frontiers | Frontiers in Environmental Science

TYPE Original Research
PUBLISHED 21 February 2025
DOI 10.3389/fenvs.2025.1511398

OPEN ACCESS

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RECEIVED 14 October 2024
ACCEPTED 30 January 2025
PUBLISHED 21 February 2025

CITATION
Divasson-J A, Aguayo-Mendoza A, Quesada C, Casado-Mansilla D and Borges CE (2025) Climate change from B to Z: a cross-generational perception study in Spain. *Front. Environ. Sci.* 13:1511398. doi: 10.3389/fenvs.2025.1511398

Climate change from B to Z: a cross-generational perception study in Spain

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In the context of increasing climate concerns, this study explores generational perceptions and responses to potential climate-induced crises through a workshop and survey methodology. The aim of this study is to understand how different age groups view and react to extreme climate scenarios and evaluate their proposed actions and attitudes toward climate change mitigation. This study investigates generational perceptions and responses to climate change through a dual-format workshop and survey, conducted both in person and online. The methodological approach involved presenting respondents with a range of apocalyptic scenarios resulting from climate change, including electricity shortages, reduced food production, fuel scarcity, inadequate home heating, drought, and raw material shortages. These scenarios aimed to assess respondents' awareness, concern, and proposed actions in response to potential future crises. The survey, administered *via* the Prolific platform, and workshops, held at the "Zientzia Azoka" science fair and online, gathered data from 153 participants across four generational cohorts, namely, Baby Boomers, Generation X (Gen X), Millennials, and Generation Z (Gen Z). The analysis revealed distinct generational differences in attitudes toward societal responsibility and action. Baby Boomers emphasized community responsibility over formal regulations, showing a preference for moral and ethical accountability rather than legislative action. Generation X displayed balanced responses, with tendencies toward valuing education and long-term stability. Millennials were more likely to emphasize the role of authorities and formal governance in addressing societal issues, reflecting their reliance on structured systems. In contrast, Generation Z showed a strong inclination to hold companies accountable, often associating responsibility with corporate entities, and were more vocal about behavioral changes and restrictions to drive progress. The study underscores significant generational differences in climate change perceptions and actions, highlighting a trend toward increasing demand for climate action and growing distrust in institutions. These insights suggest the need for inclusive, generationally tailored climate policies with a focus on education and systemic change. Future research should explore the relationship between sustainable consumption and economic vulnerability, addressing how financial constraints impact individuals' ability to adopt sustainable practices.

KEYWORDS

climate change perception, generational perspectives, energy transition, workshop engagement, climate crisis scenarios, socio-political implications

1 Introduction

In a global context marked by increasing temperatures, intensifying extreme weather events, and growing public awareness of the impacts of climate change, the perceptions and responses of different generations to climate change have become a critical area of research (Core Writing Team, H. L. and J., 2023). Climate shocks do not affect all population groups equally, and differences in life experiences, access to resources, and cultural values can significantly influence how each generation understands, prioritizes, and copes with the risks associated with climate change. This intergenerational diversity raises key questions about designing effective mitigation and adaptation strategies that are both inclusive and sustainable.

This study aims to contribute to the understanding of these generational dynamics by analyzing how different age groups perceive and respond to potential climate shocks. Using a methodology that combines participatory workshops and structured surveys, participants' attitudes, concerns, and proposed actions were assessed in relation to hypothetical climate change-related crisis scenarios, such as electricity, food, and fuel shortages, droughts, and limited access to basic resources. These scenarios not only reflect emerging problems in today's reality but also serve as tools to measure psychological, social, and economic preparedness for climate change.

1.1 Research questions or hypotheses

This study aims to identify different perceptions regarding climate change among currently active generations within the Spanish territorial framework. These perspectives can be divided into three basic principles:

- Self-perception (vision of oneself): the interviewed individuals exhibit different habits and acquired behaviors related to climate change and its mitigation. Identifying each generation's opinion about their actions helps understand the tools they possess and the channels they tend to use and detects gaps in their knowledge or resource access.
- Perception of the environment (view of the individual toward others): understanding how different generations perceive their surroundings can help explain both their motivations and behaviors. Similarly, this perspective reflects the types of tools with which they have indirect contact.
- Perception of responsibility (determination of who holds the responsibility): based on this response, one can conclude which agents should take action in the development of new measures against climate change to satisfy each generation.

These three factors, identified as highly relevant by the original study presented at the *Socioecos Conference 2024* (Divassson et al., 2024), allow for a clearer definition of generations, highlighting the differences that need to be addressed when implementing new political, social, or economic measures.

Similarly, to support the conclusion section, the authors are interested in gathering respondents' views on the actions that should be taken by these 'responsible' figures in the transition to a more sustainable society.

1.2 Literature review

Perceptions of climate change vary significantly across different age groups, influenced by a multitude of socio-demographic factors, personal experiences, and educational backgrounds. Research indicates that younger generations tend to exhibit greater concern and awareness regarding climate change than older individuals. For instance, a study conducted in Cyprus found that older respondents showed less concern for climate change and perceived lower health risks associated with it, aligning with the findings from a national survey in the United States that indicated older populations perceived lower health risks from climate-related heat events (Konstantinou et al., 2022). This trend is reflected in various studies, which suggest that age is a critical factor in shaping climate change perceptions, with younger individuals often being more proactive in acknowledging and addressing climate issues (Cvetković and Grbić, 2021).

The differences in perceptions can be attributed to several factors, including the level of education, access to information, and personal experiences with climate-related events. For example, individuals living in non-slum areas with higher education levels reported greater awareness of climate change than those living in slum areas or with less education (Toàn et al., 2014). Furthermore, although older adults are often viewed as less engaged in climate action, they possess valuable insights and experiences that can contribute to the discourse on climate change and health (Leyva et al., 2017). This contradiction highlights the complexity of age-related perceptions, where older adults may recognize climate change but feel less motivated to act, possibly due to a generational gap in the immediacy of climate impacts experienced (Solly et al., 2022).

Moreover, qualitative studies focusing on older adults reveal a nuanced understanding of climate change, where participants express concerns about the lack of leadership in addressing climate issues and emphasize individual responsibility in mitigating its effects (Salma et al., 2022). This suggests that although older adults may not be as vocal or active in climate advocacy, they possess a depth of understanding and concern that is often overlooked. Their perspectives are shaped by a lifetime of experiences, which can lead to a more cautious approach to climate change as they may prioritize immediate health and safety concerns over long-term environmental issues (Gamble et al., 2013).

In contrast, younger generations, particularly those in educational settings, often demonstrate a heightened awareness of climate change and its implications. Programs aimed at increasing climate literacy among youth have shown significant positive outcomes, fostering a sense of responsibility and urgency regarding climate action (Choi et al., 2021). This generational gap in perception is critical as it underscores the need for tailored communication strategies that resonate with different age groups. For instance, younger individuals may respond more positively to messages that emphasize immediate action and collective responsibility, while older adults might be more

influenced by discussions on health impacts and community resilience (Amin et al., 2023).

The relationship between age and climate perception is further influenced by cultural and socio-economic factors. In indigenous communities, for example, older generations often report more significant observations of environmental changes than younger members, indicating a deeper connection to the land and its changes over time (Herman-Mercer et al., 2016). This connection can influence how climate change is perceived and addressed within these communities, highlighting the importance of integrating traditional knowledge with contemporary climate science to develop effective adaptation strategies (Carothers et al., 2014).

Furthermore, the role of socio-economic status cannot be overlooked. Studies have shown that individuals from lower socio-economic backgrounds often have different perceptions of climate change, influenced by their immediate living conditions and access to resources (Bone et al., 2011). Climate change can exacerbate existing health issues in older adults, particularly those living in vulnerable situations, leading to a more acute awareness of climate-related risks (Abdullah et al., 2022). This demographic's unique challenges necessitate targeted interventions that consider their specific needs and vulnerabilities in the face of climate change.

In summary, the perceptions of climate change across different age groups are shaped by a complex interplay of factors, including education, socio-economic status, personal experiences, and cultural backgrounds. Although younger generations tend to exhibit greater concern and proactive attitudes toward climate change, older adults possess valuable insights and experiences that can help shape climate action. Understanding these differences is crucial for developing effective communication strategies and interventions that resonate with diverse populations, ultimately fostering a more inclusive approach to addressing climate change.

Despite the extensive research on generational differences in perceptions of climate change, there is still a significant gap in understanding how these perceptions translate into concrete actions, particularly in the face of apocalyptic scenarios. Although studies have explored how socio-demographic factors, education, and personal experiences shape climate change awareness, few have focused on the specific motivations and barriers to action across different age groups, especially when confronted with extreme future projections. Additionally, the existing literature often overlooks the role of autonomy and resistance to imposed measures, which emerged as key factors influencing generational responses in our study. Addressing this gap requires further investigation on how to effectively engage diverse generations in climate action by aligning communication strategies with their distinct preferences for voluntary *versus* imposed actions and leveraging their unique perspectives to drive meaningful change.

2 Methodology

As a methodological tool, a workshop was proposed and implemented both in person and online. This workshop, based on the development of a survey presenting multiple scenarios to respondents, acts as a catalyst to evaluate the interest, concern, and prespective of different generations regarding climate change and its future impacts on the current social-economic framework.

2.1 Survey design

The survey presents a series of apocalyptic scenarios in which, due to climate change, energy resources have been depleted, leading society into highly unfavorable situations. These situations, described below, were presented to each respondent at random in order to showcase a wide variety of potential futures that climate change may cause if no action is taken. This approach allows for the dissemination of a greater amount of information while simultaneously studying respondents' perceptions of these possible futures (Divassson et al., 2024).

- Electricity shortage: The decrease in fossil fuels has been too rapid to be compensated for by renewable energy sources in time, resulting in significant losses in the electrical system. Blackouts, supply failures, and long periods of electrical uncertainties are common.
- Reduced food production: Weather changes have drastically altered the environment, preventing the agricultural and livestock sectors from adapting and causing major problems in the supply chain. This has led to increased prices and reduced access to basic food for a large portion of the population.
- Reduced fuel for travel: Most gas stations have closed, and the few remaining stations are widely dispersed with prohibitive prices that prevent the average citizen from purchasing fuel. Transportation using fossil fuels has become accessible only to a fortunate few.
- Energy shortage for heating the home: Extreme temperature changes, which have increased demand, along with a scarcity of resources to meet the need, have put most of the population in a highly unfavorable situation, preventing them from maintaining healthy temperatures in their homes.
- Drought: Most areas without constant water sources and tributaries, such as large rivers, have lost their hydration sources, leading to the desertification of large parts of highly sunny regions and hindering any form of economic or social activity in these areas. Additionally, there are significant restrictions on water use, along with supply interruptions and decreases in water quality and potability.
- Raw material shortage: Extreme temperatures, fuel shortages, and resource exploitation have reduced the production of raw materials to levels insufficient to provide even the most basic services. There are widespread issues in the value chains of all types of common, sanitary, or commercial components.

It is important to note that no analysis was conducted to determine which scenarios were presented to the respondents as identifying scenarios with better or worse perceptions is not the objective of the study. The aim was to identify the generalized perception of different scenarios to which future society might be exposed due to climate change and resource overexploitation.

After presenting these extreme cases, respondents were provided with basic information on the current situation regarding various crises, highlighting how these scenarios might not be as fictitious as they seem. This was done with the intention of raising awareness and providing context to the respondents with respect to the following questions (Divassson et al., 2024):

TABLE 1 Demographic distribution of respondents by generation and gender.

	Male	Female	Non-specified	Total
Boomer	13	11	3	27
Gen X	20	9	9	38
Millennial	18	24	0	42
Gen Z	13	17	16	46
Total	64	61	28	153

1. What actions would you be willing to take to avoid this scenario?
2. Why do you think you are not taking these actions right now?
3. What do you think others (e.g., your family or friends) would do in this situation?
4. If a friend of yours was already doing these actions, what would you think of him/her?
5. How would you feel if someone imposed these actions on you instead of you making the decision voluntarily?
6. Do you think these actions should be encouraged among citizens? If yes, who and what actions should be carried out? If not, why do you think they should not be encouraged?

The responses to these questions were gathered qualitatively, allowing participants to share their most candid opinions without any constraints. Subsequently, two researchers independently reviewed and semi-quantified the responses visually, comparing their results to minimize bias.

2.2 Data collection procedure

This study used the survey as the main method of data collection, administered through the Prolific platform, a service specialized in obtaining anonymous samples with informed consent. The project was reviewed and approved by an ethics committee, ensuring compliance with current regulations on the protection of personal data and the consent of the participants. In addition, for data collection from Generation Z, special care was taken to ensure that all respondents were at least 16 years old at the time of the survey, in accordance with territorial regulations that allow them to participate without the need for parental authorization.

Additionally, in order to enrich the sample and cover possible absences in certain demographic groups, workshops were held. These began at the "Zientzia Azoka" science fair held in Bilbao in June 2022. During this event, more than 20 young people from Generation Z were interviewed, and their responses were subsequently clustered for analysis.

Subsequently, the workshop format was digitized and replicated in several additional sessions, engaging a broader spectrum of age groups. By extending the sample to other demographic groups, it sought to capture a deeper understanding of attitudes and perceptions toward climate change and associated challenges, which also facilitated the exploration of solutions tailored to different segments of society.

2.3 Population and sample

By combining the data obtained from both the survey and the workshop, we gathered responses from a population of 153 people. Regarding demographic aspects, four generational bands are considered, as outlined by Dimock (2019), and the gender distribution of the population is provided in Table 1.

The sample is homogeneous in both generational distribution and gender, ensuring balanced representation across key demographic groups. This homogeneity helps minimize bias and allows for more reliable comparisons across generations. Furthermore, the qualitative responses provided by the participants were analyzed using a rigorous labeling process. Two independent researchers categorized the responses under the thematic frameworks presented in the Results section. The categorizations were then compared for consistency, and any discrepancies were collaboratively reviewed and re-evaluated to ensure accuracy and reliability. This approach enhances the credibility of the findings by reducing potential subjective bias in the interpretation of qualitative data.

3 Results

Respondents' answers, collected qualitatively, have been clustered to enable a more cohesive and effective intergenerational analysis. The different clusters and their justifications are presented below.

In this subsection, an analysis of the data collected from the participants is presented. The analysis is structured to highlight the main trends and differences between generations and genders. It should be noted that we have not assessed the impact of educational level on the responses as 30% of the sample are still students, making this variable less representative for assessment (as it would be basically a repetition of the age-based assessment).

It is important to clarify that the percentages shown in the tables represent the proportion of labels assigned to responses within a generation, rather than the percentage of individuals within that generation. For instance, if 40% of the labels for boomers are categorized as X or Y, this does not mean that 40% of the boomers hold those views. The actual percentage of individuals may be higher as a single response can receive multiple labels. This approach reflects the distribution of themes or categories within the responses, not the overall population's agreement with those themes.

3.1 What actions would you be willing to take to avoid this scenario?

After presenting the scenarios presented in Section 2, the first question was posed. The clustering of the more than 250 items identified was conducted based on the following criteria:

- Sufficiency: change habits, such as reducing consumption or spending less.
- Nothing: unwillingness to take any further action.
- Efficiency: investing in efficiency measures, like buying a hybrid car or installing PV panels.
- Policymaking: regulating prices/consumption through energy management systems or similar approaches.

TABLE 2 Clustered responses for Question #1 (Supplementary Material): What actions would you be willing to take to avoid this scenario?

	Boomer	Gen X	Millennial	Gen Z	CORR
Sufficiency	51.7%	56.7%	59.7%	63.2%	−0.997
Nothing	3.4%	1.5%	0.0%	0.0%	0.948
Efficiency	31.0%	28.4%	29.0%	16.2%	0.824
Policymaking	13.8%	10.4%	9.7%	19.1%	−0.423
Others	0.0%	3.0%	1.6%	1.5%	−0.355

TABLE 3 Clustered responses for Question #2 (Supplementary Material): Why do you think you are not taking these actions right now?

	Boomer	Gen X	Millennial	Gen Z	CORR
Comfort	33.3%	42.3%	47.1%	40.0%	−0.592
Unawareness	29.6%	25.0%	29.4%	33.3%	−0.555
Regulatory	0.0%	3.8%	0.0%	5.0%	−0.554
Economic	18.5%	17.3%	19.6%	15.0%	0.523
Others	18.5%	11.5%	3.9%	6.7%	0.887

- Others: other types of actions like educating one's community or investing in research or technology adoption.

Thus, Table 2 shows how many respondents would be willing to take action under the previous categories. The column "CORR" shows the Pearson product–moment correlation coefficient, with a color gradient ranging from very strong (red) to very weak (purple) correlations, based on the electromagnetic spectrum.

Sufficiency emerges as the most frequent response across all generations, with Gen Z reporting the highest percentage (63.2%). A very strong negative correlation (−0.997) (Akoglu, 2018) reveals that as the proportion of "Sufficiency" responses increases, the average age of respondents decreases.

Conversely, "Nothing" demonstrates a strong positive correlation (0.948), which increases with age. Similarly, "Efficiency" also increases with age, although its correlation value (0.824) is slightly weaker. On the other hand, "Policymaking" and "Others" exhibit weak negative correlations (−0.423 and −0.355, respectively), indicating that their prevalence decreases as age increases.

3.2 Why do you think you are not taking these actions right now?

Based on the scenarios presented above, the second question was posed. More than 100 items are quantified as follows:

- Comfort: unwillingness to lose comfort.
- Unawareness: lack of interest, information, or disinformation on the subject.
- Regulatory: lack of governmental action to promote/strengthen their action.
- Economic: lack of financial resources to act.
- Others: any other reason, like mental health or aversion to the topic.

Based on these quantifications, the answers obtained are presented in Table 3. Same as mentioned before, CORR shows the Pearson product–moment correlation coefficient.

The correlation of most responses falls within a moderate range, with "Comfort," "Unawareness," and "Regulatory" categories showing very similar values (−0.592, −0.555, and −0.554, respectively), which decrease in frequency as age increases. In contrast, "Economic" and "Others" increase with age, with the latter showing greater robustness (0.523 and 0.887, respectively).

3.3 What do you think others (e.g., your family or friends) would do in this situation?

After the previous questions on self-perception, this third question was asked to understand the respondents' perception of their environment. More than 100 items are clustered into the following categories.

- Actively participate/contribute/solve problems: prioritize change by making costly or complex implementations, reducing their investments in other aspects to refocus on adaptation.
- Protest: socio-political action demanding changes from regulatory institutions.
- Change gradually: modification of behavior and/or gradual adaptation of infrastructures/tools.
- Do whatever is possible: do whatever is within one's capabilities, tempered by access to resources.
- Hoard resources: ignore common needs and exploit resources for personal gain.
- Do nothing: do not change behavior or implement any measures.

Table 4 shows the result of this quantification.

As observed, the responses in this table do not show strong correlations, making the variances only indicative rather than significant. Notably, in "Change gradually," intermediate generations (Gen X and Millennials) place less importance on this response than younger and older generations. Conversely, a different pattern emerges with "Hoard resources," where intermediate generations are the only generations to mention it.

3.4 If a friend of yours was already doing these actions, what would you think of them?

Based on the measures outlined above to avoid a catastrophic scenario, the following question was posed to the respondent. More than 100 items are quantified under the following labels:

- Admiration: genuine admiration and wholehearted support for their efforts.
- Approval: general acceptance without strong positive or negative feelings.

TABLE 4 Clustered responses for Question #3 (Supplementary Material): What do you think others (e.g., your family or friends) would do in this situation?

	Boomer	Gen X	Millennial	Gen Z	CORR
Change gradually	36.0%	25.0%	25.6%	46.7%	−0.374
Do nothing	8.0%	17.5%	4.7%	6.7%	0.361
Protest	0.0%	7.5%	0.0%	0.0%	0.229
Actively participate	16.0%	15.0%	23.3%	10.0%	0.208
Do whatever is possible	40.0%	32.5%	44.2%	36.7%	−0.038
Hoard resources	0.0%	2.5%	2.3%	0.0%	−0.025

TABLE 5 Clustered responses for Question #4 (Supplementary Material): If a friend of yours was already doing these actions, what would you think of them?

	Boomer	Gen X	Millennial	Gen Z	CORR
Admiration	18.5%	33.3%	42.9%	47.2%	−0.980
Approval	55.6%	43.6%	42.9%	28.3%	0.953
Exemplary	18.5%	15.4%	11.9%	13.2%	0.883
Unawareness	0.0%	0.0%	0.0%	1.9%	−0.752
Reluctance	7.4%	7.7%	2.4%	9.4%	−0.011

TABLE 6 Clustered responses for Question #5 (Supplementary Material): How would you feel if someone imposed these actions on you instead of you making the decision voluntarily?

Attitude	Boomer	Gen X	Millennial	Gen Z	CORR
Expectance	23.5%	19.5%	21.4%	11.1%	0.960
Oppression	7.4%	12.2%	11.9%	16.7%	−0.940
Irritation	56.0%	39.0%	54.8%	55.6%	−0.643
Confidence	3.6%	0.0%	0.0%	3.7%	−0.319
Rationalism	7.1%	29.3%	11.9%	13.0%	−0.211

- Exemplary: recognition as a role model whose actions are worth emulating.
- Unawareness: a lack of significant interest or understanding of the value of their actions.
- Reluctance: doubt or suspicion regarding their true intentions, potentially accompanied by the belief that their actions are exaggerated or insincere.

The answers obtained by examining these labels are shown in Table 5.

Most responses show a strong correlation across generations. “Approval” and “Exemplary” increase with age, displaying high correlation values (0.953 and 0.883, respectively). Conversely, “Admiration” (−0.980) and “Unawareness” (−0.752) also exhibit strong negative correlations, increasing as the sample gets younger. “Reluctance,” on the other hand, does not show a clear correlation in either direction, although a noticeable dip can be observed in the Millennials’ responses.

3.5 How would you feel if someone imposed these actions on you instead of you making the decision voluntarily?

With regard to the forced implementation of the previously expressed measures (by a power entity, such as a governmental body), respondents respond to their perception of the measures. The answers are evaluated based on the following labels:

- Expectance: they do not convey much opinion in the absence of knowing the more specific characteristics of the imposition.
- Oppression: they would feel oppressed by the new rules, questioning their personal freedoms.
- Irritation: they feel anger and irritation about the imposition.
- Confidence: they have full confidence in the entity (or entities) that has (or have) established the imposition as the best option.
- Rationalism: rationalize the imposition and perceive it as appropriate to the needs.

Table 6 shows the results of the abovementioned question.

“Expectance” and “Oppression” display strong but opposing correlations (0.960 and −0.940, respectively), indicating that responses for “Expectance” increase with age, while those for “Oppression” decrease. Similarly, “Irritation” also decreases with age, although its correlation is less pronounced (−0.643). “Confidence” and “Rationalism” follow the same downward trend with age, but their correlations are weaker (−0.319 and −0.211, respectively).

3.6 Do you think these actions should be encouraged among citizens? If yes, who and what actions should be carried out? If not, why do you think they should not be encouraged?

Table 7 demonstrates the participants’ interest in encouraging the measures against climate change presented in the previous questions.

Most respondents answer “yes,” with younger individuals more likely to condition their “yes” responses more frequently, as shown

TABLE 7 Participants' willingness toward encouraging measures against climate change.

	Boomer	Gen X	Millennial	Gen Z	CORR
Cond. yes	7.4%	10.3%	7.1%	16.7%	−0.702
Yes	85.2%	75.9%	83.3%	73.3%	0.636
No	0.0%	13.8%	7.1%	3.3%	−0.111
Unspecified	7.4%	0.0%	2.4%	6.7%	0.035

by a correlation of −0.702. In contrast, older respondents are less likely to impose conditions, with a positive correlation of 0.636. Negative responses are in the minority and are mostly associated with extremes, such as conspiracy theories, misinformation, or religious matters.

Table 8 shows who is considered responsible.

The responsibility of companies is more closely associated with younger generations, with a correlation of −0.827, while educational institutions are more associated with older generations (0.768). "Communities" and "Authorities," with lower correlations (−0.393 and −0.346, respectively), also show a slight tendency toward younger ages. Meanwhile, "Unspecified" does not exhibit significant variation across generations.

Following "*who*" should take action comes "*what*" should be done, as referenced in Table 9.

Research, although the least mentioned, is consistently referenced more by older generations (0.773), similar to education, albeit with a weaker correlation (0.549). In contrast, younger generations tend to discuss restrictions (−0.689) and behavior (−0.549) more frequently. The development of incentive policies is mentioned relatively uniformly across generations (0.006).

4 Discussion

The analysis of generational responses reveals profound differences in values and priorities across the four generations studied, namely, Baby Boomers, Generation X, Millennials, and Generation Z. These generational shifts illustrate how age, lived experiences, and socioeconomic contexts shape individuals' perspectives on societal issues. Each generation emphasizes distinct aspects of responsibility, authority, and societal roles, shedding light on the nuanced interplay between personal agency and collective responsibility.

The propensity to modify one's own behavior appears more pronounced among younger generations, particularly Generation Z. This suggests that younger individuals may be more inclined to view personal sufficiency as a viable response to societal challenges. A plausible explanation could be that their current economic circumstances limit their capacity to engage in more impactful actions (Eichelberger and Pikkemaat, 2023). Alternatively, this emphasis on sufficiency might reflect a broader cultural shift toward minimalism and conscious consumption, values often associated with younger cohorts (Shukla et al., 2023).

Interestingly, levels of "irritation" and "reluctance" decrease with age. Younger generations, such as Gen Z and Millennials, are more likely to express these sentiments, potentially due to the oppositional tendencies often observed during youth (Amit and Wulff, 2024). Millennials, in particular, demonstrate a notable decrease in their responses to "reluctance," which may signify a growing dissatisfaction with entrenched societal structures as they navigate a world undergoing rapid technological, social, and economic transformations. This dissatisfaction might originate from their position as a transitional generation, caught between traditional frameworks and emerging paradigms (Nath et al., 2023). When examining responses related to "expectance" and "oppression," opposing correlations with age emerge, further emphasizing how generational perspectives diverge in interpreting societal pressures and obligations.

TABLE 8 Responsibility for implementation of measures according to participants.

	Boomer	Gen X	Millennial	Gen Z	CORR
Companies	4.0%	6.3%	6.4%	21.2%	−0.827
Educational centers	16.0%	6.3%	2.1%	6.1%	0.768
Communities	40.0%	9.4%	19.1%	9.1%	−0.393
Authorities	8.0%	37.5%	59.6%	27.3%	−0.346
Unspecified	32.0%	40.6%	12.8%	36.4%	0.099

TABLE 9 Actions to be carried out according to the participants.

	Boomer	Gen X	Millennial	Gen Z	CORR
Research	10.0%	0.0%	2.4%	0.0%	0.773
Policymaking (restrictions)	0.0%	8.7%	7.3%	7.1%	−0.689
Behavior	20.0%	13.0%	17.1%	28.6%	−0.549
Education	50.0%	47.8%	39.0%	46.4%	0.549
Policymaking (incentives)	20.0%	30.4%	34.1%	17.9%	0.006

One of the most remarkable findings is the generational variance in attitudes toward responsibility. Baby Boomers strongly emphasize community responsibility, viewing it as a moral and ethical obligation that should originate from individuals and communities rather than being imposed by formal institutions. Notably, this generation assigns relatively little responsibility to authorities, reflecting their belief in grassroots ethics over institutional governance. In stark contrast, Generation Z places significant emphasis on corporate responsibility. This cohort's heightened awareness of social and environmental issues, combined with the visibility of corporate influence, reinforces their expectation that businesses should play an active role in addressing societal challenges.

Millennials, on the other hand, demonstrate a strong reliance on authorities to address societal concerns. This preference for institutional action may stem from their formative experiences during periods of rapid technological and social evolution, which likely reinforced their trust in structured governance to navigate complex challenges (Nath et al., 2023). Millennials' focus on institutional frameworks reflects a broader belief in the importance of systemic change as a driver of societal progress.

Across all generations, there appears to be a notable consensus regarding the importance of structured incentives to foster change. The relatively uniform agreement on this topic suggests a shared recognition of the role that policy frameworks play in catalyzing collective action. However, the lack of significant generational variation highlights deeper differences in how these policies should be implemented and by whom.

A critical yet often overlooked dimension of sustainable consumption is the issue of energy poverty. Although some individuals enjoy the privilege of making deliberate choices regarding their consumption habits, many others face economic constraints that severely limit their ability to engage in sustainable practices. As one participant eloquently expressed:

> Honestly, when "the citizenry" can choose whether to buy one car, five, or none, or have the possibility of eating steak every day, or can afford to put the heating or a couple of cookers in winter without shivering thinking about the electricity bill (or gas bill, whoever uses it), at that point, you can talk about energy sobriety and so on. When your goal is simply to make ends meet without anything breaking your budget, you do not give a damn about energy sobriety (translated from Spanish).

This statement underscores the stark disparity between those who can afford to prioritize sustainability and those constrained by economic vulnerability. Discussions on sustainable consumption must integrate this perspective as overlooking energy poverty risks perpetuating inequities. Future research should delve deeper into how generational perspectives on sustainability intersect with socioeconomic realities, particularly in contexts where energy affordability remains a pressing challenge.

5 Conclusion

This study highlights significant differences in generational perceptions and attitudes toward climate change, reflecting the influence of historical, socioeconomic, and cultural contexts. The key conclusions of this study as follows:

- Generational divergences in perceptions of responsibility: Baby Boomers stand out for their trust in the system and their focus on community and educational institutional responsibility. Although they are willing to modify aspects of their daily lives, their actions are often justified more in economic than ethical terms. This generation demonstrates a positive attitude toward their own efforts but remains more detached from the value of role models. In contrast, Generation Z, the most critical and climate-conscious generation (Tyson et al., 2021), exhibits pronounced skepticism toward institutions and places significant responsibility on corporations. This underscores a generational shift toward higher expectations of corporate accountability and diminished faith in traditional systems.
- Resistance to imposed measures: Both Millennials and Generation Z display resistance to imposed measures, albeit for different reasons. Millennials express caution about the validity of such actions, while Generation Z perceives them as an infringement on their autonomy, which is consistent with youth psychology (Amit and Wulff, 2024). This resistance highlights the need to design policies that are viewed as inclusive and respectful of individual aspirations rather than restrictive or coercive.
- Role of education and incentives: There is cross-generational consensus on the importance of education as a key tool for addressing climate change. However, each generation has different expectations regarding its implementation. Baby Boomers and Generation X emphasize the role of institutions in environmental education, while Millennials and Generation Z call for more direct policies and tangible incentives to encourage behavioral change.
- Impact of economic factors and inequality: The findings reveal a significant relationship between generational perceptions of climate action and economic barriers. Generation Z identifies economic factors as the primary limitations to adopting sustainable behaviors, a concern that also resonates with Baby Boomers. This underscores the urgency of addressing issues like energy poverty and socioeconomic inequalities to ensure that climate policies are inclusive and accessible to all population sectors.
- Growing distrust in institutions: The study highlights a growing pattern of distrust toward institutions among younger generations, particularly Millennials and Generation Z. This shift underscores the need to renew institutional legitimacy through greater transparency, accountability, and improved communication about ongoing climate efforts.

In summary, generational differences not only reflect the unique priorities and challenges of each cohort but also suggest the need to adopt diversified approaches to address climate change. Public policies must consider these nuances, fostering intergenerational collaboration, strengthening education, and ensuring that proposed incentives and measures are inclusive, equitable, and effective. Only

a holistic approach will allow us to meet the demands for climate action from current and future generations.

6 Future work

Future research should delve deeper into the relationship between sustainable consumption and energy poverty. Although this study explored generational attitudes toward climate action, it is crucial to consider how economic vulnerability limits the capacity of individuals to adopt sustainable practices. Understanding how to bridge this gap between sustainability and affordability is essential for ensuring that climate action is inclusive and equitable. This includes addressing issues such as energy poverty, where individuals are unable to make choices about their energy consumption due to financial constraints.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary Material; further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by the Comité de Ética de la Universidad de Deusto. The studies were conducted in accordance with the local legislation and institutional requirements. Written informed consent for participation in this study was provided by the participants' legal guardians/next of kin.

Author contributions

AD-J: data curation, formal analysis, investigation, methodology, visualization, writing–original draft, and writing–review and editing. AA-M: conceptualization, validation, writing–original draft, and writing–review and editing. CQ: conceptualization, resources, writing–original draft, and writing–review and editing. DC-M: investigation, writing–original draft, and writing–review and editing. CB: funding acquisition, investigation, methodology, resources, validation, writing–original draft, and writing–review and editing.

Funding

The author(s) declare that financial support was received for the research, authorship, and/or publication of this article. The research leading to this study received funding from the European Union Horizon 2020 Research and Innovation Program under grant agreement no. 891943 (WHY project); the Ministry of Science and Innovation of Spain under PID 2020-119682RB-I00; the "Grupos de Investigación del Sistema Universitario Vasco, Departamento de Educación, Universidades e Investigación" (Grupos: IT1677-22 and IT1582-22); the University of Deusto by the "Formación de Personal Investigador" (FPI-UD, 2020); IA4DER: Infraestructura de datos y servicios para el despliegue masivo de Recursos Energéticos Distribuidos en la red eléctrica (KK-2023/00083); and Grant PCI2023-145951-2 funded by MCIN/AEI/10.13039/501100011033 under the Driving Urban Transitions Partnership, which has been co-funded by the European Commission.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The authors declare that Gen AI was used in the creation of this manuscript. For the creation of this text, generative AI tools were used to facilitate the writing of certain sections (GPT-4o, GPT-4o mini, and Gemini 1.5 Flash). It is important to note that the original texts upon which this tool operated are either authored by myself or were previously agreed upon with the original authors. The AI tools were solely employed to refine the writing, preserving the integrity and meaning of the original content throughout.

Publisher's note

Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fenvs.2025.1511398/full#supplementary-material

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