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1 **Climate Change: Why Higher Education Matters?**

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40  
41 **Abstract**

42  
43 Higher education (HE) matters to the global struggle to combat climate change. Research  
44 builds knowledge and informs climate solutions. Educational programmes and courses  
45 upskill current and future leaders and professionals to tackle the systems change and the  
46 transformation needed to improve society. Through their outreach and civic engagement

47 work, HE helps people understand and address the climate change impacts, notably on  
48 under-resourced or marginalised people. By raising awareness of the problem and  
49 supporting capacity and capability building, HE encourages changes in attitudes and  
50 behaviours, focusing on adaptive change in preparing people to face the challenges of a  
51 changing climate. However, HE has yet to fully articulate its contribution towards climate  
52 change challenges, which means that organisational structures, curricula and research  
53 programmes do not reflect the interdisciplinary nature of the climate crisis. This paper  
54 describes the role of HE in supporting education and research efforts on climate change  
55 and outlines areas where further action is urgently needed. The study adds to the  
56 empirical research on HE's role in combating climate change and the role of cooperation  
57 in maximising the global effort to cope with a changing climate.

58  
59 **Keywords:** Sustainability; Climate change agenda; Interdisciplinarity; Higher Education  
60 Agenda; Social change.

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## 85 **1. Introduction**

86  
87 As well as being part of the solution, universities and colleges contribute to the global  
88 emission of greenhouse gases through their estates and operations, travel by staff and  
89 students, student residences and food waste. Many are now focused on reducing their  
90 carbon footprint (Valls-Val & Bovea, 2021; Leal Filho et al., 2023a), albeit consistency is  
91 limited (Helmerts et al., 2021), with some making public pledges to reach net zero (UNEP,  
92 2021). Switching to greening their operations and paying attention to waste management,

93 green buildings, and low-carbon transportation (Fissi et al., 2021; Papantoniou et al.,  
94 2020) are ways HEIs seek to reduce their carbon footprint.

95 Globally, Higher Education institutions (HEIs) are well positioned to use their  
96 resources more widely to drive sustainability initiatives beyond their campus and the local  
97 community to help shape more sustainable societies and reduce pressures on the  
98 environment and the world's climate. However, the degree to which universities  
99 implement sustainability practices and initiatives varies across developed (Swearingen  
100 White, 2014) and developing nations (Hoque et al., 2017), institutional archetypes, and  
101 mission (Purcell & Haddock-Fraser, 2023). Nevertheless, what is clear is that  
102 sustainability initiatives championed by HEIs can address both the causes and impacts  
103 of climate change, both locally and globally.

104 Unlocking the potential contribution of HEIs to addressing climate change demands  
105 institutional support (Ssekamatte, 2022). Leadership and governance for transformational  
106 change are necessary prerequisites and enablers of change over time (Purcell, 2019;  
107 Leal Filho et al., 2023b). Climate change should not be limited to science and engineering  
108 departments but must be addressed at a whole institutional level as central to academic  
109 strategy. HEIs can then directly engage in climate change through discipline-led activities,  
110 interdisciplinary efforts, and collaborative work with local, national and international  
111 stakeholders and partners (Leal Filho et al., 2021, 2022a, 2023c). Furthermore, they can  
112 think and act over the long term while providing a space for discussion and debates that  
113 foster the development of relevant solutions, such as by declaring a climate emergency  
114 (Latter & Capstick, 2021).

115 HEIs are central to education for sustainable education (Molthan-Hill et al., 2019),  
116 which has contributed to developing new skills, tools and concepts to tackle unsustainable  
117 practices and promote pro-sustainability efforts. This substantial amplification effect, with  
118 trained and educated people in the workforce and broader society, aids in building  
119 resilience to climate change and other related environmental effects with HEIs adopting  
120 different discourses and practices (Ruiz-Mallén & Heras, 2020). In addition, many  
121 institutions recognise the importance of supporting lifelong learning (English & Carlsen,  
122 2019; Ouane, 2011), offering training and executive education for those in work and  
123 facing the frontline challenges presented by climate change and the sustainable  
124 development goals (SDGs) (Leal Filho et al., 2022b; Vieira, 2020).

125 This perspective attempts to explain how HEIs can engage with the climate agenda.  
126 In order to shed further light on the topic, an expert-driven review was performed to  
127 explore such connections. Based on the findings, some key issues are highlighted in  
128 Table 1.

129

130 **Table 1.** Some Ways for Higher Education to Engage with the Climate Change Agenda  
 131

Type of higher education institution	Climate change aspects relevant to the institutions	References
<b>Conventional universities</b>	environmental education, green initiatives, climate declarations and pledges, and climate change research	Blanco et al. (2022); Fissi et al. (2021); Latter, B., & Capstick, S. (2021)
<b>Medical universities</b>	health impact research, public health literacy, eco-medical literacy, sustainable healthcare, clinical competency, and indigenous knowledge	Maxwell & Blashki (2016); Liao et al. (2019); Goshua et al. (2021); Teherani et al. (2023); Brand et al. (2023)
<b>Business schools</b>	economics, organisational transformation, performance measurement, operations, marketing, leadership, and governance	Howard-Grenville et al. (2014); Purcell (2019)
<b>Law schools</b>	governance, policies, climate law, agreements and treaties, and advocacy	Bouwer et al. (2022); Mehling et al. (2020); Giraudou (2021)
<b>Arts schools</b>	climate change awareness, and creative climate change communication	Qi (2023); Sommer et al. (2019); Cook et al. (2022)
<b>Veterinary schools</b>	animal health impact research, animal health literacy, and interdisciplinary learning and partnership (One Health)	Lacetera (2019); Wilkes et al. (2019).

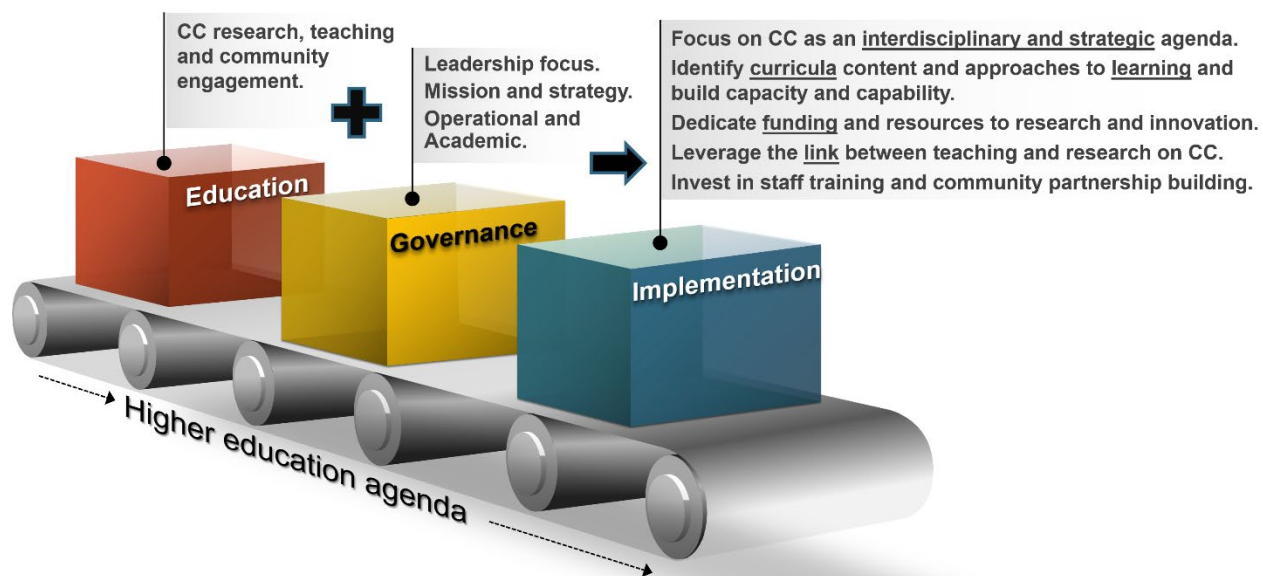
132  
 133 Source: authors

134  
 135 As seen in Table 1, HEIs may incorporate climate change into their curricula in various  
 136 ways. For example, this could be done by creating courses dedicated to climate change  
 137 or by weaving climate change concepts into existing courses.

138  
 139 **2. Operationalising climate action**

140  
 141 In choosing to focus on climate change more explicitly, HEIs may need to adjust the  
 142 scope of their work; the approaches used and their priorities (see Figure 1). Opportunities  
 143 across the institutions emerge to connect disciplines with consequent impact on the  
 144 design of educational programmes and research projects. Using the lens of climate  
 145 change enables HEIs to be alert to new ways of working, gaps in the current course and

146 programme provision, and emergent research questions with prospects for additional and  
147 new funding streams.  
148



149 **Fig. 1.** Ways a focus on climate change can impact the higher education agenda. Source: Authors.  
150 Based on data from [Torkzadeh and Mohtaram \(2022\)](#) and [Leal Filho et al. \(2021\)](#).  
151  
152

153 Although there is an increasing body of work on campus sustainability and climate  
154 issues in the curriculum, there is a need to understand more holistically the forms of  
155 influence that universities have on society and the environment ([McGowan, 2020](#)).

156 By providing training and capacity building, conducting climate change sensitisation  
157 campaigns, and advising communities and policymakers on the subject, HEIs can use  
158 their convening power to bring stakeholders together to tackle the causes of climate  
159 change and roll out solutions to reduce its impact and support adaptation where possible.  
160 In addition, research-intensive and technical universities and colleges can help  
161 community actors address climate change-related issues, offering, for example,  
162 analysing air quality and temperature measurements, monitoring traffic flows, and piloting  
163 interventions in waste management ([Strachan et al., 2022](#)). Similarly, they can be  
164 involved in co-production efforts with neighbouring communities in local adaptation and  
165 mitigation initiatives ([Hsieh & Lee, 2021](#); [Khayyam et al., 2021](#)). The potential for HEIs to  
166 promote societal change in this respect reflects their anchor status ([Fissi et al., 2021](#);  
167 [Hernández-Díaz et al., 2021](#)). Moreover, it promotes synergies across disciplines ([Leal  
168 Filho et al., 2021](#)) and campus actions in the guise of the living laboratory model ([Purcell  
169 et al., 2019](#)). In addition to the climate management measures taken by governments and  
170 civil society organisations around the world, the response to climate change and  
171 sustainability across the nations by HEIs is core to a contemporary mission for the 21st  
172 century and beyond ([Leal Filho et al., 2021](#); [Su Jeong et al., 2021](#); [Villavicencio Calzadilla  
173 et al., 2018](#)).

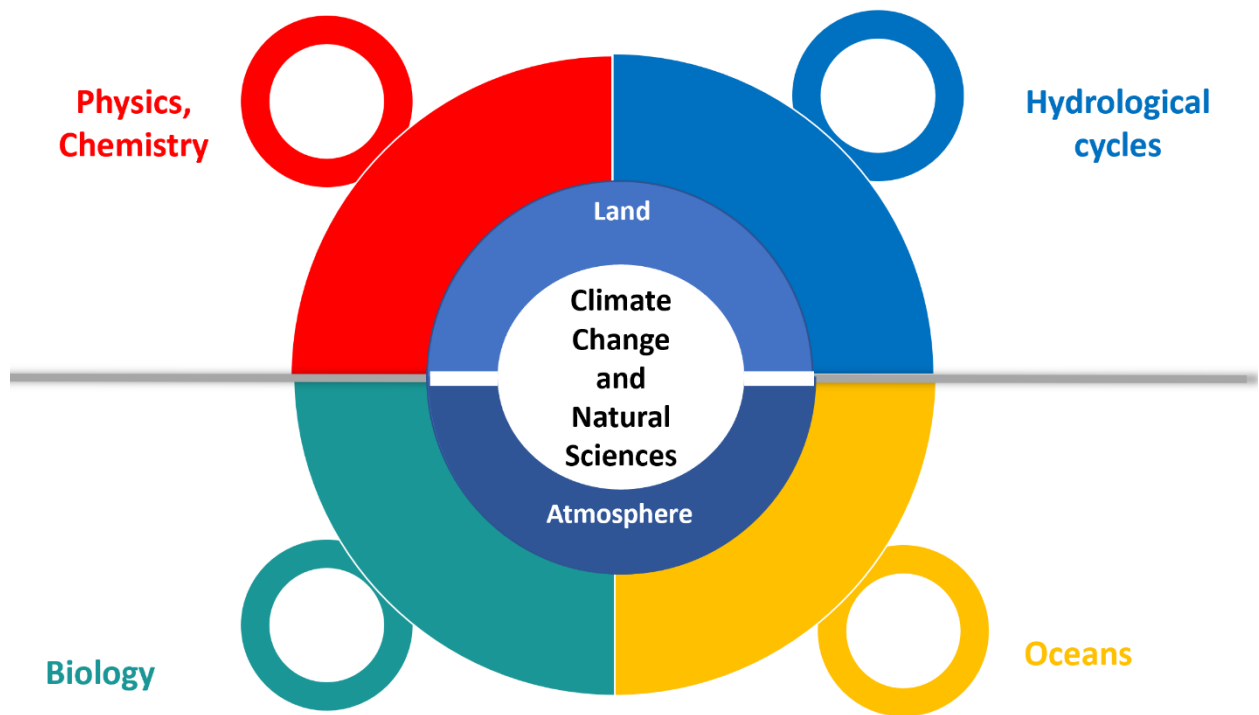
174 The recent COVID-19 pandemic revealed how fast HEIs could act when faced with a  
175 crisis and accelerated the adoption of online learning and the roll-out of new working

176 practices (Purcell & Lumbreras, 2021). As such, we should expect HEIs to act with a  
177 similar level of urgency and attention, given the gravity of the climate crisis. Takshe et al.  
178 (2022) showed the importance of post-pandemic regulations to stop a return to pre-  
179 pandemic behaviours by students in the United Arab Emirates. Similarly, the perspective  
180 of Finnish university students on climate change education highlighted the need to  
181 increase and organise knowledge, cultivate critical-thinking abilities, and promote action  
182 both now and in the future (Yli-Panula et al., 2022). A study of the impact of climate  
183 change information on university students in Turkey (Yilmaz et al., 2022) revealed that  
184 their awareness translated into improved risk perception and a heightened sense of  
185 greater responsibility with students engaged in environmental behaviour to reduce climate  
186 change.

187 To successfully implement a culture of social change within universities to focus on  
188 climate action, leadership is essential (Leal Filho et al., 2021; Torkzadeh & Mohtaram,  
189 2022) since change needs to involve all organisational levels and cross-cutting agenda,  
190 new measures of impact and accountability, as well as attention to incentives and  
191 strategies (Torkzadeh & Mohtaram, 2022). As with other organisations, universities  
192 compete for resources, and their survival and success depend on understanding  
193 emergent trends, scenario planning, and adaptability. Partnerships with other universities  
194 can help (Leal Filho et al., 2021). For example, the university questionnaire (CEDU-Q)  
195 developed by Ferrari et al. (2022) served Salamanca University (Spain) to declare a  
196 climate emergency. It showed that PhD students had the keenest awareness about the  
197 university's actions to tackle climate change, likely due to their direct focus on related  
198 research projects (Leal Filho et al., 2021). However, the same instrument revealed a need  
199 for more communication across the university community and highlighted the need to  
200 develop a more participatory culture. Environmental education by HEIs is central to  
201 increased awareness. It supports action (Blanco et al., 2022), contributing to a global  
202 problem but with local impacts (Leal Filho et al., 2021).

203 Nevertheless, climate change is not the exclusive domain of social sciences. Instead,  
204 it also entails various elements from the natural sciences. Figure 2 outlines some of these  
205 connections.

206  
207



**Fig. 2.** Some Connections Between Climate Change and Natural Sciences

In particular, the natural sciences are essential in developing and evaluating potential solutions to climate change. For example, studying atmospheric cycles is critical in preparing climate models and influencing policymaking. In addition, knowledge of how climate change influences fauna and flora is helping in guiding measures to protect biodiversity.

### 3. Future trends

HEIs play a critical role in efforts to tackle climate change. They are key players in education, research, and policymaking and have the potential to lead the way in developing innovative solutions to the climate crisis. HEIs can educate students on the science of climate change and its policy, economics, and social aspects. They can also lead the way in researching and developing renewable energy technologies and promoting sustainability through campus initiatives. Finally, universities can shape public policy by advocating and providing a platform for dialogue between industry, government, and civil society.

Some emerging research streams on climate change at universities are:

- i. Climate Modelling and Prediction: many Universities are using sophisticated climate models to predict future climate scenarios and assess the potential impacts of climate change on the environment or agriculture. Such research streams explore new data



233 sources and statistical methods to capture better the climate system's complexity,  
234 including its interactions with the biosphere, oceans, and atmosphere.

235  
236 ii) Climate Adaptation and Resilience: This research stream focuses on understanding  
237 how communities, ecosystems, and infrastructure are influenced by or can adapt to a  
238 changing climate. Many universities are studying climate change's social, economic, and  
239 environmental impacts and exploring strategies for building resilience and reducing  
240 vulnerability.

241  
242 iii) Climate Policy and Governance: This research stream examines the design and  
243 implementation of policies to mitigate greenhouse gas emissions and adapt to the impacts  
244 of climate change. Many universities are studying the political and institutional barriers to  
245 climate action, exploring the role of international agreements and national policies, and  
246 evaluating the effectiveness of different policy instruments.

247  
248 iv) Climate Change Communication and Education: This research stream explores  
249 how to communicate climate science to the public and policymakers effectively. Many  
250 universities are studying the psychology of climate change denial and scepticism,  
251 developing new communication strategies and tools, and exploring the role of education  
252 and outreach in promoting climate literacy and engagement. One particular initiative is  
253 the "International Climate Change Information and Research Programme"  
254 <https://www.haw-hamburg.de/en/ftz-nk/programmes/iccirp/>, created in 2008, congregates over  
255 7,000 climate researchers, and coordinates the World PhD Students Climate Change  
256 Network, which regularly organises climate change summits for doctoral students working  
257 on the topic (<https://esssr.eu/9-3-2022-world-phd-students-climate-change-summit/>).

258  
259 v) Climate Change and Health: This research stream investigates the health impacts  
260 of climate change, including the spread of vector-borne diseases, the effects of air  
261 pollution and urban heat on health, and the mental health consequences of extreme  
262 weather events. Universities are exploring new data sources and analytical methods to  
263 understand the complex relationships between a changing climate and human health.

264  
265 Against this background, HEIS must engage further by, for instance, partnering with  
266 local organisations to foster dialogue and raise awareness about climate change and its  
267 impacts. Also, HEIs can provide opportunities for students to get involved in climate  
268 activism and create a campus culture that values sustainability and environmental  
269 stewardship.

270  
271 Scholars can further their efforts to tackle climate change in several ways, such as  
272 researching climate change, its causes, impacts, and potential solutions and publishing  
273 their findings in peer-reviewed journals and other media such as newspapers and other  
274 non-academic publications. This can help advance scientific understanding of the issue,  
275 inform policy decisions, and foster public awareness. Also, scholars may collaborate more  
276 with colleagues from other disciplines, which makes perfect sense since climate change  
277 is a complex issue that requires expertise from multiple disciplines. Scholars can  
278 collaborate with experts from other fields, such as environmental science, engineering,

279 economics, and policy, to develop interdisciplinary solutions. A further area of action for  
280 scholars is to engage more in educating the public about climate change through various  
281 means, such as public lectures, workshops, and outreach programmes. This can raise  
282 awareness and encourage individuals to take action to reduce their carbon footprint. A  
283 further area is advocacy: scholars can use their expertise to advocate for policies that  
284 address climate change at local, national, and international levels. They can provide  
285 evidence-based recommendations to policymakers -as many do as part of the work of the  
286 Intergovernmental Panel on Climate Change (IPCC) and engage in public discourse to  
287 promote climate action.

288  
289 Drawing from its main assets: human resources and knowledge, and acting locally  
290 but connected through global networks, HEIs can bring them together to the advantage  
291 of national and international efforts to address climate change. Here collaboration  
292 between disciplines may play a key role in producing sound technological and socio-  
293 cultural solutions, which may assist in efforts to cope with a changing climate.

294  
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