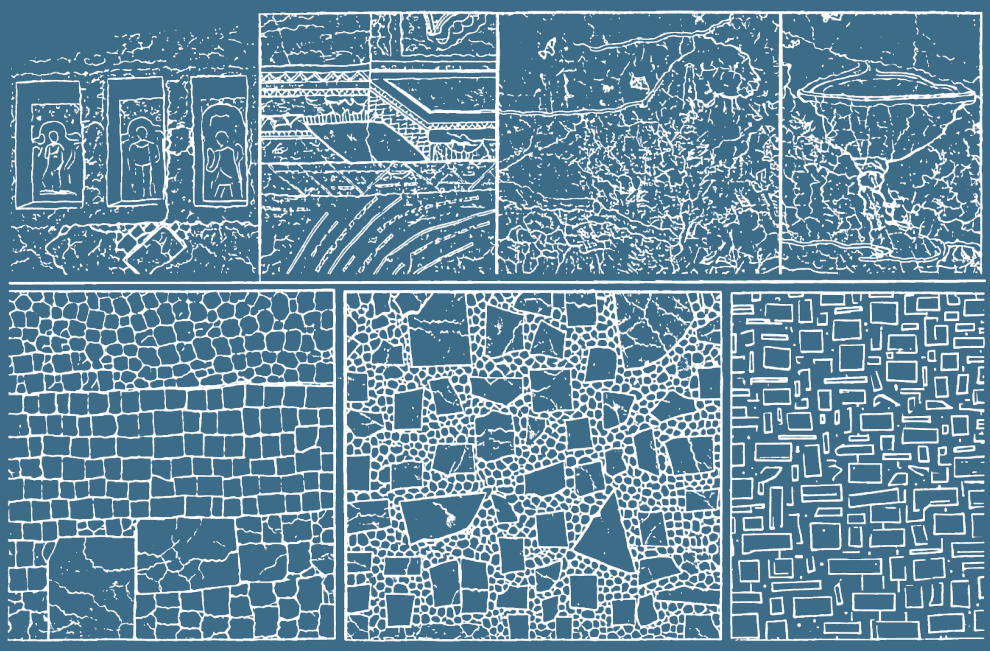
CLIMATE CHANGE
E SOSTENIBILITÀ DEI TERRITORI
TRA RISCHI AMBIENTALI E ANTROPICI

a cura di
IRENE FANTAPPIÈ e SARA ZUCCARINO



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Che cosa significa oggi abitare il pianeta? Questo volume affronta la domanda attraversando saperi e linguaggi diversi: dalle scienze ambientali al diritto, dalla matematica alle scienze sociali, dalla filosofia alla letteratura. Articolato in tre sezioni – cornici etiche, culturali e letterarie; strumenti e governance per la sostenibilità dei territori; ruolo delle università e della ricerca – il volume propone dunque una lettura transdisciplinare del cambiamento climatico come una questione insieme scientifica, politica e simbolica. Al centro, il territorio come luogo di crisi ma anche di sperimentazione, in cui si ridefiniscono le relazioni tra umano, non umano e tecnologia. I saggi indagano sia rischi e trasformazioni del passato e del presente, sia anche le possibilità di risposta: modelli sostenibili, strategie di mitigazione e adattamento, pratiche di coabitazione, nuove forme di consapevolezza. Ne emerge un invito a pensare la transizione ecologica come processo culturale e sociale oltre che tecnico, fondato su responsabilità condivisa e giustizia intergenerazionale.

What does it mean to inhabit the planet today? This volume addresses the question by bringing into dialogue diverse fields of knowledge and forms of expression: from environmental sciences to law, from mathematics to the social sciences, from philosophy to literature. Organized into three sections – ethical, cultural and literary frameworks; tools and governance for the sustainability of territories; and the role of universities and research – the volume offers a transdisciplinary perspective on climate change as at once a scientific, political, and symbolic issue. The territory is conceived as both a site of crisis and a space of experimentation, where relationships between humans, non-humans, and technology are being reconfigured. The essays explore not only risks and transformations, but also possible responses: sustainable models, strategies for mitigation and adaptation, practices of cohabitation, and new forms of awareness. Ultimately, the volume invites readers to rethink ecological transition as a cultural and social process, as well as a technical one, grounded in shared responsibility and intergenerational justice.

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RUOLO DELLE UNIVERSITÀ E DELLA RICERCA NELLA TRANSIZIONE CLIMATICA

Raising Awareness on Climate Change Among University Students: an Enterprising Journey

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Riassunto: Il tema del cambiamento climatico è sempre più al centro di studi e ricerche che coinvolgono il ruolo delle università e degli studenti nel mitigarne gli impatti. L'obiettivo del lavoro è, in primo luogo, quello di analizzare la consapevolezza degli studenti Unicas sulle tematiche del cambiamento climatico; in secondo luogo, il paper cerca di identificare possibili soluzioni che siano in grado di ridurre l'impatto. A tale scopo, propone una indagine empirica che, attraverso la somministrazione di un questionario online, rileva questi aspetti e identifica possibili soluzioni per promuovere comportamento responsabili e azioni orientate ad una maggiore sostenibilità dell'ateneo. I risultati dell'analisi denotano una adeguata consapevolezza degli studenti del campione, che propongono anche soluzioni specifiche per incentivare la lotta al cambiamento climatico.

Parole chiave: cambiamento climatico, studenti Unicas, università imprenditoriali, azioni per la sostenibilità.

Abstract: Climate change is a critical topic which is increasingly debated within research and analyses involving the role of universities and university students on its mitigation. The aim of this paper is double: firstly, it analyses the students' awareness on the issues of climate change. Secondly it tries to identify possible solutions to mitigate the climate change impact on the Universities. With these purposes, the paper puts forward an empirical analysis based on a questionnaire submitted to a sample of Unicas students. Our results evidence a relatively high level of awareness among students. Furthermore, dedicated solutions are provided to try to mitigate and fight against climate change.

Keywords: Climate Change, Unicas Students, Entrepreneurial Universities, Action for Sustainability.

1. Introduction

The role of universities in supporting Sustainable Development Goals (SDGs) has dramatically increased in recent years, which has stimulated a growing strand of literature. The contribution of universities has been analyzed from various perspectives and, as indicated by Findler[1], can be classified in the following areas: outreach, assessment and reporting, research education campus, operations campus, experiences, and generalist.

This paper deals with the role of universities in contributing to sustainable development, with a particular focus on climate change adaptation and mitigation.

The topic has been the subject of recent extensive research across a variety of university settings[2]. Leal Filho and Vargas[3] underline that, despite the unique position of universities in boosting climate action and sustainable development regionally and internationally, they have focused mainly on compartmentalized rather than holistic approaches which are not conducive to their leadership in these areas. Accordingly, holistic and integrative approaches are called into action to implement sustainability goals.

Integrative approaches, which highlight the pivotal role the Universities play in promoting climate change adaptation through good practices, have gained momentum, and are usually believed to contribute positively to addressing climate change. This process has stimulated a progressive transition towards more 'entrepreneurial' forms of education, aimed to strengthening «critical competencies, including entrepreneurial self-efficacy, system thinking, problem-solving, innovation, and interdisciplinarity»[4]. As pointed out in the EntreComp Framework, developed by the European Union, High Educational Institutions are strongly encouraged to promote entrepreneurial attitudes in the educational system, through integrating «*principles of entrepreneurship within their curricula, regardless of their discipline, and type of institution*»[5].

[1] FINDLER *ET AL*. 2019.
[2] REIMS 2021.
[3] LEAL FILHO, VARGAS 2021.
[4] ZHERDEVA *ET AL*. 2024.
[5] BACIGALUPO *ET AL.* 2016.

Furthermore, these approaches recognize the role of the students, and emphasize the need for raising their awareness and empowering them to act as a fundamental objective[6]. Actually, the International Panel on Climate Change (IPCC) addresses a set of actions aimed to empowering students, by encouraging them to mitigate climate change. Actions can be either individual or collective[7].

Set against this background, recent literature started analyzing the importance of involving students in building higher awareness on climate change in both developed and developing countries[8]. As pointed out[9] «Universities also have an important capacity to instruct students about climate change and involve them actively in climate-related issues, not only as future professionals but also as informed citizens who can influence change».

In this paper, the role of universities in positively impacting on climate change is analyzed through the theoretical lens of institutional entrepreneurship, providing universities with the opportunity to remove constraining institutional arrangements and boosting new regimes grounded on higher awareness on the issues of climate change[10].

More precisely, the paper is set against the background of the institutional entrepreneurship theory aimed to stimulate a cultural change among the students' community. It is conceived as a combination of both individual and collective initiatives whose purpose is to set up new institutional arrangements and creating new institutions or replacing previously existing ones[11]. The term 'institution' needs clarification and must be conceived from a double perspectives, formal and informal. The first term regards the formal regulation system, while informal institutions represent the 'culture' of a certain actor/institution, a 'way of doing things', an habit[12]. Accordingly, institutions both constrain and enable behavior[13]. Framed within the context of university's role in combating climate change, this brings about identifying levels

[6] REIMERS 2021; BLANCO-PORTELA *ET AL.* 2017.
[7] REIMERS 2021.
[8] WACHOLTZ *ET AL*. 2014; LONDERO BRANDLI *ET AL*. 2023; ORUONYE 2011.
[9] LONDERO BRANDLI *ET AL*. 2023, p 407.
[10] WESTLEY *ET AL*. 2011.
[11] GARUD *ET AL.* 2013.
[12] HODGSON 2004.
[13] HODGSON 2006.

of awareness about the problem and addressing possible recommendation and operational actions to reduce the problem.

Set against this background, the paper excavates the issue of awareness of climate change among university students with a double purpose:

- analyze students' rules of conduct with reference to behavior impacting climate; change as university students;
- providing possible operational rules to improve the students' contribution on climate change.

More precisely, our work explores student awareness at the University of Cassino and Southern Lazio (Unicas), a recent member of the EUt+ alliance. This membership has led to the adoption of a set of entrepreneurial practices, designed to foster sustainable transition dynamics, which have also entailed a greater focus on sustainability issues. However, how the students perceive their potential contribution to this transition requires attention and further exploration. This paper tries to address this gap by analyzing student awareness of climate change. Research questions are the following:

RQ1 – To what extent are students aware about the issue of climate change?
RQ2 – How can they contribute to mitigate impact of climate change in the University?

In the next section we introduce the methodology of analysis, grounded on primary sources, while the following paragraph 3 will show the results of the survey. Some final considerations and recommendations will end the paper.

2. Methodology

Data collection is based on an online survey administered to the Unicas student population, focused on our and international students, absorbing almost 20% of the total student population. The questionnaire is drawn on literature, more precisely, two main approaches are considered:

1) approaches aimed to excavate the level of students' attitude, knowledge and engagement on climate change, which is pointed out in other studies[14].

[14] BRANDLI *ET AL*. 2024; ESAKKIMUTHU *ET AL.* 2023; WACHOLZ *ET AL*. 2012.

2) The approach to 'Climate change education'[15], recalling the four pillars of the UNESCO's Climate Change Education for Sustainable Development program (Unesco, 2010).

The questionnaire, reported in Appemdix A, is divided into the following sections:

- Sociodemographic characteristics;
- Awareness and knowledge of climate change issues;
- Suggested action to improve the Unicas contribution to climate change adaptation and mitigation.

We collected our data using the CAWI (Computer-Assisted Web Interview) methodology via an online questionnaire distributed through a link. This method is cost-effective and fast, and it provides the benefit of having data ready for analysis immediately. However, data collected this way is often subject to self-selection bias, as respondents who volunteer to participate may share specific interests or opinions. For this reason, we consider the current survey a pilot study to test the questionnaire's structure and the data's coherence with our research aims. Based on the conclusions of this work, our intention is to plan a wider edition of the survey involving a representative sample design and a consistent data selection process, which will include all the EUt+ member universities.

3. Results

Data have been processed through the R software. Univariate statistics and graphical representation have been drawn. In this section, a synthesis of the sample characteristics and overview of the main findings of the study are presented, following the questionnaire's sections.

3.1 Sociodemographic characteristics

The main characteristics of the collected sample are summarized in table 1.

The percentage of male students is slightly higher than the female's one. The majority of responding students is aged over 24 (65.2%). Accordingly,

[15] REIMER 2021.

the majority of them (57.4%) is enrolled on master's degree programs. More precisely, 42.6% of students is enrolled in a bachelor program (38.2% of which is enrolled in Economics field), while 57.4% in a master program (53.7% in Economics).

Table 1 – Main descriptive statistics of respondents.

Variable	Percent (%)	Variable	Percent (%)
Gender		Age	
Female	43.1%	18-21	10.8%
Male	54.9%	22-24	24.0%
Not binary	2.0%	More than 24	65.2%
Program / Field of study		Nationality	
B. in Economics field	38.2%	Africa	49.2%
B. in Engineering field	4.4%	Asia	16.4%
M. in Economics field	53.7%	Central Asia	17.9%
M. in Engineering field	3.7%	Europe	7.5%
		Middle East	6.0%
		Other	3.0%

49.8% of respondents come from Africa (specifically: 38.8% from Ethiopia, 4.5% from Kenya, 3% from Cameroon, 2% from Nigeria, 1.5% from Gambia). Considering the voluntary participation to the survey, such a high percentage may suggest that the climate change represents a highly pervasive concern throughout Africa, but in particular among Ethiopian people.

Student's original family units include 4 persons or more (75%).

3.2 Awareness and knowledge of climate change issues (RQ1)

The respondents look somewhat aware and informed about the climate change issues and active against it. The 54% of them have attended courses offered at Unicas (figure 3), and the 97% would be interested in attending

courses that teach business models (for example, sustainable business planning) that reduce climate change in the future (fig. 4), even without credits recognition (55%). The 21% of them is also engaged in associations and/or social groups (e.g., Women's rights associations, environmental associations, Caritas International, etc.).

Respondents exhibit responsible mobility, with the vast majority utilizing sustainable transport to reach the university. Notably, only 5.9% of participants commute by car.

Definition of climate change shows a relatively fair knowledge, with the majority of students providing correct definition, and another share evidencing misconceptions. As a matter of fact, correctly, they recognize 'Climate change on a global scale' to be the most appropriate definition of climate change (46.3%). However, not far from the truth, 29.9% choose 'An abnormal rise or fall in temperatures', and 19.4% 'An increase in Greenhouse gasses' (fig. 1).

Almost all (89.5%) agree it is a serious and urgent matter (fig. 2 and 3). Moreover, 100% of them think that humans are responsible for climate change (specifically: 64.2% 'They are entirely responsible', 35.8% 'They are partially responsible'). No respondent selected the available answer option 'They are not responsible'.

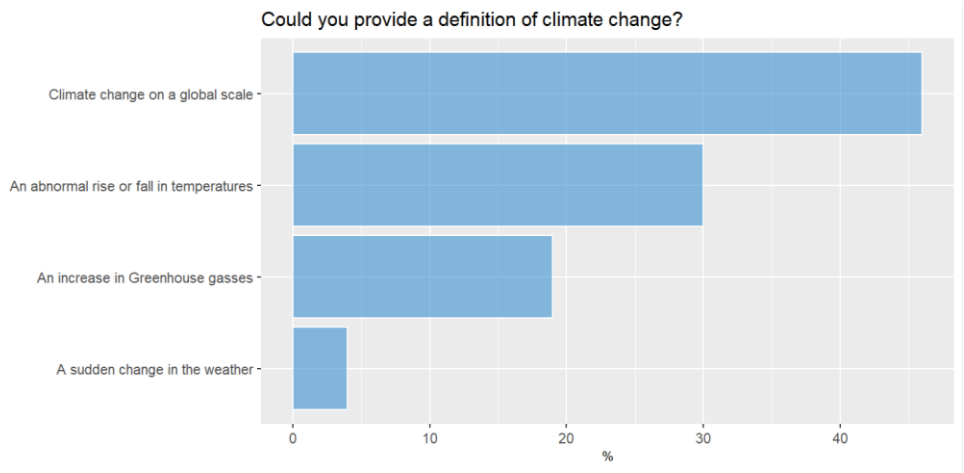

Figure 1 – Respondents' definition of climate change.

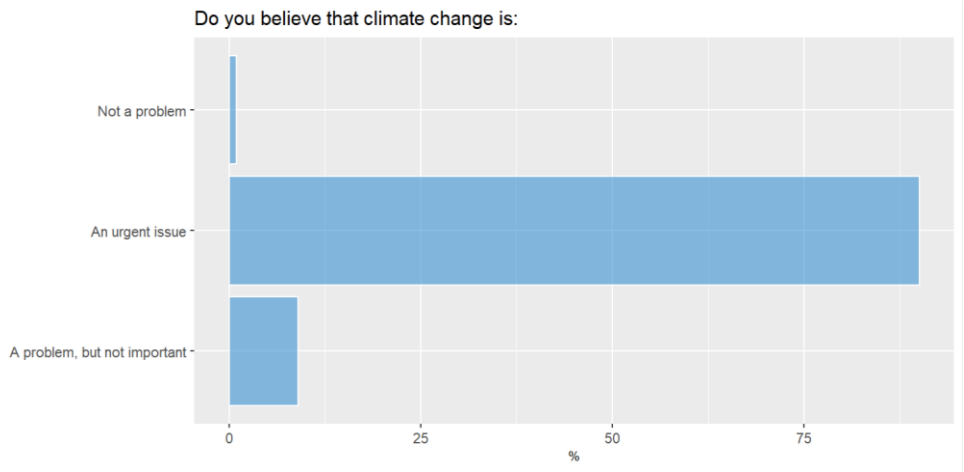

Figure 2 – Respondents' opinion on what climate change represents for humanity.

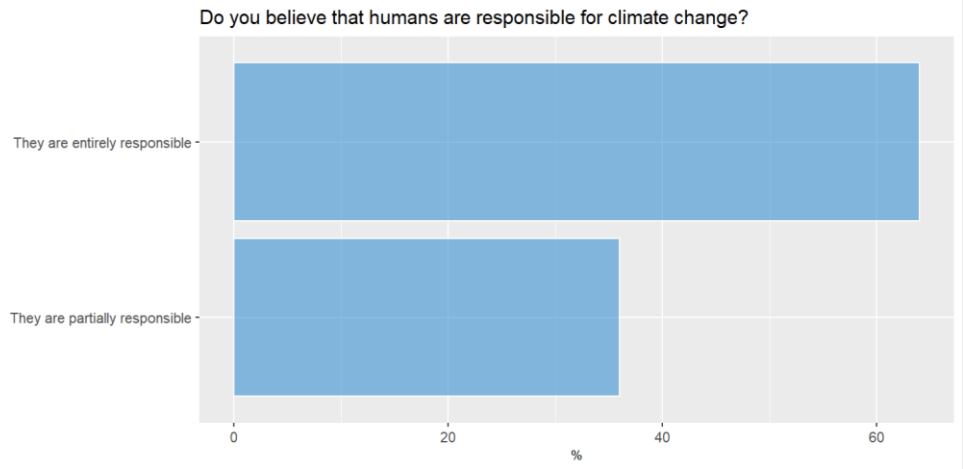

Figure 3 – Respondents' opinion about human responsibilities.

In the questionnaire, we asked respondents to rate the main drivers of climate change, including agricultural activity, industrial activity, the energy system, transport, and buildings, on a scale from 1 (not important) to 6 (mostly important). Figure 4 displays the average rating assigned to each of these factors.

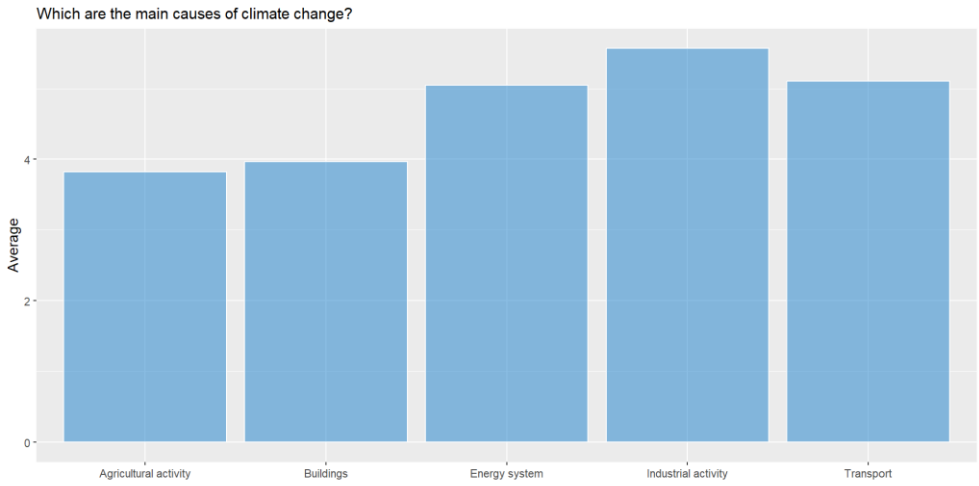

Figure 4 – The relevance of the main causes of climate change.

The students consider as mostly relevant the industrial activity, with a 5.6 mean score. In fact, 74% of students have ranked industrial activity as mostly important; the second cause is indicated in the transport, with a mean score of 5.1 (46% of students have ranked the transport as mostly important), slightly higher than energy system occupying the third position with a 5 mean score (but 47% of respondents indicating it as the most determining factor). Of less importance have been judged the agricultural activity and the building sector.

We also asked to list further important factors responsible for climate change. Fig. 5 shows the frequence of the most suggested factors.

Water and food waste emerge as the most impactful factors, underlying the students' awareness about food habits and dietary needs, particularly the impact on climate change deriving from the so-called 'westernization' of diets. This is also confirmed by the relevance of 'overconsumption' as main factor.

Pollution and the use of non-renewable energy are identified as further causes for climate change, which points out that a wider set of causes must be faced to solve this critical problem. As a consequence, an articulated set of interventions could be necessary: we asked the students to propose their solutions.

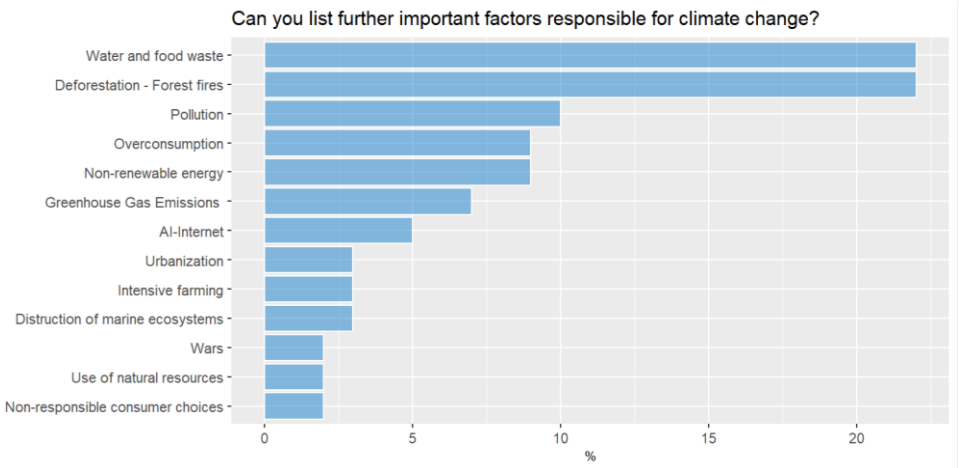

Figure 5 – Further causes of climate change.

3.3 Actions to adopt for climate change adaptation and mitigation (RQ2)

The last section of the questionnaire was dedicated to student's opinion about possible measures that the university can adopt to contrast the climate change.

We started asking students to list up to three possible behavior anyone could adopt to slow the global warming.

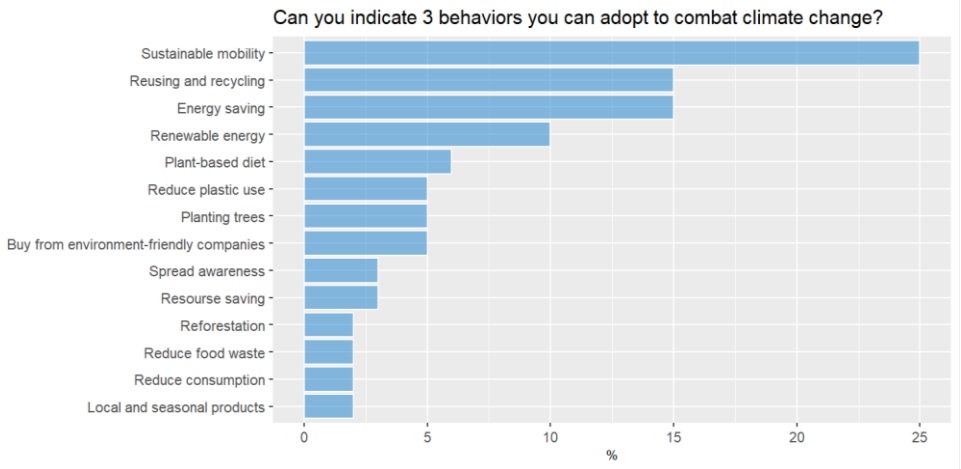

Figure 6 – Behavious one can adopt to combat climate change.

As evidenced in Figure 6, the students consider the University as a fundamental actor to fight against climate change. As a matter of fact, a variety of behaviors can be adopted by students to reduce the impact on climate change within the University. Sustainable mobility is evaluated as the most important (24.7%), followed by energy efficiency and reusing and recycling (15.3%). On the other side, reduce consumption, relying on local and seasonal products and reforesting are considered as less relevant actions.

A final aspect to be analyzed concern the actions University can take in order to address the issue of climate change. Figure 7 provides a clear answer, according to the students' view: as a matter of fact, potential strategies are polarized on two main training-related actions absorbing 85.7% of the answers: activate courses in which issues of climate change are discussed (54.3%), and organizing training days for all the University personnel (31.4%).

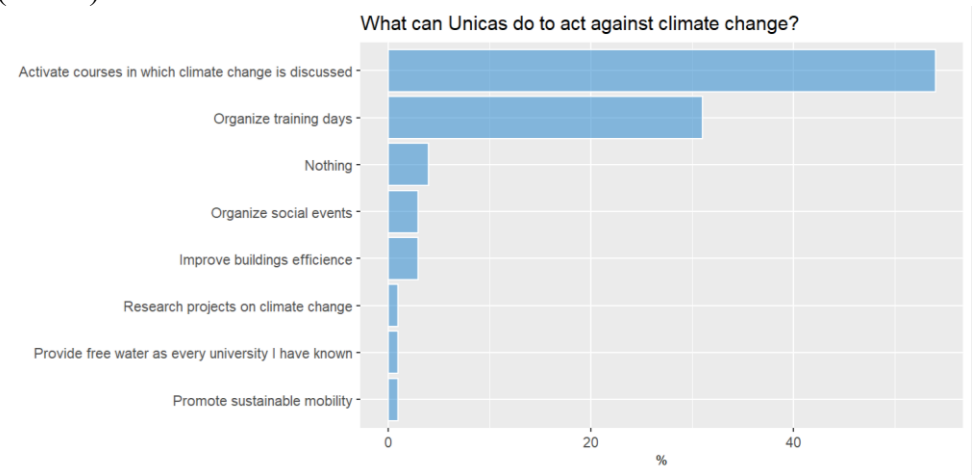

Figure 7 – Actions to be carried out by Unicas to combat climate change.

4. Discussion and conclusions

This paper aimed to gather a first insight on the students' awareness of climate change, and to address possible initiatives the University can take. The study presents limits in the reduced number of respondents. The study can be considered as a pilot study and need further development, through expanding the survey to a wider share of students. However, the students who have answered

to the questionnaire can be considered as really interested and involved in our research, which raises the quality of their answers.

Despite this limit, our research can contribute to strengthening the university commitment and raising awareness of the need to prioritize new educational and communications strategies to enhance student awareness of one of the most critical challenges of the near future.

From the empirical analysis the two research questions have gathered clear answers. The first point we want to highlight here is the high degree of maturity that the students showed regarding such an important issue: they consider climate change as a global, urgent problem. Moreover, students in university are keen to receive training on climate change, so confirming an high degree of involvement, which confirms previous analyses on the students' commitment[16].

As far as the students' awareness on climate change is concerned (*RQ1*), respondents seem to have enough knowledge about the problem and have clearly provided sound definition of 'climate change'. Moreover, some of them have identified causes which are in line with the current research on this topic. More precisely, as previous studies have underlined[17], some students display a fair understanding and knowledge of climate change while other groups of students show limited knowledge and misunderstanding.

Beyond 'conventional' impact factors, students have revealed the importance of reusing, recycling, and the relevant role played by correct food habits and behaviors, aimed to reduce the food waste.

Drawn on our analysis, policy implications are also evident (*RQ2*): it is necessary to stress the importance of universities in the creation of what Reimers[18] defines as an ecosystem of climate change education. This calls for a system thinking perspective whose purpose is to expand the '*carbon brainprint*' of the university community, through educational programs aimed to inform students and the public about climate change mitigation and adaptation (Leal Filho et al., 2021). This is in line with the idea of a new entrepreneurial function the universities can take on, bringing about institutional

[16] LEAL FILHO *ET AL*. 2021.
[17] ESAKKIMUTHU, BANUPRIYA 2023; WACHHOLTZ *ET AL*. 2012.
[18] REIMERS 2021.

entrepreneurship, whose purpose is to stimulate a change in the institutions, meant as conventions and ways of doing things[19].

As pointed out by McQuillan and Gavigan[20], additional and personalized effort from educators compared to standard courses is required to empower the goal of boosting sustainable entrepreneurship education.

Set against this background, possible options the University can adopt to combat climate change are based on micro and macro level perspectives. From microlevel perspective, our survey is encouraging and may stimulate future actions identifying the students a catalyst of change and able to boost action to fight climate change. The example of sustainable mobility suggested by the students is paramount and calls for further actions, also at EUt+ level, showing urgency of getting green travel policy in place for students.

As evident from our empirical analysis, more than half of respondents are willing to attend dedicated courses on climate change even without credit recognition, which witnesses their high level of responsibility and will to taking action. In this context, in order to increase the level of awareness and knowledge, the creation of 'university clubs' to mobilize students could be a good starting point, as demonstrated in previous studies[21]. From a macrolevel perspective, a community perspective is needed, joining entrepreneurial and sustainability competences[22] and calling the university institution into action, through educational programs, training courses for the personnel. Mostly important, the creation of networks and university alliances across Europe allow to share good practices.

In this context, the EUt+ alliance[23] can be considered as a virtuous example, joining nine universities located all across Europe, which share good example on how to build more sustainable Universities.

[19] RUTHERFORD 1994.
[20] MCQUILLAN, GAVIGAN 2024.
[21] ORUONYE 2011.
[22] ZHERDEVA *ET AL*. 2024
[23] Refer to webography entry no. 7.

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Webography

1. https://doi.org/10.1016/j.jclepro.2017.07.252
2. https://doi.org/10.1007/978-1-4614-3858-8_421
3. https://doi.org/10.1016/j.crm.2023.100486
4. https://doi.org/10.1186/s12302-021-00552-5
5. https://doi.org/10.1007/978-3-030-57927-2_1
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7. https://www.univ-tech.eu/

Appendix A – Questionnaire

Section 1 – general issues

Could you provide a definition of climate change?
□ a sudden change in the weather from one hour to the next
□ an abnormal rise or fall in temperatures
□ climate change on a global scale
□ an increase in Greenhouse gasses
□ other (please specify) _____

Do you believe that climate change is:
□ an urgent issue
□ a problem, but not important
□ not a problem

Do you believe that humans are responsible for climate change?
□ no, they are not responsible
□ they are partially responsible
□ they are entirely responsible

What are the main causes of climate change? Rank the answer from 1 (less important) to 6 (mostly important)
□ agricultural activity
□ industrial activity
□ energy system
□ transport
□ buildings
□ other (please specify) _____

Section 2 – Students' habits and culture on climate change

How do you get to university?
□ on foot
□ by scooter
□ by bicycle
□ by public transport
□ by car
□ other (…..)

Can you indicate 3 behaviors you can adopt to combat climate change?
□ _____
□ _____
□ _____

Section 3 – Pedagogical methods and impact

What can the University of Cassino and southern Lazio do to act against climate change?
□ nothing
□ activate courses in which climate change is discussed
□ organize training days
□ other _____

Have you attended courses in this university in which you have heard about climate change?
□ no course
□ yes, one course
□ yes, more than one course

Would you be interested in attending courses that teach business models (for example, business planning) that reduce climate change?
□ no, I would not attend
□ yes, only if they award academic credits (CFU)
□ yes, even without the recognition of academic credits (CFU)

Section 4 – Sociodemographic variables

Age ……
Gender ……
Course of Study ……
Family composition (number of family members) ……
Nationality …….
Membership in associations and/or social groups (e.g., Women's rights associations, environmental associations, Caritas International, etc.) □ Yes □ No