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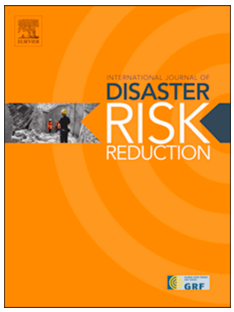

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Drivers and Barriers of Sustainable Behaviours Among Young Generations in a Climate-Vulnerable Italian City

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Keywords: Climate change, behavioural change, COM-B model, sustainable lifestyle, extreme events

Abstract

Sustainable behaviours are essential for addressing climate change, particularly as extreme weather events intensify globally. Identifying the factors that drive or hinder these behaviours is crucial for developing effective interventions. However, existing behavioural models often overlook cultural, social, and contextual influences shaping sustainable actions, especially in climate-vulnerable regions.

The COM-B model is a behavioural framework that explains behaviour change through the interplay of Capability, Opportunity, and Motivation, which together determine whether a Behaviour can occur. In this study, we apply it—among its first uses in climate change research—to analyze the determinants influencing sustainable behaviours. Conducted in Chiavari, a Ligurian city prone to floods, the research involved 470 secondary school students (aged 15–17) and 117 young adults (aged 18–35). Results show that young adults with direct experience of extreme events exhibit greater climate awareness (90% vs. 80% of students) and a higher tendency to engage in sustainable behaviours, while students demonstrate a stronger belief in the effectiveness of collective action.

The analysis highlights moderate positive correlations between motivation and sustainable behaviour, as well as between capability and both motivation and behaviour, emphasizing capability's key role in fostering motivation. However, over 40% of respondents feel no social pressure to reduce their footprint, and only 15.7% of students and 18.8% of young adults prioritize ethical and sustainable consumption.

These findings reinforce the COM-B model's potential to identify the most effective determinants for fostering sustainable behaviours. Targeting capability and motivation could enhance interventions, leveraging local awareness and direct experiences to promote climate-conscious actions.

Introduction

Behavioural and lifestyle changes, aided by policies, infrastructures, and technologies, can substantially cut global greenhouse gas emissions (IPCC, 2023). However, the effectiveness and mechanisms of behavioural interventions in mitigating climate impact remain debated (Nisa et al., 2019; Stern, 2020; van der Linden & Goldberg, 2020).

Historical transitions show that innovations and demand-side products are crucial, highlighting the need to study individual behaviours, like consumption attitudes and lifestyles, in mitigating climate change (CC - (Gifford et al., 2011). Evidence indicates that awareness or concern about climate change is key to fostering personal mitigation behaviours, with more concerned individuals being likely to engage in and support climate action (Bouman et al., 2020). Extensive research highlights the impact of climate change awareness and lifestyles on mitigation, showing greater awareness in wealthier, educated countries and stronger risk perception in highly vulnerable areas (Ehsan et al., 2022; Knight, 2016). (Lee et al., 2015)) and (Baiardi & Morana, 2021)), confirm a direct correlation between environmental concern and factors like per capita income, social trust, warm weather discomfort, media coverage, youth population, monetary losses from extreme weather, and secondary education (Castañeda et al., 2020). Surprisingly, personal experiences with extreme climate events do not always have a lasting impact on awareness (Gärtner & Schoen, 2021), highlighting the need for further research. Within families, climate change awareness often fails to translate into behaviour that reduces environmental footprints (Tiller & Schott, 2013; Venghaus et al., 2022). Conversely, public participation enhances climate awareness ((Khatibi et al., 2021) and influences political agendas (Venghaus et al., 2022). Italian students often show greater climate change awareness than adults (Antronico et al., 2023; Calculli et al., 2021) but have little trust in public administrations. Only well-informed youths demonstrate a willingness to change habits, including dietary ones (Jürkenbeck et al., 2021).

With the aim of investigating the mechanisms and identifying the determinants that influence and shape different behavioural dynamics toward sustainable behaviours, multiple frameworks have been developed over the years, particularly within environmental sociology and psychology. Examples include the Theory of Interpersonal Behaviour (Triandis, 1977), the Norm Activation Theory (NAM, (Schwartz, 1977)), the Value-Belief-Norm Theory (Stern, 2020), and the Goal-Framing Theory (Elliot & Fryer, 2008). One of the most relevant frameworks, as it includes concepts such as information, values, beliefs, attitudes, norms, and agency, is the Theory of Planned Behaviour (TPB, (Ajzen, 1991)). Widely used in environmental research, TPB explains behaviour as driven by intentions shaped by attitudes, social norms, and perceived control.

However, while these models identify key drivers and barriers to climate action, they are often criticized for their limited theoretical scope, neglect of structural factors, and insufficient consideration of cultural and physical contexts, which can lead to poorly targeted interventions and a limited impact on reducing carbon emissions ((Nielsen et al., 2021; Sniehotta et al., 2014; Whittle et al., 2019).

Given these critiques, existing behavioural models often fail to drive significant change due to their oversimplified, individualistic, and linear nature, which neglects environmental complexities (Whitmarsh et al., 2021) to induce Pro-Environmental Behaviour (Kollmuss & Agyeman, 2002). This highlights the need for more integrated, interdisciplinary approaches, such as the Capability, Opportunity, Motivation-Behaviour (COM-B, (Michie et al., 2011))

model. The COM-B model emphasizes positive climate behaviours that require individuals to know how to act (capability), have the opportunity to act (opportunity), and be motivated to act (motivation). However, this model has rarely been applied in the climate action sphere (Whitmarsh et al., 2021). In 2023, (Kureshi et al., 2023) conducted a study on promoting attitudes toward proper indoor air quality management to reduce exposure to in-door air pollutants. The results showed that the group exposed to a planned intervention based on the COM-B model significantly reduced their exposure to pollutants compared to those who were only informed.

In the following study, we explore the application of the COM-B model in climate change research (Michie et al., 2014, 2011; Whitmarsh et al., 2021) using a sustainable consumption index, i.e. a dependent variable (Behaviour index) to measure consumption patterns (PEB) aimed at reducing the environmental and social impacts of individuals (Burlingame & Dernini, 2011) and assuming that capabilities - defined as awareness of climate change consequences - shape sustainable behaviours through motivations, which are influenced also by contextual opportunities. Additionally, the research investigates the possible statistical correlation between having experienced extreme events and the motivation/sustainable behaviours indexes. Exploiting focus groups, we also tried to identify further factors that mostly influence motivation and adoption of sustainable behaviours, lifestyles, and consumption patterns.

This study presents several key novelties in the application of the COM-B model to the context of sustainable behaviours. Specifically, it tests the COM-B model as a framework for assessing behavioural change in relation to sustainability, it develops a questionnaire based on the COM-B model and operationalized through the Theoretical Domains Framework (TDF - (Michie et al., 2005; Timlin et al., 2021), and it employs a statistical model that translates qualitative data into quantitative insights.

The research was conducted in Chiavari, a coastal city in northwest Italy's Liguria region, significantly impacted by climate change (as many other coastal cities worldwide - (Laino & Iglesias, 2023; Le, 2020; Roy et al., 2023) and situated within the Mediterranean Sea hot spot (Pastor et al., 2020). This area faces rising temperatures and increased extreme precipitation events (Gallus et al., 2017). Chiavari experienced two major floods in 2002 and 2014 (Faccini et al., 2015a), events vividly remembered by adults and partially recalled by students. These factors make Chiavari an ideal case study to examine the propensity to act, mitigate, and adapt to climate change effects among those with direct experiences (Gärtner & Schoen, 2021).

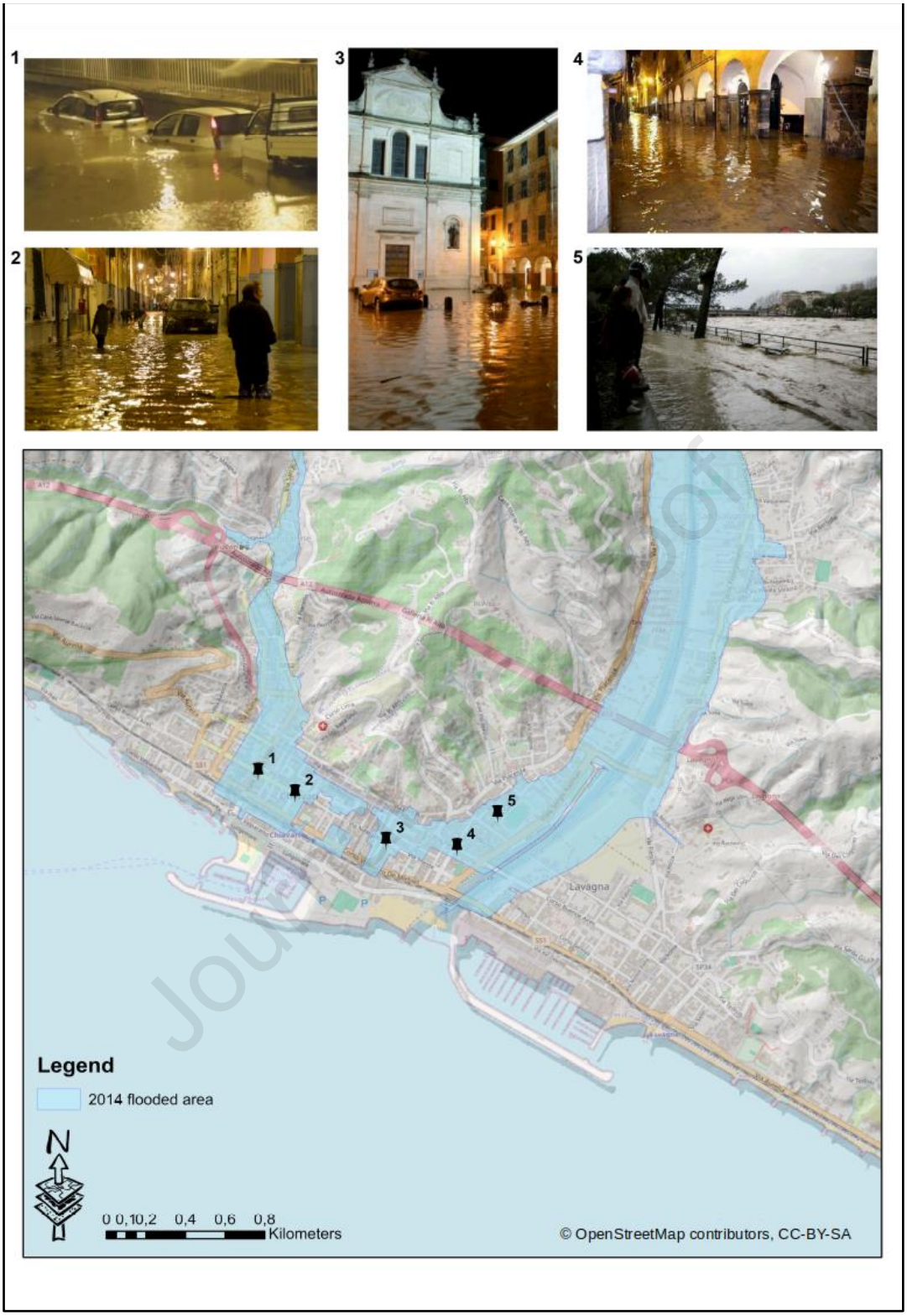
Study area

The city of Chiavari, situated in the province of Genoa within the Liguria region, is particularly susceptible to geo-hydrological events such as floods, landslides, and coastal erosion. Its morphological characteristics, typical of many Ligurian cities, make it representative of the region, which is known for its small and steep catchments highly vulnerable to intense, short-duration precipitation events that can trigger flash floods and rapid-moving landslides.

In this region, a significant study by (Blöschl et al., 2019) indicates an increase in flood

discharge occurrence. Another local study (Mazzoglio et al., 2022) focusing on the Liguria region, observed positive trends in extreme precipitation events over short durations, confirming that Liguria has been experiencing an increase in the frequency and intensity of heavy rainfall events, which are crucial contributors to the region's flood risk. The surrounding area of Chiavari is well-known to be prone to disruptive and damaging phenomena related to extreme events (Diodato et al., 2022). Recently, in 2018, the cities of Rapallo, located less than 10 km from Chiavari, and Portofino were struck by a violent sea storm that caused the destruction of the breakwater, devastating ports, boats, and land communication routes (Di Luccio et al., 2020; Iengo & Del Giudice, 2019) .

The impact of climate change-related phenomena is exacerbated by dense urbanization that increased in the last century mostly in the coastal area, and it is still ongoing. According to the last report published by the Italian Institute for Environmental Protection and Research (ISPRA, 2023), in 2022 the urbanized territory of Chiavari was 29.07% of the total surface; a significant increment occurred in the period 2006-2015 (+ 4.8 ha) with the construction of new buildings and roads. In the time span 2021-2022, a further area of 0.49 ha was built up.



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151*Figure 1: map of the study area (lower panel), illustrating the extent of the flooded area in 2014.*

152*Images of the event (upper panel), along with their locations in the area. Pictures were kindly provided*

153*by local authorities and retrieved from the internet: https://shorturl.at/TM4zw; https://shorturl.at/USvRp;*

154*https://shorturl.at/zxOg5*

155This urban expansion has been accompanied by economic growth. In fact, the city of

Chiavari has shown a steady rise from €17,655 in that year to €26,780 in 2022 (MEF, 2024). Taking this latter year as a reference, Chiavari's income level was higher than those of the Liguria region (€25,084) and the national Italian average (€22,358) in 2023 (Liguria Business Journal, 2025).

In Fig. 1, a detailed map of the study area is shown, illustrating the extent of the flooded area in 2014 (Faccini et al., 2015b). The flood, which affected a large part of the city of Chiavari, had significant impacts on buildings and infrastructure. Specifically, the floodwater transporting fine sediments and vegetal debris inundated underpasses, ground floors and basements of buildings located close to the Rupinaro and Entella rivers, as well as a series of roads hampering the rescue operations. No fatalities were recorded in Chiavari but the economical loss was quantified in about 50 million euros given the severe damage also to shops of the historical center. Fig. 1 also shows several images of the event, along with their locations in the area.

Theoretical Framework

Behaviour change interventions involve efforts by an agent, such as a person or organization, to influence the behaviour of individuals, groups, or populations (Public Health England, 2019). Various theories exist to inform these interventions, but no single theory fully explains pro-environmental behaviour, necessitating integrative models (Steg & Vlek, 2009; Whitmarsh et al., 2021). Integrative models consider the context of decisions and behaviours, helping to manage the complex connections between behaviour and interventions (Klöckner, 2013). One of the most significant studies on behavioural change was conducted by (Michie et al., 2011). Through a comprehensive literature review, the authors identified 19 behavioural change frameworks and proposed the Behaviour Change Wheel (BCW) as an analytical tool to address the complexity of factors influencing behavioural change.

Behavioural change interventions designed with the BCW follow a three-phase iterative process (*ibidem*), encompassing: (i) the understanding of behaviour through the COM-B model, (ii) the identification of intervention options based on different functions (education, persuasion, incentivization, coercion, training, restriction, environmental restructuring, modeling) supported by relevant policies and (iii) the identification and implementation of appropriate behavioural change techniques for the target group and situation. This structured approach ensures that interventions are systematically developed and tailored to effectively address specific behavioural issues.

Initially popular in the health sector (Reid et al., 2022), the BCW is increasingly used for environmental issues, such as pro-environmental behaviour change (Kolodko et al., 2021), human-nature interactions (Soga & Gaston, 2022), and biodiversity conservation (Kropf et al., 2020; Marselle et al., 2021). The theoretical framework of the BCW is based on analytical model (Fig. 2) that integrates three determinants (Capability - C, Opportunity - O, Motivation - M) capable of triggering targeted actions to change Behaviour (B) at both individual and

collective levels (COM-B); defined as:

- Capability is the individual's capacity to engage in the activity in question, including knowledge and skills and includes the physical and psychological dimensions.
- Opportunity refers to all external factors that enable readiness and ability to act, categorized into physical and social dimensions.
- Motivation encompasses all brain processes that activate and guide behaviour, including not only goals and conscious decisions but also habitual processes, emotional responses, and analytical decisions. It is divided into two distinct dimensions, (i) reflective processes (evaluations and plans) and (ii) automatic processes (emotions and impulses).
- Behaviour is any action a person takes in response to internal or external events.

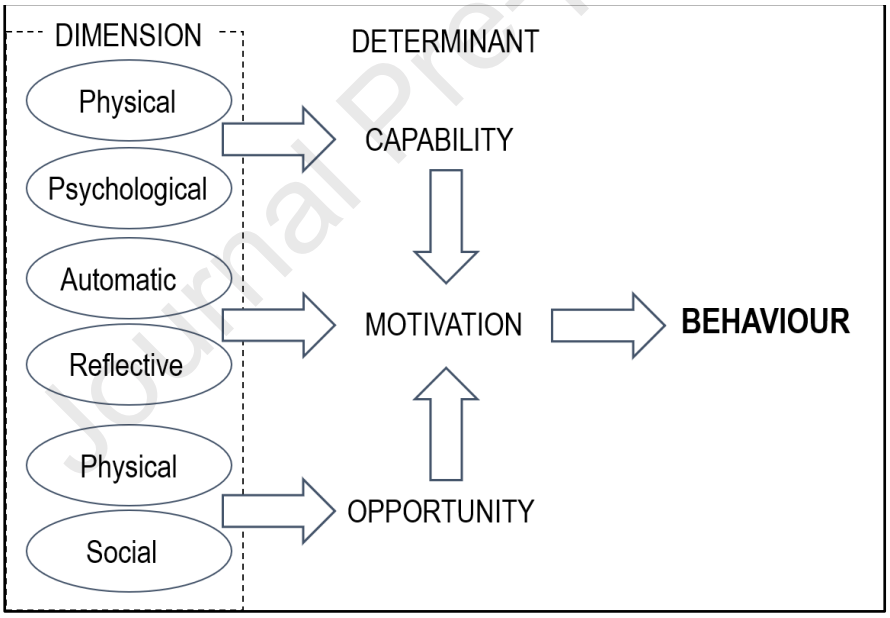

Figure 2: relationship between Dimensions, Determinants and Behaviour.

According to the COM-B model, for a given behaviour to occur, at a given moment, one must have the capability and opportunity to engage in the behaviour, and the strength of motivation to engage in the behaviour must be greater than any other competing one (Michie et al., 2014).

The COM-B model does not prioritize any single determinant over others, acknowledging that both internal (psychological) and external (contextual) factors equally influence behaviour (Michie et al., 2011). The model highlights the interaction between these determinants and how behaviour can subsequently alter capability, opportunity, and motivation. Central to the BCW, the COM-B model helps identify modifiable factors that act

as barriers or drivers to target behaviours. For example, one group might only need to understand the connection between individual consumption habits and its carbon footprint, while in different contexts the social approval/disapproval (social opportunity) is required to push individuals in acting pro-environmentally. Thus, the COM-B model provides a foundation for designing behaviour change interventions by identifying the determinants most likely to induce behavioural change when targeted.

In this study, we apply and validate the COM-B model to investigate how capability, opportunity, and motivation collectively impact teenagers and young adults, guiding their adoption of sustainable lifestyles and consumption habits.

Materials and Methods

The study was conducted through a series of sequential steps, which will be detailed in the following sections and illustrated in figure S1 in the supplementary materials. The process began with the identification of the target groups for the research, ensuring that the selected social groups were relevant to the study's objectives. Once the target was defined, attention shifted to the development of the questionnaire and the structure of the focus groups, aligning them with the COM-B model to ensure coherence with the theoretical framework. Following this preparatory phase, the questionnaires were administered, and the focus groups were conducted to gather qualitative and quantitative data. The final stage of the study involved analyzing, through univariate and bivariate statistical analysis, and discussing data collected through surveys and focus groups. These stages were followed by an in-depth exploration on how individual, social, and contextual factors shape climate awareness and sustainable behaviours and of the main findings and their implications.

The study involved secondary school students (aged 15–17) and a group primarily composed of young adults (aged 18–35). Data collection was carried out through surveys and focus groups. We designed two separate surveys targeting distinct groups: one for young students enrolled in secondary technical and scientific education programs, and another for the group consisting of young adults, primarily students' parents and relatives. The second one, more extensive and with additional thematic dimensions investigated, was

designed according to the I-CHANGE project's objectives.

The selection of these two cohorts was driven by the need to explore potential differences in climate awareness and sustainable behaviour between individuals with varying degrees of exposure to past extreme weather events. The city of Chiavari was severely impacted by major floods in 2002 and 2014, which had long-term socio-environmental effects. Young adults in our sample directly experienced these floods and were old enough to comprehend their severity, whereas high school students were either too young or not yet born when these events occurred. Including both groups allowed us to assess whether prior exposure to extreme climate events might be associated with different attitudes and behaviours toward sustainability. While this methodological approach allows for a meaningful comparison between different generational cohorts, it also presents certain limitations related to the operationalization of behavioural measures, the choice of cohorts, and the sampling strategy. These and other limitations and their implications will be further highlighted in the Conclusion section.

The surveys were administered from September to December 2023 to 470 students and 117 young adults. The survey involved 2 high schools in the Chiavari municipality. The total pool of potential study participants (the total students of Chiavari high schools) was 2300, with 470 students responding to the questionnaire, resulting in a participation rate of ~20%. The survey did not request socio-demographic data from minor students. With regard to the young adults group, they were recruited using a "snowball sampling" process, whereby students and school director were asked to share the questionnaire (physically or by email) with relatives/friends and families outside the school. Due to the sampling method used, the sample is not homogeneous and well stratified, instead polarized around the range 18-35. In fact, out of a total of 117 responses, 62.4% fall within this specific age range and this is why we define ”young adults” the members of this group. Of these 117, 57.3% identified as female and 38.5% as male. 10.3% had already completed at least one level of university education (PhD, bachelor or master degree), while 81.0% were still students and 5.0%

unemployed. All participants were from Chiavari and surrounding areas.

To better understand the possible interrelations and mutual influences between individual and external factors that may lead to behaviours and lifestyles oriented toward sustainability, four focus groups were conducted with the participation of 34 students, selected by their teachers, from the third and fourth grades (aged from 15 to 17) of a High School.

The survey

The survey design was informed by integrating the COM-B model with the Theoretical Domains Framework (TDF - (Michie et al., 2005; Timlin et al., 2021). The TDF, a widely recognized and influential framework in the field of behaviour change, incorporates the concepts of dimensions and sub-dimensions to elucidate the three COM-B determinants (Table 1). These dimensions and sub-dimensions encompass various factors influencing behaviour, including knowledge, skills, beliefs, social influences, environmental context, and resources. Table 1 outlines the dimensions and sub-dimensions utilized in this survey. In this work, for the sake of brevity, text comprehension and privacy issues (the survey was addressed to adolescents), the dimensions related to the physical aspects of Capability and Opportunity have been excluded.

The choice to use certain sub-dimensions of the COM-B Model determinants stems from the need, on the one hand, to understand which motivational factors are related to awareness and those linked to both local and general life contexts that drive teenagers (aged 15-17) to adopt behaviours associated with responsible (and sustainable or ethic-echo) consumption. This includes the ability to connect their habits and lifestyles within their behavioural sphere to the consequences they have on the environment and, more specifically, on their carbon footprint consumption habits. On the other hand, there was also the need to make the survey accessible, concise, and understandable, particularly for students, in order to allow them to complete it easily and comprehensively.

Table 1: Dimensions and sub-dimensions articulating the three COM-B determinants and the behaviour.

Determinant	Dimension	Sub-dimension
Capability	Psychological capability	Knowledge
		Beliefs

		Experience
		Perceived competences
Opportunity	Social opportunity	Availability of appropriate resources
		Social approval or disapproval
		Perceived environment (EU policies)
Motivation	Reflective motivation	Intentions
		Self-efficacy
	Automatic motivation	Goals (social)
		Affect (negative)
Behaviour	Rational Purchase	Costs/benefits
	Affective purchase	Familiarity
	Responsible purchase	Socially and environmentally friendly products

In the supplementary material, Table S1 provides, apart from COM-B determinants and corresponding dimensions and sub-dimensions, an additional column detailing the survey questions associated with each sub-dimensions. The questions were designed to address both students and young adults. Common survey questions underlining the same determinants' dimensions and sub-dimensions were subsequently utilized to calculate and analyze statistically COM-B determinants.

The survey addressing high school students was specifically structured with 22 questions (19 closed-ended and 3 open-ended) covering the areas of: i) Climate change awareness, ii) Citizen science, and iii) Participation. The survey distributed to the young adults group consisted of 34 questions divided into the thematic areas of: i) Climate change awareness, ii) Citizen science, iii) Participation, iv) Factors that hinder or promote behavioural changes to face climatic-induced extreme events, and v) Socio-demographic data.

Data collection was performed using a custom-designed web application developed with KoboToolbox (Das, 2024), a suite of free and open-source tools for field data collection. To ensure data confidentiality, KoboToolbox was installed on the local servers of the Research Institute for Geo-Hydrological Protection, located in Perugia (Italy), thereby ensuring that the questionnaires completed as part of the research remained exclusively under the control of the research partners.

Coding, Construction of Data Matrix, and COM-B determinants

To address COM-B model determinants' complexity, a transition was made from the abstract concepts (determinants) to their defining properties (dimensions and sub-dimensions), thus allowing us to define survey questions, subsequently operationalised using Likert type response (0 to 4 values - (Batterton & Hale, 2017)). In this way, we obtained ordinal categorical variables (the survey questions, see Fig. S2 in the supplementary).

To empirically translate the COM-B model determinants, indices representing each determinant (Capability, Opportunity, Motivation) and the behaviour were established according to Table 1. Every index was derived by aggregating the relevant dimensions, which were themselves obtained by aggregating the sub-dimensions and the corresponding survey questions. This was done to establish a link between questions, as a statistical variable, and the determinants under study (Corbetta et al., 2001).

The construction of the indices was developed in three steps (Nobile, 2022):

1. In the first step, the answers to the survey questions were aggregated by taking the arithmetic sum of their respective Likert scale values, provided that they met two criteria (Nobile, 2022): (i) semantic proximity (in our case, questions that fall within the same determinant according to (Corbetta et al., 2001), and (ii) the same number of modalities. In this work only two types of modalities have been used: 5 modalities (0 through 4) and 2 modalities (binary answers: 0 or 1).
2. The resulting sums were then normalized obtaining indexes in the range 0 to 1 by using the formula: $V_{norm} = (V - V_{min})/(V_{max} - V_{min})$, where V_{min} and V_{max} are the theoretical possible maximum and minimum values one can obtain by summing up the modalities.
3. The third step involved defining the classes for categorizing the COM-B Model determinants. Specifically, after setting threshold values, five classes were defined, ranging from the lowest to the highest ordinal value: class 0 (very low, 0-0.2), class 1 (low, 0.2-0.4), class 2 (medium, 0.4-0.6), class 3 (high, 0.6-0.8), class 4 (very high, 0.8-1.0).

This methodology allowed for the creation of structured and coherent empirical indices, more specifically ordinal categorical statistical variables (ranging from 0 to 4), facilitating statistical analysis and the interpretation of results within the theoretical COM-B framework.

A specific comment should be made regarding the behaviour index used to assess the propensity for sustainable consumption. The Sustainable Behaviour Index was developed as a composite measure to assess consumer behaviour in relation to environmental, economic, and social sustainability. It integrates multiple indicators including pro-environment labels,

organic and fair-trade certifications, recyclability of materials, and packaging sustainability. The index was constructed through attribute space reduction to ensure conceptual consistency while preventing excessive dispersion of cases. No weights were assigned to indicators due to the study's exploratory nature.

Data analysis

For the statistical analysis of the detected cases and their respective modalities, the statistical variables were coded using the Statistical Package for Social Science (SPSS, version 29.0.1.0) by IBM.

In the initial phase, a descriptive statistical analysis (univariate) was conducted on the gathered data, focusing specifically on COM-B Model sub-dimensions that were deemed pivotal for the research objectives. Subsequently, a bivariate analysis aimed to detect and interpret potential relationships—particularly their existence, direction, and strength—among the COM-B model indices was carried out. The indices in this study consist of ordinal categorical variables, allowing for the utilization of measures that leverage the inherent order among these categories. Specifically, a rank correlation measure (Corbetta et al., 2001) was employed, which capitalized on the ordinal nature of the variables.
For the bivariate analysis, a non parametric statistical coefficient (Kendall's Tau-b) was utilized. These coefficients assess co-graduation relationships by indicating a value of +1 for a perfect positive relationship, -1 for a perfect negative relationship, and 0 for no relationship. To interpret Kendall's Tau-b, we referred to the cutoff values proposed for Pearson correlation strength by (Schober et al., 2018; Wicklin, 2023): negligible (0.00–0.06), weak (0.06–0.26), moderate (0.26–0.49), strong (0.49–0.71), and very strong (0.71–1.0).
The choice of this non-parametric test is justified by several considerations: the COM-B model variables are ordinal qualitative in nature, they do not necessarily follow a normal distribution, and each participant (statistical unit) provides a value for all variables. Additionally, Kendall's Tau-b was selected because the contingency table is square, and the ordinal variables representing the COM-B indices have fewer than eight categories (Corbetta et al., 2001).
The approximate significance coefficient (commonly referred to as statistical significance level or α) is the threshold that determines whether a particular result can be considered statistically significant and is decided in advance. In this study, a α level (threshold value) of 0.05 was adopted, which is commonly used in bivariate analyses with ordinal categorical variables (Corbetta et al., 2001). If the p-value is less than alpha (0.05), the null hypothesis of statistical independence, assumed by the test, among the considered variables is rejected.

Focus groups

The research sought to explore several key aspects, including to analyze how the

393determinants of the COM-B Model affect adolescent consumption patterns and lifestyle
394choices. Additionally, it investigated the motivations that could encourage sustainable
395practices in consumption, mobility, and daily living. The study also examined the contextual
396factors (both social and physical factors, such as, respectively, social pressure and
397sustainable mobility infrastructures) that either enable or impede these sustainable choices,
398including the influence of political, cultural, and social frameworks. Finally, it sought to
399understand how young people perceive individual and collective commitments to mitigating
400and adapting to climate change. During the focus groups, various photos and images were
401also used to stimulate discussion and engage the students. Table 2 shows the questions
402posed to the participants.

403

404*Table 2: questions posed to the focus groups participants*

Thematic Area (Topics Investigated)	**Questions**
Capability (Knowledge, perceived competences, beliefs, experience)	- Climate change or climate crisis? Have you heard about it? How would you define it? - Can you tell me the causes and consequences of the climate crisis? - Are you worried about it? - What does being sustainable mean?
Opportunity (Social approval or disapproval, availability of appropriate resources, perceived environment)	- What prevents you from being sustainable? - What are the conditions in the context in which you live that could facilitate a behavioural and lifestyle change toward sustainability? Examples: *walking, cycling, or taking public transport to school or around town; recycling waste; buying local products; drastically reducing purchases of plastic-packaged products; reducing consumption; traveling less by plane; becoming vegetarian/vegan; using less energy at home; throwing away less food; renting or borrowing instead of buying.*
Motivation (Intentions, self-efficacy, social goals)	- What can we do to be more sustainable? - Are you sustainable? Examples: *walking, cycling, or taking public transport to school or around town; recycling waste; buying local products; drastically reducing purchases of plastic-packaged products; reducing consumption; traveling less by plane; becoming vegetarian/vegan; using less energy at home; throwing away less food; renting or borrowing instead of buying.*

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Results

Univariate analysis

Univariate analysis was conducted to verify the plausibility of values, identify distribution imbalances and opportunities for aggregation, and critically assess the dataset (Gasperoni & Marradi, 1996). In this study, it also aimed to explore the sub-dimensions of the COM-B model, focusing on students' climate change awareness, contextual opportunities for sustainability, motivational drivers, and actual consumption behaviours, with comparisons to young adults.

In the initial phase, we examined the frequency distribution and dispersion of data around the central value (range index) for the COM-B determinants and the behaviour index, broken down into its components (Table 1). As shown in Table 3, measures of central tendency (mean, median, mode) and variance were calculated for each index. The results indicate a substantial similarity between students and young adults, except for the Capability determinant, where students show a lower mean value despite a shared mode of "2" (corresponding to "medium" on the Likert scale). In contrast, for Motivation, students exhibit a central tendency closer to "3" ("high"), while young adults' mode remains at "2".

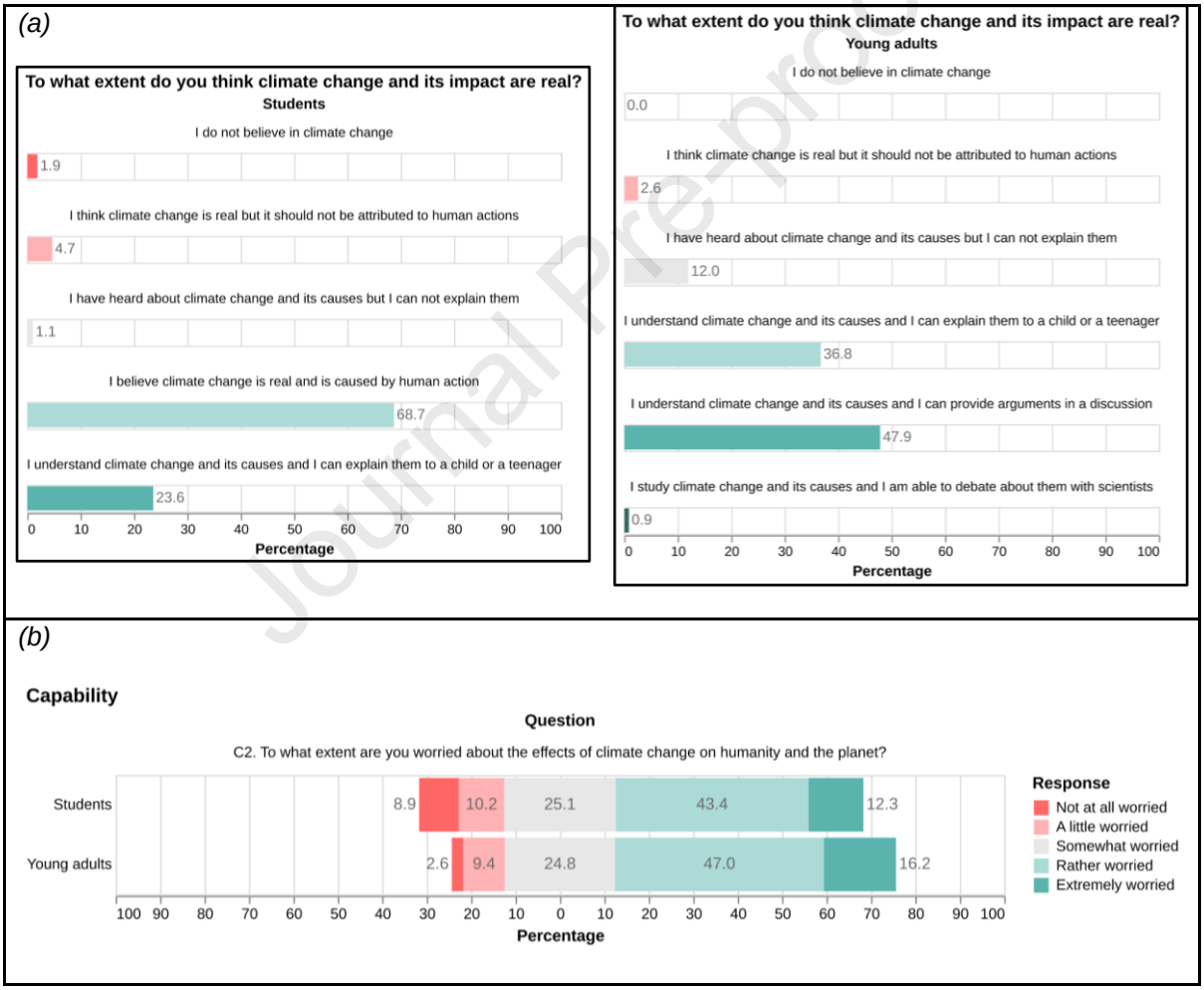
Table 3: central tendencies (mean, median, and mode) and the variance for each COM determinant (original values range between 0 and 4).

		STUDENTS	YOUNG ADULTS
CAPABILITY	Mean	1.7	2.2
	Median	2	2
	Mode	2	2
	Variance	0.6	0.6
OPPORTUNITY	Mean	1.8	1.8
	Median	2	2
	Mode	2	2
	Variance	0.7	0.7
MOTIVATION	Mean	2.5	2.4
	Median	2	2
	Mode	3	2
	Variance	0.6	0.6

As shown in Figure 3a, nearly all students acknowledge climate change, believe it is human-induced, and one in four feels confident explaining its causes to peers. Among young adults,

428responses are similar, though they perceive themselves as more informed. Figure 3b shows
429that 80% of students express concern about climate change, with 12.4% being extremely
430concerned, while among young adults, this rises to nearly 90%. Additionally, 56% of students
431regularly seek climate information, compared to 83% of young adults. The most frequently
432experienced extreme events are heatwaves and heavy rainfall, while young adults also
433report flash floods—likely because the last major floods in Chiavari occurred in 2002 and
4342014, when most students were too young to remember them. Landslides and forest fires
435are the least frequently encountered extreme events across both groups (Figure 4).

436



437*Figure 3: responses to the question regarding (a) the tendency to believe that climate change is real*
438*(students and young adults) and (b) level of concern about climate change effects.*

439

440Less than half of the respondents believe they have the skills to reduce their burden on
441climate (Figure 4), highlighting a gap between awareness and perceived ability to act. More

than 40% of respondents in both groups do not feel social pressure to limit their environmental footprint, with young adults being more skeptical (47%) than students (36%) about the EU's ability to achieve net-zero emissions by 2050. However, this contrasts with the predominant belief that climate change can be mitigated to a tolerable level, particularly among students.

Significant differences emerge in Motivation. About 28% of students believe their individual actions do not impact climate change, compared to only 10% of young adults. Nonetheless, both groups strongly endorse the role of collective action (71% of students and 78% of young adults). A majority of students (63%) and young adults (78%) also support the EU's goal of achieving net-zero emissions by 2050. As shown in Figure 5, many students (45%)—and an even larger proportion of young adults (63%)—are willing to accept lifestyle changes due to climate policies. A relative majority of students (46%) believe a sustainable lifestyle involves reducing consumption, a perspective even more pronounced among young adults (68%). Resistance to dietary changes is evident (Figure S3, supplementary material), with over 86% of students and 87% of young adults unwilling to adopt a vegetarian diet. While there is general willingness to recycle, reduce waste, and avoid plastic packaging, fewer respondents prioritize renting over purchasing. Sustainable mobility finds greater acceptance among students (70%) than young adults (45%), while both groups are more reluctant to limit air travel. Students are also more inclined (60%) than young adults (47%) to reduce home energy consumption.

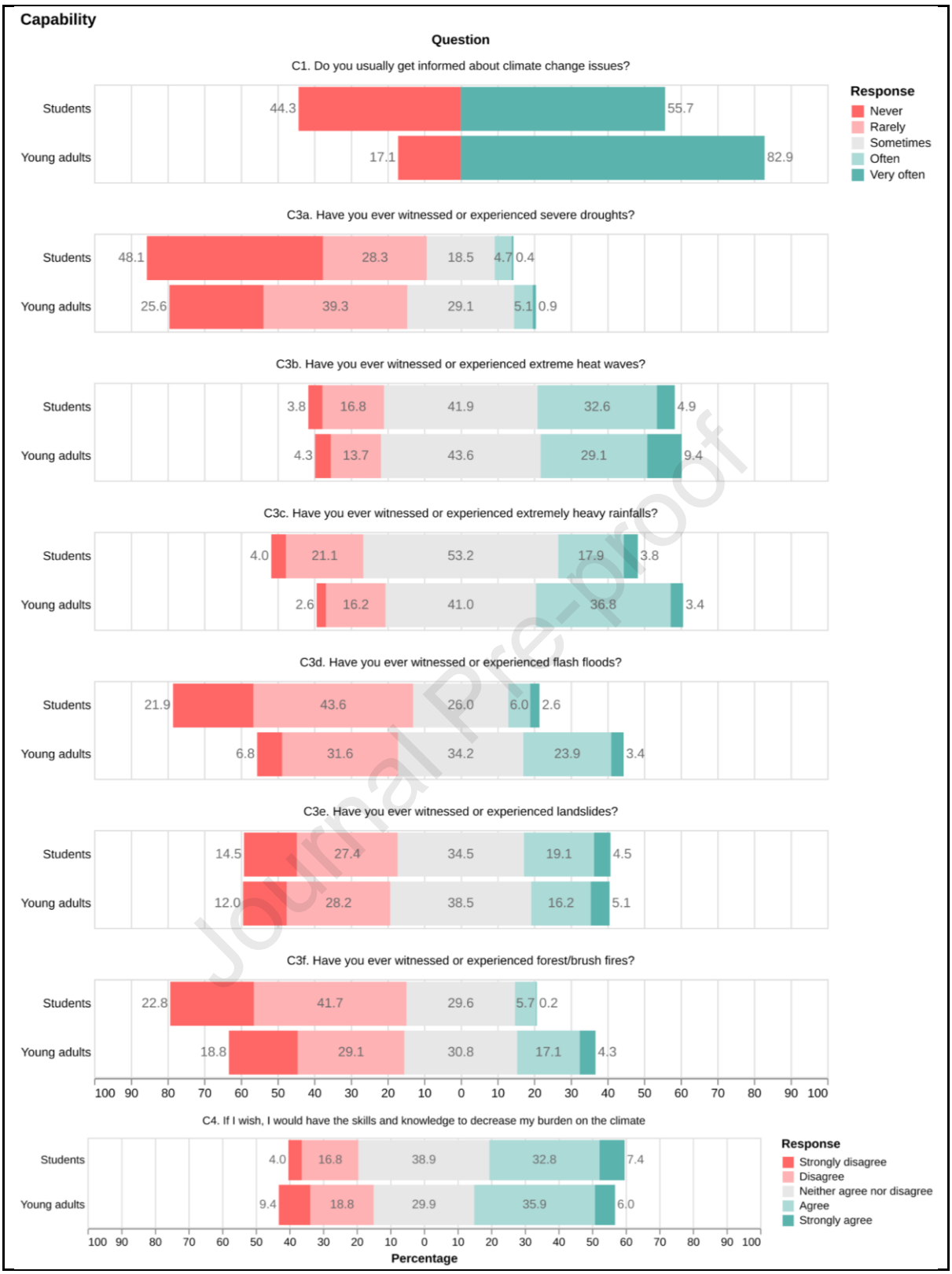


Figure 4: answers to the questions concerning the Capability determinant (students and young adults).

467*Figure 5: answers to some questions concerning the Opportunity and Motivation determinants*

468*(students and young adults).*

469

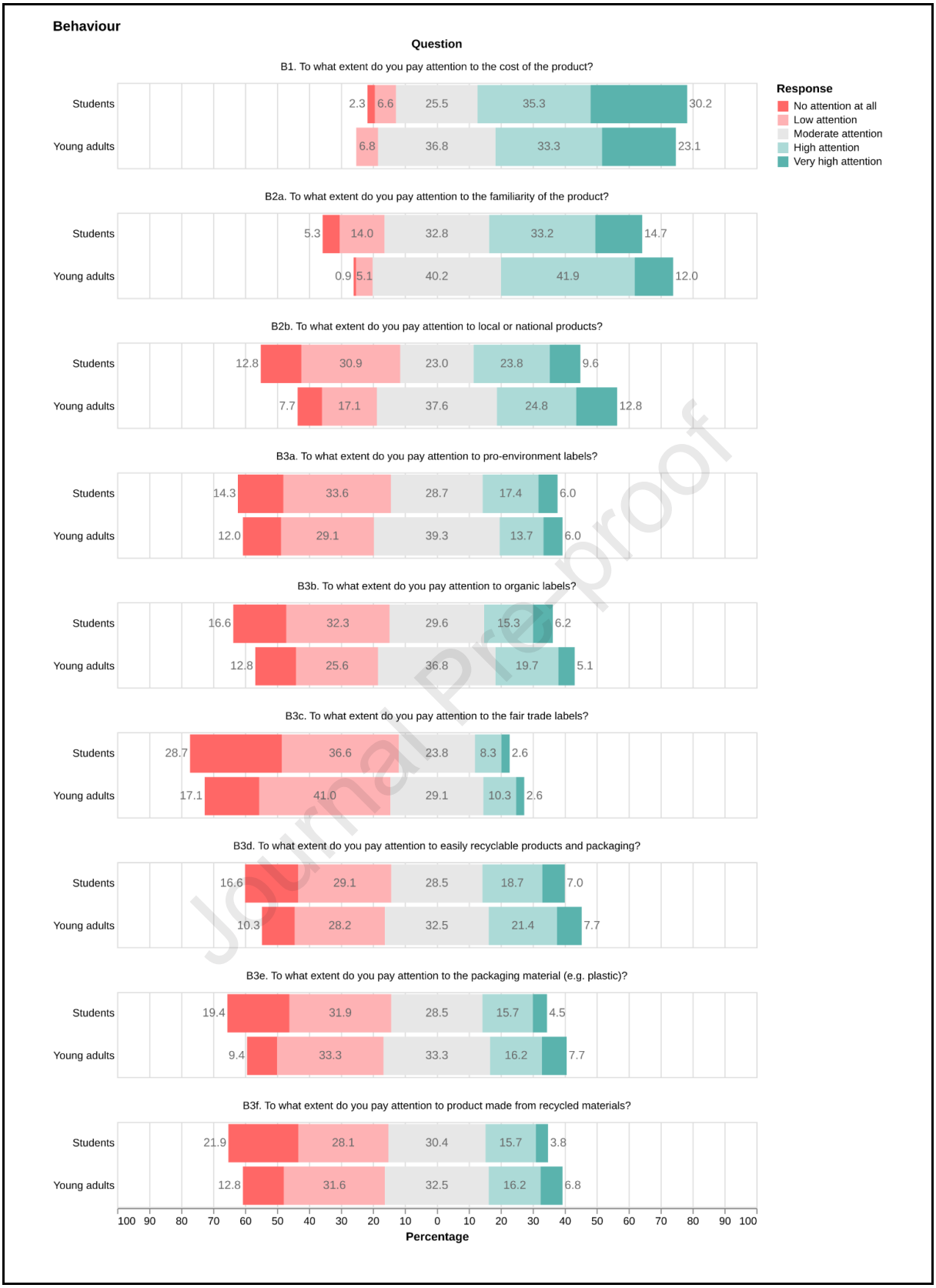


Figure 6: answers to the questions concerning the Behaviour index (students and young adults).

Regarding Behaviour (Figure 6), cost is the primary factor influencing purchases for over 55% of both groups. Product familiarity matters to 48% of students and 54% of young adults.

Students show less concern for product quality and sustainability—such as organic origins, reduced packaging, and fair trade sourcing—compared to young adults. As detailed in Table 4, responsible consumption scores lower than other purchasing behaviours (rational, affective, and local consumption). When Likert scale responses are grouped into two categories—(1) "Moderately or minimally interested" and (2) "Highly or very highly interested"—a clear pattern emerges. For rational consumption, 65.5% of students and 55.6% of young adults fall into the second category, confirming cost as a key driver. In contrast, for ethical and sustainable consumption, only 15.7% of students and 18.8% of young adults fall into the second category, indicating that fewer than one in five individuals prioritize sustainability in their purchasing decisions.

Table 4: central tendencies (mean, median, and mode) and the variance for behaviour indices.

		Students	Young adults
BEHAVIOUR (rational consumption)	Mean	2.8	2.7
	Median	3	3
	Mode	3	2
	Variance	1.0	0.8
BEHAVIOUR (affective - familiarity consumption)	Mean	2.4	2.6
	Median	2	3
	Mode	3	2
	Variance	1.1	0.6
BEHAVIOUR (affective-national or local product consumption)	Mean	1.9	2.2
	Median	2	2
	Mode	1	2
	Variance	1.4	1.2
BEHAVIOUR (ethic-eco consumption)	Mean	1.5	1.7
	Median	1	2
	Mode	2	2
	Variance	1.1	0.9

A subset of questions focused on the role of schools in climate education. About 80% of students report that climate change awareness initiatives are sporadic and not part of the curriculum. Additionally, most students have never participated in a climate strike (Fridays for Future - (FridaysForFuture, 2025), with 42% citing a lack of opportunity and 22% expressing disinterest.

Bivariate analysis

We used bivariate analysis to examine co-graduation relationships among the COM-B model

494determinants (Capability, Opportunity, Motivation), as well as between these determinants 495and the Behaviour Index (responsible consumption), assessing their associations, statistical 496significance, and the strength and direction of these relationships.

497According to the hypothesis proposed in this research, capabilities—particularly understood 498as awareness of climate change consequences—impact sustainable behaviours, 499represented by the propension to adopt responsible (sustainable or ethic-echo) consumption 500lifestyles, through the mediation of motivations, which are in turn influenced by contextual 501opportunities, as shown in Fig. 2.

502Fig. 7 shows the resulting Kendall's Tau-b statistical coefficients, which are always positively 503rank-correlated. All coefficients were statistically significant, with p-values less than 1×10^{-6} 504in many cases. Among young adults, the relationships between opportunity and motivation 505and between opportunity and behaviour had p-values closer to the 0.05 threshold (0.017) but 506remained statistically significant.

507

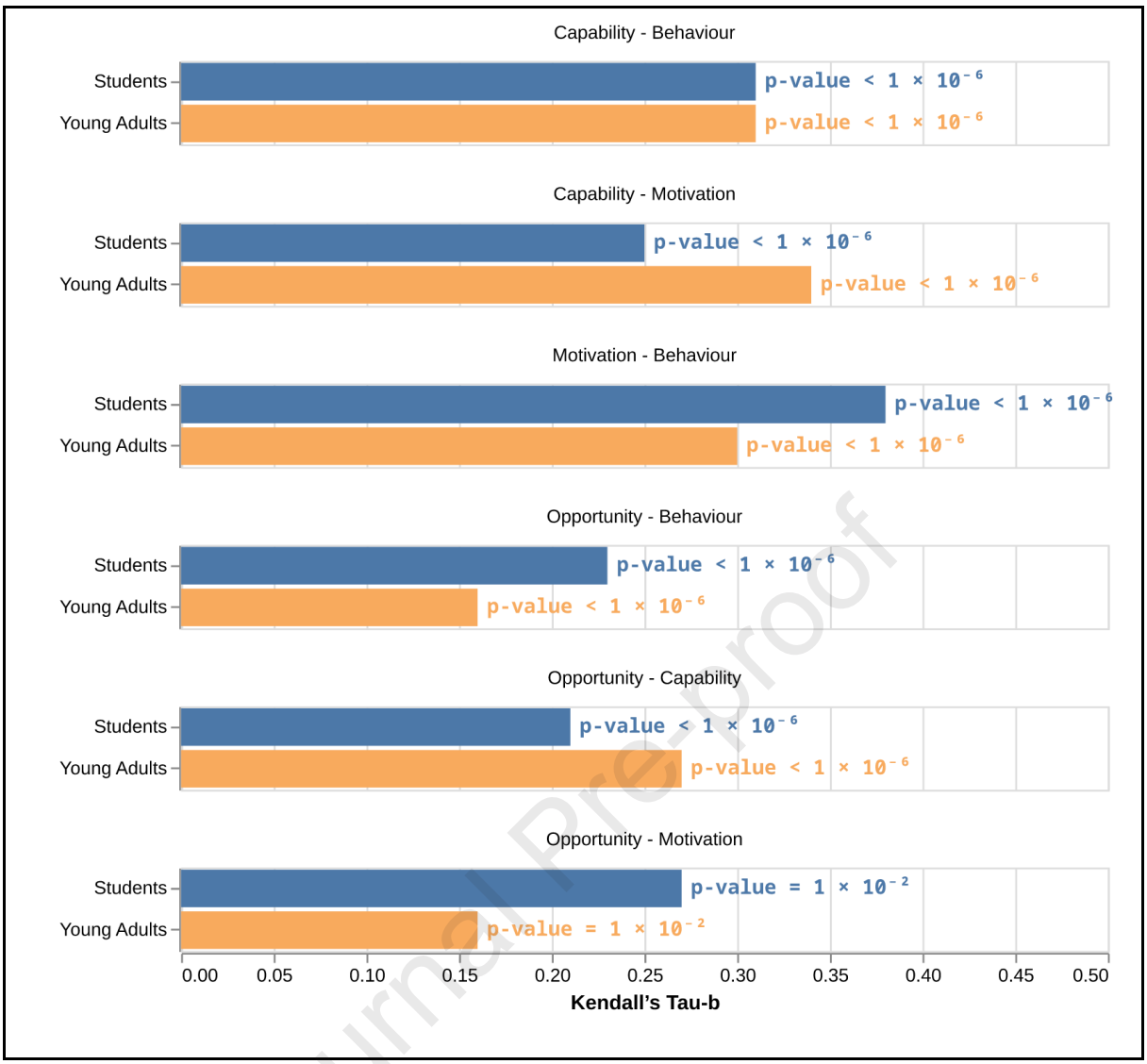


Figure 7: comparative graphs concerning statistical coefficients representing co-graduation between COM-B Model determinants.

As for students, Capability is weakly rank-correlated with Motivation (Tau = 0.25) and moderately with behaviour (Tau = 0.31). Motivation is moderately rank-correlated with Behaviour (Tau = 0.38), with a stronger correlation compared to the co-graduations calculated for other determinant pairs. Opportunity is weakly rank-correlated with Capability (Tau = 0.21), Motivation (Tau = 0.27), and Behaviour (Tau = 0.23). Results are similar for young adults. Capability is moderately rank-correlated with both Motivation (Tau = 0.34) and Behaviour (Tau = 0.31). The opportunity determinant is positively rank-correlated with capability (Tau = 0.27). On the other hand, motivation is positively rank-correlated with behaviour (Tau = 0.30).

In order to better understand the correlation among COM-B model determinants, single determinant's sub-dimensions were cross-referenced. The objective in this analysis is to determine whether specific sub-dimensions of the COM-B Model indices are deemed particularly relevant to the research aims. For this purpose, the non-parametric Kendall's Tau-b correlation and its approximate significance coefficient were applied. Table 5 presents the results of these variable cross-comparisons, specifically displaying only the combinations that yielded significant correlations (p-value < 0.001) in at least one of the two social groups (Students or Young Adults).

Table 5: tau-b coefficient value that can be classified as at least moderate for one of the two groups (students or young adults).

	Kendall's Tau-b		p-value	
	Students	Young adults	Students	Young adults
Capability (Knowledge)/Motivation	0,26		<0.001	
Capability (Beliefs)/Motivation	0,29	0,46	<0.001	<0.001
Capability (Perceived competences)/Motivation	0,25		<0.001	
Capability (Experience forests fire)/Motivation		0,34		<0.001
Capability (Knowledge)/Behaviour	0.37	0.27	<0.001	<0.001
Capability (Beliefs)/Behaviour	0.28	0.31	<0.001	<0.001
Opportunity (social approval or disapproval)/Motivation	0.28		<0.001	
Opportunity (social approval or disapproval)/Behaviour	0.30		<0.001	
Motivation (intentions- recycling)/Behaviour	0,27		<0.001	
Motivation (intentions- purchase zero km products)/Behaviour	0,33	0,27	<0.001	<0.001
Motivation (intentions - reduce plastic packaging)/Behaviour	0,31	0,29	<0.001	<0.001
Motivation (intentions- reduce consumption)/Behaviour	0,25		<0.001	
Motivation (intentions- less airplane)/Behaviour	0,23		<0.001	
Motivation (intentions- veg)/Behaviour	0,27	0.19	<0.001	<0.01
Motivation (intentions- throw away less food)/Behaviour	0,21	0,20	<0.001	<0.01
Motivation (intentions- renting or borrowing)/Behaviour	0,25		<0.001	
Motivation (Self-efficacy - single action effects)/Behaviour	0,23		<0.001	

The capability sub-dimensions show a correlation with motivation that differs between young adults and students. Specifically, student motivation appears to be influenced (Tau > 0.24, p-value < 0.05) by Knowledge, Belief, and Perceived Competences, while only Belief (Tau =

5350.46, p-value < 0.05) and experiences (as forest fires) seems capable of impacting young 536adults motivation. As for opportunity sub-dimensions, only in the case of students there 537seems to be a positive statistical correlation between social pressure and both motivation 538and behaviour index, with a moderate co-graduation.

539In general in the case of students, it is found that all the sub-dimensions related to the 540intention (motivation) to adopt sustainable lifestyles are positively rank-correlated with the 541behaviour index, while in the case of young adults this is verified only for some sub-542dimensions. Moreover, in the case of students, the co-graduation relationship is stronger, 543especially in the case of "purchasing zero-kilometer products" and "reducing plastic 544packaging." Additionally, a positive rank-correlation is noted, with weak co-graduation, 545between the Motivation sub-dimension Self-efficacy (single actions effects) and the 546behaviour index for students, while the intersections with the other sub-dimensions 547considered are particularly weak.

548Since the bivariate analysis did not provide evidence to support a correlation between a 549higher level of experience with extreme events (extremely heavy rainfall and flash floods) 550and/or greater economic resources with increased motivation or a stronger tendency toward 551sustainable consumption behaviours, we conducted a univariate analysis on the variables 552'Experiencing extremely heavy rainfall,' 'Experiencing flash floods,' and 'Having the financial 553means to reduce one's carbon footprint.' More specifically, we calculated the average values 554of the motivation index and the sustainable behaviour index across the five levels (0 to 4, 555ranging from 'very low' to 'very high') of these three variables. The results are presented in 556Fig. 8.

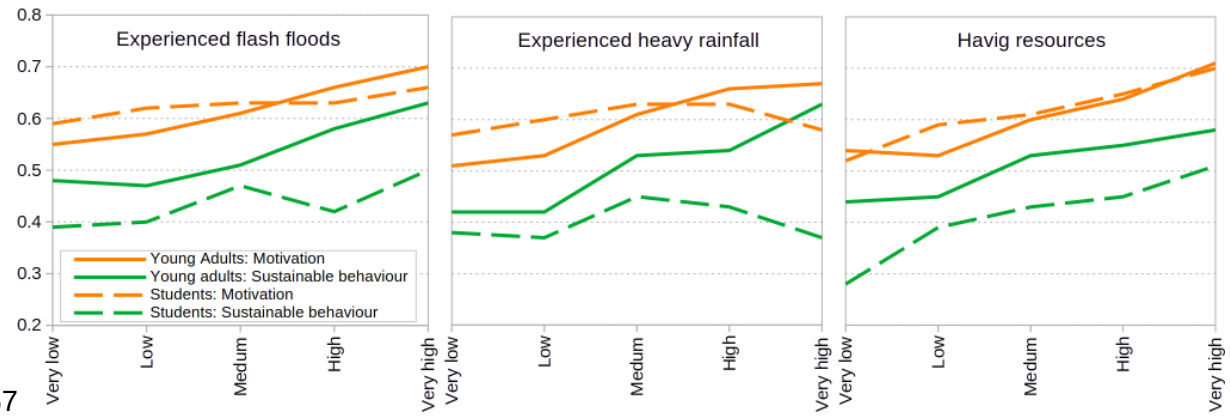


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Figure 8: Average values of the motivation index and the sustainable behaviour index across the five levels (0 to 4, ranging from 'very low' to 'very high') of the variables 'Experiencing extremely heavy rainfall,' 'Experiencing flash floods,' and 'Having the financial means to reduce one's carbon footprint.

Fig. 8 provides evidence that young adults' motivation and sustainable behaviour are influenced by their experience with extreme weather events, rather than solely by economic capacity. Young adults, having more frequently experienced heavy rainfall and flash floods, exhibit a clearer upward trend in both motivation and sustainable behaviour indices as their exposure increases. This pattern is significantly less evident among students, who were either too young or had not yet been born during major past events. While financial capacity could influence sustainable behaviours, the figures show that the availability of financial resources follows a similar pattern in both groups, yet only young adults display a stronger dependence on past experiences. This suggests that direct exposure to extreme events plays a distinct role in shaping attitudes toward sustainability, beyond economic considerations.

Moreover, across both groups, the motivation index is consistently higher than the sustainable behaviour index, indicating that while awareness and willingness are present, actual behavioural change may be constrained by additional barriers, including economic or structural factors.

Focus group

This section presents the results of the qualitative research conducted through four focus groups involving high school students from Chiavari. The full report of the focus groups is included in the supplementary material. The participants demonstrated a high level of awareness about climate change, both in terms of understanding its causes and effects and experiencing its impacts directly. This awareness often leads to concern or eco-anxiety, especially when participants feel vulnerable to climate events. Their understanding is shaped

by firsthand experiences of extreme weather events, such as the 2014 flood, the 2018 storms in Rapallo, and increasingly frequent tornadoes and abnormal weather patterns. However, several students stated that they had little to no memory of past extreme events, particularly flash floods, as they were too young at the time to fully comprehend their impact. The issue of how climate-related information is communicated emerged strongly. Media coverage of extreme events often depends on the prominence of the affected areas. Weather alerts, perceived as either exaggerated or underestimated, add to this complexity. Interestingly, families were seen as minimizing the climate crisis, citing natural periodicity, while schools played a significant role in raising awareness and encouraging engagement with environmental issues.

For younger generations, particularly millennials, understanding and adapting to the environmental crisis appears easier, as they have grown up in a period of heightened alarm about climate change. Their future-oriented perspective contrasts with the difficulty older generations face in changing ingrained habits, rooted in long-standing mindsets.

Environmental activism was noted as politically charged, potentially alienating those outside specific ideologies. While activism and sustainable behaviours are seen as collective responsibilities, they are often viewed as ineffective in challenging economic and political power. More radical activism, such as actions by the Ultima Generazione group (a climate activism movement operating in Italy and part of the international A22 Network - (A22 NETWORK, 2025), was widely criticized for polarizing opinions and detracting from solidarity with the environmental cause.

Participants emphasized the need for infrastructural improvements, particularly safer and more extensive bicycle lanes, better public transportation with more frequent and accessible services, and an improved waste management system for effective recycling and collection. Economic disparity was recognized as a barrier to sustainability, with wealthier individuals having greater access to sustainable options, leading to inequalities in quality of life and life expectancy. This gap highlighted the intersection of social class and environmental practices.

Frustration over the lack of decision-making power among younger generations was widespread. Participants pointed to entrenched power structures that prioritize individual wealth and uphold the status quo, creating a disconnect between young people and the

political class. This division, aggravated by demographic aging, fosters a gerontocratic system that sidelines the interests of the younger population.

Finally, there was a clear understanding of sustainable lifestyles and behaviours, which were seen as generally achievable. However, certain areas, such as reducing meat consumption, were met with resistance, as participants were unwilling to make sacrifices in this regard.

Discussion

This study carried out in Chiavari confirms the research hypothesis formulated in the introduction, with bivariate analysis showing small differences between the investigated social groups. Young adults exhibit a moderate link between capability and motivation and a similar link between motivation and behaviour, while students show a weaker capability-motivation link but a stronger motivation-behaviour connection. These results highlight distinct pathways through which capabilities and motivations influence sustainable behaviour in each group, warranting further exploration of the contextual and developmental factors that shape these dynamics.

Overall, our study reveals, at least in Chiavari, a positive correlation both between each of the COM-B model determinants and the behaviour index (responsible consumption), as well as among the determinants themselves. The opportunity determinant requires further exploration, as statistical analysis offers limited insights into its influence on motivation and behaviour.

Univariate analysis confirms the similarity in the responses of the two different social groups apart from the stronger motivation index of the students with respect to the young adults. A key finding from the univariate analysis highlights that the central tendency of the sustainable behaviour index is lower than that of the rational consumption index. This supports the theory of rational choice, which posits that individuals base decisions on a cost-benefit analysis, emphasizing price as a key factor in purchasing decisions. However, this theory often overlooks the growing role of moral principles in consumer behaviour (Paltrinieri & Degli Esposti, 2017).

To gain deeper insights, univariate and bivariate analyses were conducted on the COM-B determinants and behaviour index indicators. The results show that, in Chiavari, most students and young adults acknowledge climate change, with young adults displaying higher concern and greater awareness of its impacts, as found also in other Italian areas struck by

geo-hydrological disasters (Antronico et al., 2023; Esposito et al., 2023). Heightened concern does not necessarily and consistently translate into sustainable behaviour and actions (Gärtner & Schoen, 2021). Research shows that while information provision may change attitudes or awareness, it does not necessarily change behaviour (Abrahamse et al., 2005). For instance, (Monroe et al., 2019) noted that educational interventions are more likely to impact knowledge, understanding, and skills rather than actual behaviour change. Similarly, (Nisa et al., 2019; Stern, 2020; van der Linden & Goldberg, 2020) found that information-based interventions, though common, have limited effects on changing behaviour. For young adults, there was no significant statistical link between the indicators and the behaviour index.

We suggest that a relevant role in these results is played by Participants' personal encounters with extreme weather phenomena, such as major floods, intense storms, and an increasing occurrence of unusual climatic events that, for example, have led to wildfires. In fact, the univariate analysis suggests that direct exposure to extreme weather events, such as heavy rainfall and flash floods, may also play a role in shaping motivation and behaviour. Young adults—who have more frequently experienced such events—show an upward trend in both motivation and sustainable behaviour indices as their exposure increases. This pattern is less evident among students, likely because many were too young to have directly experienced past extreme events. These findings highlight the factors shaping climate change awareness, particularly how target groups access information and the practical, economic, and daily challenges of adopting sustainable consumption behaviours.

Notably, about 80% of students report that climate change initiatives in schools are sporadic relying instead on internet media for information. Students primarily obtain climate change knowledge online. The family's role as a socializing agent is weak, with discussions on climate change often avoided or downplayed. This creates a more individualistic yet "social" learning approach, with the risk of echo chambers—online environments where users primarily encounter content and opinions aligned with their own beliefs (Bruns, 2023). Students who actively seek information tend to behave more sustainably, and greater concern about climate change correlates with more sustainable consumption behaviours (Jürkenbeck et al., 2021). However, the data reveals low willingness to reduce meat consumption, fly less, or opt for borrowing and renting over buying. This reflects both limited awareness of the environmental impact of personal consumption and the influence of marketing in promoting the idea that "green" purchases alone can solve environmental issues (Crivellaro et al., 2012). This highlights the need to imply further and assign different weights to the various sub-dimensions of the capability index and analyze them individually to better understand the potential cause-effect relationships that might encourage sustainable consumption behaviours.

The analysis of the data collected in Chiavari, particularly the qualitative ones, also highlighted that for students, the involvement of the entire community in climate change

adaptation and mitigation actions is crucial, considering the strong connection with their community and place of origin that emerged prominently during the focus groups. Despite this awareness and motivation, survey data and focus groups clearly show that the opportunities, provided by the living environment, to adopt sustainable behaviours, lifestyles, and approaches remain limited. For instance, sustainable mobility infrastructures are often insufficient, poorly managed, and in disrepair; financial resources required for sustainable living are accessible to only a few, and opportunities to influence decision-making processes are scarce. These limitations contribute to frustration and distrust toward the political class, leading many students to consider leaving their homeland after completing their studies. As we found in the focus group context, this lack of opportunities contributes to frustration and distrust toward the political class, leading many students to consider leaving their homeland after completing their studies and ultimately hindering a broader shift toward environmentalism. In fact, for the students involved in the study, forms of pro-environmental activism, such as those linked to Fridays For Future, can take on controversial aspects: their usefulness is not always perceived, and there are concerns about issues like political manipulation and excessive ideological influence.

We conclude that capabilities are not solely innate personal abilities but also encompass the freedoms and opportunities shaped by the interplay of individual skills and the political, social, and economic environment. Therefore, it is essential to emphasize the dual importance of the subjective element (capability) and the cultural context (opportunity), expressed through norms, values, beliefs, and symbols. Both dimensions should be thoroughly explored using qualitative and quantitative sociological methods to better assess the suitability of the COM-B model for studying the factors driving a potential shift toward CC sustainable behaviours.

Conclusion

This study contributes to the growing field of behavioural research on sustainability by

applying the COM-B model to analyze sustainable behaviours among young generations in a climate-vulnerable Italian city. By focusing on two cohorts—high school students and young adults—the research provides insights into how individual, social, and contextual factors shape climate awareness and sustainable behaviours.

The findings indicate that capability, opportunity, and motivation all play a role in driving sustainable behaviour, with capability emerging as a crucial factor in shaping motivation and, consequently, behaviour. While individual awareness is an important driver, broader structural and social barriers, such as limited infrastructure, economic constraints, and insufficient educational initiatives, hinder the transition from knowledge to action. The study also suggests that direct or indirect exposure to extreme weather events may influence climate awareness and motivation, as young adults—who experienced past local floods with greater awareness—tend to report a stronger sense of urgency regarding climate action. However, this effect is not universal, indicating that personal experience alone is not always sufficient to drive sustainable behaviours and must be supported by targeted interventions.

This study acknowledges several limitations. First, while the COM-B model provides a valuable framework for understanding behavioural dynamics, its operationalization in this study is one of many possible approaches, and different methodological choices could yield alternative results. Additionally, the survey questions have not been previously validated in other studies, requiring further empirical testing. Second, the measurement of sustainable behaviour was simplified to ensure accessibility for adolescents, which may have excluded more complex behaviours. Third, the sampling method—particularly the snowball sampling used for the young adult group—does not allow for a fully representative population, limiting the generalizability of the findings.

Despite these constraints, the study provides valuable insights into the interplay between behavioural determinants, climate experiences, and sustainability choices among young people. The results clearly indicate that describing Pro-Environmental Behaviour (PEB) is highly complex. In this context, the COM-B model, operationalized through questionnaires

and focus groups based on the Theoretical Domains Framework (TDF), emerges as a sufficiently structured tool to capture this complexity. This paper aims to encourage more researchers to adopt this framework, fostering its use in project assessment and planning for behavioural change in specific domains. However, it is essential to recognize that COM-B represents only the initial step in designing behavioural change interventions. In the future, policymakers and practitioners can integrate this assessment framework within the broader Behavioural Change Wheel to develop more comprehensive strategies. Future research should expand the sample size and apply the COM-B model on a broader scale to enable more extensive statistical monitoring of sustainable behaviours. Integrating this approach into the BCW could further enhance its application as a tool for policy development, supporting targeted interventions aimed at fostering sustainable lifestyles.

Declaration of Generative AI and AI assisted technologies in the writing process statement

During the preparation of this work the authors used the Generative AI tool 'ChatGPT v.4o,' developed by OpenAI, in order to improve readability and language. After using this tool, the authors reviewed and edited the content as needed and took full responsibility for the content of the publication.

CRediT authorship contribution statement

All authors have carried out important, albeit different, activities for the successful completion of the work and should therefore be considered equal contributors alongside the first author

761or the corresponding author. The specific activities are detailed in the following "CRediT 762authorship contribution statement”

763Umberto Mezzacapo: Conceptualization, Methodology, Formal analysis, Investigation, Data 764Curation, Writing - Original Draft, Writing - Review & Editing,

765Debora Voltolina: Software, Validation, Formal analysis, Investigation, Data Curation, Writing 766- Review & Editing, Visualization

767Christian N. Gencarelli: Validation, Formal analysis, Investigation, Data Curation, Writing - 768Review & Editing, Visualization

769Giuseppe Esposito: Investigation, Data Curation, Writing - Review & Editing

770Alessandro Mondini: Software, Validation, Formal analysis, Writing - Review & Editing

771Paola Salvati: Conceptualization, Investigation, Formal analysis, Writing - Review & Editing, 772Visualization

773Selene Tondini: Methodology, Data Curation, Writing - Review & Editing

774Teresa Carlone: Methodology, Data Curation, Writing - Review & Editing

775Alessandro Sarretta: Validation, Investigation, Writing - Review & Editing

776Antonella Galizia: Investigation, Writing - Review & Editing, Project administration, Funding 777acquisition

778Simone Sterlacchini: Investigation, Resources, Writing - Review & Editing, Visualization, 779Project administration, Funding acquisition

780Ivan Marchesini: Conceptualization, Methodology, Investigation, Data Curation, Writing -

Original Draft, Writing - Review & Editing, Visualization, Supervision, Project administration, Funding acquisition

Declaration of competing interest

There are not financial interests/personal relationships which may be considered as potential competing interests

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Data Availability

Private link: https://figshare.com/s/4c9ebd73a6dace792184

Doi (not working under embargo): 10.6084/m9.figshare.28087469

Code availability

The survey was developed for the aim of the H200 I-CHANGE european project. The entire list of questions is available on request to the authors

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805

Highlights

- Among the first applications of the COM-B model in climate change research
- Positive correlations between capability, opportunity, motivation, and behavior
- Sustainable behaviors are crucial for addressing the climate change challenges
- Needs of community-driven plans to foster collective action toward sustainability
- Experience on climate extreme events influences adoption of sustainable behaviors

Declaration of interests

☐ The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Ivan Marchesini reports financial support was provided by EU Horizon H2020 program. Umberto Mezzacapo reports financial support was provided by EU Horizon H2020 program. Simone Sterlacchini reports financial support was provided by EU Horizon H2020 program. Antonella Galizia reports financial support was provided by EU Horizon H2020 program. If there are other authors, they declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.