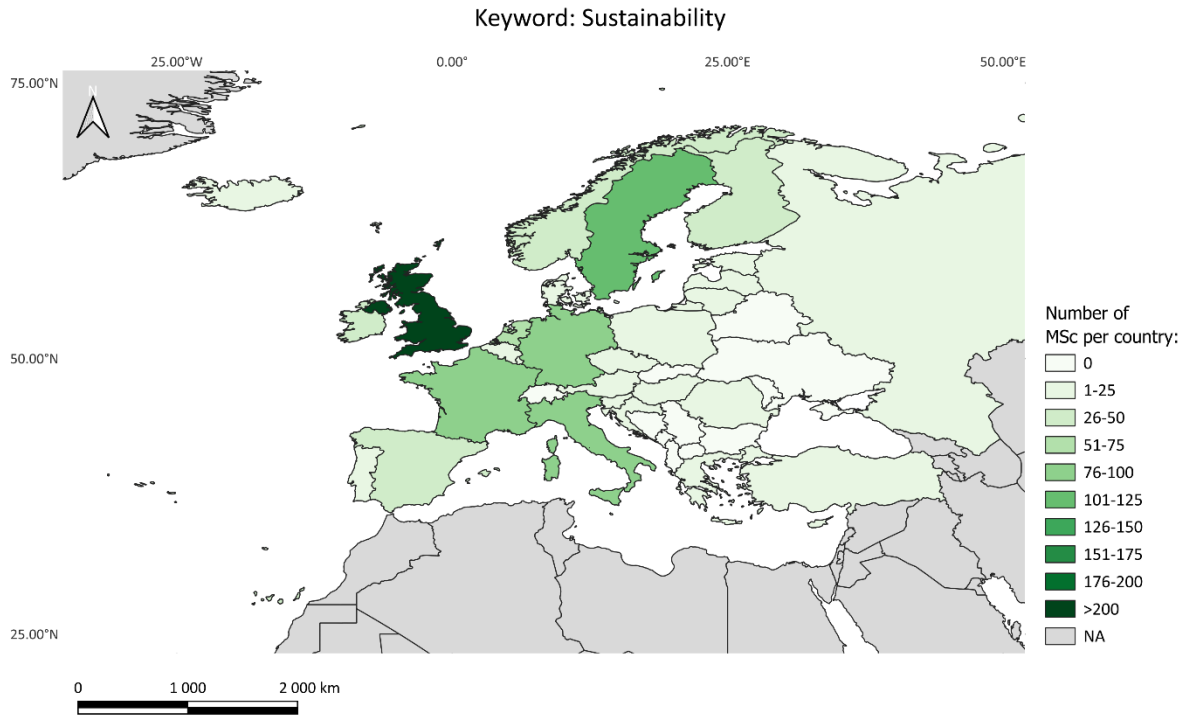
Keyword: Mitigation
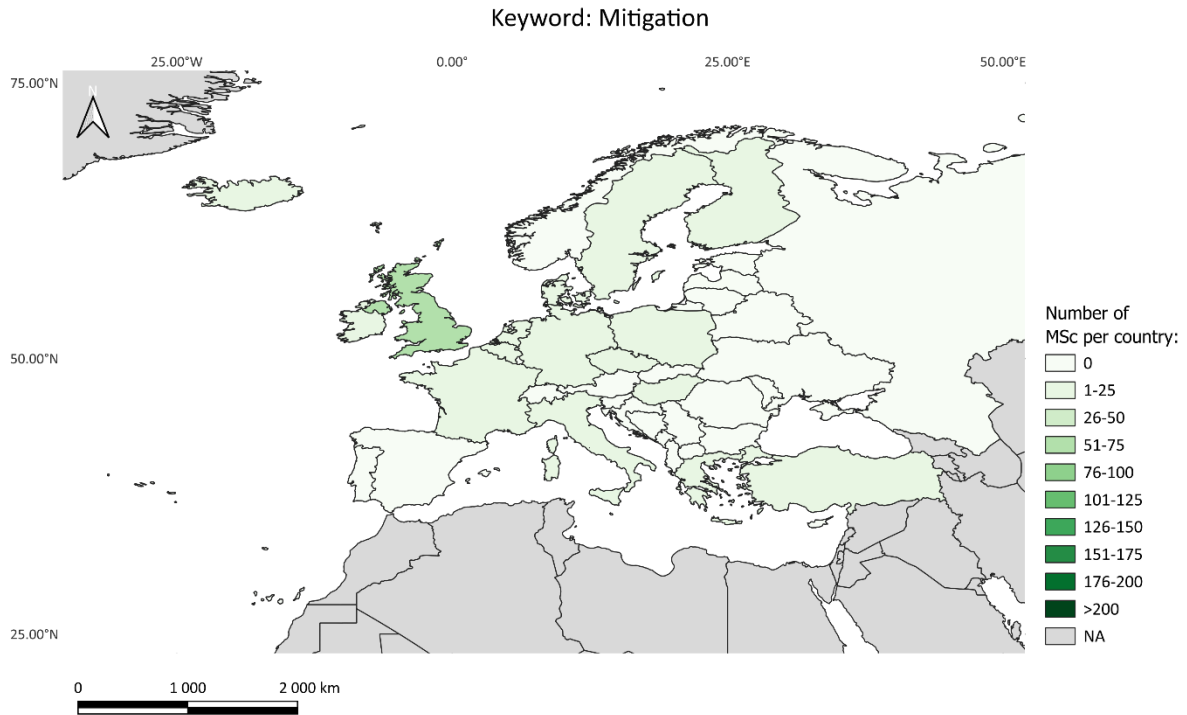
Figure IV.3: Distribution of the number of dedicated sustainability-related MSc degree programmes in Europe, per country, in 2024, using the keyword mitigation.

Keyword: Climate risk
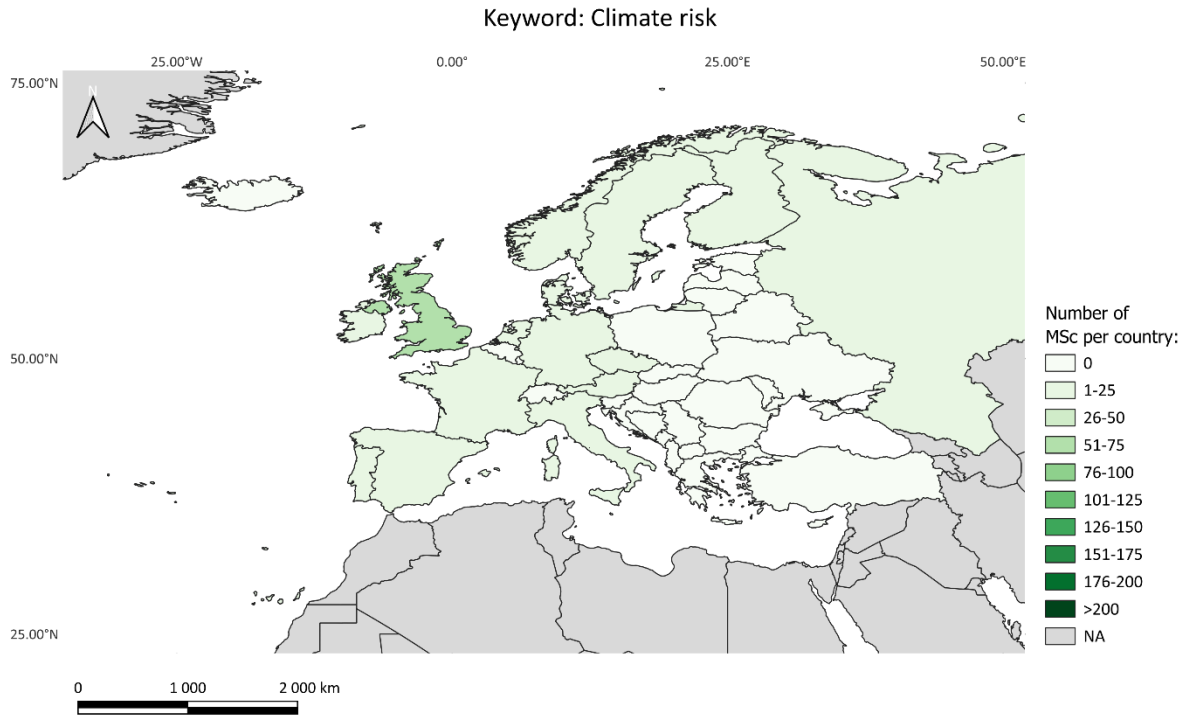
Figure IV.4: Distribution of the number of dedicated sustainability-related MSc degree programmes in Europe, per country, in 2024, using the keyword climate risk.

Keyword: Global changes
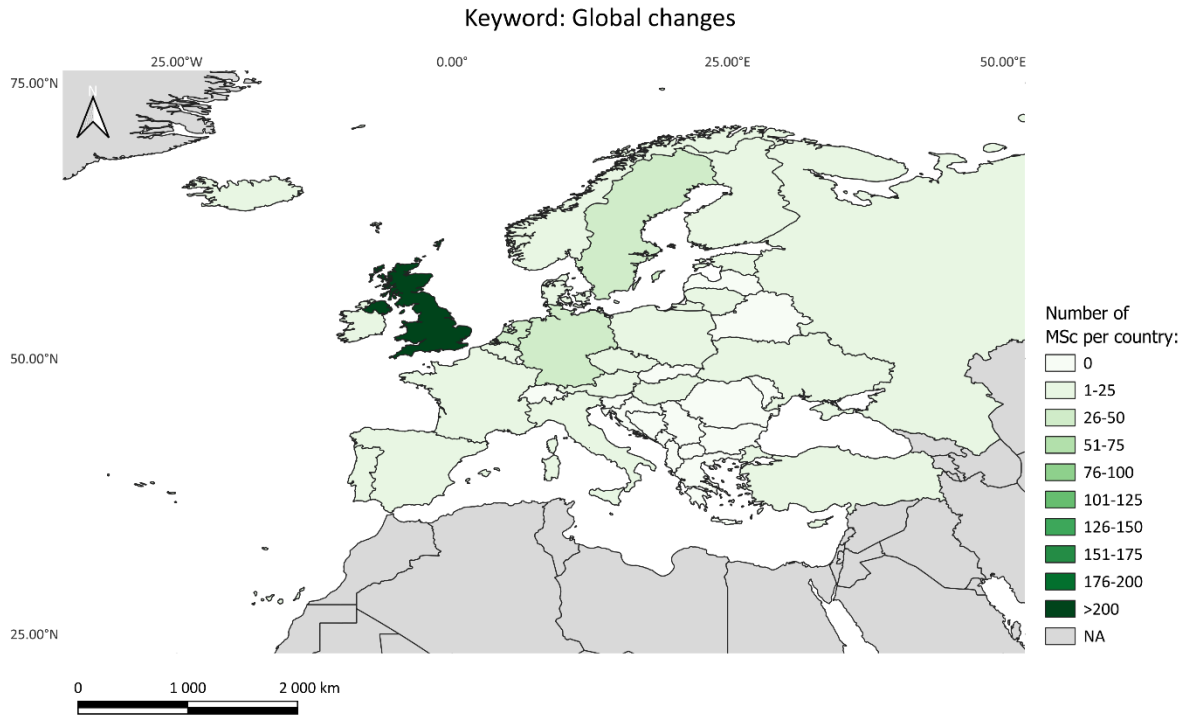
Figure IV.5: Distribution of the number of dedicated sustainability-related MSc degree programmes in Europe, per country, in 2024, using the keyword global changes.

Keyword: Energy transition
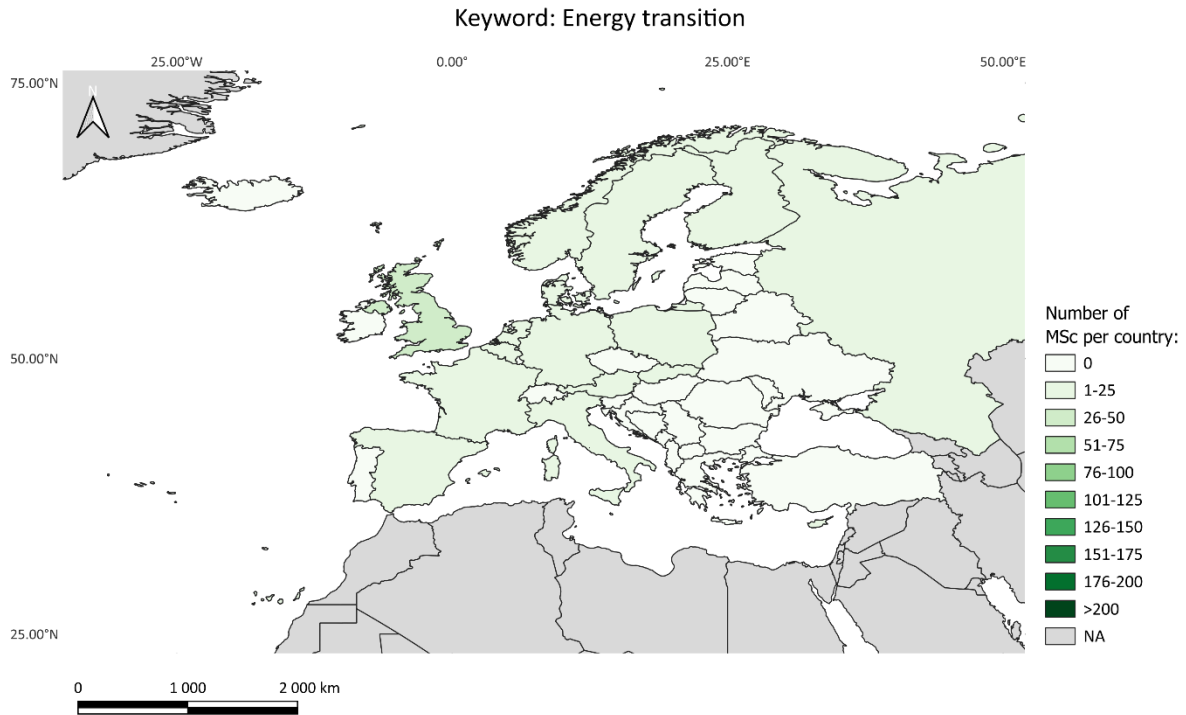
Figure IV.6: Distribution of the number of dedicated sustainability-related MSc degree programmes in Europe, per country, in 2024, using the keyword energy transition.

Keyword: Renewable energy
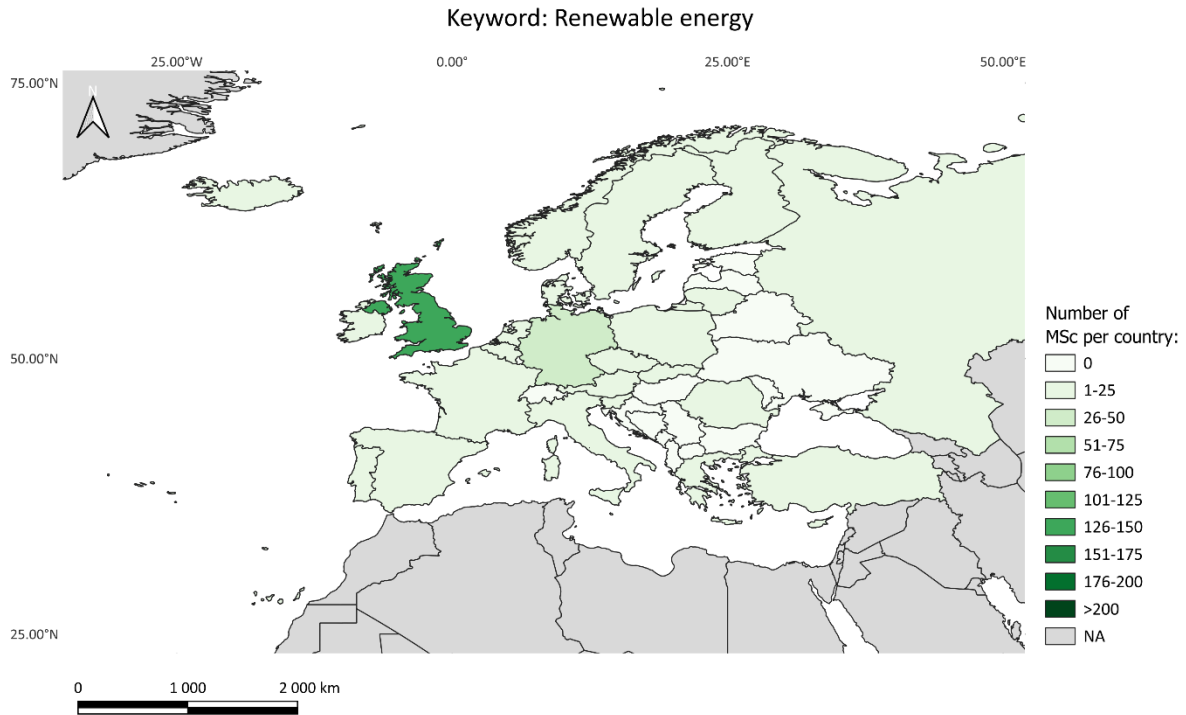
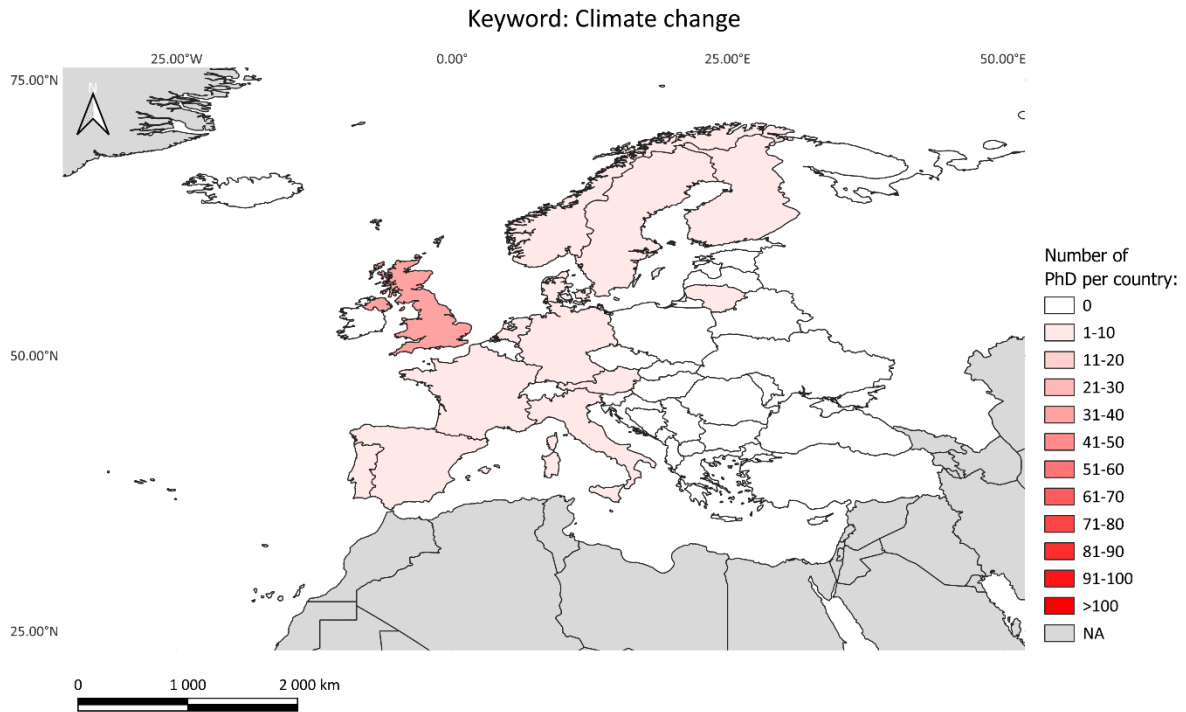**Figure IV.7: Distribution of the number of dedicated sustainability-related MSc degree programmes in Europe, per country, in 2024, using the keyword renewable energy.**

Keyword: Sustainable energy

Figure IV.08: Distribution of the number of dedicated sustainability-related MSc degree programmes in Europe, per country, in 2024, using the keyword sustainable energy.

Keyword: Environmental policy
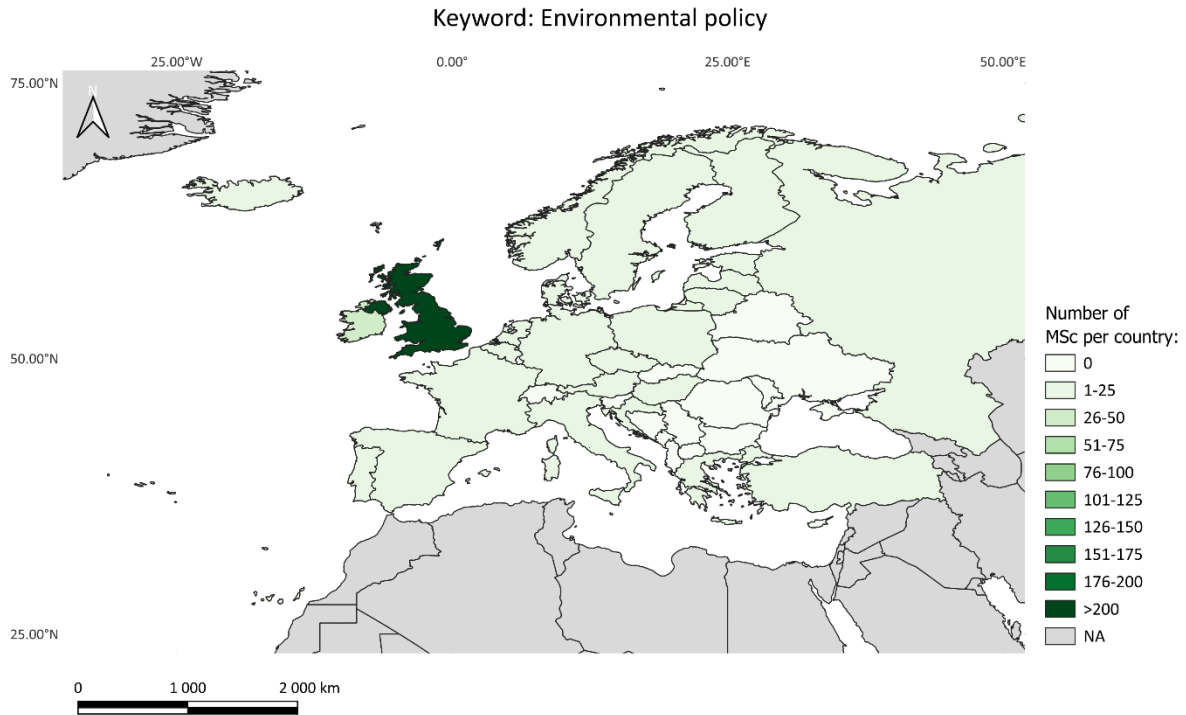
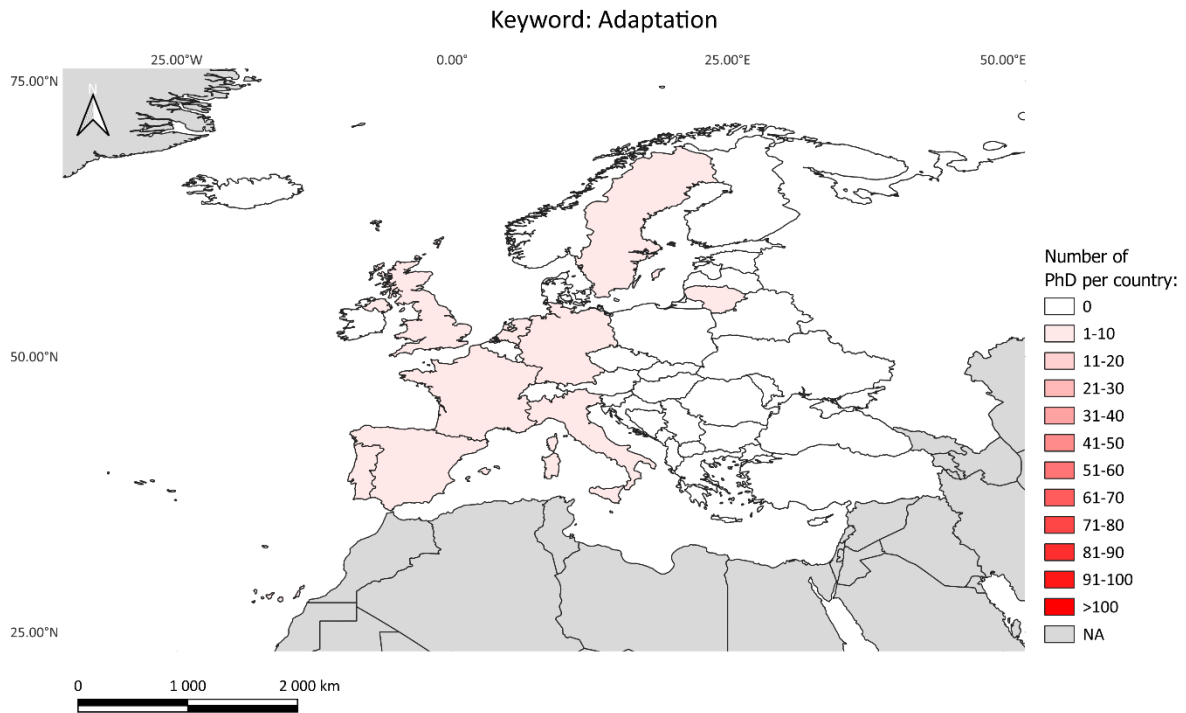**Figure IV.9: Distribution of the number of dedicated sustainability-related MSc degree programmes in Europe, per country, in 2024, using the keyword environmental policy.**

Keyword: Climate resilience
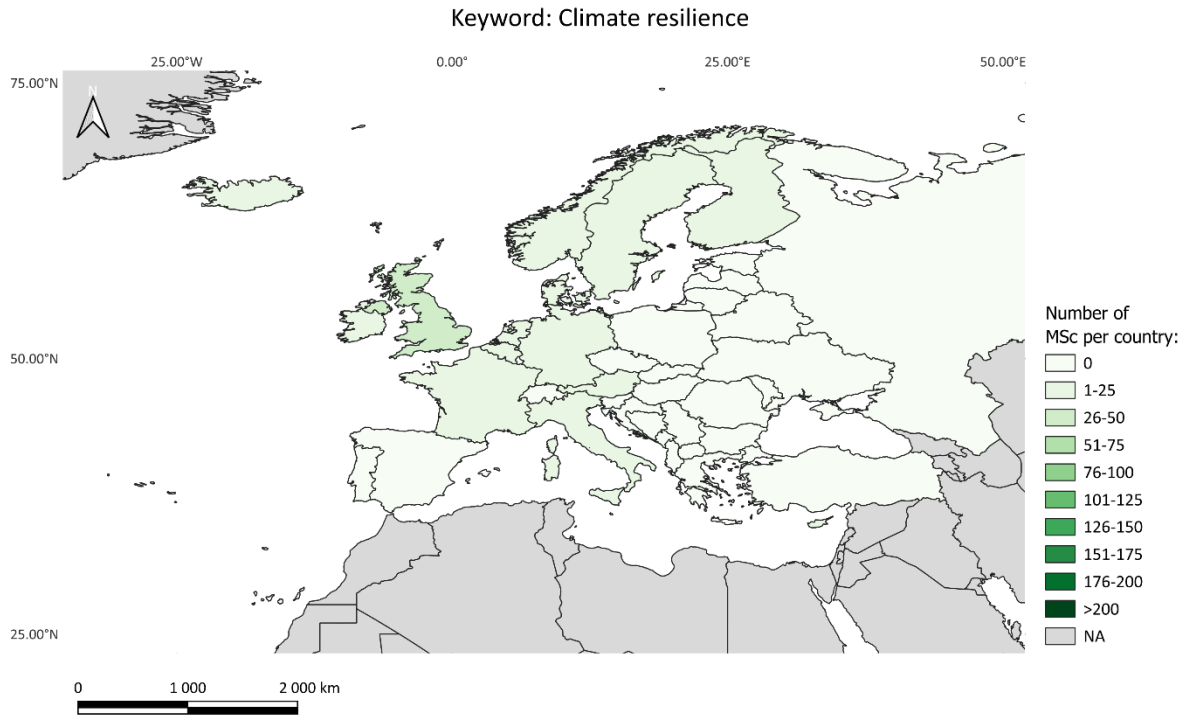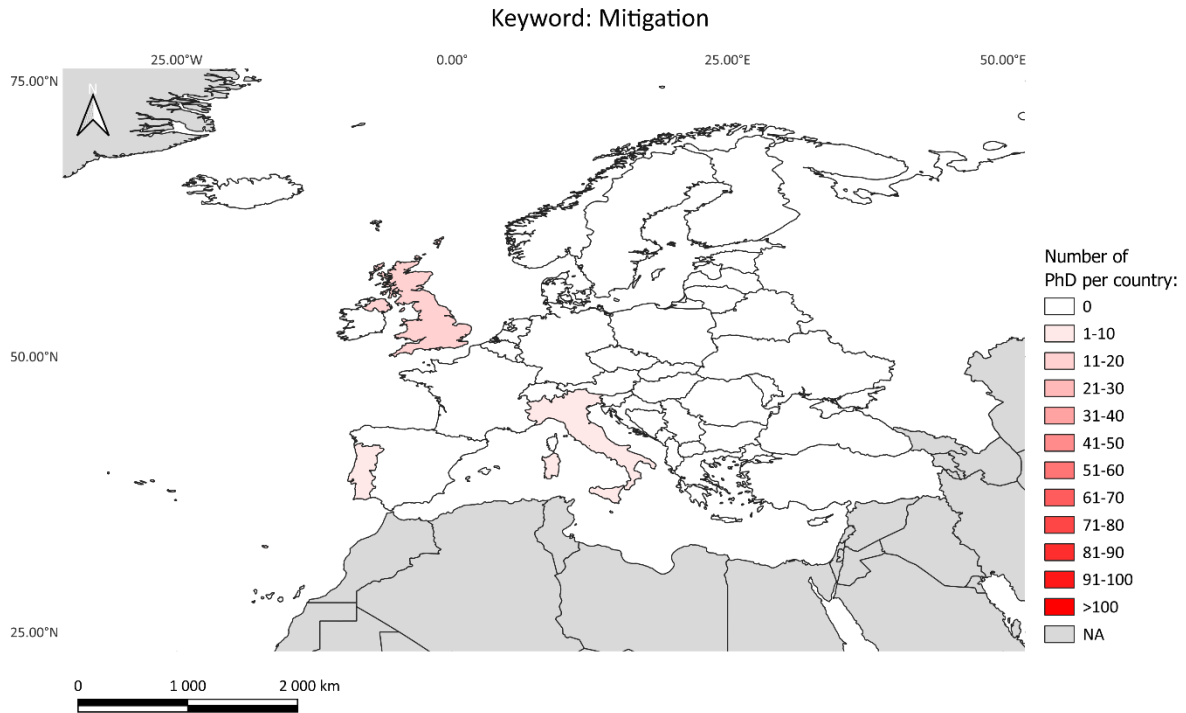
Figure IV.10: Distribution of the number of dedicated sustainability-related MSc degree programmes in Europe, per country, in 2024, using the keyword climate resilience.

Keyword: Resilience

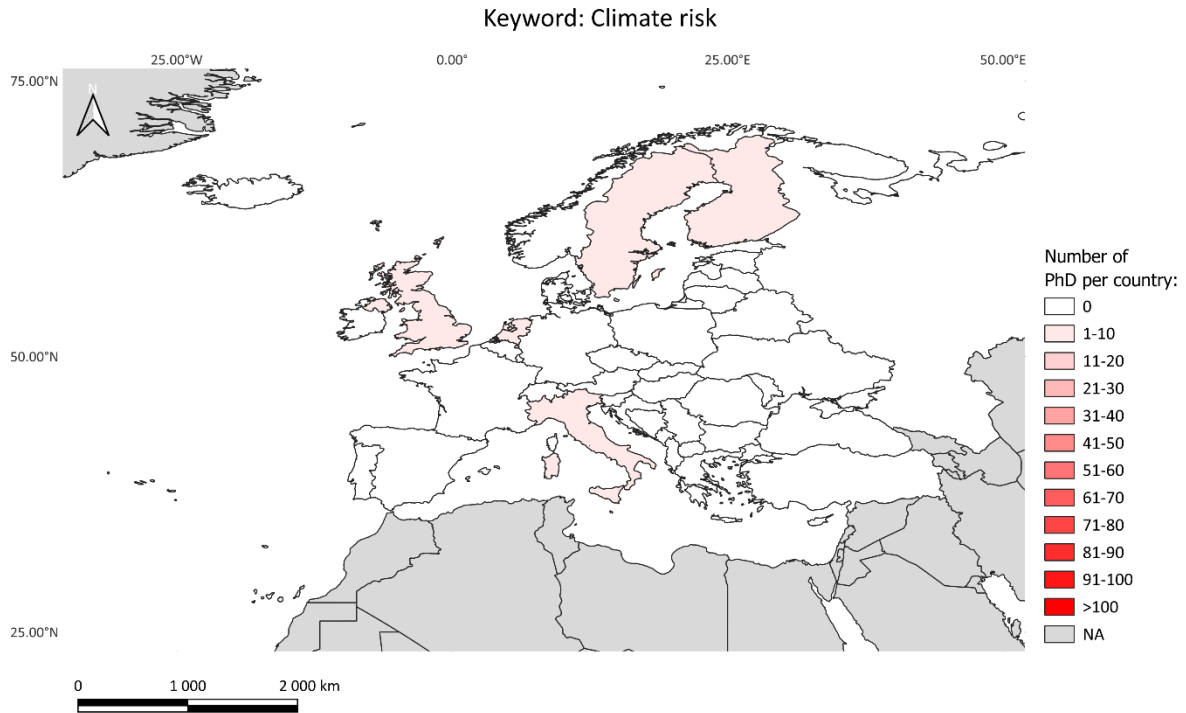**Figure IV.11: Distribution of the number of dedicated sustainability-related MSc degree programmes in Europe, per country, in 2024, using the keyword resilience.**

Figure IV.12: Distribution of the number of dedicated sustainability-related MSc degree programmes in Europe, per country, in 2024, using the keyword sustainability.

Annex V

The following figures represent the distribution of the number of dedicated sustainability-related PhD degree programmes in Europe, per country, in 2024, per each of the 12 keywords used in the study search.

| Search keyword	Figure
Climate change	V.1
Adaptation	V.2
Mitigation	V.3
Climate risk	V.4
Global changes	V.5
Energy transition	V.6
Renewable energy	V.7
Sustainable energy	V.8
Environmental policy	V.9
Climate resilience	V.10
Resilience	V.11
Sustainability / Sustainable development	V.12

Figure V.1: Distribution of the number of dedicated sustainability-related PhD degree programmes in Europe, per country, in 2024, using the keyword climate change.

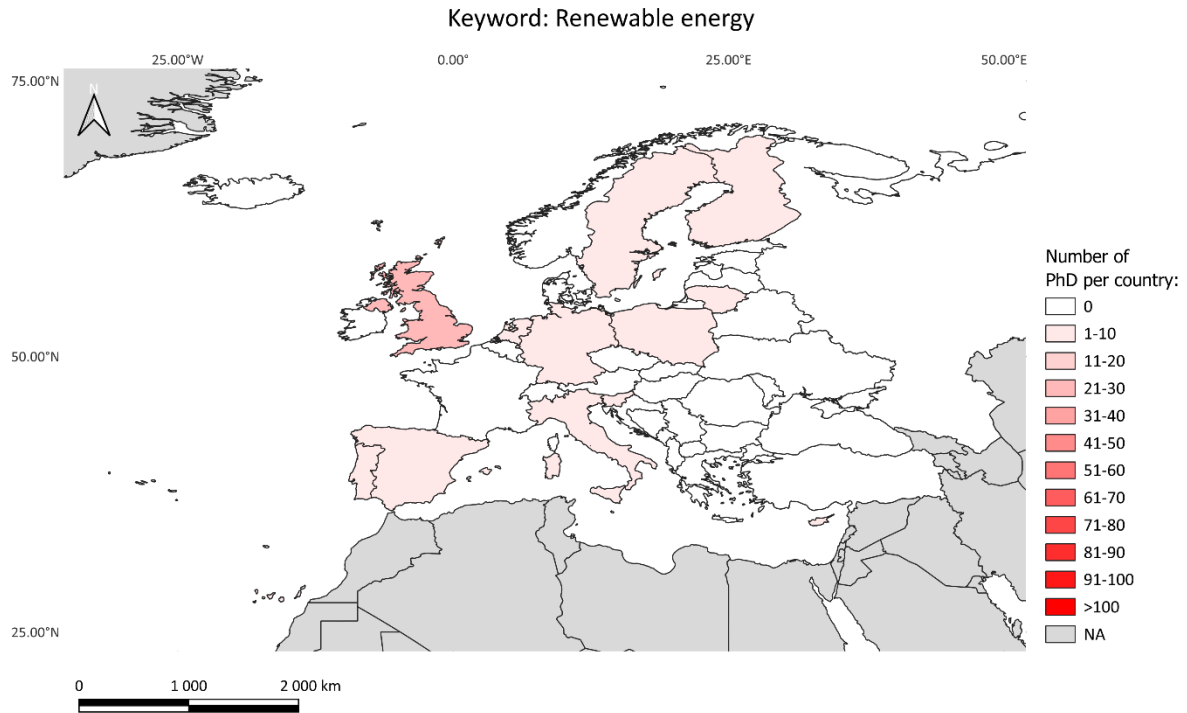**Figure V.2: Distribution of the number of dedicated sustainability-related PhD degree programmes in Europe, per country, in 2024, using the keyword adaptation.**

Figure V.3: Distribution of the number of dedicated sustainability-related PhD degree programmes in Europe, per country, in 2024, using the keyword mitigation.

Figure V.4: Distribution of the number of dedicated sustainability-related PhD degree programmes in Europe, per country, in 2024, using the keyword climate risk.
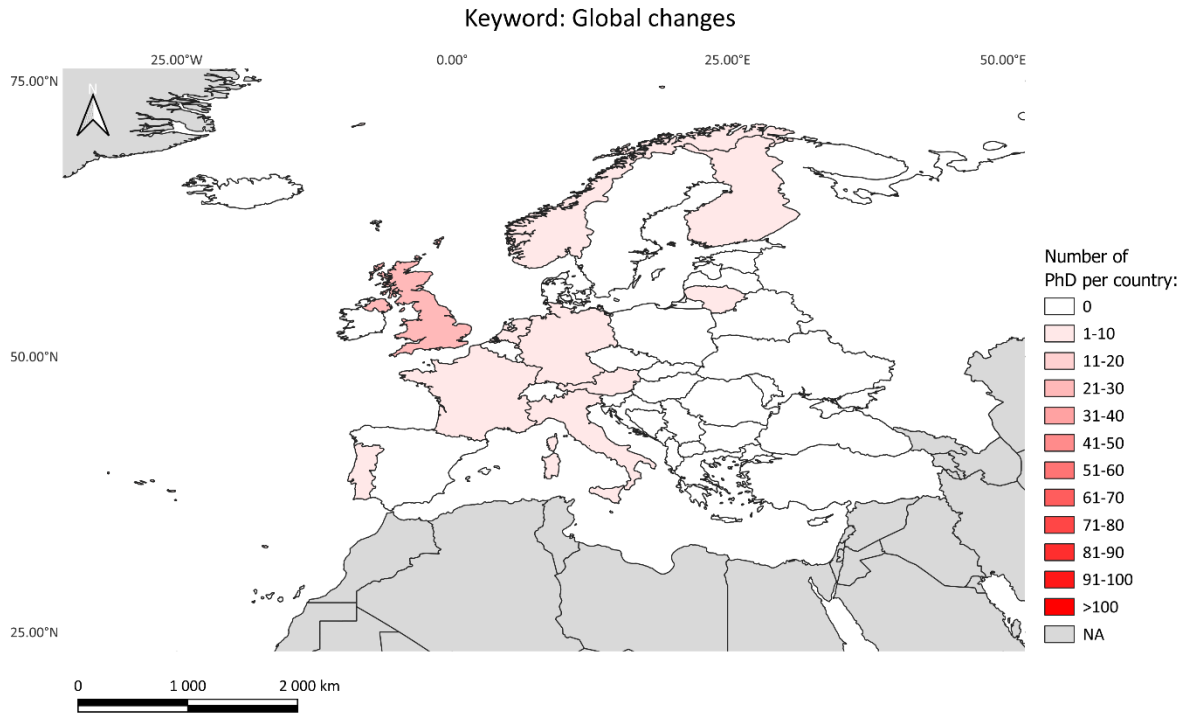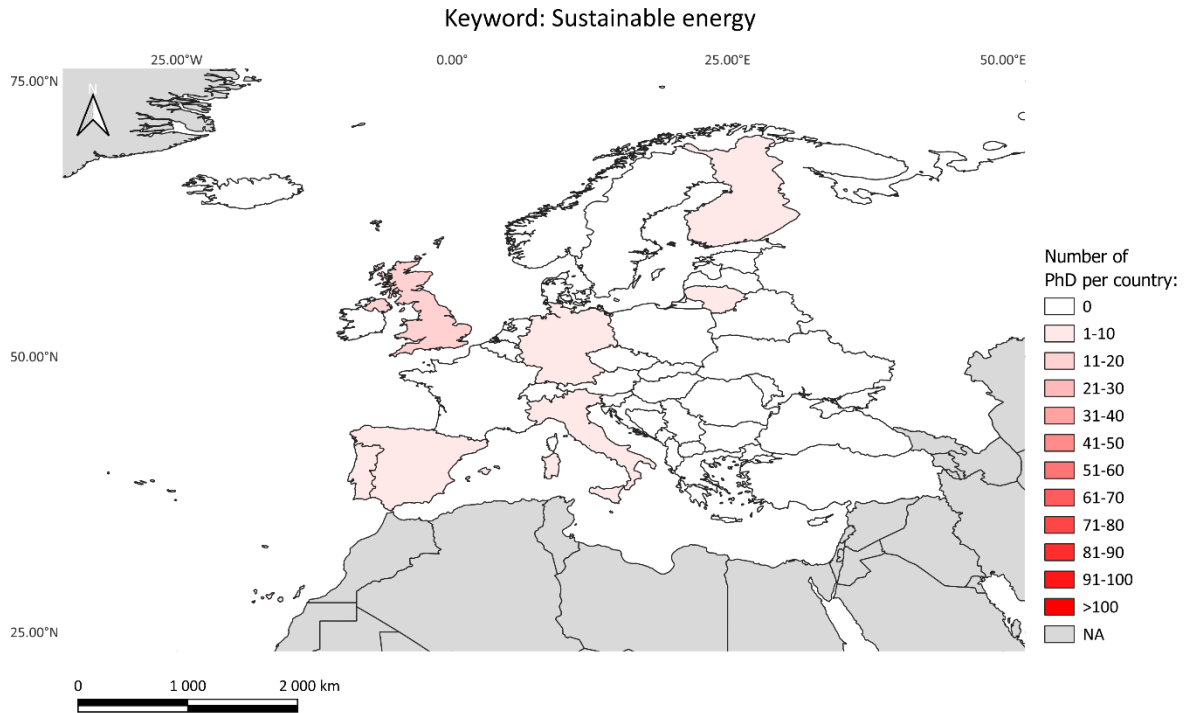
Figure V.5: Distribution of the number of dedicated sustainability-related PhD degree programmes in Europe, per country, in 2024, using the keyword global changes.
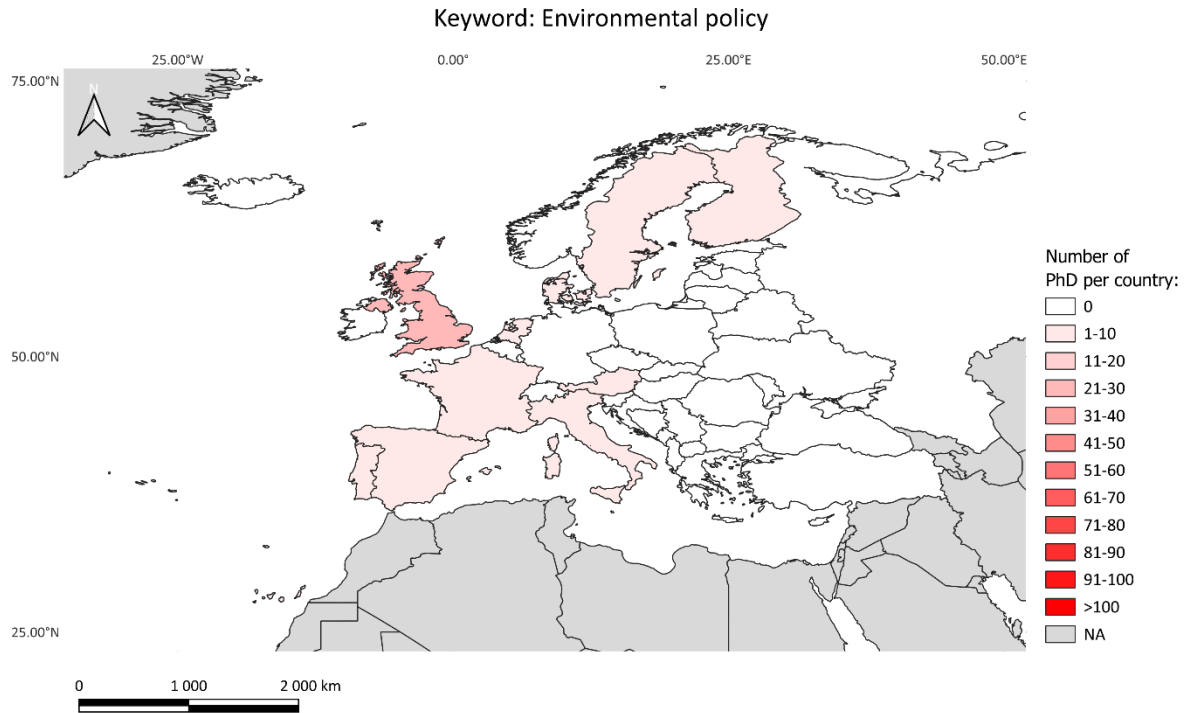
Keyword: Energy transition
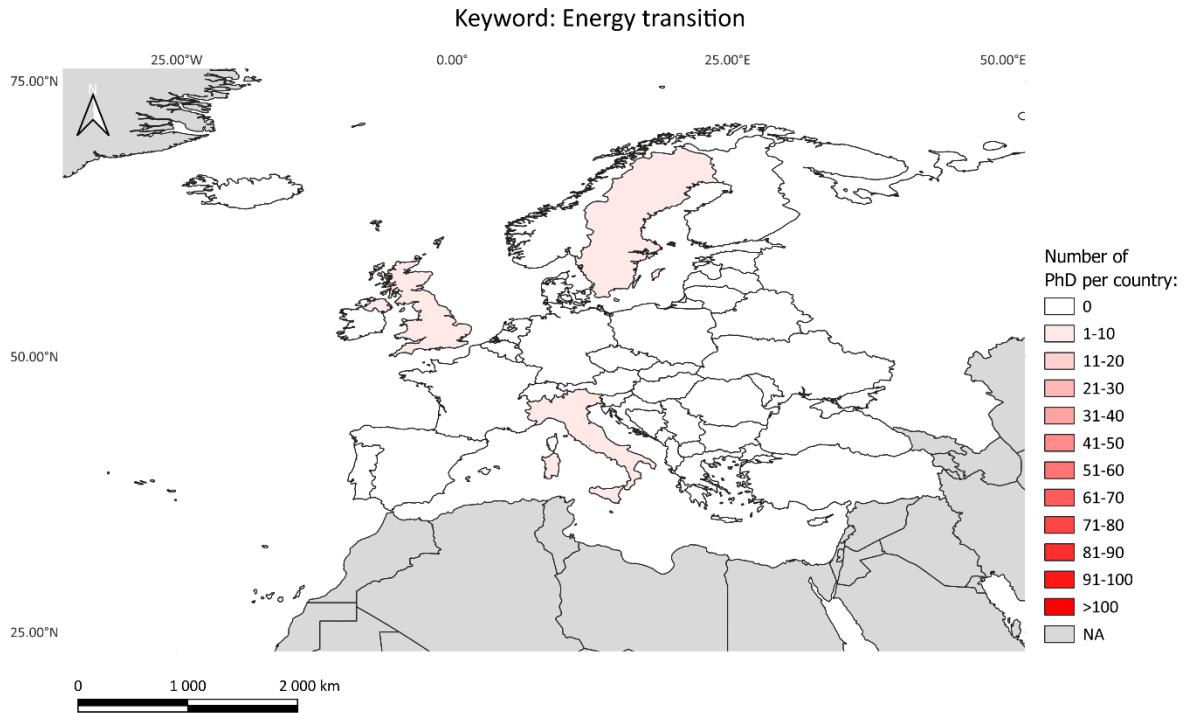
Figure V.6: Distribution of the number of dedicated sustainability-related PhD degree programmes in Europe, per country, in 2024, using the keyword energy transition.

Figure V.7: Distribution of the number of dedicated sustainability-related PhD degree programmes in Europe, per country, in 2024, using the keyword renewable energy.

Keyword: Sustainable energy

Figure V.8 Distribution of the number of dedicated sustainability-related PhD degree programmes in Europe, per country, in 2024, using the keyword sustainable energy.

Figure V.9: Distribution of the number of dedicated sustainability-related PhD degree programmes in Europe, per country, in 2024, using the keyword environmental policy.
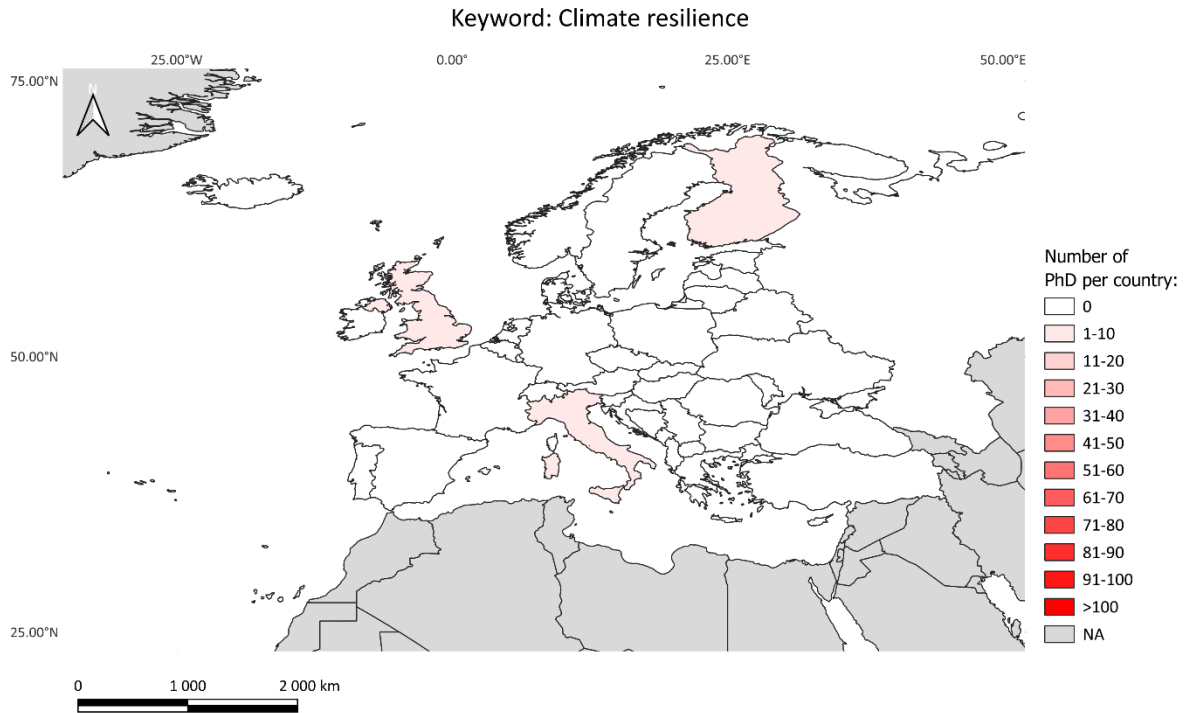
Figure V.10: Distribution of the number of dedicated sustainability-related PhD degree programmes in Europe, per country, in 2024, using the keyword climate resilience.
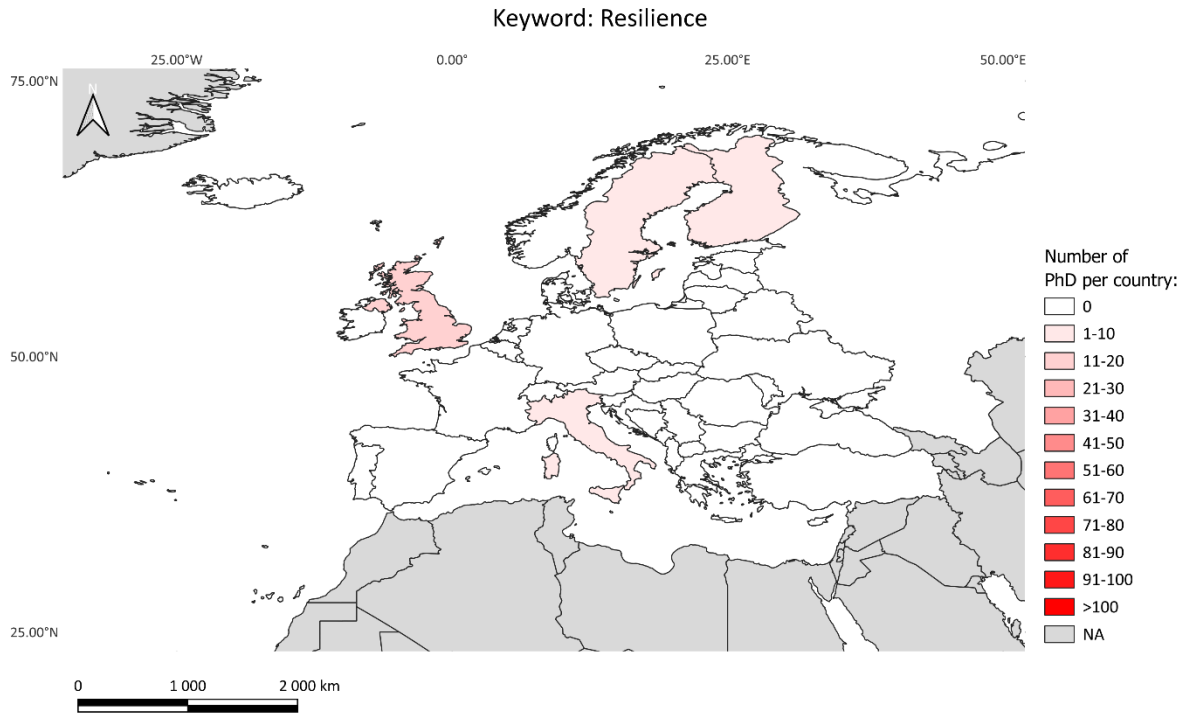
Keyword: Resilience

Figure V.11: Distribution of the number of dedicated sustainability-related PhD degree programmes in Europe, per country, in 2024, using the keyword resilience.
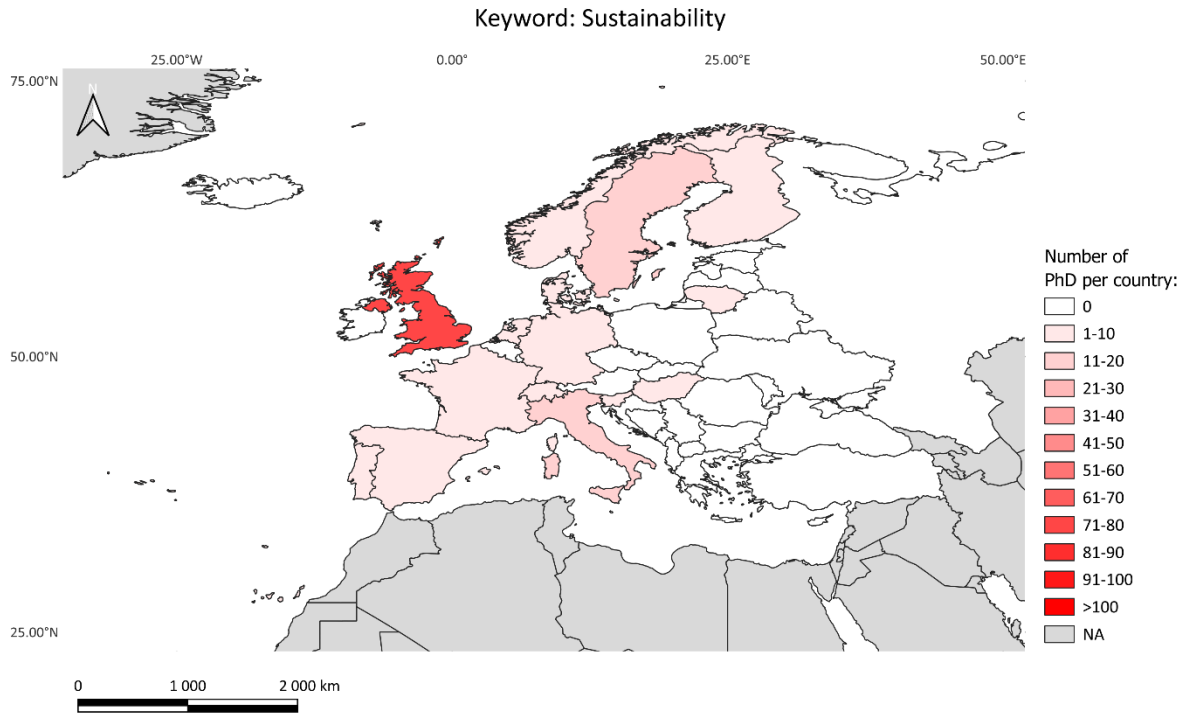
Figure V.12: Distribution of the number of dedicated sustainability-related PhD degree programmes in Europe, per country, in 2024, using the keyword sustainability.

Project partners